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MECHANICAL FUEL LOAD REDUCTION TRIALS – SOCIAL ATTITUDES

June 2018

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ACKNOWLEDGEMENTS

We thank the 49 stakeholders who dedicated time and effort to participate in our mechanical fuel load reduction workshops and phone interviews, and the several thousand survey respondents who contributed their time and energy to complete survey questions related to this project. We would also like to thank all those who contributed to developing and testing the survey questions and helping organise workshops, including staff at the NSW Department of Industry, the mechanical fuel load reduction project trial proponents, stakeholders who distributed workshop invitations, researchers at the University of Canberra, and those who assisted in testing and discussing the survey questions. This project was funded by the NSW Department of Industry.

This report forms a component of the Mechanical Bushfire Fuel Load Reduction trials. The Australian Government is providing \$1.5 million, under a National Partnership with the NSW Government, to undertake the Mechanical Bushfire Fuel Load Reduction trials. These trials are part of the National Bushfire Mitigation Programme (NBMP), which provided \$15 million over three years to states and territories to implement long-term bushfire mitigation strategies and improved fuel reduction activities.

The Mechanical Bushfire Fuel Load Reduction trials aim to establish whether mechanical thinning of forests can reduce bushfire risk in an economical, socially acceptable and environmentally sound manner around key assets, such as conservation areas or townships, where prescribed burning is undesirable for a range of reasons.

EXECUTIVE SUMMARY

Managing bushfire risk is an important issue across Australia. Controlled burning is a common fuel management strategy used to reduce bushfire risk, but is not always possible or appropriate. In recent years some government inquiries have recommended using a greater suite of fuel management options to reduce bushfire risk, including greater use of ‘mechanical fuel load reduction’ (MFLR), particularly near residential areas or other assets, along roadsides and in other areas where controlled burning may not be an option. In 2016, the National Partnership for Mechanical Fuel Load Reduction Trials was initiated as part of the National Bushfire Mitigation Programme. The objective of the trials, conducted in three regions (one in Victoria, one in New South Wales and one in Western Australia), was to begin to address gaps in knowledge about the effectiveness of using MFLR, to improve understanding of the environmental, economic and social implications of doing so, and to make recommendations regarding the future use of this strategy alongside other fuel management strategies in Australia’s forested areas.

As part of the project, researchers at the University of Canberra were commissioned to examine the social acceptability of MFLR (‘social acceptability study’), the subject of this report. The objectives of the social acceptability study were to identify the extent to which using MFLR is considered acceptable by different people and groups, and to understand key factors that influence social acceptability of using mechanical fuel load reduction.

Social acceptability of MFLR

While multiple studies have examined the social acceptability of various natural resource management practices, relatively little has examined acceptability of MFLR. From available work relevant to MFLR (including studies examining acceptability of MFLR, of controlled burning, and more broadly of natural resource management practices), several key factors were identified that are likely to influence the social acceptability of MFLR. These include:

- Geographic and socio-demographic characteristics (e.g. a person’s gender, age or the location in which they live)
- A person’s perceptions of
 - the problem being addressed (e.g. bushfire risk)
 - the effectiveness of proposed actions (does MFLR reduce bushfire risk in a given situation)
 - the benefits and costs of a proposed action (what positive and negative outcomes does a person believe will result from use of MFLR)
- The way the proposed action is designed and implemented (is MFLR being conducted in appropriate ways)
- Governance (who is making decisions about MFLR and how)

- Values and norms relevant to the action (for example about the relative priority of protecting the environment versus reducing bushfire risk), and
- Past experiences.

Methods

Both quantitative and qualitative data were collected and analysed in this study.

Quantitative data were collected via a survey of people living across Australia, in which they were asked their views about MFLR. This provided a robust assessment of initial views about the use of MFLR across the population and for different types of people and people living in different locations. Data were collected by including questions about MFLR in the University of Canberra's annual Regional Wellbeing Survey (RWS). Survey items were designed in a multiple stage process that included focus group and pilot testing. The sample frame involved recruiting stratified random samples from different regions and groups. A total of 13,302 people took part in the 2016 RWS; of these, over 11,500 answered questions about acceptability of mechanical fuel load reduction and controlled burning, and over 9,000 answered other questions related to mechanical fuel load reduction and controlled burning. Individual response figures are given when results are presented for each question in this report. Weighting of the data set was used to correct deliberate biases introduced due to the stratification of the sample, as well as to correct unintentional biases, and ensure where appropriate results were representative of the adult population.

Qualitative data were collected via stakeholder workshops held in each of the three trial site locations, as well as phone interviews for those who were interested in the project but could not attend a workshop. MFLR is not a familiar practice amongst the general public, and views are likely to be influenced by how key stakeholders view the use of MFLR. Interviewing these stakeholders provided important insight into the factors influencing social acceptability of MFLR amongst key groups who are involved in land and fire management, and who are key influencers of public opinion about different management practices. A total of 49 stakeholders participated in workshops and interviews. The aim was to ensure that as wide a diversity of views was included as possible, with the overall criteria for inclusion being that a stakeholder group had interest in, knowledge or, or may be affected by the implementation of MFLR. Most participants represented either bushfire management, environmental non-government organisation (ENGO), forest industry or natural resource and land management organisations. Fewer represented recreational users, Traditional Owners, and commercial users other than the forest industry, with lower interest in participating from these groups despite active efforts to involve them in the study.

Acceptability of MFLR

Social acceptance of an action is something that can change over time, and which will depend on how that action is designed, implemented and managed. This means that the

survey data collected in this project assessed initial views about the social acceptability of MFLR. As MFLR is a relatively new practice in Australia, currently implemented in relatively small areas typically close to built infrastructure, these initial views provide an indication of the 'starting position' of acceptability – whether members of the community and members of different stakeholder groups are starting with a relatively positive or negative perception of MFLR – but are likely to change as people are exposed to information on MFLR. Stakeholder interview/workshop data provides a useful indicator of the factors that will influence how attitudes to MFLR change if it is more widely implemented.

In the survey of Australians, 50% of rural and regional Australians and 42% of people living in major cities felt MFLR was acceptable to some degree, less than the 76% of both groups who felt controlled burning was an acceptable practice in their local area. Close to one-third (30%) of rural and regional Australians, and 32% of major city residents, felt MFLR was unacceptable, compared to 10% and 8% of rural/regional and urban residents who found controlled burning unacceptable. The remainder were neutral or 'unsure'. Very few people felt they would not support MFLR under any circumstances (13%), and 62% of rural/regional and 57% of major city residents agreed that they *might* support MFLR depending on how it was done, higher than the proportion who support the idea of MFLR more generally. This suggests that initial views about MFLR, while more positive than negative, are highly subject to change depending on the types of information and views they are exposed to about MFLR.

People living in cities were less likely to find MFLR acceptable than those living in more rural and remote regions. People were significantly more likely to find MFLR acceptable if they were male, earned higher household income, had lower levels of formal education, and were employed in wood-related industries.

In stakeholder workshops and interviews, similar to the survey findings, almost all participants stated that they would support MFLR under some circumstances. However, the large majority also indicated they would oppose the use of MFLR in some (or many) circumstances. These circumstances, and factors that influenced levels of support for MFLR under different circumstances, were explored in detail.

Factors influencing acceptability of MFLR

Seven key factors were explored when examining the circumstances in which people would find MFLR more or less acceptable: perceived need for MFLR, perceived effectiveness of MFLR, perceived benefits and costs, how MFLR is designed and implemented, how MFLR is governed, values and norms, and past experiences.

Perceived need

The extent to which a person finds MFLR acceptable is likely to be influenced by whether they believe there is a problem that requires action – in this case, a need to reduce fuel loads in order to reduce bushfire risk.

More than half of rural and regional Australians (54%) and urban Australians (55%) felt that they lived in an area with high bushfire risk. Fewer - 36% of rural and regional Australians and 39% of urban Australians – were specifically worried about the potential impact of bushfires on their property or business. When asked whether fuel loads were too high in their local region, around one-third agreed (36% of rural/regional residents and 31% of major city residents), 32% of both groups disagreed, and many were unsure (17% of rural/regional and 24% of major city residents). Similarly, when asked whether it was difficult to get enough controlled burning done in their region, 30-40% of people were unsure, while around one-third agreed. If a person felt there was high bushfire risk in their region, were worried about impacts of bushfires, felt fuel loads were too high, and/or felt it was difficult to get enough controlled burning, they were significantly more likely to feel that MFLR is acceptable.

In workshops and interviews, while all attendees agreed on a need to manage bushfire risk in the landscape, they often differed substantially in their views on the most appropriate methods of reducing this risk, and about the circumstances in which they felt there was a legitimate need for MFLR as part of bushfire risk reduction strategies in different circumstances. In particular, many felt that MFLR was needed only in specific circumstances, and some felt that investment in fuel reduction efforts in general was inappropriately high due to reactionary approaches to bushfire management and negative social norms about fire in the landscape. The location or scale at which MFLR is implemented was a key consideration in assessing perceived need. A need for MFLR was most commonly identified as occurring in specific, small-scale areas to address specific risks, particularly near assets such as built infrastructure or plantations, and in situations where other bushfire risk reduction strategies were not feasible. Fewer felt there was a need for MFLR at larger landscape scales.

Perceived effectiveness

The extent to which a person feels that MFLR will be effective in reducing risk of damage from bushfires through reducing fuel load and/or fuel structure will also influence perceived acceptability of MFLR. This topic was discussed in stakeholder workshops and interviews. Many stakeholders felt that MFLR could be effective in specific situations, specifically where there was evidence it might reduce speed or spread of fire near built infrastructure. Many did not feel it would be effective at larger landscape scales. It was typically viewed as effective if it formed part of an integrated toolbox of strategies that were used together to reduce risk of bushfire damage. Multiple questions were asked about effectiveness of MFLR by stakeholders who wanted these questions to be answered by the trials or other processes. These questions included what types and structures of fuels should be removed for greatest effectiveness; how long fuel reduction would be effective, whether there would be rapid regrowth of vegetation and of fire risk; and how often MFLR treatment might be needed in different forest types. More broadly, some stakeholders felt that effectiveness

needed to be assessed with consideration for the relative environmental impacts of MFLR versus other fuel reduction strategies that might have similar effectiveness in reducing fuel loads.

Perceived benefits and costs

A person's beliefs about the benefits and costs associated with the implementation of a natural resource management practice influence how acceptable they find that practice. The survey asked about perceptions of impacts of MFLR and controlled burning on three key areas: forest and vegetation health; animal and bird populations; and human health and impacts. Around one-third of respondents were unsure, selecting 'don't know' in response to these questions. Around one-quarter felt MFLR would be good for forest and vegetation health while a similar proportion felt it would have negative impacts; controlled burning, meanwhile, was considered positive for forest/vegetation health by 67% of both rural/regional and major city residents. When asked if MFLR is likely to harm animal and bird populations, 44% of rural/regional and major city residents agreed, and 20% of rural/regional and 18% of major city residents agreed. Controlled burning was viewed as slightly less likely to harm animal and bird populations. People were more likely to worry about the impacts of controlled burning on human health compared to MFLR: 24% of rural and regional residents and 25% of major city residents agreed that they worry about the effects MFLR could have on human health, compared to 39% of both groups who worried about health effects of smoke from controlled burning. There was a strong association between overall views about acceptability of MFLR and perceptions of its benefits and costs.

In stakeholder workshops and interviews, potential benefits of MFLR were more commonly discussed by representatives involved in bushfire management and forest management, while concerns about negative impacts (costs) were more commonly discussed by representatives of ENGOs and NRM organisations. Impacts of MFLR for environmental health, bushfire risk, cost effectiveness, commercial sale of timber, the forest industry, other industries, human health, and landscape aesthetics were discussed.

When discussing environmental impacts, multiple topics were discussed. One of the most common was concern about potential for loss of biodiversity when vegetation was removed in MFLR, although a small number discussed situations in which MFLR could assist regeneration of specific species, or protect important habitats with high vulnerability to damage from fire. Potential impacts on forest structure were also discussed: some felt that MFLR had potential to help restore some forest structures that were under-represented in the forest estate, while others were concerned that in long-term repeated application of MFLR to a given area would change stand structure in negative ways, including potential loss of particular layers of understory and/or age classes of trees. MFLR was also viewed as needing to be carefully managed to reduce potential for spread of invasive weeds, while providing potential avenues for managing large woody weeds such as pine wildings. Concerns about potential impacts of use of machinery on soil health, particularly soil

compaction, as well as concerns about impacts of clearing groundcover vegetation on soil health, were also raised.

One of the most commonly cited potential benefits of MFLR was the ability to increase the toolbox of options fire managers have for reducing bushfire risk, particularly by providing an option that could be applied in situations in which controlled burning is not an option, or in situations where MFLR might enable subsequent re-introduction of controlled burning (for example in areas of NSW forest affected by bell-miner associated dieback). Others spoke more specifically about the trials, feeling they provided some insight into whether use of MFLR could be extended beyond current uses that often focus on slashing and mowing of grasses, to the mechanical removal of other layers of vegetation.

The financial cost of MFLR, and how cost effective it is compared to other fuel reduction strategies, was raised by several participants. Many felt that MFLR would not be cost effective compared to controlled burning in situations where both were feasible options, with this contributing to the commonly held view that MFLR was appropriate as a tool to be used where other options were not feasible, but not generally in competition with them, although some argued MFLR would be cost effective if conducted at large scales that reduced the fixed costs of floating machinery to individual sites.

Closely related to discussions of cost effectiveness were discussions about the commercial sale of timber removed during MFLR. This was a key issue in most focus groups and interviews, with some feeling that any commercial sale of removed materials would result in substantial problems, while others felt this was one of the potential benefits of MFLR compared to other fire control methods. Some stakeholders – predominantly some of those involved in managing forests for timber production – felt that commercial sale of removed timber could make MFLR cost effective. However, this was often reliant on achieving a scale and volume sufficient to support an industry, something which raised significant concerns for other stakeholders. Stakeholders from ENGO groups, and some NRM representatives, were generally actively opposed to commercial sale of material removed using MFLR, viewing this as ‘logging by stealth’ that, even if done with good intentions, would result in perverse outcomes due to commercial interests becoming a driver of decision making, rather than considerations of bushfire risk reduction.

Other benefits and costs were discussed by fewer people: some forest industry representatives felt it could provide new silvicultural options in forest areas managed for timber production; potential benefits for grape growers compared to use of controlled burning were also identified; a need to understand impacts on pollen production and apiarists was identified; MFLR was identified as potentially better for human health than controlled burning due to reducing health impacts from smoke; and the need to manage appropriately for animal welfare impacts was also raised.

Design and implementation

The way MFLR is designed and implemented will influence the extent to which it is viewed as acceptable. This was predominantly examined in stakeholder interviews and workshops, where the most common topics raised related to:

- the locations in which MFLR is applied: most stakeholders supported use in locations near specific at-risk infrastructure such as buildings but often not in other locations
- scale of implementation: most stakeholders supported smaller-scale application of MFLR, but many would not support large-scale application
- frequency of application, type of vegetation removed, and machinery used: these aspects of design would influence about effectiveness of MFLR and potential environmental impacts, and stakeholders often wanted more information about how best to design these aspects
- use of removed material: several stakeholders felt that commercial sale of removed material was unacceptable; others supported it. Almost half (49.6%) of rural and regional Australians, and 44.1% of major city residents, would support sale of timber removed in MFLR, while 20% would not support it and many (21.2% of rural/regional and 27.2% of urban Australians) were unsure.
- integration of MFLR with other actions to manage bushfire risk: MFLR was in general viewed as more acceptable if undertaken as part of an integrated strategy to manage bushfire risk that involved multiple actions, rather than being undertaken separate to broader bushfire management action.

A common over-riding theme was a need for clear guidance on when MFLR was and wasn't an appropriate action to implement, and for clarity about the guiding objectives that would be used to determine this. Stakeholders often expressed a desire for this type of guidance to be provided as an outcome of the MFLR trials.

Governance

The way MFLR is governed – in other words, the processes by which decisions are made about whether, when, where and how MFLR will be undertaken, and the organisations that make these decisions – will influence the extent to which a person finds MFLR acceptable.

In the survey, questions about governance focused on understanding the extent to which different organisations would be trusted to make decisions about MFLR, as this is a key indicator of the extent to which there is likely to be social acceptance of these decisions. The group most trusted to undertake both MFLR and controlled burning was rural and volunteer fire brigades, with 59% of rural/regional and 53% of urban Australians having high trust in this group to undertake MFLR, while 80% of both rural/regional and urban Australians had high trust in this group to undertake controlled burning. National Park managers were the next most trusted group: 53% of rural/regional and 56% of major city residents trusted them to undertake MFLR. Government-owned forestry

agencies/businesses were trusted by fewer: around two in five people trusted these agencies to undertake MFLR. Farmers and private forestry companies/logging contractors were less commonly trusted to undertake MFLR.

When stakeholders discussed governance, acceptability of MFLR was contingent upon trust that agencies involved were trustworthy based on past experience, had the skills and knowledge required to manage for both bushfire mitigation and ecological aspects of forest management, and did not have conflicts of interest. Forestry agencies had low trust from ENGO stakeholders, and sometimes other stakeholders, due to both a legacy of conflict about forest management, and concern that these agencies would have conflicts of interest when making decisions about MFLR, between bushfire risk reduction and making commercial return. Fire management organisations and agencies were more widely trusted to make decisions about MFLR. Some stakeholders suggested that rather than having single organisations responsible for all or the majority of decision making about MFLR, or more broadly about fire risk management, it was better to have governance arrangements in which multiple stakeholders shared responsibility for decision making. This was viewed as ensuring that different interests were considered and needed to be satisfied in decision making, and reducing the risk of decision making being biased to particular interests.

To be acceptable to most stakeholders, governance systems for MFLR should be designed to be integrated with decision making about bushfire risk reduction more generally. They should provide space for evidence-based decision making, and require appropriate environmental and animal welfare assessment prior to MFLR, training of operators, monitoring and assessment of outcomes, and accountability for outcomes. Any sale of materials should be managed in ways that ensure commercial imperatives do not become a driver of decisions about when and where MFLR will be used. Ideally, clear guides or codes of practice should be developed to govern on-ground practices and this should occur in a legislative and regulatory environment that places appropriate conditions on when, where and how MFLR occurs, while also enabling it to be undertaken where it is appropriate rather than placing tenure-based restrictions on when and where it can occur. More broadly, a need for long-term and stable political support for bushfire risk reduction was identified, with concern that specific practices such as MFLR might be promoted in the short-term rather than longer term investment in an integrated set of bushfire risk reduction strategies.

Values and norms

A person's values and norms – deeply held beliefs, and expectations about acceptable behavior, that guide a person in determining what they believe to be right or wrong – will influence the extent to which they believe MFLR is an acceptable practice.

Survey participants were asked the extent to which they found a number of activities acceptable or unacceptable, including MFLR and controlled burning. People were significantly *more* likely to find MFLR acceptable if they also felt that (i) logging native forest

for wood production, (ii) open-cut mining and (iii) growing genetically modified crops was acceptable. This suggests that if a person believes that humans are capable of successfully harvesting, mining or manipulating natural resources without causing significant harm, they are more likely to support MFLR. People were significantly *less* likely to find MFLR acceptable if they felt it was acceptable to (i) plant trees on good agricultural land for environmental purposes, and/or (ii) implement regulations that restrict farmers from clearing native vegetation, and if they felt there were significant environmental degradation problems in their local area. These results suggest that those who value environmental attributes above human use attributes of resources are less likely to support MFLR.

In workshops and interviews, values were examined by analysing the criteria that different stakeholders prioritised when describing whether they would or would not support the use of MFLR in different circumstances. There was in workshops and interviews a clear distinction between two types of values that underpinned arguments made about the acceptability or unacceptability of MFLR. On one hand, many ENGOs representatives and some NRM representatives viewed environmental protection as occurring when human intervention is reduced or removed, rather than when it is increased. For these stakeholders, optimal fire risk reduction was more likely to occur through use of natural processes or of processes that closely mimic natural processes, with MFLR not generally viewed as doing this. On the other hand, members of the forest industry, and to a lesser extent stakeholders involved in fire management, felt that human intervention was an appropriate means to achieve desired outcomes in forest areas, whether those desired outcomes be environmental enhancement, reduced fire risk, or others. The values held by this group include high trust in humans being able to achieve positive outcomes through direct intervention in nature, and also a sense of moral obligation for human intervention to achieve these outcomes, with a strong belief that without intervention, there may be damage to forest health. While not all stakeholders fit the extreme ends of this spectrum of values, the findings do suggest high potential for social conflict about the use of MFLR if it is applied on a large scale, given the reasonably high polarisation between these differing values.

Past experiences

Acceptability of different land management practices can be influenced by positive and negative past experiences with that practice, as well as by having no prior experience by which to judge the practice. This was explored in the survey, by asking about past experience of bushfire. Survey respondents who had been more severely affected by a bushfire in the last 10 years were significantly more likely to find MFLR acceptable.

Information needs and access

Survey participants were asked how they prefer to access information about natural resource management. Their preferences varied, although the three most preferred ways of

accessing information were typically (i) information provided via websites, (ii) being sent occasional emails, and (iii) information on television. The variance in preferences beyond this, for examples for information in local newspapers versus Twitter, highlights that any information sharing about MFLR as a practice needs to use more than one information delivery method to successfully reach different groups.

Stakeholders identified a wide range of information needs about MFLR, examined throughout this report. In particular, they sought information on the effectiveness of MFLR for reducing bushfire risk; impacts on biodiversity and environmental health more generally; cost effectiveness; and specific guidance on appropriate use of MFLR in differing contexts. Ideally, this would be situated in information about addressing bushfire risk more generally, enabling better identification of when and in what circumstances MFLR was appropriate compared to other strategies for addressing bushfire risk.

Overall, while most stakeholders agreed that trials of MFLR were a useful action to invest in, and many supported the specific trials undertaken in this study, many felt that on their own these trials would not be sufficient to answer the question of whether, when, and under what circumstances MFLR is an appropriate method to use to reduce bushfire risk. Several specifically identified a need for longer term funding for trials, particularly an extension of time for monitoring of the three sites, and ideally funding for longer term experiments with MFLR applied at differing temporal scales and with a wider range of vegetation removal designs, to better understand the implications of variations in design. Some also felt a wider range of case study sites was needed, and that a broader range of environmental attributes should be monitored at each site.

Conclusions

This study aimed to better understand whether and under what circumstances MFLR would be supported as a practice used to reduce bushfire risk. The findings show that while MFLR is considered acceptable in principle by many people, that acceptance is highly conditional on how MFLR is applied. This means that some forms of MFLR would have high levels of social acceptance, while other forms would be highly likely to attract high levels of opposition and active protest. The factors that most influence whether MFLR is considered acceptable or unacceptable include who is managing and implementing MFLR, where it is being used, the scale at which it is used, the type and scope of vegetation removed, how frequently it occurs, and what is done with the removed materials. Small-scale application of MFLR in proximity to at-risk assets such as houses and high value assets was considered more acceptable and large-scale landscape scale application less acceptable. MFLR is considered more acceptable when undertaken as part of an integrated bushfire risk reduction plan, guided either by bushfire management agencies or multi-stakeholder committees, and less acceptable when undertaken by forestry agencies without being part of broader bushfire risk reduction strategies. Sale of removed materials increases the unacceptability of MFLR substantially for some stakeholder groups, with concerns about

how this sale affects the way decisions are made about MFLR. Views about acceptability will be influenced by the findings of the trials, particularly around how environmental attributes of the sites and fuel loads change with application of MFLR, however the short-term nature of the trials limits the extent to which they will provide the types of evidence being sought by many stakeholders.

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1. INTRODUCTION

Managing bushfire risk is an important issue across Australia. Controlled burning is a common fuel management strategy used to reduce bushfire risk in forested areas, not only in Australia but internationally (Fernandes and Botelho 2003, McCaw 2013), but it is not always possible or appropriate. In recent years some government inquiries have recommended using a greater suite of fuel management options to reduce bushfire risk, including greater use of ‘mechanical fuel load reduction’, particularly near residential areas or other assets, along roadsides and in other areas where controlled burning may not be an option (see for example Parliament of Victoria 2010, Commonwealth of Australia 2010, Government of Western Australia 2016).

Mechanical fuel load reduction is commonly used in forested areas in North America (USDA 2015), but it is not used extensively in Australia. In Australia, its use has traditionally been limited to small areas of mechanical removal of fuel using methods such as scrub rolling, slash of tall grass, or manual felling. This has been predominantly done in small areas around built assets, high value natural assets, roads and other infrastructure that presents a high risk of starting bushfires (e.g. powerlines) (Ximenes et al 2017).

In addition to its limited history of use in Australia, little research has examined the environmental, social or economic impacts of using mechanical fuel load reduction in a wider set of contexts, and as a result there is limited understanding of the costs and benefits of using it in different situations, and how it compares to other options for managing fuel loads (Ximenes et al 2017).

In 2016, \$1.5 million was invested in the National Partnership for Mechanical Fuel Load Reduction Trials, as part of the National Bushfire Mitigation Programme. The objective of the trials was to begin to address gaps in knowledge about the effectiveness of using mechanical fuel load reduction to reduce bushfire risk, to improve understanding of the environmental, economic and social implications of doing so, and to make recommendations regarding the future use of this strategy alongside other fuel management strategies in Australia’s forested areas.

Three sites were selected at which mechanical fuel load reduction (MFLR) trials were conducted:

- Victoria, near Cann River (managed by VicForests)
- New South Wales, near Wauchope (managed by the Forestry Corporation of NSW)
- Western Australia, near Collie (managed by the University of the Sunshine Coast in partnership with the Forest Products Commission, the Department of Biodiversity, Conservation and Attractions (includes the former Department of Parks and Wildlife) and WA Plantation Resources).

At each site, randomised block treatments were applied to examine the effects of using mechanical versus other methods to reduce fuel load, involving three blocks of four treatments at each site: (i) controlled burning only, (ii) mechanical fuel load reduction only, (iii) mechanical fuel load reduction followed by controlled burning, and (iv) control sites with no treatment applied. At each site, trial site managers conducted assessments of before and after treatment conditions related to fuel load, biodiversity and other key characteristics. Data collected at the trial sites informed subsequent analysis by other project partners, who assessed aspects including cost-benefit analysis of mechanical fuel load reduction compared to controlled burning; bushfire behavior modelling; and machinery time and motion, and suitability assessments.

As part of the project, researchers at the University of Canberra were commissioned to examine the social acceptability of MFLR ('social acceptability study'), the subject of this report. This component of the project included both a large-scale survey of community attitudes, and focus groups with representatives of a range of groups in the regions in which the three trials were implemented.

Understanding social acceptability of fuel management strategies is an important step in effectively planning for their implementation (Lijeblad et al. 2009; Toman et al 2011, McCaffrey et al. 2013, Mylek and Schirmer 2016), because practices that are not publicly supported are less likely to be broadly implemented, regardless of their effectiveness in reducing fuels and bushfire risk (Brunson and Evans 2005, Shindler *et al* 2002, Toman *et al* 2011). Understanding social acceptability of fuel management practices can help incorporate social expectations when planning for the implementation of these practices, and can help prepare better communication and engagement strategies (Mylek and Schirmer 2016).

The objectives of the social acceptability study were to identify the extent to which using MFLR is considered acceptable by different people and groups, and to understand key factors that influence social acceptability of using mechanical fuel load reduction, including:

- How the design and implementation of this practices affects social acceptability (for example, the scale and location in which it is undertaken)
- How decisions about mechanical fuel load reduction are made and implemented (governance processes)
- Views about positive and negative impacts of the practice, and
- Socio-demographic, geographic and other factors.

The report details the social acceptability study and findings of the work. Chapter 2 briefly reviews factors known to influence social acceptability of both fuel management used to reduce bushfire risk, and of natural resource management practices more broadly. Implications of this existing knowledge for understanding the social acceptability of MFLR are then discussed. Study methods are described in Chapter 3. Chapter 4 presents findings

of the study in several parts, focusing on first understanding the overall social acceptability of MFLR, and then on understanding what factors appear to influence acceptability, and information and communication preferences about MFLR. The discussion and conclusions (Chapters 5 and 6) then focus on implications of the findings for any future design and implementation of MFLR in forested landscapes.

2. SOCIAL ACCEPTABILITY OF FUEL MANAGEMENT TO REDUCE BUSHFIRE RISK

This chapter reviews current literature on factors known to influence social acceptability of natural resource management practices, focusing on studies that have examined management practices intended to reduce fuel loads to reduce bushfire risk, such as mechanical fuel load reduction (MFLR) and controlled burning.

A significant body of literature has examined the social acceptability of various natural resource management practices, including forestry, conservation of wildlife or threatened species, renewable energy and water management (e.g. Stankey and Schindler 2006, Wustenhagen et al 2007, Earl et al 2010, Williams et al 2012, Ribe et al 2013, Ford and Williams 2016). However the majority of research looking specifically at social acceptability of MFLR and controlled burning is limited to North America, with only a handful of Australian studies examining social aspects of fuel management strategies aimed at reducing bushfire risk. For example, Bell and Oliveras (2006) explored public perceptions of controlled burning in the Wombat State Forest in Victoria, Altangerel and Kull (2013) examined the debate surrounding controlled burning in Australia by looking at submissions to a parliamentary inquiry, and Ximenes et al. (2017) explored the potential use of MFLR in Australia and the issues to consider in the implementation of the MFLR trials in this project, including social aspects of the practice. The only study to specifically examine social acceptability of MFLR in Australia was Mylek and Schirmer (2012 & 2016), who examined the acceptability of controlled burning, MFLR and livestock grazing used to reduce bushfire risk in and around the Australian Capital Territory (ACT).

Given this limited number of studies examining fuel management to reduce bushfire risk, when identifying factors likely to influence social acceptability of MFLR we drew on the broader body of literature examining social acceptability of natural resource management practices. This ensured that we identified the factors known to be relevant in the context of natural resource management, and reduced the risk of some key factors being ignored.

2.1 FACTORS INFLUENCING SOCIAL ACCEPTABILITY

Many factors have been found to influence social acceptability of natural resource management practices, including fuel load reduction practices used to reduce bushfire risk. Table 1 summarises factors commonly identified in past studies. These include perception of the problem, perceived effectiveness of the action, perceived benefits and costs, design and implementation of the action, and how it is governed. Going beyond a person's beliefs about the problem and their views of the action designed to address the problem, their views will likely also vary depending on their values and norms, overall familiarity with and knowledge of the practice, their past experiences, and their socio-demographic and geographic characteristics. The following sections briefly describe each of these topics.

Table 1 Key factors likely to influence social acceptability of MFLR

Factor influencing acceptability	Description – general	Application to MFLR
Geographic and socio-demographic variation	Views about acceptability often vary amongst groups of people living in different locations (geographic variation) and with different socio-demographic characteristics (e.g. age, gender, educational attainment, income, occupation)	Does the geographic location in which a person lives, or their socio-demographic characteristics, predict the extent to which they find MFLR acceptable/unacceptable?
Perception of the problem	A person who believes a problem exists and is significant is more likely to find actions intended to address that problem acceptable.	Does a person’s perception of the risk of bushfire, and contribution of high fuel loads to this risk, predict the extent to which a person finds MFLR acceptable/unacceptable?
Perceived effectiveness	A person who believes a proposed action is likely to be effective in achieving its intended outcome is more likely to consider it acceptable.	Does a person’s perceptions of the likely effectiveness of MFLR in reducing bushfire risk predict the extent to which a person finds MFLR acceptable/unacceptable?
Perceived benefits and costs	A person who believes a proposed action will have more benefits than costs, and that any costs they believe it has are ‘acceptable’ costs, is more likely to consider it acceptable.	Does a person’s perceptions of the nature and extent of the benefits and costs of MFLR predict the extent to which a person finds MFLR acceptable/unacceptable?
Design and implementation	A person who believes a proposed action has been designed and implemented appropriately is more likely to consider it acceptable.	Does a person’s perceptions of the appropriateness of different aspects of the design and implementation of MFLR predict their likelihood of finding this type of MFLR acceptable or unacceptable?
Governance	A person who believes an action is being implemented using appropriate governance arrangements is more likely to consider it acceptable.	What governance arrangements would need to be in place for a person to find MFLR more acceptable? Which governance arrangements would reduce acceptability of MFLR?
Values, norms, attitudes, beliefs	A person who believes an action is consistent with their values, norms, attitudes and beliefs is more likely to consider it acceptable.	Do some values, norms, attitudes or beliefs predict the extent to which a person finds MFLR acceptable/unacceptable?
Familiarity and knowledge	A person who is more familiar with an action may be more likely to accept it than one who is unfamiliar (depending on the views about effectiveness, benefits and costs that arise from that familiarity)	In this study, few people had spent time examining MFLR in detail, so it was considered unlikely that there were substantially different levels of familiarity and knowledge. Given this, the focus was on identifying how people would prefer to receive information about practices such as MFLR in order to build familiarity and knowledge.
Past experiences	A person’s past experiences with similar problems, with similar actions, or with agencies proposed to carry out an action,	Does a person’s past experiences with bushfire, fuel load reduction strategies, or particular agencies, predict the extent to which they find MFLR acceptable/unacceptable?

2.2 GEOGRAPHIC AND SOCIO-DEMOGRAPHIC VARIATION

Acceptability of natural resource management practices can differ between regions, and can be associated with location specific social and environmental factors, suggesting a need to avoid using a 'one-size-fits-all' model when applying natural resource management strategies such as fuel management (Brunson and Schindler 2004). Socio-demographic characteristics, such as age, gender or education level, are often associated with differing levels of acceptability of natural resource management practices, but results are often highly variable across studies (a factor found to be influential in one or not found to be influential in another, or to be associated with the opposite relationship) (Syme et al 2004, McCaffrey 2013). This suggests a need for caution in relying on socio-demographic or geographic variation to predict acceptability in any given study: these may be proxies for other underlying factors that are driving acceptability and these underlying factors (for example, the topics listed in the sections above) should be explored to better understand why particularly geographic or socio-demographic groups are more or less likely to support a particular practice.

2.3 PERCEPTION OF THE PROBLEM

For a natural resource management practice or policy to be supported, people need to believe there is a problem that needs addressing, or a reason for the practice taking place in the first place (Bamberg and Rolle 2003). The need for people to perceive a problem to be willing to either take action to address it themselves, or support others taking action to address is, is well recognised across multiple fields. For example, lack of recognition that speeding drivers cause problems has been identified as a factor influencing both perceived acceptability of policies aiming to reduce speeding and the likelihood of a driver reducing their incidence of speeding (Goldenbeld et al. 2008), lack of awareness of problems resulting from high energy consumption (including higher cost to consumers and costs to environmental health) has been identified as influencing energy consumption patterns (Vringer et al. 2007), and more generally the need to influence 'problem perception' has been identified as critical to achieving social and political acceptance of actions intended to address complex sustainability issues (Keys et al. 2010). While problem perception is not typically discussed in previous studies examining management of fuel loads to reduce risk of bushfire, it has been proposed as a key factor linking forest governance and management to social acceptability (Górriz-Mifsud et al. 2016).

2.4 PERCEIVED EFFECTIVENESS

Several studies have concluded that a person's level of acceptance of different NRM practices and environmental policies is influenced by their views about whether the practice will effectively contribute to solving a particular environmental problem (Bamberg and Rolle 2003, Eriksson et al 2008). Perceived effectiveness of an action has been identified as

influencing social acceptability of NRM practices ranging from use of recycled water (Menagaki et al. 2007) to management of threatened and endangered species (Cvetkovich and Winter 2003) and household water use behavior (Jorgenson et al. 2009). Whittaker and Mercer (2004) argue that the debate over fuel management strategies used to reduce bushfire risk is partly because of disagreement about its capacity to meet expectations of bushfire protection, as well as disagreement about the level of risk that people should accept. Perceived effectiveness of MFLR in achieving reduction in fuel loads, and through this reduction in risk of harm from bushfire, is therefore likely to influence perceptions of social acceptability.

2.5 PERCEIVED BENEFITS AND COSTS

The acceptability of a natural resource management practice has been found in multiple past studies influenced by a person's beliefs about the benefits versus the costs associated with the implementation of that practice (Vaske et al 2007, Vinning and Merrick 2008, Everett et al 2016). This has been identified in fields ranging from social acceptability of climate change actions (Scherage and Grambsch 1998) to management of invasive species (García-Llorente et al. 2008).

While there have been few studies examining the perceived benefits and costs of MFLR, a small number have identified some potential benefits and costs. Perceived benefits of MFLR reports in previous studies have included that when using MFLR it is more possible to target which fuel will be removed compared to controlled burning; this has the benefit of improving ability to manage impacts of fuel management on specific areas or species. Another potential benefit noted in past studies has been the potential to recoup some of the costs of reducing fuel loads by selling the removed materials, which is not possible when using controlled burning (Stephens and Moghaddas 2005, McCaffrey et al 2008). However, it is important to note that social concerns have also been raised about the sale of materials, documented in the results of this report. Perceived costs of MFLR documented in the literature include concerns about potential for negative impacts on environmental health, including for negative impacts on some plant and animal species, and on soil and water quality; the potentially high cost of implementing MFLR; visual impacts of MFLR in the landscape; and the potential for spread of weed species by machinery uses for fuel removal (Winter et al 2002, Brooks et al 2006). The benefits and costs documented in the literature are reasonably limited overall, suggesting a need to more fully explore how different stakeholders view the potential benefits and costs of MFLR.

2.6 DESIGN AND IMPLEMENTATION

The way MFLR is designed and carried out, and the places in which it is implemented, are likely to influence how acceptable it is considered to be. Past studies have identified that the acceptability of natural resource management practices varies depending on where they are undertaken in a landscape: for example some activities are less acceptable when

undertaken close to natural, build or cultural assets people value highly, or have a strong attachment to (Winter et al 2002, Brody et al 2004, Gill 2008). For example, some studies have found that MFLR is considered more acceptable than controlled burning close to assets such as residential areas, but controlled burning is considered more acceptable than MFLR in more remote areas further away from those assets (Brunson and Shindler 2004; Paveglio et al. 2011). Other studies have found that in areas considered more 'natural' (for example conservation areas or national parks), all types of fuel management strategies are considered less acceptable compared to their use in areas considered less 'natural' (Gunderson and Watson 2007, Mylek and Schirmer 2016).

2.7 GOVERNANCE

The governance processes used to make decisions about, implement, and monitor MFLR will likely affect how acceptable a person feels MFLR is. In particular, the extent to which a person trusts that the people and groups responsible for or influencing decisions about MFLR will make the right decisions is likely to be highly influential.

Lack of trust in agencies undertaking controversial natural resource management practices has been identified as one of the most important barriers to social acceptance of natural resource policies and actions. Multiple studies have identified that social acceptability is highly influenced by the extent to which stakeholders trust the processes used to develop and implement a proposed action or intervention (Gross 2007), as well as in the people and organisations involved (Dare et al. 2014). This is because trust has a significant influence on how people form judgements about risks and benefits (Siegrist and Cvetkovich 2000, Shindler et al. 2002, Shindler and Toman 2003, Lachapelle et al. 2003, Winter et al 2004, Toman et al 2006, Lijebblad et al. 2009, Earl et al 2010, Ford and Williams 2016). Acceptability of fuel management strategies is reliant upon stakeholders having confidence that those making decisions about the strategy will consider and manage the risks appropriately (Shindler and Toman 2003).

2.8 VALUES AND NORMS

Multiple theories argue that a person's underlying values, together with social norms, influence a person's attitudes and beliefs (e.g. Schwartz 1994, Stern et al. 2000). 'Held' values are generally understood to be enduring principles that guide people's choices and behaviours, including their assessments of acceptability versus unacceptability of particular actions (whether undertaken by themselves or by others); they are argued to remain relatively stable over time (e.g. Schwartz 1994, Lockwood 1999, Dietz et al. 2005). 'Assigned' values meanwhile are values held about specific goods, activities or services, which identify what is considered to be important and valuable about these things (McIntyre et al. 2008, Lockwood 1999). Both held and assigned values influence beliefs, attitudes and norms. Norms can be defined as things a person feels an obligation to do or act on, both as a result of their individually held values, and as a result of what they believe society expects of them

(social norms); beliefs are views about the ‘facts’ of a matter such as the types of positive and negative impacts an action is expected to have or its level of difficulty; and attitudes are views about what a person thinks should and should not be done or their rating of the outcomes of an action (Stern et al. 2000, Dietz et al. 2005, Vaske and Donnelly 1999). In this project, attitudes being measured are those about the social acceptability of MFLR, and beliefs include beliefs about benefits and costs, effectiveness, needs, design and implementation, and governance as described in previous sections. Values and norms may be an important factor driving both these different beliefs, and overall attitudes about the social acceptability of MFLR.

2.9 KNOWLEDGE AND INFORMATION NEEDS

Familiarity with natural resource management practices, including fuel management strategies, has been found to have a positive relationship with acceptability of those strategies, or with taking action to address environmental issues (Shindler and Toman 2003, McCaffrey 2004, Earl et al 2010, Mankad and Tapsuwan 2011, McCaffrey et al 2013, Mylek and Schirmer 2016). In relation to fuel management, McCaffrey et al (2013) found that, together with trust in agencies responsible for fuel management strategies, familiarity with a fire management strategy is one of the most consistent factors influencing acceptability.

Objectively measured or self-rated knowledge about MFLR was not collected as part of this study because MFLR is a relatively unfamiliar practice in Australia and hence there was unlikely to be a suitable sample of people with familiarity and knowledge of it who could be compared to those with less familiarity and knowledge. Given that in Australia the issue is likely to be understanding how to build familiarity and knowledge of MFLR to support people to make judgments about acceptability, we elected to identify (i) information needs and (ii) how people prefer to receive information about natural resource management.

2.10 PAST EXPERIENCES

Acceptability of controversial practices can be influenced by past experiences, both positive and negative, or by having no prior experience at all by which to judge the practice (Earl et al 2012, Schindler et al 2002, Stankey and Shindler 2006). In the case of fuel management strategies, past experiences of both the practices, or of bushfires in general, can influence acceptability (Blanchard and Ryan 2004, Gunderson and Watson 2007, McCaffrey et al. 2013). For example, personally experiencing a severe bushfire may increase acceptability of various fuel management strategies that are designed to protect lives and assets from the impacts of future bushfires, or experiencing an escaped controlled burn can negatively influence acceptability of controlled burning, but might increase acceptability of other methods such as MFLR.

3. METHODS

This chapter describes the methods used in this study. Both quantitative and qualitative data were collected and analysed. Each type of data provides different insights, and when used together they provide a better understanding of social attitudes than would be achieved using only one or the other.

Quantitative data were collected via a survey of people living across Australia, in which they were asked their views about MFLR as part of a larger survey. They provide a robust assessment of initial views about the use of MFLR across the population and for different types of people and people living in different locations. Incorporating questions about MFLR in a larger ‘omnibus’ survey reduced potential for survey results to be biased due to bias in those who chose to respond, as responses were not skewed to those with a particular interest in MFLR or bushfire risk management more generally. However, despite the ability to analyse who held what views robustly, the limitation of quantitative data is that it can give limited insight into how people think about MFLR and the types of information they process when considering whether or not they find it acceptable. The limited space available in a survey means that respondents can be provided very limited context and explanation of MFLR, an issue for a practice that is unfamiliar to many Australians. Additionally, views of the public are likely to be strongly influenced by the views of key stakeholders about MFLR.

For these reasons, collecting qualitative data was also important. Qualitative data were collected via stakeholder workshops held in each of the three trial site locations, as well as phone interviews for those who were interested in the project but could not attend a workshop. The workshops and interviews provided a space in which stakeholders with specific interests in MFLR could describe the factors influencing their views about MFLR, and when and why they believe MFLR is appropriate and not appropriate to use. This provides more in-depth insight into views about MFLR, the kinds of information needs required by stakeholders, and the acceptability of different aspects of these fuel management practices.

The methods used to collect and analyse quantitative and qualitative data are described in the next sections.

3.1 QUANTITATIVE DATA COLLECTION AND ANALYSIS

Quantitative data were collected by including questions about MFLR in the University of Canberra’s annual Regional Wellbeing Survey (RWS). The RWS was launched in 2013 to examine wellbeing, resilience and liveability in Australia’s rural and regional areas, and how people living in these regions view different policies and changes implemented in their regions. Since 2013, the survey has expanded to include a sample of people living in major cities as well as those living in regional and rural areas.

3.1.1 SURVEY QUESTION DESIGN

Survey items relevant to MFLR were initially drafted by the project team with input from the broader group of researchers working on the National Partnership for Mechanical Fuel Load Reduction Trials. Draft survey items were then tested in focus groups, revised, professionally formatted, formally pilot tested with a sample of 77 people. Following pilot testing, a final revision of items was undertaken before the survey was launched. The final questions included in the survey relevant to MFLR are provided in Appendix 1.

3.1.2 COLLECTING SURVEY DATA

The Regional Wellbeing Survey is open to adult residents of Australia. Most survey participants are from rural and regional Australia, defined as all areas of Australia outside the capital cities of Sydney, Melbourne, Brisbane, Adelaide, Perth and Canberra. A comparison sample was also collected from these large cities. In 2016, participants could complete the survey between October 12th and December 1st. They could complete the survey online or on paper.

- *Online survey:* The survey could be completed online at www.regionalwellbeing.org.au. The online survey was designed so that the participant did not have to complete the survey in one sitting.
- *Paper survey:* People who could not (or preferred not to) complete the survey online, were able to request a paper survey be mailed to them by calling a free telephone number prominently displayed on all survey recruitment materials. Additionally, paper surveys were mailed directly to a large number of farmers. Paper survey recipients were sent a survey pack that included the survey form, an information sheet and a prepaid envelope to return the completed survey.

The Regional Wellbeing Survey primarily uses an online platform for a number of reasons. The most important is that online platforms offer greater flexibility in survey design compared to other platforms, and enable a larger range of items to be included in the survey. The cost of collecting data via an online platform is also substantially lower than for other platforms, and online surveys can be designed to minimise data entry error. However, online surveys also have disadvantages: the most commonly cited disadvantage is that they can result in a biased sample. This is addressed in the Regional Wellbeing Survey by (i) offering a paper survey option to ensure those who are unable or unwilling to complete the survey online are able to participate, and (ii) using recruitment methods (described below) that reduce the likelihood of bias by ensuring the survey is promoted to a random sample of households.

3.1.3 SURVEY PANELS

Omnibus surveys such as the RWS typically have large numbers of participants, and not all survey questions are asked of every participant. In 2016, in the RWS, online survey

participants were given the option of choosing to complete a short or regular-length version of the survey. The short version contained 'core' survey items that were included in all survey panels. The regular length version also included some questions that did not need to be asked of all participants in order to obtain a robust sample. Paper survey participants were assigned to one of four survey 'panels'. Panel 1 was completed by all non-farmers and included all survey items other than those that were relevant only to farmers. Farmers completed one of three 'farmer panels' (Panel 2, 3 and 4 of the survey). Each farmer panels included all questions that appeared on the short online survey, as well as one-third of other topics in the regular length online survey.

Questions about overall views of the acceptability of mechanical fuel load reduction and controlled burning were asked of every survey participant (online and paper). A smaller group of participants – those who chose to complete the regular-length online survey, non-farmers who completed a paper survey, and those who completed one of the three farmer survey panels – were asked some more detailed questions about how they perceived MFLR and controlled burning, and their level of trust in organisations carrying out these fuel management strategies. Thus the total sample size varies for different questions analysed in this report.

3.1.4 SAMPLE FRAME

When recruiting survey participants, a sampling frame was first established. In 2016, the sampling frame for the RWS included:

- A random sample from across Australia, stratified by population density (with more intensive sampling of regional and rural populations compared to urban populations)
- Several intensively sampled regions. Within each of these regions a random sample was sampled for, but with a larger number of respondents sought than in other locations across Australia. In 2016, intensively sampled regions were those where a large sample was needed for the purposes of different studies which were collecting data via the RWS, and included over-sampling of the following regions:
 - Victorian rural and regional areas (supported by funding from the Victorian government)
 - Communities in Victoria, Tasmania, South Australia, Western Australia, Queensland and the South West Slopes of NSW with high numbers of jobs in the forest industry (supported by funding from Forest and Wood Products Australia)
 - The three MFLR trial site locations, with intensive sampling from the local government areas within a one hour drive of these locations (funded by this study).

In addition to deliberately over sampling some regions using the stratifications identified above, the survey deliberately over-sampled farmers, to ensure this group could be analysed. Previous survey participants were also asked to complete the survey again.

The sample frame thus involved recruiting stratified random samples from different regions and groups. Weighting of the data set (described in detail in later parts of this section) was then used to correct deliberate biases introduced due to the stratification of the sample, as well as to correct unintentional biases.

3.1.5 RECRUITMENT OF SURVEY PARTICIPANTS

Participants were recruited using the following methods:

- **Flyers and printed surveys delivered to letterboxes.** These were delivered to randomly selected residences. In intensively sampled regions, flyers were delivered to every letterbox in designated postal areas. In non-intensively sampled regions, flyers were sent to addresses selected at random from the publicly available mailing database 'Aus-On-Disc'. This resulted in a smaller proportion of households being requested to participate in the survey compared to the intensively sampled regions, but ensured a random sample was selected. Printed surveys were mailed directly to a random sample of farmers selected from the FarmBase database.
- **Email promotion.** Previous Regional Wellbeing Survey participants who had given permission to be contacted about the survey again were emailed an invitation to participate in the survey. In addition, rural and regional organisations throughout Australia were asked to promote the survey to their online networks by forwarding an email encouraging participation in the survey.
- **Newsletter, social media and traditional media promotion.** Some organisations chose to post a notice about the survey on their social media sites (Facebook, Twitter), an online version of the flyer on the homepage of their website, or included an item in their newsletter. While this was not a primary means of recruiting participants, it acted to increase awareness of the survey and in particular to increase responses from those sent flyers and printed surveys as part of the random sampling process.
- **Prize draw.** To increase survey participation, a prize draw was offered. This can reduce bias in responses as some participants will complete a survey in order to enter a prize draw even when not highly interested in the survey topic/s being asked about. A prize pool of \$9,000, comprised of 20 gift cards to differing values, was offered. Winners could choose a Flight Centre, Coles- Myer, WISH or Bunnings gift card.

3.1.6 SURVEY RESPONSES

A total of 13,302 people took part in the 2016 Regional Wellbeing Survey. Over 11,500 rural and regional Australians answered questions about acceptability of mechanical fuel load reduction and controlled burning, and over 9,000 answered other questions related to mechanical fuel load reduction and controlled burning. Individual response figures are given when results are presented for each question throughout this report.

As the RWS uses non-traditional survey recruitment methods, it is not possible to estimate the total number of people who received a request asking them to consider taking part in the survey, and hence it is not possible to accurately estimate a survey response rate. Response rates are also a relatively poor indication of the quality or representativeness of survey responses (Johnson and Wislar, 2012). Instead, representativeness was first examined by comparing the characteristics of survey respondents to those of people living in rural and regional Australia, followed by weighting of the data to correct intentional and unintentional biases. This analysis considered both the groups and regions that are deliberately oversampled in the survey. As intended, the survey sample over-represented farmers and Victorians (Table 2). There was also an unintended bias towards older and female respondents, an issue that is observed in many surveys. While the biases identified are expected, they need to be addressed when analysing data. The methods used to do this are described in the next section.

Table 2 Comparison of Regional Wellbeing Survey respondents to characteristics of rural and regional Australians

Characteristic		Rural and regional Australia, 2016 ¹	Regional Wellbeing Survey, 2016
State	NSW & ACT	28.3%	27.0%
	Vic	20.5%	28.4%
	Qld	25.5%	16.1%
	SA	6.7%	11.6%
	WA & NT	11.3%	9.2%
	Tas	7.7%	7.7%
Gender	Female	50.6%	54.7%
	Male	49.4%	45.3%
Age	18-39	32.0%	12.6%
	40-54	25.9%	23.9%
	55-64	17.8%	27.7%
	65+	24.3%	35.8%
Working as a farmer	Farmer	2.5%	40.7%
	Non-farmer	97.5%	59.3%

¹Data source: Australian Bureau of Statistics *Census of Population and Housing* 2016. Data accessed via TableBuilderPro. Data were calculated for rural and regional Australia and exclude people living in the cities of Sydney, Melbourne, Brisbane, Adelaide, Perth and Canberra.

3.1.7 DATA ANALYSIS AND WEIGHTING

Prior to data analysis, Regional Wellbeing Survey data were processed and cleaned. This involved:

- Entering data from paper surveys into the online survey form, and checking data for errors
- Formatting survey data (both online and paper), with responses to each survey item checked for consistency, coded numerically where appropriate, and any missing data identified
- Removal of invalid surveys. All surveys in which a participant had completed fewer than 10 items were removed. Duplicate surveys (for example, in which a participant began the survey more than once) were also removed, as were any responses in which participants had deliberately completed the survey multiple times.

The cleaned data set was then analysed. Analysis of data for this report was undertaken using Microsoft Excel and SPSS.

Data weighting

A key part of the analysis was the weighting of data where appropriate. 'Weighting' refers to a statistical process in which known biases in the responses received are corrected for. Weighting was used to correct for both intentional over-sampling (of farmers and some regions), and non-intentional biases (the bias towards female and older respondents). The weighting of responses involves adjusting the relative contribution each survey respondent makes to the whole when analysing survey results, so analysis of the sample more accurately represents the population from which it was drawn (in this case, people living in rural and regional Australia). Weighting doesn't change the answers people gave to survey items.

Weighting has been applied to analyses in this report when presenting the views of the population (for example, presentation of acceptability of controlled burning and mechanical fuel load reduction). Data were weighted using GREGWT, a generalised regression weighting procedure developed by the Australian Bureau of Statistics. GREGWT is a SAS macro that generates survey weights so that survey estimates agree with external benchmarks, which were obtained from the 2011 Australian Bureau of Statistics (ABS) *Census of Population and Housing*. For those classified as 'rural and regional Australians', the benchmarks used were age (15-39, 40-49, 50-54, 55-69, 70+), gender (female, male), agricultural occupation (farmer, not-farmer), and geographical location (35 geographic regions were defined across Australia in which sampling intensity varied, and each included as a benchmark, enabling different sampling intensities to be corrected as part of the weighting process). For the small number of people classified as 'urban Australians', the benchmarks used were age (15-39, 40-49, 50-54, 55-69, 70+) and gender (female, male) only. Due to the way GREGWT

calculates weights, a small number of respondents were allocated unrealistically high weights. This was a consequence of having a small number of observations corresponding to a particular benchmark category. To control for extreme weights, weights were Winsorised at the 95th percentile, thus limiting the effect of unrealistically high weights. Winsorisation was considered an appropriate method of adjusting the data as (i) the source of data bias was known, and (ii) comparison of Winsorised and non-Winsorised datasets against independent benchmarks for key variables showed that the Winsorised data better reflects distributions seen in other datasets. Independent benchmarks were taken in all cases from the Australian Bureau of Statistics 2011 *Census of Population and Housing*.

Confidence intervals

Throughout this report, 95% confidence intervals are shown as part of the results. A confidence interval, put simply, is a measure of how confident we can be in the results. More accurately, it tells you the boundaries between which, statistically, the mean value of a given variable would be 95% likely to fall if the survey was repeated multiple times with a similar sample. In general, confidence is higher if there is a large sample size and little deviation in responses (for example, almost all people answered '4' on a scale of 1 to 7). Confidence is lower if there is a small sample size and high deviation (for example, equal numbers of people answered 1, 2, 3, 4, 5, 6 and 7 on the 7-point scale).

While confidence intervals provide a useful way of understanding how reliable the results are likely to be, they are not perfect. Confidence interval calculations assume that data are normally distributed, and a representative sample has been achieved. If these conditions are not met, the confidence interval may not be an accurate representation of confidence.

In this report, most of the data presented with confidence intervals have also been analysed using other statistical analysis techniques.

Other statistical analysis

When exploring differences in views among different groups of people who responded to the survey, bivariate analysis has been used. Spearman's rho (r_s) was used to examine correlations between two ordinal/continuous variables, and Kruskal–Wallis tests (H) were used to explore differences between ordinal/continuous variables and two or more independent groups.

3.1.8 LIMITATIONS

While the Regional Wellbeing Survey has a large sample which can support robust weighting of the sample, and analysis of different groups and regions, all research has limitations. In particular, although data have been weighted to correct known sampling biases, this is unlikely to remove all sample-related error (as is the case for any survey). Additionally, some groups are less well represented in the survey than others, particularly those with higher

literacy. As with any survey conducted at a single point in time, the views represent a snapshot of a single point in time (in this case, spring 2016), and will change over time.

3.2 QUALITATIVE DATA COLLECTION AND ANALYSIS

Qualitative data were collected via focus groups and interviews with stakeholders who had an interest in MFLR or more broadly in bushfire risk reduction.

3.2.1 FOCUS GROUP AND INTERVIEW LOCATIONS

As trials for the broader project this study forms part of were being held in three distinct location, the focus of qualitative data collection was on (i) stakeholders in those three locations, and (ii) stakeholder representative groups operating and state or national scale whose representation included one or more of the three trial locations.

Stakeholder workshops were held in each of the three trial site locations in April and May 2017, and phone interviews were conducted with stakeholders who were interested in participating but were unable to attend a scheduled workshop. Two separate workshops were offered in each of the trial site locations; one workshop was offered during work hours and another after hours in each of the locations. In two locations (Victoria and NSW) no stakeholders opted for the after-hours session, instead requesting different times and/or locations. Table 3 outlines when and where the final stakeholder workshops were held, and how many people attended workshops and participated in interviews in each region. A total of 49 stakeholders participated in workshops and interviews.

Table 3 Stakeholder workshops

State	Trial site location	Workshop location	Date and time	Participants
Victoria	Cann River	Goongerah	26 April 2017 2-3.30pm	11 workshop attendees 2 phone interviews
		Orbost	27 April 2017 2-4pm	2 MFLR trial project staff also attended the Orbost workshop
NSW	Wauchope	Wauchope	8 May 2017 2.30-4pm	13 workshop attendees 4 phone interviews
		Wauchope	9 May 2017 10.30am-12.30pm	1 MFLR trial project staff member
WA	Collie	Collie	16 May 2017 2-4pm	19 workshop attendees 2 phone interviews
		Collie	16 May 2017 6.30-8.30pm	2 MFLR trial project staff members

3.2.2 SAMPLING

The goal of sampling in this part of the project was to ensure that as wide a diversity of views was included as possible, with the overall criteria for inclusion being that a stakeholder group had interest in, knowledge or, or may be affected by the implementation of MFLR. First, a list of the different types of groups who met these criteria was drawn up

based on review of the literature on both MFLR and bushfire management more broadly in Australia. Trial site managers were asked for their input to help identify the types of stakeholders with an interest in MFLR that they were aware of. This process resulted in the following list of types of interests and knowledge being identified:

- Local government
- Environmental non-government organisations
- Traditional Owners
- Apiarists
- Farming organisations
- Rural fire brigades (volunteer and professional)
- Local businesses and representative organisations such as Chambers of Commerce)
- Natural resource management agencies and groups
- Road and traffic authorities
- Tourism organisations
- Recreational groups (bushwalking, 4WD, mountain biking, hunting)
- Forest managers (those responsible for managing forest areas on different land tenures e.g. National Parks and Wildlife Service, commercial forest managers)
- Government land management agencies
- Forest industry members (e.g. firewood industry, forest industry representative organisations, wood processors)
- Wildlife rescue organisations
- Water catchment management agencies.

For each of the three regions, a list of groups and people who represented these interests was then developed, and invitations were sent to at least one (and where possible three to four) representatives from each group, inviting them to participate in a workshop or interview, and also inviting them to pass the invitation on to others who might be interested in participating. This ensured that snowball sampling could be used to ensure that those who might be interested in participating were invited.

3.2.3 PARTICIPANTS

As noted earlier, a total of 49 stakeholders participated in a focus group or interview. These included the following interests (note that the total adds to more than 49 as some stakeholders had multiple interests or responsibilities):

- Bushfire managers (including local government, state government, and community interests) (14)
- Environmental non-government organisations (13)
- Forestry (including representatives of government agencies that manage forests, and forest industry representatives) (17)
- Natural resource management (7)

- Apiarist (1)
- Rural landholder (1)
- Road and traffic agency (state government) (1)
- Business (2)
- Traditional Owner (1).

The representation of different interests in workshops and interviews was not as broad as initially sought: in particular, despite multiple approaches to several groups, recreational forest users, farming organisations, and commercial users of forests other than the timber industry typically declined to participate. Reasons cited were usually lack of interest in the topic and/or lack of time. Representation of Traditional Owners was also very low, and this report cannot be said to represent the views of Traditional Owners adequately as a result.

3.2.4 INTERVIEW SCHEDULE

A semi-structured open-ended question format was used in workshops and interviews. This enabled stakeholders to explore different issues in depth, while also ensuring key topics were asked about.

The interview schedule was provided to attendees prior to workshops and interviews, and included the following open-ended questions (see also Appendix 4):

3. What questions do you have about mechanical fuel load reduction?
4. What benefits/positive impacts do you think the use of mechanical fuel load reduction could have?
5. What costs/negative impacts do you think the use of mechanical fuel load reduction could have?
6. What types of information would you like to have access to about mechanical fuel load reduction?
7. If mechanical fuel load reduction is implemented as part of the suite of practices used to reduce bushfire risk in forested areas, what is needed to ensure good practice?
8. What do you think are the best approaches to managing bushfire risk in your region?
9. Are there any other topics you would like to discuss about either mechanical fuel load reduction, or methods of reducing bushfire risk more generally?

These questions were used as a general guide for the discussion. The questions and discussion were often preempted by the participants themselves rather than being prompted by the facilitator. Thus, the interviews were based upon a flexible rather than fixed research interview protocol. Using the interview schedule in this flexible manner ensured the same topics were discussed across all workshops and interviews, while also allowing discussions to flow naturally across areas of high salience to participants (Miles and Huberman 1994). During the discussions the researchers asked follow-up questions to gain further insight into different areas raised by participants.

3.2.5 TRANSCRIPTION

The workshops and phone interviews were recorded with permission of participants. In all but one case participants provided their approval for recording. Workshop discussions were recorded using a digital recorder, and phone interviews were conducted using Skype and recorded using an 'add on' recording application. The recordings were transcribed, and reviewed for accuracy. Participants were given the option of reviewing transcripts and providing comment on them, and those who wished to do this were sent copies of transcripts to review. Corrections and clarifications made by participants were included in the final files, which then formed the raw data for coding and analysis.

3.2.6 QUALITATIVE CODING

Interview and focus group transcripts were coded, a process in which they were systematically reviewed, common topics and themes were identified and grouped, and the resulting thematic groups were then analysed to identify key findings (Richards and Morse 2007). Specifically, descriptive, topic-based and thematic coding were used.

Descriptive codes in simple terms describe or label the data, and are generally pre-determined. Descriptive codes support analysis of how themes across the discussions vary across different stakeholders, circumstances, or contexts. Three descriptive codes were applied to group the stakeholders by their representation across (i) state, (ii) scale and (iii) sector. Descriptive codes were also used to group discussion points, where relevant, with reference to five key areas that arose in the discussions: (i) The MFLR Trial, (ii) MFLR generally, (iii) Controlled burning, (iv) Bushfire management, and (v) Forest management. A dichotomous descriptive code was also identified to provide basic categorization of whether a discussion point was positively or negatively related to the acceptability of MFLR.

Topic codes help to organise or group the data into areas of key interest to the overall research questions. Initially, six topics were identified: (i) Stakeholder information needs in relation to MFLR, (ii) Perceived need for bushfire management or fuel reduction, (iii) MFLR design and implementation considerations (including perceptions of effectiveness), (iv) Governance considerations in MFLR, (v) Costs or concerns about MFLR, and (vi) Benefits or opportunities of MFLR.

Interview content that had been organized based on descriptive and topic codes were then thematically coded: this involves analysing transcripts to identify the key themes that emerged in interviews within each of the topic codes, and whether some themes were more commonly raised by some groups or in some locations. Thematic codes were initially developed by one team member, and then cross-checked by two other team members. This ensured development a consistent set of themes that evolved and developed over the course of the coding process. While being shaped the conceptual framework for social acceptability identified at the start of the project, the coding process also in some cases identified new topics that were used to iteratively refine this framework. Table 4 summarises the core thematic codes that emerged from interviews.

Table 4 Thematic codes

Theme	Content of theme	Relevant topics
Commercial sale	Concerns and opportunities related to commercial sale of native vegetation removed as part of MFLR operations	Information needs; Design considerations; benefits; costs; governance
Community engagement	Community consultation and engagement in relation to MFLR decision-making	Governance
Economic justification	Economic viability of MFLR and how it can be evaluated	Information needs; Governance
Environmental impact	Positive and negative environmental impacts of MFLR	Information needs; Perceived need; Design considerations; Benefits; Costs; Governance
Environmental assessment	Environmental monitoring and assessment of MFLR – methods and scope	Information needs; design considerations; governance
Environmental regulations	Environmental regulations relevant to MFLR	Governance
Evidence-based decisions	Integration of scientific evidence to support decisions and operations in relation to MFLR for bushfire risk mitigation	Design considerations; governance
Native forest management	Native forest management considerations	Perceived need; design considerations
Forestry management	Commercial forestry management considerations	Perceived need; design considerations
Governance	Who is involved in decision-making about MFLR, policy processes, rules and regulations	Information needs; Design considerations; Costs
Human health and wellbeing	Benefits and costs of MFLR to human health and wellbeing	Benefits; costs;
Location/scale	Location and scale of MFLR, in term of design, governance, and how this influences benefits and costs arising	Design considerations; benefits; costs; governance
Operational costs	Operational costs of MFLR, including administrative costs	Costs
Operational design	On-ground operations and design of MFLR	Information needs
Planning	Planning of MFLR operations and management objectives	Design considerations
Policy process	Bigger picture policy processes such as funding cycles and implications for benefits and governance arrangements	Benefits; governance
Political influence	Political influence and vested interests in relation to governance of MFLR	Governance
Program integration	Integrated approach to bushfire management, and the integration of MFLR with other aspects of bushfire management	Perceived need; design considerations; benefits; governance
Risk mitigation	Elements of bushfire risk mitigation, including the perceived need, MFLR design, and changes in risk	Perceived need; Design considerations; benefits; costs
Shared-responsibility	Shared-responsibility in bushfire risk mitigation	Perceived need
Socio-cultural considerations	Social and cultural drivers in relation to fuel reduction and bushfire management	Perceived need; governance

4. ACCEPTABILITY OF MECHANICAL FUEL LOAD REDUCTION

Social acceptance of an action is something that can change over time, and which will depend on how that action is designed, implemented and managed. This means it is critical not only to understand what a person feels at a given point in time, but to understand how that view might change depending on the design, implementation, and management of the action.

This section assesses initial views about the social acceptability of MFLR. As MFLR is a relatively new practice in Australia, currently implemented in relatively small areas typically close to built infrastructure, initial views about social acceptability do not necessarily provide a good guide to the likely acceptability of any subsequent wider scale implementation of MFLR. Instead, they provide an indication of the ‘starting position’ – whether members of the community and members of different stakeholder groups are starting with a relatively positive or negative perception of MFLR, which helps in identifying how those views might change if MFLR was implemented on a larger scale in Australia in future.

When assessing social acceptability, it is useful to first identify initial views about a particular practice or action without specifying how it is to be undertaken. This helps identify the ‘starting level’ of acceptability. Subsequent work can then identify the extent to which this ‘starting level’ acceptance will change depending on how the action is designed, implemented and managed, or depending on other factors.

Initial assessment of acceptability was done in two ways in this project:

- First, views about acceptability of MFLR in general amongst the general public were assessed using survey data to identify the ‘starting level’ of acceptability. To assist in identifying whether this was a high or low level of acceptability, views about MFLR were compared to views about the widely used practice of controlled burning.
- Second, focus groups and interviews were used to both ask about overall acceptability of MFLR (‘starting level’), and to explore what that acceptability is conditional on. This provides a better understanding of how starting levels of acceptability might change depending on the type of MFLR proposed, the places it is proposed to be used in, and proposed management (governance structure) for MFLR.

4.1 SURVEY FINDINGS

We examined overall views about acceptability of MFLR, and compared these to perceptions of controlled burning using data from the Regional Wellbeing Survey. This ‘snapshot’ aimed to understand the initial response of Australians to the idea of MFLR, without presenting substantial information to them about the practice. This information is useful in gaining an insight into how the general public responded to the concept of MFLR

when it was presented to them with little background explanation or context. It thus represents a 'starting level' of acceptability, meaning an attitude that is subject to change depending on the type of information a person is then presented about MFLR.

4.1.1 STARTING LEVELS OF SOCIAL ACCEPTABILITY

The views of (i) rural and regional Australians (defined as those living outside the 'big 6' capital cities) and (ii) urban Australians (those living in the 'big 6' cities of Sydney, Melbourne, Brisbane, Adelaide, Perth and Canberra) are shown in Figure 1. Survey respondents were asked 'how acceptable do you find reducing bushfire risk by removing vegetation with heavy machinery in your local area'. This phrasing was used to ensure enough detail was provided for a person unfamiliar with the concept of MFLR to understand it, but provided no details about the scale and scope of vegetation to be removed.

In total 50% of rural and regional Australians and 42% of people living in major cities felt MFLR was acceptable to some degree, less than the 76% of both groups who felt controlled burning was acceptable in their local area. Close to one-third (30%) of rural and regional Australians, and 32% of major city residents, felt it was unacceptable, compared to 10% and 8% of rural/regional and urban residents who felt controlled burning was unacceptable. The remainder either stated they were 'unsure' or that MFLR was neither acceptable or unacceptable.

The strength of acceptability and unacceptability also varied: people were less likely to find MFLR very acceptable (and more likely to find it slightly or moderately acceptable) compared to controlled burning, where 'very acceptable' was the most common response; views about unacceptability were generally spread between slightly, moderately and very unacceptable.

These findings indicate that around half of the population views MFLR favourably when initially asked about it, but do not generally find it highly acceptable, with the more tentative acceptability ratings more likely to be subject to change. There is a significant proportion of the population with initially unfavourable views, as well as 20% (rural and regional) and 26% (major city residents) who are 'sitting on the fence' with views highly likely to change.

Support for controlled burning is much higher than for MFLR, a finding that is not surprising considered the much higher level of familiarity most residents would have with the practice of controlled burning compared to MFLR.

This suggests that initial views about MFLR, while more positive than negative, are highly subject to change depending on the further information received about MFLR. If the further information received is viewed favourably – for example the person feels confident MFLR will be undertaken in suitable places, using suitable methods, and without causing unacceptable impacts, and trusts the organisations undertaking it – then the proportion

finding MFLR acceptable would likely increase. If the further information is viewed unfavourably – the person feels MFLR is being proposed at the wrong scale, in the wrong places, using methods that have negative impacts, or undertaken by organisations they don't trust – the proportion finding MFLR acceptable would likely decrease.

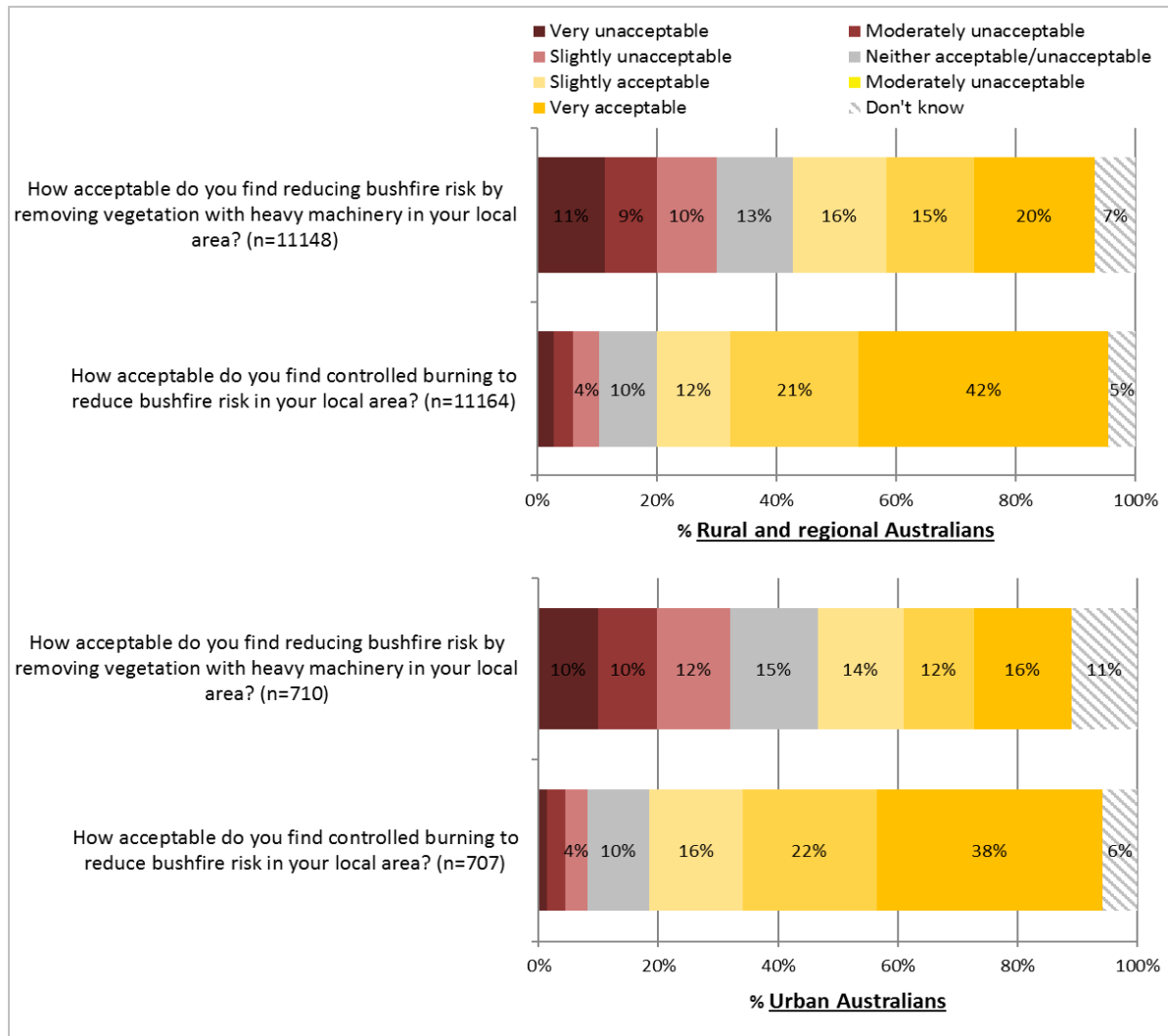


Figure 1 Acceptability of MFLR and controlled burning

To further identify what initial views about MFLR were conditional on, survey participants were asked some questions which tested the extent to which views might change depending on how MFLR is implemented. Specifically, they were asked if they (i) might support MFLR depending on how it is done, a statement that allows people to express conditional support, (ii) would not support MFLR under any circumstances, and (iii) would support MFLR near their residence. A small number of comparison questions were asked about controlled burning (Figure 2).

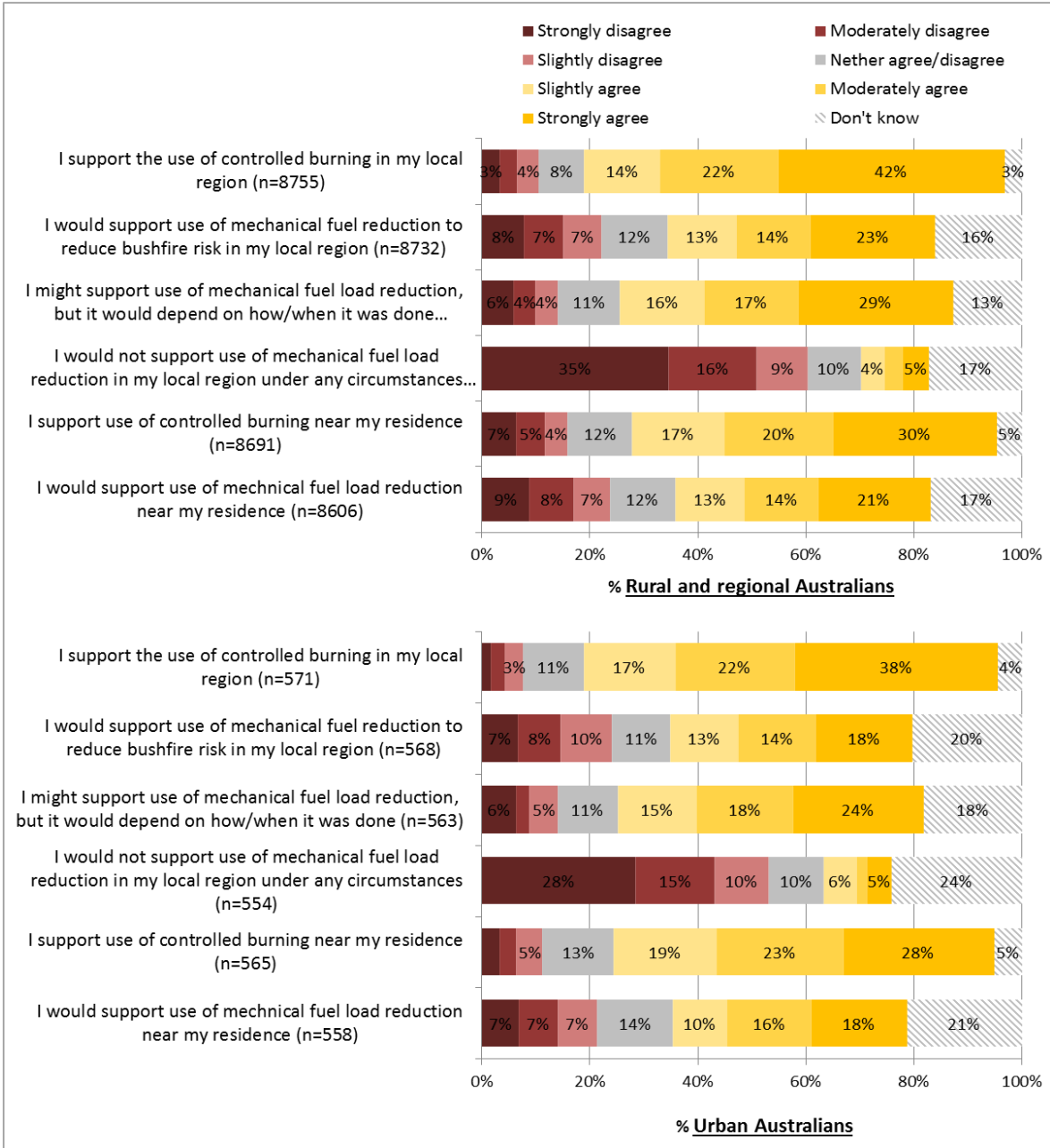


Figure 2 Support for MFLR and controlled burning in local region and around residence

As can be seen in Figure 2:

- When asked if they might support MFLR depending on how it was done, support was higher, with 62% of rural/regional residents agreeing with this compared to 50% who said they would support MFLR in general (and 57% of major city residents compared to 45% who would support MFLR in general). This supports the argument that views about MFLR are highly likely to change as people are provided information about the specific types of MFLR practices being proposed for implementation.
- Very few – 13% of both major city and rural/regional residents – stated they would not support MFLR under any circumstances. This again suggests that there is

willingness to consider supporting MFLR, but only after being able to assess the specific ways in which it is being designed and implemented.

- Most residents were just as likely to feel they supported (or did not support) MFLR near their residence as to report supporting/not supporting it in their local region.

These results point to a high conditionality of any support for MFLR: to find MFLR socially acceptable, most people expect to first assess information about where, when and how it will be implemented before forming a final judgment. Most are willing to consider these issues and then make a judgment, with few finding the practice intrinsically unacceptable, suggesting that the practice is not in and of itself considered unacceptable, and that levels of acceptability will change based on information provided about how MFLR will be implemented and its benefits versus costs.

4.1.2 GEOGRAPHIC VARIATION IN STARTING LEVELS OF SOCIAL ACCEPTABILITY

Acceptability of natural resource management practices can vary between regions for a range of reasons. Views about acceptability were compared across geographic regions to identify if there was any noticeable variation, and were also compared based on the type of place a person lived in. There was little difference in acceptability of MFLR between geographic regions (Figure 3). People living in Victoria were slightly less likely to feel MFLR is an acceptable strategy to reduce bushfire risk compared to people living in other states, although differences were small, and there was no significant difference in acceptability of MFLR between the three trial site areas. There were, however, significant differences in how acceptable people found MFLR based on the 'remoteness' of the place in which they lived. There was a linear relationship in acceptability with those living in major cities least likely to consider MFLR acceptable, and those in the most remote areas most likely to find it acceptable. Similarly, those living on a rural property were more likely to find MFLR acceptable compared to those living in a town, suburb or village.

4.1.3 SOCIO-DEMOGRAPHIC VARIATION IN STARTING LEVELS OF SOCIAL ACCEPTABILITY

Socio-demographic characteristics of the community can sometimes be associated with acceptability of land management practices, but as noted earlier in this report typically show inconsistent associations across studies, limiting conclusions that can be drawn. Differences in the extent to which people found MFLR acceptable are shown in Table 5 for people of different gender, age groups, household income, formal education, industry of employment, health and wellbeing. As is shown in the table, people were significantly more likely to find MFLR acceptable if they were male, earned higher household income, had lower levels of formal education, were employed in wood-related industries, or (to a lesser extent) if they had higher levels of wellbeing ('life satisfaction').

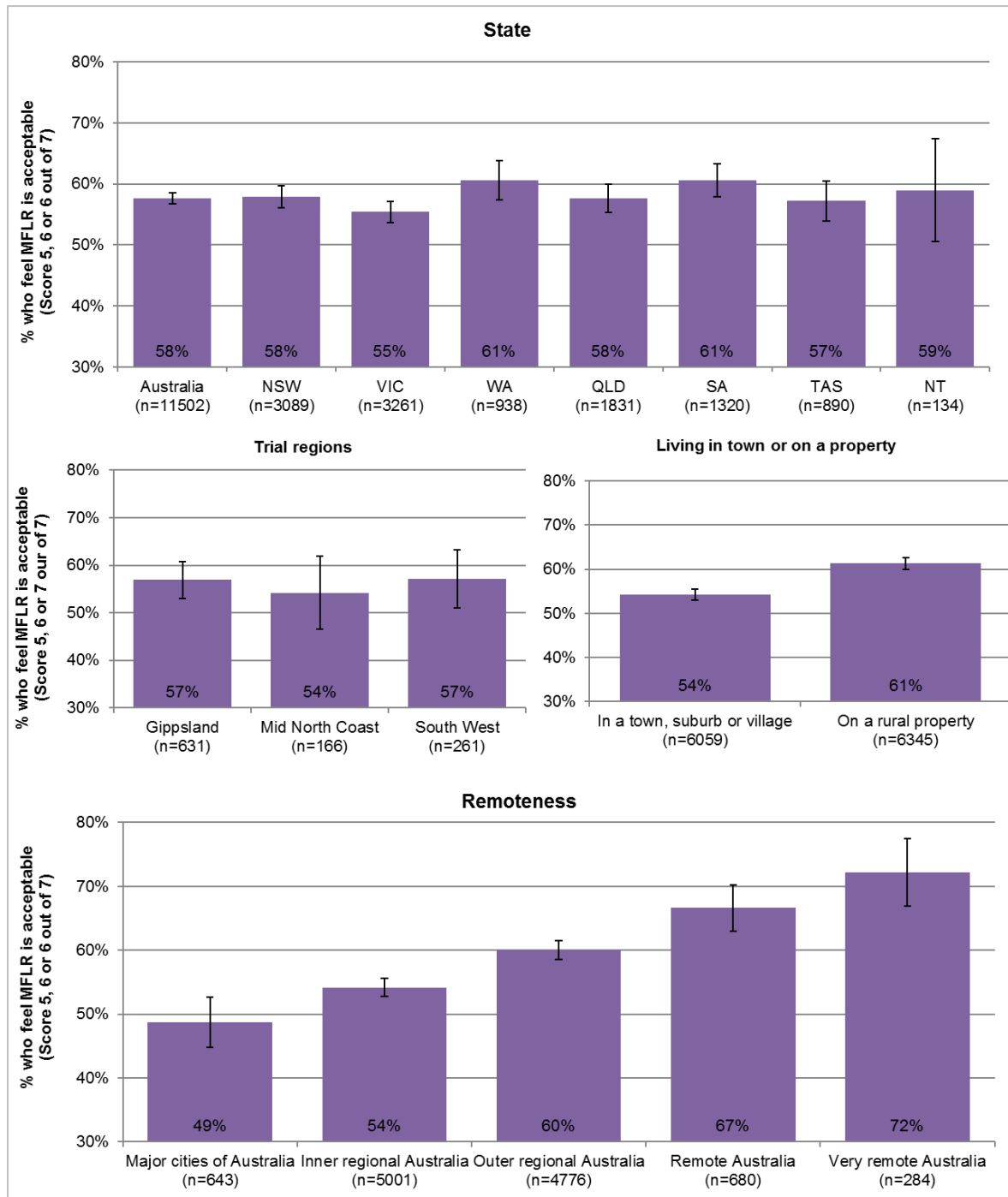


Figure 3 Geographic variation in % who felt MFLR was acceptable¹

Table 5 Socio-demographic differences in acceptability of MFLR

	Relationship with acceptability of MFLR
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¹ 'Trial region' boundaries are based on Regional Development Australia regions where the trial sites were located

Socio-demographic group		% who feel MFLR is acceptable ¹ , n	n	Effect size and significance	Significant relationship with acceptability of MFLR?
Gender	Female	53%, 6113	11379	$H=118.44$ $p=0.00$	✓
	Male	63%, 5266			
Age	18-39 years	60%, 1403	11426	$r_s = 0.00$ $p=0.68$	✗
	40-54 years	58%, 2741			
	55-64 years	56%, 3232			
	65+ years	58%, 4050			
Household income	\$0-\$31,999	57%, 3364	10581	$r_s = 0.03$ $p=0.01$	✓
	\$31,200-\$62,399	57%, 2843			
	\$62,400-\$103,999	58%, 2564			
	\$104,000-\$155,999	58%, 1618			
	\$156,000+	62%, 1113			
Highest level of formal education	Year 12 or equivalent	62%, 1424	11453	$r_s = -0.14$ $p=0.00$	✓
	Certificate or diploma	58%, 3682			
	University degree (undergraduate or postgraduate)	51%, 4262			
	None of these	65%, 2085			
Employment industry ²	Forestry or wood and paper manufacturing	71%, 101	10872	$H=19.49$ $p=0.00$	✓
	Tourism	60%, 2302			
	Agriculture (farming) or food/agriculture manufacturing	54%, 234			
	Other (includes fishing, mining, other manufacturing, transport, building/construction, retail/hospitality, government, education, health related, professional services and other)	57%, 8235			
Overall life satisfaction ³	Low life satisfaction (Lowest 25% - score 0-6.9 out of 10)	56%, 2812	11422	$r_s = 0.03$ $p=0.00$	✓
	Moderate life satisfaction (middle 50% - score of 7-8.9 out of 10)	57%, 5191			
	High life satisfaction (Highest 25% - score 9-10 out of 10)	60%, 3419			

¹ A score of 5, 6 or 7 on a scale from 1 'not at all acceptable' to 7 'very acceptable'. Total n excludes those that indicated 'don't know'.

² Respondents could indicate more than one industry that they worked in. Those who selected forestry or wood and paper manufacturing were allocated to this group regardless of whether they indicated any other industry. Those who selected tourism were allocated to this group regardless of other industries, unless they also selected forestry or wood and paper manufacturing (in which case they would have been already allocated to that group). This was followed by those who selected agriculture or food/agriculture manufacturing, then other.

³ The overall life satisfaction measure was used: "Thinking about your own life and personal circumstances, how satisfied are you with your life as a whole?" using a scale from 0 'completely dissatisfied' to 10 'completely satisfied'. See www.regionalwellbeing.org.au for more information on this measure.

4.2 STAKEHOLDER WORKSHOP/INTERVIEW FINDINGS

In stakeholder workshops and interviews, common themes emerged about overall views of the acceptability of MFLR. In particular, similar to the survey findings, almost all participants stated that they would support MFLR under some circumstances. This indicates that the

practice of MFLR is not in and of itself considered inherently negative or unacceptable, but rather that judgments of acceptability are dependent on whether a person considers that MFLR is being implemented in ways they believe are appropriate. This is an important distinction: there are many examples of practices that are considered inherently unacceptable by a large proportion of the population. For example, as is briefly presented subsequently in this report, a very large proportion of the population believe coal seam gas mining of any kind is inherently unacceptable. MFLR is different: very few feel it is inherently unacceptable as a practice. Many, however, believe that it can be unacceptable if it is designed, implemented or managed in the wrong way.

Consistent with this, almost all workshop and interview respondents identified that they would support the use of MFLR in some circumstances, indicating MFLR is not an inherently unacceptable practice. Specifically, no participants felt they would oppose MFLR in all circumstances, with all able to identify at least one scenario under which they would support the use of MFLR. However, the large majority also indicated they would oppose the use of MFLR in some circumstances. All but three participants were able to specify at least one circumstance, and often many circumstances, in which they would find MFLR an unacceptable practice. The remaining three indicated more global support, being likely to support the use of MFLR under most if not all circumstances; all three were either working in the forest industry or for a government land management agency.

The factors which would make MFLR acceptable or unacceptable to stakeholders are explored in detail in subsequent sections; to avoid repetition they are not examined in detail here. However, there were strong commonalities in the factors interviewees identified as determining whether they would find MFLR acceptable or unacceptable. These are summarised in Table 6.

Overall, the interview and focus group findings further support that, while MFLR is not a practice considered inherently unacceptable in and of itself, it is one where acceptance of its use will be strongly condition on the way in which it is designed, implemented and governed. Most people will find MFLR acceptable in some circumstances but find it unacceptable under other circumstances.

Table 6 MFLR aspects influencing acceptability: summary of common themes from focus groups/interviews

Design element	Less acceptable	More acceptable
Governance – decision making	Forest industry, commercial interests making decisions about when, where and how to conduct MFLR	Bushfire experts, fire management organisations/agencies, or multi-stakeholder bushfire panels making decisions about when, where and how to conduct MFLR
Governance – integration of decisions	Decisions about using MFLR made in isolation of other decisions about managing bushfire risk	Decisions about using MFLR form part of integrated bushfire risk management decision making, and are one of suite of strategies
Location	Using MFLR in forested areas away from build infrastructure or other sensitive areas (viewed as ‘logging by stealth’ by multiple stakeholders)	Using MFLR near towns/residential and built areas, and near sensitive infrastructure that can be damaged by other fuel reduction strategies
Scale	Using MFLR over large areas of land, particularly away from assets/ infrastructure	Using MFLR at small scales only in areas where there is a specific need
Type of vegetation removed	Removal of larger trees or vegetation considered to provide important habitat	Removal of grasses or smaller vegetation, with strategic decisions clearly justified based on how their removal changes likely fire behaviour
Method of vegetation removal (type of machinery)	There was less clarity about this topic, but in general use of machinery considered likely to cause issues such as soil compaction or other damage was considered less acceptable	
Use of harvested products	Commercial sale to forest industry with profits not directly returned to invest in bushfire risk reduction	No commercial sale of product removed from forest; commercial sale to markets other than forest industry, with returns invested directly in bushfire management

5. FACTORS INFLUENCING ACCEPTABILITY OF MFLR

As identified earlier in this report, multiple factors are likely to influence the social acceptability of actions such as MFLR. In this chapter, we examine seven key factors:

- perceived need (perceived risk/need for fuel management)
- perceived effectiveness
- perceived benefits and costs
- design and implementation of MFLR
- governance, including trust in organisations undertaking fuel management
- values and norms
- past experiences with fuel management and bushfires

5.1 PERCEIVED NEED

The extent to which a person believes there is a need to address a problem will influence the likelihood that they will find an action intended to address that problem acceptable. This means that, when examining MFLR, the extent to which a person finds MFLR acceptable is likely to be influenced by whether they believe there is a need to reduce fuel loads in order to reduce bushfire risk.

5.1.2 SURVEY FINDINGS

The perceived need for actions to reduce risk of bushfire in general, and for actions such as MFLR more specifically, was examined in the survey by asking participants whether they felt they lived in an area with high risk of bushfire, the extent to which they were concerned about potential impacts of bushfire on their property or business, and whether they felt it was difficult to achieve adequate controlled burning in their region to reduce bushfire risk.

More than half of rural and regional Australians (54%) and urban Australians (55%) felt that they lived in an area with high bushfire risk (Figure 4). Fewer - 36% of rural and regional Australians and 39% of urban Australians – reported that they worried about the potential impact of bushfires on their property or business. This indicates that many people do not feel actively worried about bushfire risk, potentially reducing this as a factor influencing the extent to which they see a need for use of MFLR.

When asked whether fuel loads were too high in their local region, around one-third agreed (36% of rural/regional residents and 31% of major city residents), 32% of both groups disagreed, and many were unsure (17% of rural/regional and 24% of major city residents). Similarly, when asked whether it was difficult to get enough controlled burning done in their region, a large proportion were unsure (31% of rural/regional and 40% of major city residents), while around one-third agreed (36% of rural/regional and 30% of major city residents).

All four survey items were significantly and positively correlated with views about acceptability of MFLR: if a person felt there was high bushfire risk in their region, were worried about impacts of bushfires, felt fuel loads were too high, and/or felt it was difficult to get enough controlled burning, they were significantly more likely to feel that MFLR is acceptable (Figure 5 and Table 7)².

² Throughout this report, bivariate analysis and presentation of how different factors are related to acceptability of MFLR are unweighted.

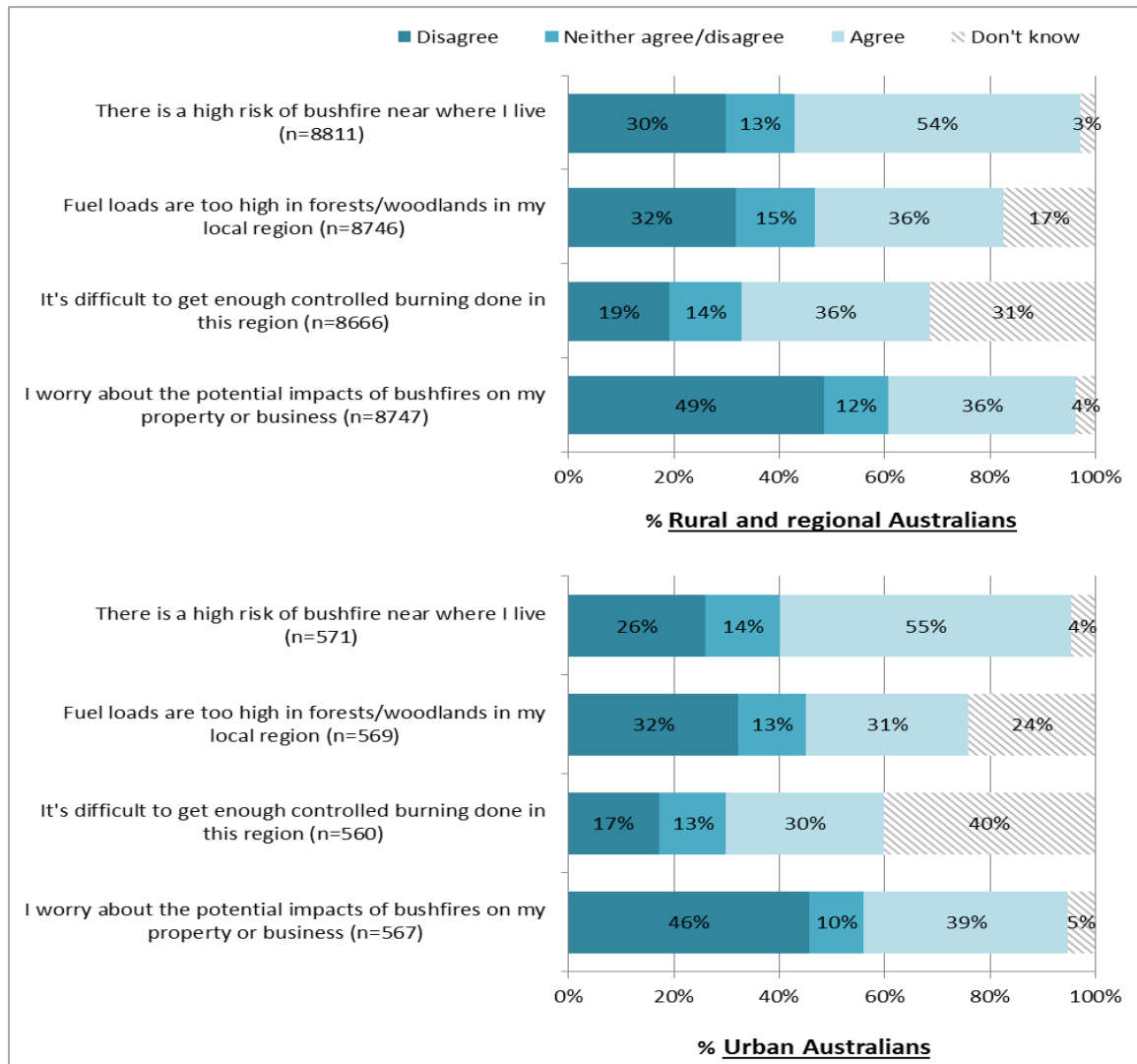


Figure 3 Views about bushfire risk and the need for fuel management

Table 7 Relationship between the perceptions of the need for fuel management and acceptability of MFLR

Perceptions of perceived need ¹	n	Effect size and significance (<i>r_s</i> , <i>p</i>)	Significant relationship with acceptability of MFLR? ²	Nature of the relationship ³
There is a high risk of bushfire near where I live	8687	0.10, 0.00	✓	Positive
I worry about the potential impacts of bushfires on my property or business	8568	0.12, 0.00	✓	Positive
Fuel loads are too high in forests/woodlands in my local region	7748	0.24, 0.00	✓	Positive
It's difficult to get enough controlled burning done in this region	6650	0.20, 0.00	✓	Positive

¹ On a scale from 1 'strongly disagree' to 7 'strongly agree'
² On a scale from 1 'not at all acceptable' to 7 'very acceptable'
³ Positive = Those who agree with the statement, are significantly more likely to find MFLR acceptable

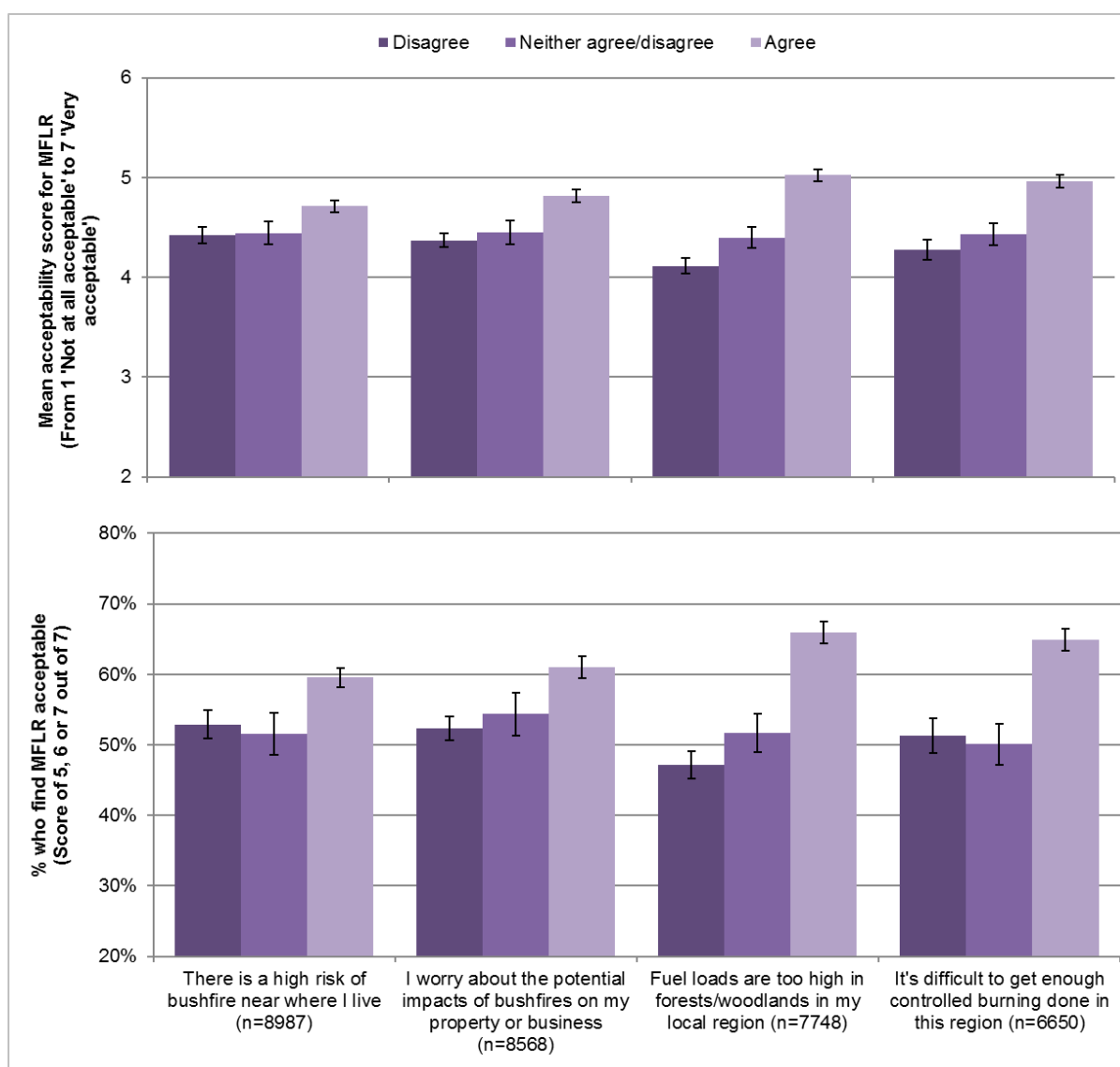


Figure 4 Perceptions of the need for fuel management and acceptability of MFLR

5.1.3 STAKEHOLDER WORKSHOP/INTERVIEW FINDINGS

In workshops and interviews, views about perceived need were discussed in more detail and more specifically. A wide range of views were expressed: while all attendees agreed on a need to manage bushfire risk in the landscape, they often differed substantially in their views on the most appropriate methods of reducing this risk, and about the circumstances in which they felt there was a legitimate need for MFLR as part of bushfire risk reduction strategies in different circumstances. In particular:

- Many participants felt that MFLR was needed only in specific circumstances, and was not needed in others.

- Some participants felt that investment in fuel reduction is inappropriately high due to reactionary approaches to bushfire management and negative social norms about fire in the landscape
- Some participants felt that the entire model of reducing bushfire risk needed to change, with greater emphasis on sharing responsibility for managing risk.

A perceived need for MFLR to achieve risk mitigation was mentioned by multiple types of stakeholders, with no type of stakeholders more likely than others to discuss the view that there was in some circumstances a need for MFLR to reduce bushfire risk. Negative perceptions about the use of MFLR to mitigate bushfire risk, in which participants discussed concerns that MFLR is not needed or appropriate in particular circumstances, were raised more often than positive views, and were most commonly raised by representatives of NRM group and ENGOs, and much less often by other groups.

Common themes raised around the perceived need or lack of need for MFLR to reduce bushfire risk related to location/scale of implementation, the need for a broader toolbox of bushfire risk reduction management strategies, socio-cultural considerations, forest management priorities, and managing forests for multiple objectives.

The location or scale at which MFLR is implemented was a key consideration in assessing perceived need. MFLR was viewed as being a potentially useful tool in situations where controlled burning is not feasible (for example near built infrastructure), or where potential damage from a bushfire was extremely high in terms of risk, with multiple stakeholders describing this. It was described as having a positive role when used strategically in specific, small-scale areas to address specific risks, or when used to help create a situation in which it is feasible to re-introduce the use of controlled burning. In general, the view was that MFLR can be appropriate, but predominantly at the small-scale, in specific situations where other methods cannot be used:

I consider there's a use for it [MFLR] on the urban interface where people are very sensitive to fire. Forestry - 14

...[W]hether it be for the social boundaries or just the nature of fuels where it is very difficult to introduce fire. So you might do a one-off mechanical thinning to be able to get fire into it and then to be able to maintain with fire. Forestry – 8

Support for MFLR at these small scales and specific locations was contingent on meeting appropriate management criteria. In particular, participants wanted assurance that MFLR would result in retention of appropriate levels of organic matter on sites, would not remove unnecessarily large volumes of vegetation, and would select the material to be removed appropriately.

...There might be unnecessarily too much being taken out. Again, I can see the situation that you've taken out maybe a little bit of thinning, under-scrubbing at the ground and mid-story or under-story level, and that's enough. NRM - 4

The perceived need for MFLR was much lower in other circumstances, specifically some questioned whether MFLR would reduce the risk of losing built infrastructure in bushfires, and several felt there was no rationale for applying MFLR at a large-scale rather than using other existing methods.

Well, I don't think the case has been made, really ... This money [for the MFLR trial project] was given basically as a response to a number of wildfires that led to serious loss of houses and really when you look at the results of where those houses burnt there are a whole lot of factors that determine whether or not a house burnt. There were houses in the middle of those which fires that did not burn because, for example, they had a whole lot of design features in the house itself, which meant that they didn't burn, they had area around it that was not flammable. So there are a range of things that [can be done] if we want to save houses, which is the argument that we might engage, but just going out and basically thinning - this is thinning disguised as fuel reduction. ENGO - 5

Related to views about the need for MFLR in different contexts, two participants, both in the bushfire management sector, specifically felt that MFLR was needed to expand the toolbox of options available to reduce bushfire risk, and that the trials conducted in this study were needed to examine the feasibility of MFLR:

...[W]e are looking to broaden our fuel treatment toolbox, if you like, to give us opportunities to modify our approach to fuel management based on community needs, risk and a whole heap of things. Bushfire - 8

We just can't pin our hopes of protecting the community because we have a limited range of options to do that and so we need more of this research. ... We need to keep trying to develop the range of treatment options to protect the community from bushfire over the long time. Bushfire - 1

Several ENGO and NRM stakeholders raised concern about the perceived need for MFLR over-riding considerations about protecting environmental values: while they could see a need for MFLR, they felt the relative need for use of MFLR was potentially being overstated relative to the need to protect environmental values:

I don't think there's a quick answer, but I think the pressure ... the reason there's so much pressure is because we want to protect lives, but whether this is the right thing from an ecological perspective, I'm still not convinced. NRM - 2

[Environmental values are] paid lip service to and it's point number four, the last one on the list of things to consider in the management of fire: environmental values. It never gets considered. ... fire safety ... always comes number one and I'm just wondering with this [MFLR], where does environment come in and is it going to be pipped all the time on public safety so it never gets considered. ENGO – 1

Further driving these concerns were concerns from some, particularly NRM and ENGO stakeholders, that bushfire management decisions are determined by political drivers and

social pressure to accept particular fuel management strategies, rather than independent risk-based assessments.

The best approach is not one of a knee-jerk politically driven response after a major fire. ... science should be used to develop and plan appropriate landscape treatments, with a risk-based application. This is important to ensure expensive treatments are not being used in areas where the risk or change in risk is minimal. Without the use of scientific, risk-based approaches millions of dollars can be spent with very minimal benefit. NRM - 1

...there seems to be this - I don't know - mafia that is controlling the whole fire agenda and logging agenda and we're not really hearing from a lot of those people that just dare not go to those public meetings because they don't want to be seen questioning it ... I don't know how you overcome that. ENGO - 1

Building on this, some felt that rather than exploring one particular bushfire risk management strategy, longer term strategies needed to be introduced that focus on restoring systems that reduce fuel loads, giving examples of reintroduction of native wildlife as management options that they felt were not being considered:

There is anecdotal evidence from the Australian Wildlife Conservancy about Karakamia, that the fuel load inside Karakamia Sanctuary takes twice as long to build up inside the fence as it does outside the fence because they've taken out the cats and the foxes and the rabbits and they've reintroducing the native animals, the woylies and other animals and they reduce the fuel load naturally. We're trying to replace natural fuel reduction and all the ecosystem services of these native animals ... with fire, which destroys the habitat, pollutes the air and look at the mess we're in. If we could try to manage the bush to bring back the native animals, and ... allow them to reduce the fuel rather than these mechanical imposed methods that have got nothing to do with nature. ENGO-6

Overall, most stakeholders felt there was a potential need for MFLR, but in defined circumstances, usually at small scales, and only when a clear rationale could be put forward for the use of MFLR versus other tools to reduce bushfire risk.

5.2 PERCEIVED EFFECTIVENESS

Closely related to perceived need is perceived effectiveness: the extent to which a person feels that a proposed action will be effective in achieving its stated goals. In this case, this means the extent to which a person feels that MFLR will be effective in reducing risk of damage from bushfires through reducing fuel load and/or fuel structure.

The question of effectiveness was examined in stakeholder workshops and interviews only. It was not examined in the survey, as early focus groups examining potential question topics indicated that most people were very unfamiliar with the basic idea of MFLR, and did not feel able to make any judgment about its potential effectiveness. Stakeholders with an interest in MFLR, however, were asked to discuss their views about effectiveness in workshops and interviews.

5.2.1 STAKEHOLDER WORKSHOP/INTERVIEW FINDINGS

Discussion of the effectiveness of MFLR in different circumstances was raised multiple times in workshops and interviews, including in a positive context (in which MFLR was described as being potentially more effective than alternatives in some circumstances) and a negative context, in which MFLR was described as potentially lacking effectiveness in some circumstances. Discussion of effectiveness occurred in relation to the location and scale at which MFLR was undertaken, the need for MFLR to be integrated with other fire risk reduction strategies, concern about whether use of MFLR would be motivated by its effectiveness or other factors, and concern about the extent to which MFLR would be effective in achieving reduced fuel loads beyond the very short-term.

Some felt that MFLR could be effective in specific situations, specifically where there was evidence it might reduce speed or spread of fire near built infrastructure, but that there needed to be realistic evaluation of the situations in which MFLR could achieve this outcome, and that under catastrophic bushfire conditions it would not necessarily make a significant difference to outcomes:

The other [issue]... is overstating the benefit that some mechanical fuel reduction can have...I don't want the community to be led into a false sense of security about how [applying MFLR]..three kilometres away is going to help them... when fire can move across that landscape irrespective. NRM – 4

Most of our assets that are lost are lost in the severe catastrophic fire days. Fire behaviour is probably not going to be changed by a mechanical thinning, it's not changed by hazard reduction in most cases. So that would be my concern, are we actually trying to reduce the risk on these severe catastrophic days, when we know it's going to be difficult to do that unless we've done large scale thinning, or whatever we call it or are we trying to do just for our standard days? So those high ones are driven by weather, they're not driven by fuel. ENGO - 13

Several felt that MFLR could be effective in close proximity to assets, but not at larger landscape scales, typically citing evidence on effectiveness of controlled burning and arguing this would likely also apply to MFLR:

Yeah there's some evidence out there that shows that ...the effectiveness of burning reduced dramatically to almost nothing after about 300 metres away from a farm or that type of asset around a town. ENGO - 2

MFLR was typically viewed as effective if it formed part of an integrated toolbox of strategies that were used together to reduce risk of bushfire damage.

You have to look [at] a) it's effectiveness in the acute fire weather and b) it's effectiveness against other ways of saving lives. ENGO - 4

... mechanical fuel reduction is just one tool, in the suite of potentially many, and through this [regional initiative] a lot of it is about increasing the capacity of all land managers. Traditionally at the moment it's State Forests and National Parks who tend to do things like hazard reduction burns on their property because the rest of us don't have the capacity and private landholders are the same. NRM - 5

Within all bushfire risk management plans there's a whole suite of treatments... About half a dozen broad treatments. And community engagement is considered one of the treatments, but we don't do it much. ... So, if we're going to do this sort of mechanical trial and then we might adopt it, or might not, then again, it's one of the treatments that we should be comparing against all the other treatments. Not just the fuel reduction treatments, but all the other treatments that we look at. It's risk reduction. ENGO - 13

Others identified that effectiveness needed to be assessed not in terms of simply effectiveness in achieving reduced fuel loads, but effectiveness in achieving this (i) in the short-term versus long-term, and (ii) without causing damage to other environmental, economic or social values. In particular, several stakeholders felt that MFLR might reduce fuel loads in the short term, but be followed by a rapid increase in fire risk due to regrowth of vegetation:

... I don't think that it'll actually really help with the fire suppression either. Because over here we've got quite a few really fast-growing weedy-type native trees and if you clear a patch out of the bush they'll start growing real quick and they are very flammable. Business (apiarist) - 2

... they'll go through [doing a first round of MFLR on a site] while it's an economical process and get the wood. But when the volume of biomass isn't there in the period five years after they've done work, but there's a whole lot of other flammable material that has created as a result of the opening up [done in the MFLR] it won't be economical to go back in to do it again. ENGO - 5

I think it's going to be really easy to show that the fire hazard is reduced in the short-term in this trial. But they need to do five-year monitoring and look at the fuel load again in each of the sites at least over a five-year period, every year. Maybe over a ten-year period

because you're not going to ... also are we going to go into a drought, is there going to be more rain, we need to look at this on a longer term. ENGO-3

You're talking about removing some of the canopy trees as well so you are you going to get more sunlight. You're kind of encouraging the growth of some of those plants that might be creating a new fuel problem in a short amount of time. Particularly thinking about grass ... within 12 months you might have a worse [fire risk] problem. NRM-4

5.3 PERCEIVED BENEFITS AND COSTS

A person's beliefs about the benefits and costs associated with the implementation of a natural resource management practice influence how acceptable they find that practice. Perceptions of benefits and costs were explored to a limited extent in the quantitative survey, where limited space meant that three key areas only could be examined. They were explored in more detail in stakeholder workshops and interviews.

5.3.1 SURVEY FINDINGS

As people in the general public often have very low familiarity with MFLR, questions about potential costs and benefits needed to be matched to their level of knowledge and ability to comment. The aim of examining perceptions of benefit and cost in the quantitative survey was to understand initial reactions to the concept of MFLR, which give an indication of whether initial reactions involve concern about particular areas, or perceptions of positive opportunity. Specifically, the survey asked about perceptions of impacts of MFLR and controlled burning on:

- Forest and vegetation health
- Animal and bird populations
- Human health and impacts.

These three dimensions were selected as environmental and health impacts are common topics of discussion when benefits and costs of controlled burning are reviewed. Figure 6 shows basic findings for these topics, while Table 8 identifies whether each predicts acceptability of MFLR.

5.3.1.1 *Perceptions of impacts on forest and vegetation health*

When asked whether MFLR was likely to be good for forest and vegetation health, the most common responses was 'don't know', with 32% of rural/regional and 36% of urban residents giving this response. Of those who felt able to give a response, just over a quarter agreed (28% of rural/regional and 27% of major city residents) and a similar proportion disagreed with this statement (27% of rural/regional and 28% of major city residents). Controlled burning, meanwhile, was considered positive for forest/vegetation health by 67% of both rural/regional and major city residents. There is there much less confidence that MFLR will be positive for forest and vegetation health than is the case for controlled burning, and high levels of uncertainty.

5.3.1.2 *Perceptions of impacts on bird and animal populations*

When asked if MFLR is likely to harm animal and bird populations, 44% of rural/regional and major city residents agreed, and 20% of rural/regional and 18% of major city residents disagreed. Around one quarter of people were unsure, and some stated they neither agreed or disagreed. Controlled burning was viewed as slightly less likely to harm animal and bird populations, with slightly fewer agreeing with this statement when asked about controlled

burning, and more disagreeing. Again, more people indicated that they 'don't know' whether MFLR would harm bird and animals populations (23% of rural and regional Australians, and 28% of urban Australians), compared with controlled burning (12% of rural and regional Australians, and 19% of urban Australians). These findings suggest that concerns about animal and bird impacts are high for both MFLR and controlled burning, but slightly higher for MFLR of the two practices.

5.3.1.3 Perceptions of impacts on humans

People were more likely to worry about the impacts of controlled burning on human health compared to MFLR: 24% of rural and regional residents and 25% of major city residents agreed that they worry about the effects MFLR could have on human health, compared to 39% of both groups who worried about health effects of smoke from controlled burning. This suggests that MFLR may be viewed positively relative to controlled burning in terms of health impacts, although many people – over 36% to 44% - had no concerns about the health impacts of either MFLR or controlled burning.

In addition, a further item was asked of survey participants, in which they were asked whether they felt there was a high risk of controlled burns getting out of control in their region. This was asked as MFLR literature has suggested that one benefit of MFLR is the ability to reduce risk of controlled burns becoming uncontrolled and causing impacts on humans (for example through damage to infrastructure or greater impacts from smoke), through using MFLR in some situations to mitigate risk. A total of 33% of rural and regional Australians and 29% of urban Australians felt there is a high risk of controlled burns getting out of control in their region, while 39% and 36% respectively did not feel this was an issue.

5.3.1.4 Association with perceived acceptability

The perceived benefits and costs of implementing controlled burning and MFLR were further examined to determine how or if they were associated with acceptability of MFLR, as well as controlled burning. Acceptability of both MFLR and controlled burning were investigated with all of the views (both about MFLR and controlled burning) to better understand the relationship between the perceived impacts of these strategies.

Bivariate results are presented in Table 8, showing that the relationships between all perceived benefits and costs and acceptability of both MFLR and controlled burning were significant. Respondents were likely to respond similarly across these items regardless of whether they were about controlled burning or MFLR. The negative perceived impacts of one strategy did not necessarily make the other strategy more acceptable. For example, those who were concerned about the health impacts of smoke from controlled burns were significantly less likely to rate controlled burning as acceptable, but they were also significantly less likely to rate MFLR as acceptable.

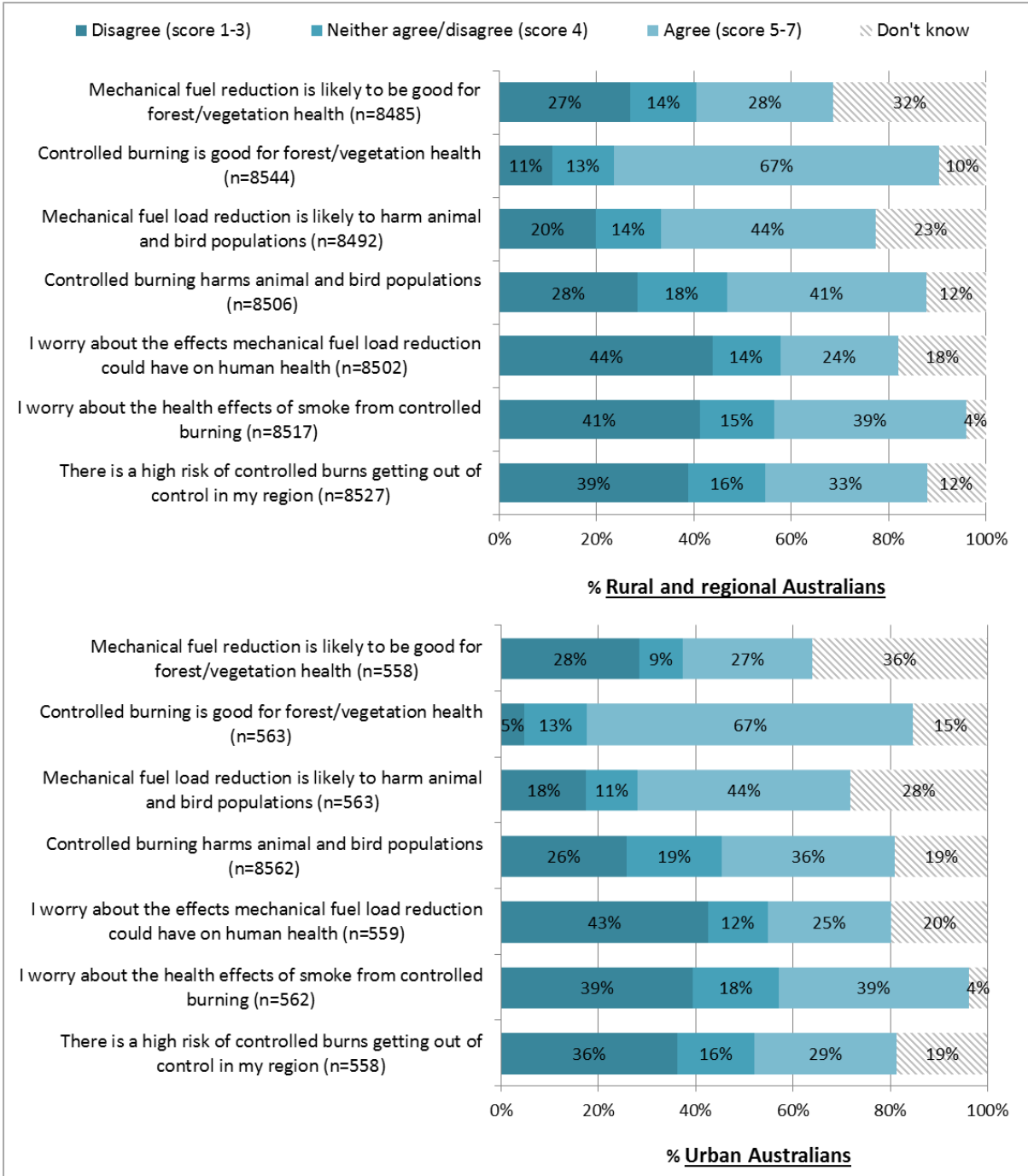


Figure 5 Perceived benefits and costs of MFLR and controlled burning

Table 8 Perceived outcomes and impacts of MFLR and controlled burning, and acceptability of MFLR and controlled burning

Perceived benefit and cost items ¹	Relationship with acceptability of MFLR ²				Relationship with acceptability of controlled burning ²			
	n	Effect size and significance (<i>r_s</i> , <i>p</i>)	Significant relationship?	Nature of the relationship ³	n	Effect size and significance (<i>r_s</i> , <i>p</i>)	Significant relationship?	Nature of the relationship ³
Mechanical fuel reduction is likely to be good for forest/vegetation health	6497	0.54, 0.00	✓	Positive	6530	0.28, 0.00	✓	Positive
Controlled burning is good for forest/vegetation health	8090	0.35, 0.00	✓	Positive	8228	0.53, 0.00	✓	Positive
Mechanical fuel load reduction is likely to harm animal and bird populations	7271	-0.36, 0.00	✓	Negative	7346	-0.20, 0.00	✓	Negative
Controlled burning harms animal and bird populations	7982	-0.21, 0.00	✓	Negative	8102	-0.30, 0.00	✓	Negative
I worry about the effects mechanical fuel load reduction could have on human health	7531	-0.21, 0.00	✓	Negative	7609	-0.19, 0.00	✓	Negative
I worry about the health effects of smoke from controlled burning	8473	-0.15, 0.00	✓	Negative	8630	-0.23, 0.00	✓	Negative
There is a high risk of controlled burns getting out of control in my region	8031	-0.14, 0.00	✓	Negative	8133	-0.23, 0.00	✓	Negative

¹ On a scale from 1 'strongly disagree' to 7 'strongly agree'

² On a scale from 1 'not at all acceptable' to 7 'very acceptable'

³ Positive = Those who agree with the statement, are significantly more likely to find MFLR acceptable; Negative = Those who agree with the statement, are significantly less likely to find MFLR acceptable

5.3.2 STAKEHOLDER WORKSHOP/INTERVIEW FINDINGS

In stakeholder workshops and interviews, participants were asked to discuss the potential benefits and costs of MFLR. These discussions were then coded into common themes. In some cases, both benefits and costs were identified related to the same issue: in particular, when discussing environmental impacts both potential benefits and potential costs were identified. For other themes, the discussion predominantly focused on either benefits or costs.

In general, potential benefits of MFLR were more commonly discussed by representatives involved in bushfire management and forest management, while concerns about negative impacts (costs) were more commonly discussed by representatives of ENGOs and NRM organisations. However, this was not always the case, with many participants expressing views both about potential benefits and potential costs.

The types of benefits and costs most commonly discussed were the following, each of which is described in more detail in this section:

- Environmental impacts
- Bushfire risk management impacts
- Economic impacts – cost and cost effectiveness
- Economic impacts – commercial sale of removed timber
- Economic impacts – forest industry
- Economic impacts – other industries
- Health impacts
- Landscape aesthetics
- Other benefits and costs.

5.3.2.1 Environmental impacts

The potential environmental impacts of MFLR were discussed in almost all workshops and interviews, and by a large number of participants in each workshop. Both benefits and costs were discussed, and predominantly focused on impacts on biodiversity, forest structure, weeds and invasive pests, and soil health.

Biodiversity impacts

Most discussions about biodiversity impacts focused on concerns about loss of biodiversity, although some participants also felt that MFLR could be used to protect habitat that would be threatened by use of controlled burning, or that is at high risk in bushfire, and pointed out that MFLR might promote regeneration of some species that did not have regeneration triggered by fire:

These old habitat elements, where we've got high boles that when they catch fire they form chimneys, fire can really destroy these old habitat elements that are so important

for cockatoos and other fauna. Certainly, I think [MFLR] ... can really work to preserve those iconic trees, I guess. Forestry – 15

Whatever you do you're going to change the suite of understory plants that you've got there. When you burn, there are some plants that are geared up to react to the heat and the smoke and that's their primary trigger. But there's other plants where if you just open the site up and produce a bit of bare dirt, they've also got a chance to regenerate there. So [a] combination of mechanical treatment and burning is probably the way to think about it in the long term. Forestry - 11

Concerns about negative impacts on biodiversity were raised, with many stakeholders wanting to know whether the way in which MFLR was undertaken would reduce species diversity due to removing some specific layers of vegetation, particularly populations of rare or threatened understorey species:

It's homogenising the landscape, and from a conservation perspective, I think we don't understand enough about interaction of different species and how they use the topography, but I think that [MFLR] would be huge for species that rely on moving across the landscape. NRM-2

...in the forests of northern New South Wales, several hundred plants ... are listed on the threatened species list. I think that clearly in any sort of mechanical operation with the possibility of doing serious damage to those plants is a very real concern. ENGO-1

... what's the impacts of burning plus mechanical fuel reduction, and then the biodiversity outcome in the long run ...[O]bviously we need to create that separation [between housing and vegetation] enough to protect those houses, to a reasonable level, but we also have been very, I guess, mindful of the environmental impacts as well. Bushfire-9

I worry [MFLR is] ... taking out all that under-scrub, which is perfect habitat for insectivorous birds. We're tipping it to a system dominated by things like Noisy Miners or even potentially Bell Miners in the absence of fire, again. Therefore, we're just seeing a whole unravelling of the system over time, rather than fire, which could have been the very thing that it needed to stay healthy. NRM-5

Forest structure impacts

Related to discussions about impacts on biodiversity, some participants focused on how changes in forest structure might result from the use of MFLR. Some felt that MFLR provided an opportunity to restore some types of forest structures that are currently under-represented:

I think that there is more that we can do to restore the full spectrum of forest structures and make that more representative. ... [MFLR] presents an opportunity to enhance the growth rates of the retained trees and potentially move to recover a larger percentage of the forest estate in a condition characterized by larger sized classes dominating, whereas at the moment, the forest structure tends to be dominated by the smaller size classes. And so ... we

can transition more quickly than we would than in a non-interventionist regime to the sorts of stand structures that I think a large sector of the public appreciate and enjoy when they go out to look at the forest. Forestry – 15

...[T]he other advantage that we're seeing in the smaller areas that have been done is actually the health of the bush. Where we've done [MFLR] on smaller scale, we're actually seeing that the trees that are left, the larger trees, within a couple months look totally different. They're a healthier tree. Bushfire-5

Others, however, felt that in the long-term repeated application of MFLR to a given area would change stand structure in negative ways, including raising concerns about potential loss of specific parts of stand structure and some age classes of trees:

[I]n 20 years from now, where are the 20 year old trees coming from, given that they're going to be continually getting mowed down with successive risk mitigation measures? NRM-3

[T]he fact that it's removing the trees is the biggest concern. If it was mainly taking the understory out, that wouldn't have quite as big impact, but the understory is almost as important as the main Jarrah and Marri trees. We definitely need to have some form of fire management because when you get a wildfire it just ... it's crazy. But my personal opinion would be that they need to do more buffer strips and mechanical clearing could be an answer to that. Business – 2

If it was just leaf matter and they don't remove the big things like logs that provide habitat that would be half-acceptable. But if they start removing habitat for lizards, for little animals, then I think that may not be appropriate.... that wouldn't be something I would see as a positive thing. NRM-2

This was associated with concern that the short time period in which the trials were to be conducted would not allow sufficient time to identify and assess the impacts of MFLR on forest structure:

From what I understand from what you've told me about the trial, basically it's enormously changing the structure of the forest. Now, it doesn't take a lot of understanding of forest ecology, to know it's going to change habitat ... which means you're going to have an effect on anything that's in there in some way or other. I just don't think that doing a limited survey of what's there is, is going to give it a real indication of what the real impact will be. ENGO-4

Invasive weed and pest species

MFLR was viewed by some as having potential to assist with managing invasive weeds, while others felt it had potential to increase spread of weeds and create openings for some invasive pest species. When discussing these issues, participants often identified that whether this occurred would depend on how MFLR was undertaken, and raised concern

about whether this issue would be assessed adequately in the short time period of the trials:

... would it increase weediness where it abuts agricultural land and so on? This is a very important question. Or, on the contrary, does it actually give us a good response from the understory because it's less competition and actually you get more floristic diversity? Both are possible. ENGO - 7

There's a lot of species out there for weed management that sometimes the low intensity burn really does assist us in our weed management. Mechanical hazard reduction doesn't tend to help a great deal with any sort of weed management. Bushfire - 9

If you've put mechanical plant into areas, and you've got a bit of weed in there, you go in and do some clearance, before you know it, you've created a bigger weed problem down the track if you haven't actually dealt with that weed problem as part of that initial works or you don't have the resources to go back in and continue to follow up or do the maintenance... Bushfire – 11

The spread of dieback with machinery is a problem. Dieback hasn't been mapped in all places, you don't really know where it is anyway, and large machinery could propagate it, and then the cleaning and then having protocols for people to do the right thing could, over a large area could be difficult to manage. NRM - 2

In general, when positive impacts were discussed, it was in relation to potential to address problems of large woody weed invasion through MFLR, for example invasion of pine wildings into native forest areas:

I think there's also opportunities around pine plantations. It's quite common to get wildings of pines that'll spread off into the bush. ... I think you could achieve benefits both for protecting the plantation itself, but also dealing with the pine invasion and potentially that could be quite a commercially attractive operation. You've got decent sized wildings here, you could have quite a good return ... I suppose there are other places too where we've got other invasive woody weeds which are quite significant weed problems. They are often difficult to burn because they have a dense canopy and it's difficult to get a ground fire run underneath them, or if it does burn, it'll burn pretty hot. So I think there are some applications there. Forestry - 1

Soil health

MFLR can be done with a range of machinery, including heavy machinery. Some participants expressed concern about the potential for soil compaction to result from the use of machinery:

Now, we're talking about mechanical removal. This means machinery. This means compaction. ... with your machines going in and flattening the vegetation and removing it, you're going to create soil compaction that will last for 50 years. Let me tell you some of the problems with soil compaction. Soil structure, water infiltration decrease, erosion speeds up. All of these processes lead to changes in plants' physiology. Photosynthesis,

transportation, nutrient uptake, microbes, rhizomes are all possible avenues for these changes. ... ENGO - 6

Others felt that soil health could be negatively impacted if groundcover vegetation was cleared as part of MFLR:

If we're talking about just going in and doing a bit of clearing and still keeping that ground cover, then the impacts aren't potentially as disruptive ... Whereas, if we're talking about going in and taking back to bare soil, then you've got erosion problems and weed problems ... Bushfire - 12

5.3.2.2 Bushfire risk management – increasing the toolbox of options

When asked to discuss potential benefits of MFLR, participants – particularly those directly involved in management of bushfire risk – commonly felt that MFLR could provide an additional risk mitigation tool that provided options in situations where other fuel reduction methods could not be applied. Some focused on the benefit of ‘expanding the toolbox’, while others emphasised that they would only support the use of MFLR in a limited number of contexts where there was both an identified need, MFLR could be effective, and there were few or no other options for reducing bushfire risk.

When discussing the places in which MFLR might provide an option for reducing fuel loads or achieving positive outcomes that cannot be achieved using other methods, participants typically described MFLR as being a tool for use near built infrastructure or other assets (for example pine plantations) where controlled burning was not feasible, or as being used to increase the ‘window’ of time in which controlled burning was possible:

... we are looking to broaden our fuel treatment toolbox, if you like, to give us opportunities to modify our approach to fuel management based on, you know, community needs, risk and a whole heap of things... Bushfire - 8

...the potential benefits of mechanical fuel reduction...[include using it in] places where burning is difficult, because of proximity to assets or if you've got small urban bush reserves, mechanical fuel reduction gives you some additional scope there. For some vegetation types...where you've got tall, dense forest with a dense understory that are quite hard to dry out, and doing some sort of mechanical treatment will open up the burning window. Forestry - 17

There are obvious benefits in terms of expanding the opportunities for fuel management in particular areas of the landscape, such as peri-urban areas where fuel management is highly constrained. NRM - 1

Well, I think it does have a place in this- sort of the fuel reduction that I talked about that was closer to households and so on. ENGO – 4

Our major interest is in the protection of a particular asset, which is pine plantations. About 80 to 90% of the damage that occurs to or that pine plantations are subjected to comes from bushfires that burn into the pine plantation ...We view mechanical fuel

reduction as a means to treat the perimeter of pine plantations ... such that ... fire-fighters will feel a lot more comfortable putting themselves between a fire burning into a fuel-reduced area and plantation, knowing that the fire's going to come out of the crown, I hope, and become a ground fire and they can suppress it. Forestry – 11

I suppose the whole exercise near assets or further from assets is pushing back the number of days you can get to crown fire. ... but if you've got dry elevated fuel up to the canopy, it might be 100 days a year that you might expect a crown fire there, if you make that 60 [through use of MFLR], that's a big difference..... so you've got an option to push that back down, the number of days where [bushfire is] uncontrollable. Forestry – 6

Others spoke more specifically about the trials, feeling they provided some insight into whether use of MFLR could be extended beyond current uses that often focus on slashing and mowing of grasses, to the mechanical removal of other layers of vegetation:

At the moment our mechanical type treatments are limited to mowing, slashing, maybe to a minor extent grazing. ... So, actually removing that middle layer of vegetation is another aspect that we hadn't really considered until recently and that's why I am supportive of the trial to see how well it goes. Bushfire – 6

In addition to identifying MFLR as having potential to be used where fire cannot be used, and to be used in ways that increase the window of time for controlled burning, two participants also discussed MFLR as providing a tool for use in areas of forest in NSW affected by bell-miner associated dieback (BMAD) or where there are other forest health issues that make initial use of fire difficult, but where MFLR may provide a way of returning the forest structure to one where controlled or ecological burning could be used:

[MFLR provides an option for fuel management] in a mesic forest or a BMAD situation or broadening out from BMAD to any forest health issue. ... So you might do a one off mechanical thinning to be able to get fire into it and then to be able to maintain with fire. ... even though [we don't know] ... how much it's going to cost or how many times you've got to do this, what's the cost or the negatives around maintenance, it's actually still more positive than doing nothing. Forestry – 8

Importantly, when talking about MFLR as adding another tool into the toolbox of options for bushfire risk reduction, many stakeholders emphasised the importance of that tool only being applied in the specific situations where they felt it had relevance and benefit, and not in others where they felt the application of MFLR would be inappropriate. In particular, many felt that large-scale application of MFLR at a landscape scale away from built assets would be inappropriate:

I think the circumstance here where this may be beneficial maybe is in badly disturbed areas around townships. Not out in the open forest. ENGO – 9

...I can see the advantages of actually removing fuel loads in our coastal scrubland, heathland, areas. That's just opening up big firebreaks. The firebreaks do help control the

fires up there. Then also, you've got something to burn back on as well. ... But I'm not too sure how it would go in the forest as such. Business – 2

5.3.2.3 Economic impacts – cost and cost effectiveness

Many participants discussed the likely cost effectiveness of MFLR in focus groups and interviews, expressing a range of views. Many felt that MFLR would not be cost effective compared to controlled burning in situations where both were feasible options, with this contributing to the commonly held view that MFLR was appropriate as a tool to be used where other options were not feasible, but not generally in competition with them:

I think in more remote areas I'd be really, really surprised if [MFLR] came up as a cost-effective intervention. I just don't think it would stack up anywhere near broad-scale burning. Bushfire - 8

Others felt that if commercial sale of removed material occurred it may make MFLR cost effective. Views about this aspect of cost-effectiveness related in large part to whether participants felt it was either appropriate or possible to sell some of the material removed from the forest in MFLR. Some felt that being able to sell removed materials could reduce the costs to a point where MFLR became a viable option that was cost effective compared to other fuel reduction techniques:

So if you're trying to offset your costs, you get the most return you can. You'll never get it cost neutral but certainly being able keep down the cost would be the biggest advantage as a selling point to private land holders. Bushfire - 6

Another key consideration on cost-effectiveness was the cost of floating machinery to sites to undertake MFLR, particularly when shifting from the grass slashing and mowing common to MFLR to date in Australia, to removal of larger stems as was a key focus in these trials. Those who discussed this issue felt that the high cost of floating machinery meant that MFLR would likely need to be conducted on relatively large areas to be cost effective:

For this sort of operation to be successful in my experience requires every bit of gear known to man. You're going to have about six bits of gear there and you're going to have probably \$20,000 float costs to shift it all to the site and it doesn't ... And particularly if you're doing a partial thing, a thinning or a multi-age or something that's not a deck it and start again, you've got very high moving costs [for machinery]. And so the size of the coupes is going to be really important. And I don't believe the current coupe sizes are in any way conducive to making this sort of thing viable. ... I don't think twenty hectares is going to be enough, I think you're not going get enough commercial wood. If you're going make it commercial ... I would say you would probably want to be looking at 500 to 1,000 hectares in a cluster to make this sort of operation viable. ... Forestry - 10

Others raised concern about the long-term viability of sale, feeling that to be effective, repeated MFLR would be needed in a given stand, but that saleable material would decline over time:

... it's that first round [of MFLR] that gives you the cash [from sale of removed material] to inject, and the subsequent rounds don't have much biomass to come out, do they, to sell? That's where you find fuel load in the under shrubs and things which aren't very valuable commodities, but are actually quite a large bushfire risk potentially. NRM - 5

Others felt that cost-effectiveness needed to be assessed by identifying how MFLR and controlled burning could work in tandem, with strategically conducted MFLR reducing some sorts of managing fires:

I don't think it'll work on a broad scale unless it was linked to some commercial operation, but certainly around the edges of high value assets, the extra cost may be justified. Removal of any coarse woody debris in the buffer zone would make the mop up [of fire] a lot quicker and cheaper in the long term. ... [and] fire is going to be easier to manage. Mechanical removal of the coarse woody debris removes hot fire from the edges where burning debris is a source of re-ignition and often with long residence times that have the potential to damage nearby trees (if logs are close to trees). Bushfire - 6

Cost effectiveness therefore had multiple dimensions, and a case for cost effectiveness of MFLR would need to be made in relation to the costs of alternatives relative to the cost of conducting MFLR.

5.3.2.4 Economic impacts – commercial sale of removed timber

Closely related to discussions of cost effectiveness were discussions about the commercial sale of timber removed during MFLR. This was a key issue in most focus groups and interviews, with some feeling that any commercial sale of removed materials would result in substantial problems, while others felt this was one of the potential benefits of MFLR compared to other fire control methods.

Some stakeholders – predominantly some of those involved in managing forests for timber production – felt that commercial sale of removed timber could make MFLR cost effective (as described in the previous section), and felt there were potential markets into which materials removed using MFLR (typically relatively small diameter) could be sold, particularly for woodchips or biomass energy generation:

There's a range of different products from biomass. ... you can either export it, you can turn it into charcoal. You can use the ethanols and the extractives of the material to use in chemicals. There's a whole range of, right down to power generation level to pulp and paper ... it can be creating some self-sufficiency or an energy supply in a smaller area. Forestry – 13

... [commercial sale] can help drive this and create a whole new industry with a whole lot of wood that's currently not marketable. Forestry – 14

However, this was often reliant on achieving a scale and volume sufficient to support an industry, something which raised significant concerns for other stakeholders (described further below):

... I think there's a lot of scope to provide jobs and economic growth in regional areas ... there's a lot of scope for renewable energy generation if the contrary to the idea that it is going to be small and boutique, if you can scale [MFLR] up enough and bring in the investment to turn the wood fuel into a form that could be burnt with coal, you've got a real scope to create a base load energy, renewable energy that's not going to crap out when the wind stops blowing or the sun stops shining. Forestry – 11

Others felt that commercial sale was necessary but questioned whether appropriate markets could be created for the harvested material:

So I'm interested in what sort of yields, what sort of products came off these trials...I'm particularly interested in where you've got non-commercial species or non-preferred species, the challenges you have in managing that interface there where you don't have a traditional ... market ... without that market for residues, you're not going to have a project that pays for itself, so that makes it a bit of a concern for me as a long term sustainable practice. Forestry - 13

Some felt that while commercial sale could reduce costs, it would create significant problems in terms of community perception:

[A challenge is] selling [MFLR] to the interest groups. In this [trial], the removed product was chipped to ... a garden mulch ... If I was a private land holder, who was undertaking this process, I'd be considering more options that just creating the lowest value product. I'm sure there's other, higher value products that you could use. But that seemed to be the sticking point to the [interest] groups...because it was perceived as being commercial harvesting. Bushfire - 11

Stakeholders from ENGO groups, and some NRM representatives, were generally actively opposed to commercial sale of material removed using MFLR, viewing this as 'logging by stealth' that, even if done with good intentions, would result in perverse outcomes due to commercial interests becoming a driver of decision making, rather than considerations of bushfire risk reduction:

That's one of the biggest problems in land management. That once you introduce a commercial incentive to run a program, then that becomes a driver of the program. That's a really unfortunate thing in terms of land management. Or it can be a hugely unfortunate thing. The idea that we can run fuel reduction, at no cost or something, theoretically for some sort of outcome. But, what that means is that obviously it becomes cheaper to run if you take out more. Then that just potentially increases your impact on biodiversity considerably. So you've actually built in a driver by handing it to a commercial operation. That's just perilous, absolutely perilous. ENGO-4

Any trial [of MFLR] must not take into account any commercial use of this material because it'll be into the national parks, the nature reserves, it will be into anything using this as an excuse to strip biomass. That's my warning to us. It cannot be commercial. We know what'll happen. We know what happened with wood chips. ... Let's be very, very careful with what we're doing here. ENGO-6

It's a very short-term process, like everything. It's a very short-term process that has benefits the first time round and then after that it's even more costly and the industry's moved on. They just want to do bits where they can get wood. ENGO - 5

Key to the concerns expressed about commercial sale of removed materials was the concern that this would result in commercial imperatives. In some interviews, participants also discussed whether systems could be implemented to reduce this risk occurring, discussed further in the section examining governance.

5.3.2.5 Economic impacts – forest industry

A very small number of participants – two, both representing forest industry interests – felt that beyond sale of material removed from the forest in MFLR, MFLR could have broader impacts on the forest industry. This could occur through MFLR providing a silvicultural treatment that improved growth of retained trees; reducing intensity of fires when they occurred and hence reducing damage done by fires to volume of timber available from forests; and by developing markets for smaller diameter materials which could be used by the forest industry.

...by having lower fire intensities as a result of the fuel reduction when we do get a fire, the intensities are less and so there's often, we're going to achieve less damage to the retained trees. I think there's an important economic benefit there in terms of managing the production forest estate. Forestry – 15

If those markets [for other forest products] are there ... [MFLR] then offers a whole different suite of silvicultural options which [we] simply don't have now. A lot of those are much more likely to be acceptable, I think. So I think it's really big thing in terms of the options. Forestry - 14

...[T]here are a number of ecological benefits to the forest from a silvicultural point of view. We've had problems here in WA, evidence in 2010, 2011 of mass tree mortality in the Jarrah forest in drought years. A lot of it is attributable to high transpiration rates associated with high stocking of small size classes. There's a strong case for silvicultural thinning in order to reduce that risk, and this mechanical fuel load reduction can serve that silvicultural outcome, as well as the fire risk mitigation. Forestry – 15

5.3.2.6 Economic impacts – other industries

A small number of participants identifies that MFLR had potential to have some impacts for other industries. For example, one felt that MFLR could have benefits for grape growers as if used in place of controlled burning it would reduce risk of smoke taint affecting grape harvest:

... the grape grower community, who don't like smoke. That would certainly be an economic advantage for them to have mechanical fuel reduction if the smoke wasn't around their grapes at the time of maturing and what the effects of that is, or what the so-called effects of that is. The vineyard owner people are very concerned about the

timing of the smoke neighbouring their places. It's another positive aspect of mechanical fuel reduction... NRM – 2

Bee keepers reported a need to consider potential impacts on pollen availability, describing issues both with controlled burning practices that have for some affected their production substantially when hot burns have reduced flowering, and potential issues if MFLR substantially changes flowering patterns or reduces amount of pollen available.

[Those managing bushfire risk] don't take into account at all the flowering cycles of any of the trees. That's not important to them. The main thing is just burn and they have a target to aim for, and that's regardless of wildfires or anything like that... They don't take into consideration the flowering cycle of the trees... Business - 2

Other potential impacts reported included increased water yield from forests that could support agriculture in downstream areas, although this was raised by only one participant.

5.3.2.7 Health impacts

One potential benefit of MFLR compared to controlled burning was reduced risk of health impacts resulting from smoke associated with controlled burning:

It offers the benefit of reducing smoke from fuel reduction burns which can be a significant health risk for asthma sufferers. There is an increase in respiratory-related hospital presentations during fuel reduction burn days. NRM – 1

5.3.2.8 Landscape aesthetics

Stakeholders varied in their views of whether landscape aesthetics would be impacted positively or negatively by MFLR. Some felt that MFLR could 'open up' the forest and create forest stands with larger trees more rapidly that are often visually attractive; others felt that MFLR would create changes that may not be viewed as aesthetically pleasing:

The impact in terms of ecology and visual feel of the landscape will depend on the intensity of the MFLR. The thinning of forested areas can create a very different look and feel to the landscape. It is difficult to know what the impact will be without seeing examples of before and after. I may be used to seeing changes due to my professional experience whereas the broader community may be challenged by the change. NRM - 1

5.3.2.9 Other benefits and costs.

A small number of other benefits and costs were also described. These included concerns about potential animal welfare impacts of MFLR, and the potential for MFLR to 'open up' forest and make it easier for illegal hunters to access and use some of these forest areas:

... making sure they have vets on site and if they do damage to animals accidentally through machinery work that they manage [that] - they would need to manage that well. ... Because the community, animal lovers won't like anything that cause harm... I don't know what technique they're using, so potentially there's actually no harm at all on animals... NRM - 2

... fauna destruction becomes quite another aspect that could occur if there's greater access by illegals. It's easy to go spotlighting when there's a track ... So, that's another thing that would need to be mitigated against if there was increased access on the forest floor. Forestry - 12

5.4 DESIGN AND IMPLEMENTATION

The way MFLR is designed and implemented – meaning the types of actions implemented on the ground – will influence the extent to which it is viewed as acceptable. This section examines the specific practices undertaken, while the next section examines how decisions made about MFLR are made (governance). Different approaches to design and implementation were not generally examined in the survey, as the low level of awareness of MFLR in general meant that it was not appropriate to ask about different approaches to design and action. Instead, this topic was examined in detail in focus groups and interviews. However, one item was asked about in the survey: participants were asked whether they would support sale of timber removed from the forest during MFLR, as this was identified as one area where survey participants often held opinions.

As workshops and interviews provided most of the data for this topic, findings from these are presented first, followed by survey findings.

5.4.1 STAKEHOLDER WORKSHOP/INTERVIEW FINDINGS

When discussing the specific actions taken as part of MFLR, several themes were raised that related to the ways MFLR was designed and implemented:

1. Location in which MFLR is applied
2. Scale of implementation
3. Frequency of application
4. Type of vegetation removed
5. Machinery and equipment used
6. Use of removed material
7. Evidence-based integration of MFLR with other actions to manage bushfire risk
8. Objectives of MFLR.

A common over-riding theme emerging in conversations around all of these aspects of design and implementation was a view that, for stakeholders to support it, there needed to be clear guidance on when MFLR was and wasn't an appropriate action to implement. Stakeholders often asked for this type of guidance or identified a need for it, and expressed a desire for this type of guidance to be provided as an outcome of the MFLR trials:

My experience in this space is you need good operational specifications that have the rigour and the science behind them to be able to absolutely maintain standards, not compromised based on opinion. Bushfire - 8

[Good practice requires]... having ... some sort of standards ... So often when we're doing bushfire work, it's like we're aiming for a certain fuel load to be left, like a maximum fuel load. You're also aiming for a grass height, or a shrub, ground height. Other times about 10 centimetres is what we're aiming for if it's a grass land type community as opposed to just completely smashing it to the bare earth. Things like that, and then obviously we need separations, and what we can leave. That's why we need the science [on MFLR] to work out,

*you know those fuel loads, and those impacts, and how much benefit are we getting ...
Bushfire – 9*

5.4.1.1 Location in which MFLR is applied

Support for MFLR depended often on the location in which it would be applied. In general, most stakeholders felt MFLR had a potential role on reducing bushfire risk when applied close to houses or other built infrastructure:

... there is an area close to houses that you could make an argument where some kind of mechanical fuel reduction would be valid. It would appear that you're really talking about a zone 20 to 30 meters from houses ... You could certainly argue that there's potentially a useful role for that kind of thing within that urban wildland, as they say, interface... ENGO- 5

I always think ... mechanical fuel reduction is purely for those sites that you cannot use fire as a means to manage the landscape, so those urban interfaces. - NRM-5

[O]bviously for places where burning is difficult, because of proximity to assets or if you've got small urban bush reserves, mechanical fuel reduction gives you some additional scope there. Forestry – 17

MFLR was also viewed by some as having applications in locations where it could be used to improve fire fighting conditions and in particular access for either controlled burning or for fire fighting in wildfire:

So my gut feeling here is that mechanical fuel treatment is best done on our roadsides ... [to] ... help us maintain an operational platform for bushfire management, planned burning. ...[t] helps maintain the function of roads for a number of purposes but from a bushfire management perspective it allows you to maybe use those roads in defense as a bushfire or to light back burns from during a bush fire. ... it would take the intensity off road side edges and help manage risk. Bushfire – 8

However, when MFLR was proposed for other locations, some stakeholders who often had concerns about cost effectiveness and about whether MFLR in other locations might be serving interests other than bushfire risk reduction. Some of these concerns were identified in earlier sections:

I understand that [a forest manager] might want to apply it to protect their timber resource in here, but I wonder how that differs from traditional thinning practices which might also meet similar outcomes. NRM - 5

The location of the three MFLR trials itself raised concern from some stakeholders, highlighting just how critical the location in which MFLR is applied is to its acceptability to many people. In particular, the use of trial sites in two of the three locations that were not located near built infrastructure was questioned by some participants, who felt this was not acceptable. More generally, conducting MFLR in large-scale more remote locations was viewed by some as being motivated not by objectives of bushfire risk reduction, but by a desire for commercial returns from the material harvested:

What are you doing there with mechanical fuel reduction? This makes me suspicious that's its not the fuel reduction that you're interested in, but the product that you're going to extract and sell to shove in the furnace. So you're after the trees. It's far less the fuel reduction than the product that you intend to sell. ENGO - 6

5.4.1.2 Scale of implementation

While some stakeholders felt MFLR could be 'scaled up' and applied at large scales across the landscape, more commonly stakeholders expressed a view that MFLR had mostly small-scale applications, or that they felt landscape-scale application would be inappropriate:

...the potential for fuel reduction projects like this could work on that small scale locally ... I would only be supportive of it at that small scale if it meant it wasn't happening at the large scale in both burning and mechanical fuel reduction at the large scale. ENGO - 2

...we do use it [MFLR] a lot on the urban interface and those areas you just can't utilize burning for one reason or another. To me, it is not suited too much to the broader landscape through cost, impacts on biodiversity, and so on. Bushfire – 9

I don't think I can see it being used too much unless it's really targeted and it will only be relatively small areas where, the sort of things that this trial talks about doing is going to be worth investing in. – Forestry - 16

5.4.1.3 Frequency of application

Several stakeholders stated that they would need to know whether MFLR sites would receive repeat 'treatments' of MFLR over time before being able to make a judgment about the acceptability of MFLR. For many, this related to concern that MFLR might create only short-term fuel reduction and would need to be funded to occur regularly to have ongoing effects on fuel reduction. Some felt that if done inappropriately, MFLR might result in a net increase in bushfire risk over time through encouraging rapid regeneration that was structured in ways that support fire spread. Others raised concerns about the potential impacts on biodiversity or other environmental values of the forest if MFLR was applied too frequently on a given site:

...if you had to reduce your fuel loads then maintain those fuel loads, you're going to have do continual follow-up, mechanical work. What sort of impact is that going to have? And this trial doesn't really address that because you haven't got that timeframe. That would be the issue, is you've got to keep coming back to this site. You could burn but you've got to continue to burn and at what frequency are you looking at doing the mechanical work and the fire work or both? ENGO - 12

5.4.1.4 Type of vegetation removed

MFLR can be designed to remove different types or layers of vegetation in a forested area. MFLR currently undertaken in Australia often involves simple grass mowing or slashing in non-forested area. The trials were established to examine taking out some trees in order to

reduce fuel loads of different structures of vegetation. Several respondents queried exactly how the trials were designing vegetation removal, and what layers of vegetation they felt needed to be removed to reduce fuel load and/or bushfire risk in terms of fire spread:

[W]hat we're looking at is the complete removal of what I would assume would be the mid-story. Now, obviously, if you could remove that the benefits from that would be reduced fuel load. You're now removing the fuel load. I agree totally...in regard to just going into thin it. First thing they do [when thinning] is come and cut the biggest value log that's in there. [With] traditional methods, as soon as they cut that it's destroying 30 trees underneath it. Surely, we should be removing the 30 trees that need to go out and leave the top-story alone? If that's the objective, that the top-story isn't where the fire's going to start. The fire will start from, again like I said before, embers going on to the ground and then this mid-story, these suckers, these small mid-ranged trees, where they go back into the crown.
Forestry – 1

...[A]s far as I can work out, this seems to be a bigger operation that is... thinning out trees, as in having less trees. Having no understory or mid-story... It needs to have a very specific definition too- as we already have mechanical fuel reduction. ... the information that you gave me did not say to what degree the fuel is being reduced. So I don't know that. So that's a huge question. What is it? What is actually happening in terms of what's being taken out of the forest in those areas? I've got no idea at all. So there must be some very clear criteria set up, some guideline ... ENGO - 4

... when it's reducing [fuel]load, it should be about the leaf matter. If you're removing logs, you can damage the ecosystem, you're removing hectares worth of habitat. ... If it was just leaf matter and they don't remove the big things like logs that provide habitat that would be half-acceptable. But if they start removing habitat for lizards, for little animals, then I think that may not be appropriate. ... Dying trees, trees that fall on the floor are really important for all of those species... NRM - 2

Overall, stakeholders wanted the trials to provide specific advice on the environmental impacts of removing different parts of vegetation structure, as well as on the effectiveness in reducing bushfire risk.

5.4.1.5 Machinery and equipment used

Several stakeholders debated what type of machinery and equipment should be used in MFLR. This was often discussed in relation to concerns about potential for soil compaction when using heavy machinery, and in some cases to concerns about cross-over between commercial timber harvesting and MFLR:

...I suppose there is the potential ... to actually send plant in and they do cause, or the potential to cause, more of an impact on that local natural environment as opposed to sending someone in or a team of guys in just doing it by hand or looking at other impacting sort of methods. ... We had this, I mentioned it before, a Posi-Track. It's only a small piece of plant but it can certainly still get in and actually mulch things down and clear quite well that

sort of middle story layer. It can push smaller trees over and things like that. I think there's certainly that opportunity at the smaller scale. Bushfire - 11

I think it's absolutely vital that [MFLR] should be uncoupled from any form of traditional native forest logging for all the sorts of reasons that we've been talking about for the last hour and three quarters. That would mean things like it would absolutely have to be done with much more small-scale machinery. Like light, flexible things, which are more suitable to agriculture..- ENGO - 7

... if you go into an area where a track machine had been used, then you went to where the rubber tyre machine, a hell of a difference. The impacts are not there because of the gouging as you guys have been talking about. That's probably another methodology there. ENGO-11

To be acceptable, MFLR needs to use machinery that has been shown not to have negative impacts on aspects such as soil compaction, and for some would be acceptable only if using smaller machinery not designed for commercial logging.

5.4.1.6 Use of removed material

Concerns about the impacts of selling the material removed from forests in MFLR were documented in the previous section. However, for several stakeholders having no use of this material was also unacceptable. Some felt that creating smaller-scale local industries, including making cleared materials available for local firewood use or energy generation, would be a more acceptable end-use of materials from MFLR compared to selling them into markets such as woodchips for paper production or large-scale energy biomass use:

[At] the moment a lot of people go into the bush and cut firewood. There are downsides to that maybe this is an opportunity to say, "Okay, well look. We can supply cut firewood in a managed way." ... where we're not having random people going into the bush on their own, and cutting down standing dead wood or cutting up logs that are lying on the ground. That whole process can be managed, and there can be an income derived from that. Maybe income can go towards offsetting the cost or maybe some of the income can go towards the community as a whole, things like that perhaps might make that whole commercial aspect of it a little bit more palatable towards some of the community. Forestry - 15

I guess the emphasis for me is weighing up how a local community can buy in and if there's a bit of physical material that can be used particularly at a local level, mulches, a bit of fuel for co-generation, a small fuel plant, all those things are what matter. And unless they are able to be developed, then I don't think there's a lot of application for this sort of method over and above normal forestry practice and normal burning practice. – Forestry – 16

5.4.1.7 Evidence-based integration of MFLR with other actions to manage bushfire risk

In general, MFLR was discussed more positively when participant discussed it being used in an integrated manner with other actions to manage bushfire risk, with consideration for local context and needs, and ensuring integrated consideration of the relative costs and benefits of MFLR compared to other options:

I just really do believe in an integrated approach and I think if we try to sell any method as the panacea or the way forward I think we'll fail. I think we need to talk about the right intervention in the right, geographically the right place for the right reasons and I think if you sort of think about it in that context and how you integrate those interventions, I reckon we'd probably somewhere near where we need to be. Bushfire – 8

We need to look at actually resourcing, pre-planning, and pre-management much more across the suite of measures and that includes ecological data gathering, I mean fuel hazard gathering data, to see what's working, so you can apply [MFLR] more site specifically, and then into the landscape, that we're working from there. Bushfire - 10

[I have some support for MLFR if applied] in conjunction with other measures as well. If they wanted to put some money into bush fire prevention or asset protection then providing opportunities for people to do small scale fuel reduction around their houses, planting fire retardant species, incentives to plant fire retardant species as well, really good fire bunkers and sprinkler systems, there are other ways of reducing the risk of property loss without actually causing broad scale environmental disruption. ENGO - 2

So, any small scale [MFLR] around towns and houses has to be complemented with actually providing resources to communities to improve their properties for fire safety. ENGO - 3

Some expressed concern about both controlled burning and MFLR, and argued there is a need for a different approach to reducing bushfire risk focused on restoring biodiversity in forest areas:

Our forest and our bush used to be teeming with native mammals, potoroos, woylies, quendas, bilbies, they overturned and dug and reduced the fuel load. ... We should be aiming to bring these animals back and managing the bush so that they come back. The way that we manage the bush now, they'll never come back because we burn and burn and burn. We open up the bush for the cats and foxes and then we blame the cats and the foxes for reducing our native animals. ENGO - 6

Well that sort of begs the question, there's a load of science that say [prescribed burning] is not really effective and there was that guy recently, was he from Monash or Melbourne, that did the study on the Lyre birds and how much they turn over every year, tonnes of it. It reduces fire risk by 25% or something I think he came up with and that's exactly what is being destroyed when these fires are put through. So I think question number one should be is burning effective and it's a white fella myth I think that we've just been led to believe you've got to burn to be safe. ENGO - 1

5.4.1.8 Objectives of MFLR

Finally, MFLR needed to be designed and implemented based on the right objectives in order to be considered acceptable. This meant an objective of reducing bushfire risk with minimal environmental impact, or ideally positive environmental impact. There was some skepticism that the MFLR trials would successfully assess the different attributes that stakeholders felt should be considered core objectives when assessing MFLR:

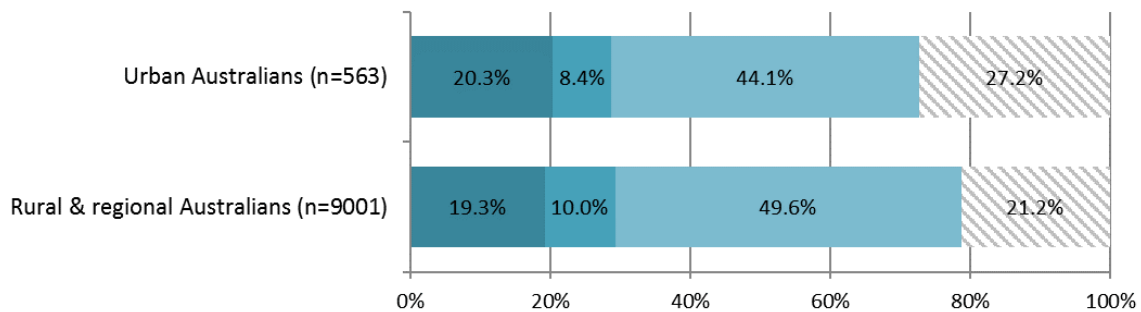
A forest restoration program that's been genuinely looking at a whole range of goals, which include better water quality, dealing with a whole lot of erosion issues that have made, recognizing that wildlife habitat has been destroyed and to be re-created. That project that we could have a trial and we might feel a bit more like being a partner or interested in, but this is trial that is about getting out forest biomass under the guise of dealing with a bushfire hazard. As such, it does not have our support. ENGO - 5

I think you touched on it before when you talked about checklists, you should be doing proper ecological impact assessment of flora and fauna survey, a seven-part test or whatever you need to do ... I mean, you could be going through a habitat of some kind of threatened species, and not even know if you don't do a proper assessment. NRM - 4

We want to make that same level of scrutiny is under any bushfire plan, wouldn't we? We'd want to make sure threatened species are dealt with adequately, you can't just willy-nilly slash, some areas it is probably ok to do that in, but a whole heap aren't. Forestry - 6

5.4.2 SURVEY FINDINGS

When asked whether they would support the sale of timber removed from the forest during MFLR, almost half (49.6%) of rural and regional Australians, and 44.1% of major city residents, agreed they would support sale of timber removed. Around 20% disagreed, while over one in five rural and regional Australians (21.2%) and over one in four urban Australians (27.2%) were unsure (Figure 7).



I would support sale of the timber removed from forests using mechanical fuel reduction

Figure 6 Support for sale of timber removed from forests using MFLR

5.5 GOVERNANCE

Previous studies have consistently identified that trust in governance arrangements influences the extent to which a given practice is considered socially acceptable. This means that the way MFLR is governed – in other words, the processes by which decisions are made about whether, when, where and how MFLR will be undertaken, and the organisations that make these decisions – will influence the extent to which a person finds MFLR acceptable.

Views about governance were examined in both the survey and workshop/interviews. In the survey, questions focused on understanding the extent to which different organisations would be trusted to make decisions about MFLR, as the initial level of trust in an organisation is a key indicator of the extent to which there is likely to be social acceptance of their decisions, and is a key driver of views about the acceptability of unfamiliar practices. As MFLR is a highly unfamiliar practice to the majority of the general public, asking about trust in different organisations is a useful measure of likely levels of trust in governance. In interviews and workshops, however, stakeholders were asked to discuss in more detail their views about what would (and wouldn't) be appropriate governance processes for MFLR. As the stakeholders invited to participate in workshops and interviews typically had higher levels of knowledge and interest in both fire and forest management, they were able to discuss in detail their views about appropriate governance.

5.4.1 SURVEY FINDINGS

Survey participants were asked how much they would trust different organisations to conduct MFLR to reduce bushfire risk near their residence. The organisations asked about were those who often involved in implementing actions to reduce bushfire risk and/or managing forest areas more generally, and included government-owned forestry agencies, National Parks and Wildlife Service (NPWS), rural and volunteer fire brigades, farmers and private forestry companies. Respondents were asked how much they trusted each organisation to conduct (i) MFLR and (ii) controlled burning activities. Comparing views about the two activities enabled a better understanding of whether differences in levels of trust were driven by low levels of trust in an organisation to undertake fire risk reduction activities in general, or by more specific concerns about an organisation being involved in MFLR.

The group most trusted to undertake both MFLR and controlled burning was rural and volunteer fire brigades (Figures 8 and 9), with 59% of rural/regional and 53% of urban Australians having high trust in this group to undertake MFLR, while 80% of both rural/regional and urban Australians had high trust in this group to undertake controlled burning. Much of the difference in trust levels was due to a higher proportion of people indicating they were unsure when asked about MFLR, although there was also a higher proportion who indicated low trust in fire brigades to undertake MFLR compared to controlled burning.

The NPWS was the next most trusted group: 53% of rural/regional and 56% of major city residents trusted to NPWS to undertake MFLR, with trust being similar to that for rural fire brigades. For controlled burning, 62% of rural/regional and 70% of major city residents trusted the NPWS to undertaken controlled burning. Fewer than one in five had low trust in the NPWS to undertake either MFLR or controlled burning.

Government-owned forestry agencies/businesses were trusted by fewer: around two in five people trusted these agencies to undertake MFLR (42% of rural/regional and 40% of major city residents), while around half trusted them to undertaken controlled burning (49% of rural/regional and 54% of major city residents). Between 20% and 23% had low trust in these agencies to undertake either practice.

How much do you trust the following organisations to conduct Mechanical Fuel Reduction to reduce bushfire risk near your residence?

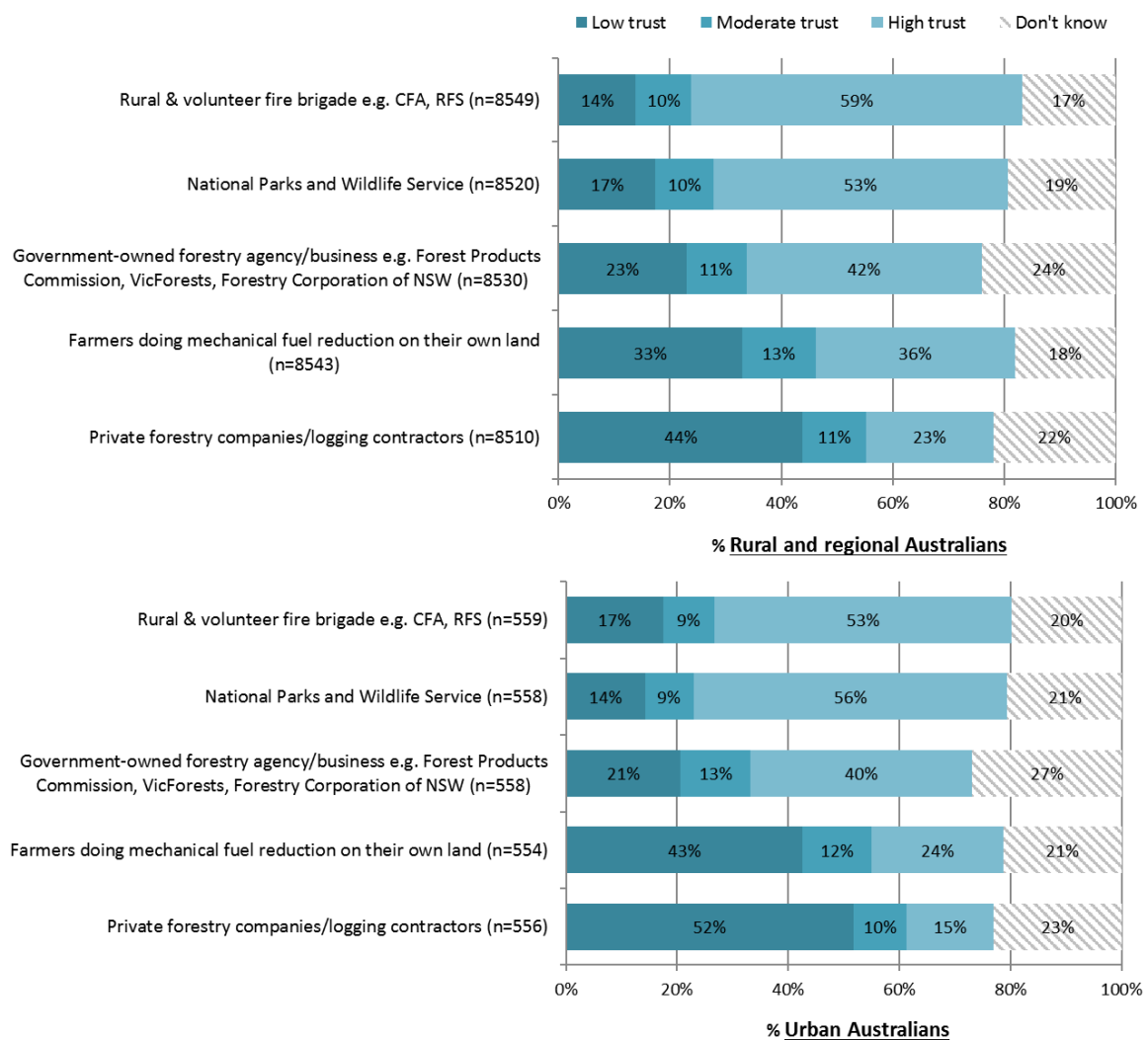


Figure 7 Trust in organisations conducting mechanical fuel load reduction

How much do you trust the following organisations to conduct CONTROLLED BURNING to reduce bushfire risk near your residence?

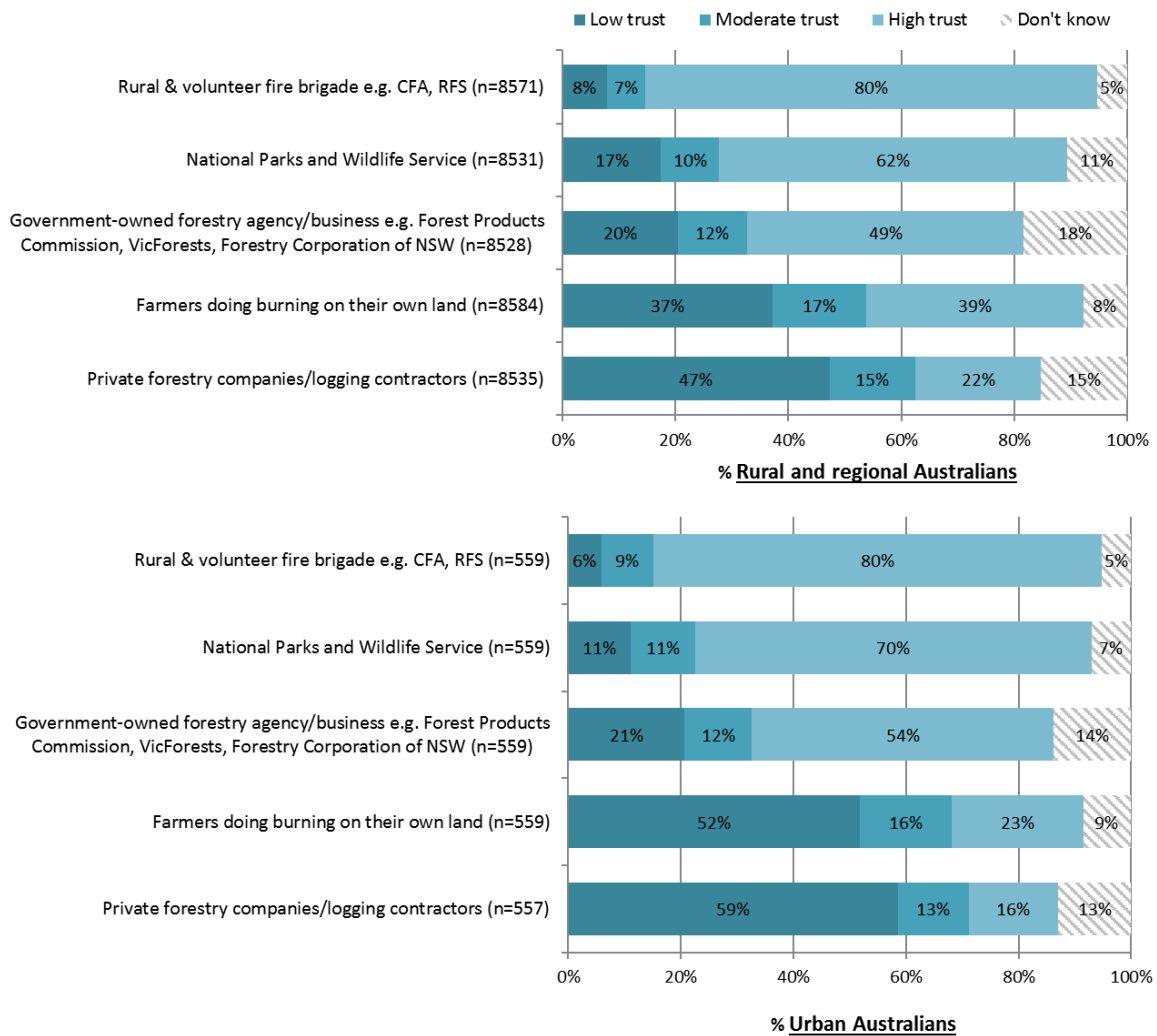


Figure 8 Trust in organisations conducting controlled burning

Of the five groups asked about, people were least likely to trust farmers and private forest companies/logging contractors to do either MFLR or controlled burning near their properties, with similarly low levels of trust for both activities. Private forest companies and logging contractors were trusted to undertake MFLR by 23% of rural/regional and 15% of urban Australians, while they were trusted to undertake controlled burning by 22% of rural/regional and 15% of urban Australians. Farmers were trusted to undertake MFLR on their own land by 36% of rural/regional and 24% of urban Australians, and trusted to undertake controlled burning by 39% of rural/regional and 23% of urban Australians.

The survey results highlight that there are significant differences in levels of likely trust in decision making depending on the organisation entrusted with that decision making, and the types of decisions they are making. There were low overall levels of trust in farmers and private forestry companies irrespective of the type of fuel reduction activity being

undertaken. For other organisations, there was generally higher trust to undertake controlled burning than MFLR, and fire brigades and NPWS had higher trust than government forestry agencies/businesses to undertake either MFLR or controlled burning. This suggests that when implementing MFLR, building trust in the competence of different organisations to carry out the practice is highly important, but more so for some organisations than others.

Trust in the different organisations that might conduct MFLR was explored further to assess whether responses differed across regions, including across states and the regions surrounding the different trial sites. Responses were also assessed to see if there was a difference between people living in towns/suburbs/villages or on rural properties, and between people living in different levels of remoteness, from living in major cities to very remote Australia (Figure 10). The following differences were observed:

- Rural and volunteer fire brigades: Those living in South Australia (SA) and Tasmania were more likely to place trust in fire brigades compared to other Australians, and those living in Victoria were least likely to trust fire brigades to conduct MFLR. There was no significant difference in trust levels between trial site regions or between those living on a rural property or those living in towns or suburbs.
- National Parks and Wildlife Service: People living in Tasmania were significantly more likely to trust the NPWS to conduct MFLR activities than those in other regions, while those living in Western Australia (WA) were least likely to trust them. There was no significant difference in trust between trial site regions. Those living on a rural property were less likely to trust the NPWS than those living in towns or suburbs, and people living in remote and very remote Australia were less likely to trust the NPWS than those living in cities and regional Australia.
- Farmers: Those living in WA, Queensland (Qld) and SA placed more trust in farmers to conduct MFLR on their own property than those living in other states. People living in the South West region of WA were more trusting of farmers conducting MFLR compared to those living in Gippsland and the Mid North Coast. Those on rural properties were more likely to trust farmers than those living in towns, and in general, increasing remoteness was associated with increasing trust in farmers conducting MFLR on their own property.
- Government-owned forestry agency/business: People living in WA, Qld and SA were least likely to trust government-owned forestry agencies to conduct MFLR, and those living in Tasmania were most likely to trust government-owned forestry agencies. There was no significant difference in trust between trial site regions. Those living on rural properties and in remote regions were less likely to trust government-owned forestry agencies than those living in towns, cities and regional areas.

- Private forestry company/logging contractors: Those living in Tasmania, WA and SA placed more trust in private forestry companies compared to those living in other states. There was no significant different in trust between trial site regions. Those living on rural properties placed more trust on private forestry companies than those living in towns. People living in major cities were significantly less likely to place trust in private forestry companies compared to others living in regional or remote Australia.

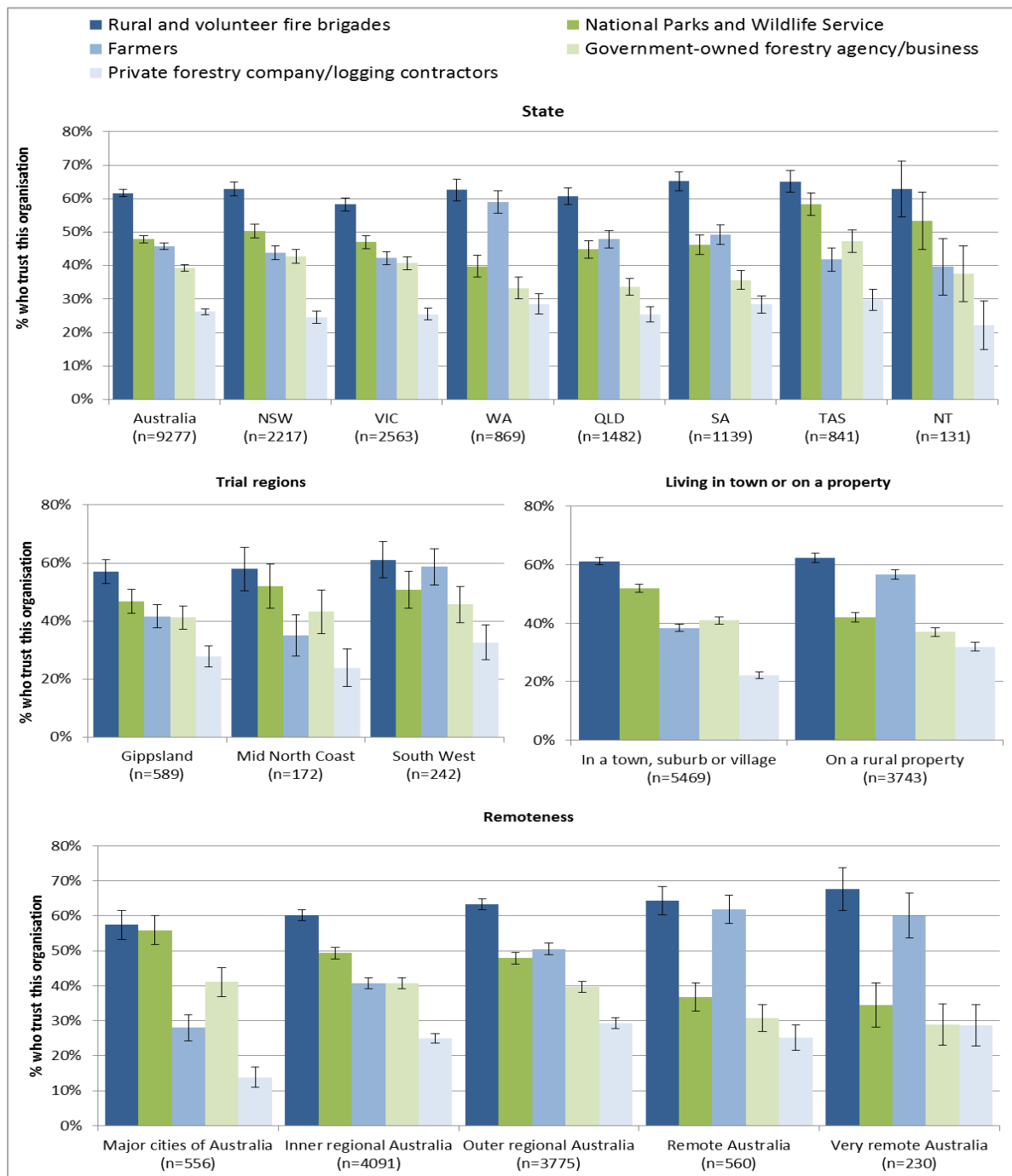


Figure 9 Trust in organisations conducting MFLR in different regions

5.4.2 STAKEHOLDER WORKSHOP/INTERVIEW FINDINGS

Stakeholders discussed multiple aspects of governance in workshops and interviews. From this, multiple common themes emerged related to (i) who is trusted to make decisions about MFLR and how past experiences and views about conflict of interest influence this; and (ii) how governance systems are designed, for example in relation to ensuring adequate assessment, training, compliance and monitoring, oversight of what happens to material removed from the forest, and ensuring an appropriate enabling environment in terms of legislation and regulation.

5.4.2.1 Who is trusted to govern MFLR?

Multiple stakeholders discussed who they felt would be the best organisations or agencies to govern MFLR. Their judgments about this typically were discussed in terms of their past experiences with different organisations, their views about their technical and operational capacity, and their views about whether a given organisation would have any significant conflicts of interest when making decisions about MFLR. Specific discussions occurred about forestry agencies, bushfire management organisations, and conservation agencies, as well as to a lesser extent about the role of local government. More broadly, several stakeholders discussed potential governance arrangements in which decision making could be a responsibility shared across multiple interests using multi-stakeholder governance systems, and in which there could be greater community involvement.

Maybe there's a need for some sort of organization that has the endorsement and support of the general community, you know, and the trust of the general community to be able to auspice the prescriptions. Forestry – 12

In general, acceptability of MFLR was contingent upon trust that agencies involved were trustworthy based on past experience, had the skills and knowledge required to manage for both bushfire mitigation and ecological aspects of forest management, and did not have conflicts of interest.

Forestry agencies

The type of organisation most commonly discussed in relation to MFLR governance was forestry agencies, largely due to higher levels of concern expressed about forestry agencies by some stakeholders. In particular, ENGO representatives often stated they would not trust forestry agencies to make decisions about MFLR, citing past experiences and conflict of interest as two key criteria for their low trust.

Past experiences were commonly cited as a reason for low trust, focused on concerns about environmental outcomes of management of timber harvesting from native forests:

Well, the organizations that I'm part of...that have been concerned about forest management issues for 40 years are extremely concerned [about MFLR]. A large part of that relates to the deplorable state of the region's forests that have been managed by what is now Forest Corp,

which means that we are extremely worried about any project they're involved in. Their record with respect to forest management, concern about water and species and habitat and biodiversity and soils and carbon is a joke. ENGO - 5

There's so many issues around our current management of Jarrah Forest, that in any way to associate this with current management practices would, I'm sure, fail to gain a lot of support in the southwest. ENGO - 7

... our groups are consistently finding that VicForests's logging operations are failing to comply with even the most basic of regulatory requirements. ... Obviously having VicForests involved, is you know getting the contractors and as a service delivery agent, we'd expect there'd be problems with compliance to the regulatory framework if they can't get it right with their logging operations. ENGO - 2

A range of concerns were also raised about perceived conflicts of interest if forestry agencies involved in commercial timber harvesting managed MFLR:

It seems to me they're trying to find some way to keep people in bulldozers when they're not necessarily known to be logging and they all know that the logging industry out in Victoria is just about dead. They've over-harvested, there's not much timber left and I'd be concerned that the social and environmental implications of these trials may be overlooked in order to get a project like this going ... ENGO - 3

If it is Forest Product Commission-led then people will instantly assume that it's run by commercial interest, production, and even then there will be a feeling that it will be subsumed amongst bigger contract issues. Forestry – 11

I am sure the MFLR will come up against concern by some in the community that is it a timber harvesting operation rather than a bushfire risk reduction operation. Making a clear differentiation will be needed. This will be a very important consideration to manage with any MFLR program. NRM – 1

The involvement of forestry agencies in the MFLR trials was a source of concern for several stakeholders, predominantly those representing ENGOs, and was described by some of those as reducing their willingness to trust outcomes of the trials. This further highlights the low level of trust some stakeholders have in forestry agencies, and was raised by some stakeholders as a reason to reduce involvement of forest agencies in decision making about MFLR even when they felt forestry agencies had the technical capability to hold this type of role:

Because the interest around the timber industry, to be honest, can be quite emotive and when you mix them up with programs where we're trying to talk about the good for the community, then sometimes it can get blurred and it tends to stop things pretty dramatically. Bushfire – 8

Fire management organisations/agencies

In some cases stakeholders with concerns about vested interests indicated that they would be more likely to find MFLR acceptable if it was governed by organisations who focused on reducing fire risk, rather than by the forestry sector:

I think that's the fire service. I think that the fire service carries the least baggage and has the highest reputation. ... If it's coming from the fire agency, then it's clearly not for production purposes. Forestry – 11

I vote for the RFS [to govern MFLR]. Bushfire – 5

Conservation agencies

Relatively few stakeholders discussed conservation agencies when discussing who they felt should make decisions about MFLR, although there were a small number of comments, usually about specific situations with conservation agencies, including both positive and negative views.

Other organisations

A small number of stakeholders were concerned about the role of Commonwealth versus state governments in MFLR, usually in relation to the MFLR trials, which were funded by the Commonwealth. The key concern raised was in relation to the motivation of the Commonwealth funding:

...money is very powerful. So the reason these [trials are] happening is because the Commonwealth has thrown a lot of money at it... The trials are fine, really like the idea of the trials. The trials are sensible. ... But if the Commonwealth is going to make the decisions to fund more mechanical fuel reduction, then ... it takes the decision making process a bit away from the states... ENGO-4

Multiple stakeholder governance at local scale

Some stakeholders suggested that rather than having single organisations responsible for all or the majority of decision making about MFLR, or more broadly about fire risk management, it was better to have governance arrangements in which multiple stakeholders shared responsibility for decision making. This was viewed as ensuring that different interests were considered and needed to be satisfied in decision making, and reducing the risk of decision making being biased to particular interests.

This idea was most commonly raised in the context of bringing decision making to a local level, with the view that in different communities having direct community engagement in reducing fire risk (using any methods, including MFLR and controlled burning) was a potentially effective approach to governance that enabled local context to be considered and responded to:

... in America they've been looking at how they manage this and the intensity of wildfires... What they've done is look at actively engaging those communities on the interface that are still looking at traditional fire as a fuel reduction, but expanding the opportunities to develop that at a community level, so they become owners of that ... Bushfire - 10

I think the golden rule and it's already becoming obvious, there needs to be some kind of local involvement in where it's done and how it's done. If you do ... then you're going to

have a lot more care taken. I think that's absolutely critical to get support for it, too. It's really important. ENGO - 7

Could the community actually have a say as to whether they wanted it. Rather than it imposed, we keep having things imposed on us even when the community is pretty against the planned burning... ENGO – 1

Some described processes in which integrated decision making already occurred involved multiple organisations, and felt MFLR decision making should be integrated into these existing systems:

I think a lot of [bushfire management] is just coming down to good planning and preparation. I think it's having good relationships with the fire management agencies. Rural Fire Service up here and also Fire and Rescue, so the metro guys. We have what we call the Bushfire Management Committee in the districts, meets regularly. We have risk sub-committees, which meet regularly. We have a Bushfire Risk Management Plan, which is relevant to the local district. It's having those good planning documents and priorities. Bushfire – 12

5.4.2.2 How is MFLR governed – designing appropriate governance systems

What specific ways in which MFLR is governed were also discussed by many stakeholders. When discussing how MFLR is governed, in other words the specific processes required, discussions focused on ensuring (i) integration with bushfire risk reduction strategies more broadly, (ii) evidence based decision making about when, where and how to conduct MFLR, (iii) conducting environmental assessments prior to MFLR, (iv) appropriate training of operators, (v) use of material removed from the forest, (vi) monitoring and assessment of outcomes, (vii) accountability for outcomes and meaningful community consultation, (viii) enabling legislative and regulatory environments, and (ix) potential roles for codes of practice or other guides to govern on-ground practices.

Integrated bushfire risk reduction strategy

When describing how MFLR should be governed, a common theme was that many stakeholders – representing a range of interests – felt that decisions about MFLR should be made as part of broader planning for reducing bushfire risk, rather than separately to these processes. They felt this would ensure that decision making focused on selecting the right mix of strategies for reducing bushfire risk and mitigating impact, rather than focusing on use of one particular approach to reducing bushfire risk. Some described this through describing problems they had observed with decision making processes related to fire that did not use integrated approaches, while others more specifically advocated for MFLR-related decisions to be made only in a context in which it was situated within broader processes of decision making about managing bushfire risk:

... the council has allowed a subdivision of a block ... right next to the .. forest reserve ... The conditions allow houses to be 20 metres from the fence of the ... forest. There is no other alternative than to mechanically reduce that fuel load. It will be too close to the houses to burn... The councils just have to stop doing this sort of stuff. Putting houses 20 metres from a forest. ENGO – 8

It's trying to educate the community...that they need to take responsibility for management of their own property... It's a challenge for us as well in trying to educate the community that we're trying to manage the conservation values of the reserve when a lot of the times they're just concerned about protection of life and property, which when it comes to the crunch will also be our number one priority as well. Bushfire - 12

I would have to see that [MFLR] would be combined with a community education program on fire and incentives to build new types of fire safe dwellings ENGO-3

As also described in the 'Design and implementation' section, overall, MFLR was viewed as more acceptable if people knew decisions about it would be made as part of broader decision making about managing bushfire risk and impact, and not separately to other bushfire prevention and management strategies.

I just really do believe in an integrated approach and I think if we try to sell any method as the panacea or the way forward I think we'll fail... Bushfire – 8

Evidence-based decision making

When considering how decisions about MFLR should be made, multiple stakeholders emphasised a need for evidence-based decision making. Comments about the need for a strong evidence based were made both in the context of commenting on the trials, and more broadly.

The scope of the trials, and whether they were considered likely to provide suitable evidence to support robust decision making about the use of MFLR, was discussed by several stakeholders. In these discussions, while most supported the concept of building an evidence based through trials of MFLR, the scope of the trial was considered inadequate by several stakeholders, particularly the timeframes in which it was being conducted. This reduced trust in the utility of the outcomes of the trials for making robust recommendations about use of MFLR, both for critics of the trials, and also for some of those who were supportive of the trial and the potential for MFLR:

I think it's a waste of money. Your trial is so Mickey Mouse, so restricted, so short, that you're wasting your time and you're wasting your money, unless you have a predetermined outcome. ENGO - 6

I'm fully supportive of the trial and the research going on, and I suppose the disappointing aspect for me is that, it's only got three year funding for that and really I'd like to see at least a monitoring situation continue for a lot longer than that because it needs an opportunity to actually be tested in case there was a fire heading towards town, did it work or didn't it? ...We want to have all risk treatment options available to the risk

managers and this is just one aspect of it, and I was really keen to see what outcomes come from it. Bushfire - 6

More broadly, several stakeholders identified that they trusted governance that was based on sound evidence, and that they felt greater investment in evidence-based decision making was needed in making decisions about managing fire in the landscape in general, including the potential role of MFLR as part of that:

...science should be used to develop and plan appropriate landscape treatments, with a risk-based application. This is important to ensure expensive treatments are not being used in areas where the risk or change in risk is minimal. Without the use of scientific, risk-based approaches millions of dollars can be spent with very minimal benefit. NRM - 1

... ultimately you can't manage a problem without understanding it, and to understand it you've got to measure it and assess it in a structured way. Forestry – 14

... if you were able to say well this is actually meets our [fuel load] treatment strategy over a long term, and there's good science behind it, it would be an easier sell. Bushfire – 6

When applied to MFLR, this meant a need to have sufficient evidence to answer key operational questions about when, where and in what ways MFLR would be an appropriate, cost effective option that would achieved intended risk mitigation outcomes without causing inappropriate harm. This was noted earlier in this report in terms of a need for clear specifications (in the 'Design and implementation' section), where participants specified a need to have guidance on the ability to use MFLR to achieve specific fuel load goals in different vegetation types, the extent to which that would reduce fire risk, and the costs and benefits (social, environmental and economic) of using MFLR versus other methods to achieve that risk reduction.

Environmental and animal welfare assessment pre-MFLR

Ensuring adequate environmental and animal welfare assessment of sites prior to conducting MFLR was mentioned by some stakeholders as an important requirement they would expect to see in any process of making decisions about when, where and how to use the practice:

It's a general concern. All the forests, in northern New South Wales, are part of that biodiversity hotspot so without proper site surveys, you don't know what plants you've got there, where they are, and you're certainly not going to see them crawling over them in a mechanical harvesting machine. ENGO – 5

...[W]e have various wildlife care groups up here in our particular patch ... I'd be recommending that you certainly engage with stakeholders like that, potentially get them out on site, which is what we do from time to time before we go in and do a hazard reduction burn or something or after there's been a fire, we get those groups out as well to come through and actually look for and relocate if needed particular wildlife, animals, things like that. That certainly should be also considered depending on where you're going to go in and clear that you're not only looking at disturbance to the ground in the

plant side of things, the flora, but you're also addressing the fauna and looking at particular species that might be in those strips or those zones as well. Bushfire – 11

...I'm going to look at it a little bit from an animal welfare perspective, and especially in a large scale operation. Spotters, and policies in place to deal with injured animals, not just koalas, anything. The loss of species that are going to occur through this mechanical removal. I mean, we're damned if we do and damned if we don't. If fire happens then we'll lose them all anyway, but I think there needs to be measures in place for welfare. ENGO - 12

Some felt that existing processes would already require suitable assessment, or expressed concern about what they viewed as overly onerous requirements being made before approval could be obtained to use practices such as MFLR:

We're sort of bound that we'd be going out and doing environmental assessments and things like that and making sure we tick all our boxes from a conservation perspective to make sure we're not going in and clearing threatened species or endangered ecological communities or anything like that. We should be covering that before we actually send the plant in. Bushfire - 12

Our biggest concerns are the stepping stones that you've got to get through for the environmental clearing and things like that. Environmental groups seem to be dead against anything that we try and do. Bushfire - 5

Training operators

The capacity of operators to conduct MFLR to appropriate standards was an area raised by some stakeholders, who emphasised the importance of ensuring contractors were trained to meet appropriate environmental and other standards, and of valuing skills and experience through actions such as awarding longer contracts:

...in the long term, if this is going to go to contractors ... If this is going to be a standard practice, we've really got to manage dieback properly...I think that any practice where you have people entering remote areas, you can bring in diseases, especially dieback. NRM-2

... [It's] important that there be a method which encourages the continuity of small-time contractors with the right gear, and that they're not all who's got the price this year and who's got the best gear and you keep changing. I think that this is getting back to the sense of continuity. ... those who implement and practice [need] good knowledge, good experience, and buy into how it's done. Bushfire - 5

Sale or other use of removed vegetation

One of the most commonly discussed topics was how decisions should be made about the use of vegetation removed in MFLR, particularly any sale or commercial use of the material. In particular, many ENGO stakeholders, and smaller numbers of others, were concerned that sale of removed product had potential to result in decision making being driven by commercial considerations rather than by bushfire risk reduction considerations. These

concerns for some extended to criticism of the commercial sale of materials removed as part of the trials (in two of the three locations, some of the removed material was sold):

As soon as it becomes economic, we are bugged.... Any trial must not take into account commercial use of this material because it'll be into the national parks, the nature reserves, it will be into anything using this as an excuse to strip biomass. That's my warning to us. It cannot be commercial. ENGO - 6

... if there was a market for products being made out of the fuel load that is being extracted then there's a danger that it would become an industry in itself, so they'd go out to areas to where they maybe don't need to reduce the fuel loads necessarily. ENGO - 2

I'm concerned if a monetary value is given to the removed fuel, what is potential that the money will drive what gets taken out, where, how much of it, and how MFLR will be implemented. Business - 1

Just say there was a successful industry developed, and it became a big money spender, what's the chance that we're going to keep pushing further and further and keep getting more and more of this biomass, to be selling it because it's making more money. It becomes more about making money. NRM - 4

These trust concerns were more pronounced for some products than others; sale of removed product for biomass energy production was specifically mentioned by some:

...the idea that now they're [forestry sector] going to get a whole lot money to turn [forests] into a biomass pellet industry is really offensive. ENGO - 5

In some cases, past experiences contributed to a lack of trust surrounding the governance of commercial activities for MFLR, particularly past experience of harvesting of native forests for commercial woodchip production:

I've done 35 years of forest activism and I'm cynical...I've seen the chipping industry entry starting off as picking up rubbish on the floor. ... is [MFLR] going to be an excuse to have access to forests anywhere for harvesting? ENGO - 8

Other stakeholders felt sale of removed product had potential benefits but were concerned at how it would be perceived by members of the community, identifying potential for sale of removed product to trigger opposition:

It might be that the MFLR offers a win on both sides – there may be more than one outcome achieved. It may manage to reduce the fuel load and bushfire risk as well as offer a timber harvest benefit. This is not a bad thing but MFLR as a method will run into challenges because the idea of multiple benefits can be a difficult concept for some to grasp. NRM - 1

I think the question for me, once again, is well how do you tell the story [about MFLR] that it's not just a grab for commercial gain versus longer term benefits for fire management or protection and community...[We] have to manage the public land estate and that won't make everyone happy but I think just from a government's perspective it is about being very clear about the commercial aspects versus the long-term community benefits. Bushfire - 8

The social acceptability of MFLR for the ENGO stakeholders, in particular, is contingent upon either having no commercial sale of removed timber, or on ensuring that governance arrangements put in place mitigate the risk of commercial imperatives driving decision making if any sale of removed material occurs.

Monitoring and assessment of outcomes

Monitoring and assessment of outcomes was another aspect of governance mentioned by some stakeholders. This was often mentioned in negative ways, with a perceived lack of monitoring of outcomes of other bushfire risk reduction measures, or forestry practices, cited as a reason for not supporting MFLR:

There's no oversight of what's going on [with controlled burning]. They just go out and do something and nobody goes out and checks to see if they achieved their objectives or monitors what's going on. ENGO - 6

*...we've certainly got to be careful as to what we do, where we do it, how we do it, and make sure that those impacts on the conservation values ... are appropriately managed...
Bushfire – 12*

...historically, the department will only act on environmental concerns once the community raises them really. If they're not raised by the community then they often go unconsidered. ENGO - 2

Others felt that setting clear targets related to bushfire risk reduction and monitoring outcomes could improve community acceptance of MFLR:

...if we agree that there's a benefit in terms of fuel reduction then some way of expressing ... the reduction in risk [because] A, it makes it more digestible for the community and B, if you align it with your objectives then it lets you measure your performance and you can review what you're doing over time... Forestry - 14

Clear resourcing for monitoring and assessment of outcomes was therefore critical for many stakeholders as part of any system of governing MFLR.

Accountability for outcomes and meaningful community consultation

Related to monitoring and assessment, several stakeholders identified a need for meaningful community consultation, and responsiveness to community concerns, as part of governance processes.

For some, these concerns emerged due to a perceived lack of responsiveness of government agencies to concerns raised about forest management practices in general, which they felt would also occur in relation to MFLR:

There isn't any community input into the state government agencies that are supposed to administer these things. You mentioned governance, the community has to play a role in governance. The community complains about breaches and just ignored. So the community gets more cynical each year. ENGO - 8

Others specifically felt that the MFLR trials had limited consultation with communities:

*I actually live here and have done forever and I didn't know anything about your trial.
Business - 1*

*I watched the trees get marked out there and I was wondering what was going on. ...
There were just three or four words in the back of the paper saying what was going to
happen. Nobody knew what was happening. ENGO - 8*

Stakeholders representing the bushfire management sector suggested that lessons from community consultation in other bushfire risk management contexts are relevant for understanding social acceptability of MFLR. In particular, they highlighted a need for good communication with different stakeholders and communities:

*I think it would come down to good consultation or communication with the adjacent
neighbourhood or neighbours, stakeholders, the community in general. I think you need
to have a good communication plan in place or a communication strategy that's sort of
followed through prior to doing the work and then while the work is taking place because
it can potentially generate a bit of interest ... Bushfire - 12*

*Good explanation and good information to get out to the broader communities so they
actually understand what's going on. Forestry - 14*

However, some felt that achieving positive consultation was difficult due to a lack of shared understanding about priorities, fear amongst some in the community of raising concerns, and stakeholder fatigue resulting from past experiences in which they feel raising concerns has not resulted in action:

*The big problem now is that no one is listening. [Government forestry representatives] are
talking about optimizing government processes. The greenies out there in the forest are
talking about maintaining the environment and there is a complete functional break
between the two languages. There are two completely and mutually incomprehensible
arguments... ENGO - 8*

*The community complains about breaches and is just ignored. So the community gets
more cynical each year. ENGO - 8*

*I'm hearing that a lot of people are really annoyed by all the burning that is going on ...
and a lot of people I know are also saying the flammable growth has just come back
worse ... we're not really hearing from a lot of those people that just dare not go to those
public meetings because they don't want to be seen questioning it and targeted in the
street or by shop keepers. I don't know how you overcome that. ENGO - 1*

Overall, governance of MFLR was expected to include good information provision to stakeholders and community members, coupled with meaningful opportunities for those stakeholders and communities to have input into the governance of MFLR, from raising concerns and issues and receiving responses through to more active and ongoing engagement in decision making processes.

Legislative and regulatory environment

An appropriate legislative and regulatory environment was also identified as a necessary prerequisite for MFLR, with a need for legislation and regulation to identify when and where MFLR would be considered a permitted use:

... So there are some legislative issues. We probably don't have clear policy in relation to it being a legitimate fuel treatment. Bushfire - 8

Issues raised in relation to this focused on whether some aspects of MFLR would be permitted in specific areas, particularly conservation reserves, under current regulations,

In regulations [for National Parks], you can't harm, you can't pick, you can't remove, you can't whatever. [Commercial sale of removed material] sort of goes against our own legislation.... even though it might be by-product of doing this sort of work, it becomes just a bit of a tricky issue or subject for us to look into. It has been talked about. It has been raised before, but, yeah, I don't- to be honest with you, I don't know if we've got really a good guiding policy or position on how we would manage that or do that either today or in the future. Bushfire – 12

A key issue raised was the difficulty of enacting landscape scale strategies for bushfire risk reduction (using any methods, including but not limited to MFLR), when the landscape involves multiple land tenures, each with a differing set of regulatory and legislative requirements guiding management:

There's a stumbling block also through existing tenure and legislation that governs it in this state and probably lots of others. For example, under the Forest Products Act, even if we wanted to, our organisation couldn't get involved in that patch out there because it [is] ... controlled by the Department of Water. Where there's reserve land, and under the Parks and Wildlife control they can't sell anything commercially. That is going to be big issues for deriving a sort of practical outcome... Forestry - 12

More broadly, a need for long-term and stable political support for bushfire risk reduction was identified, with concern that specific practices such as MFLR might be promoted in the short-term rather than longer term investment in an integrated set of bushfire risk reduction strategies. This created concerns about whether available funding enables suitable research into impacts and effectiveness of different bushfire risk reduction approaches, and appropriate monitoring of outcomes of actions:

The best approach is not one of a knee-jerk politically driven response after a major fire. NRM - 1

... And funding cycles, you find you have a big bushfire every year or two then you've got some good funding for the next few years. Then things go quiet for a few years, and suddenly the purse strings get tighter, it's that cycle. ... It's just such a balancing act really, because you're balancing for multiple values. ... Any research into the impacts of different fuel reduction methods, and then how long that might last for, but you also need to see how that balances for the biodiversity, and everything else as well. Bushfire - 9

There's never money allocated to do monitoring and the follow-up work. ... That's the sort of thing that's going to happen here is that yes, they'll go through while it's an economical process and get the wood. But when the volume of biomass isn't there in the period five years after they've done work, but there's a whole lot of other flammable material that has created as a result of the opening up it won't be economical to go back in to do it again. ENGO - 5

Support for MFLR will therefore in part depend on whether stakeholders believe there is support for long-term investment in bushfire risk reduction that includes investment in monitoring of outcomes and research into effectiveness, and a legislative and regulatory environment that enables landscape scale risk reduction strategies to be applied in a suitable way.

Codes of practice, best practice guides

When asked what would assist in building support for MFLR, some stakeholders identified a need for suitable best practice guides or codes of practice to guide decisions about when, where and how MFLR was used as part of bushfire risk reduction strategies:

If you look across all sorts of activities there are multitudes of codes for all sorts of things, milking cows or selling wood, so you have a code [for MFLR]. A code or some sort of legislating instrument ... I suppose just some controls on silviculture itself so you don't end up potentially making the situation worse or degrading the stand from forestry, ecologically and a bunch of other things. Forestry - 8

...some sort of best practice guidelines...that could be a document that was put together and had the backing of a number of different agencies. Could be fire agencies, the land management agencies, of forest products and the forest industry, more broadly, local governments. I guess the broader the base of people that sign up to contribute to that, the more likely it is to be accepted. Bushfire - 6

5.6 VALUES AND NORMS

A person's values and norms – deeply held beliefs, and expectations about acceptable behavior, that guide a person in determining what they believe to be right or wrong – will influence the extent to which they believe MFLR is an acceptable practice. Values and norms, and the attitudes and beliefs that are shaped by those values and norms, can be measured in many ways. In this study, rather than seeking to measure held values (enduring values that guide choices and behaviours), we focused on 'assigned' values, meaning values assigned to particular practices. This was done in the survey through examining whether views about MFLR were predicted by views about either (i) views about the acceptability of other natural resource management practices or (ii) views about environmental health in their local region. In workshops and interviews, values were examined by analysing the criteria that different stakeholders prioritised when describing whether they would or would not support the use of MFLR in different circumstances.

5.6.1 SURVEY FINDINGS

Survey participants were asked the extent to which they found a number of activities acceptable or unacceptable, including MFLR and controlled burning. Several of the other activities they were asked about were practices that, when examined to see how closely views about them are associated with views about use of MFLR, can shed light on the types of values that may be influencing views about MFLR. In particular, participants were asked about activities that may reveal values oriented towards (i) environmental protection and enhancement, (ii) human development of resources, with a focus on asking about management of trees, and management of resource use more generally.

Of five NRM and resource use practices asked about, acceptability of MFLR was positively related to four and negative related to two (Table 9). People were significantly *more* likely to find MFLR acceptable if they also felt that (i) logging native forest for wood production, (ii) open-cut mining and (iii) growing genetically modified crops was acceptable. This suggests that if a person believes that humans are capable of successfully harvesting, mining or manipulating natural resources without causing significant harm, they are more likely to support MFLR. Conversely, if a person believes that NRM practices that involve active human intervention in natural resources are unacceptable – whether it be harvesting timber from forests, mining resources, or manipulating resources genetically – they are less likely to find MFLR acceptable. MFLR thus appears to be grouped in many people's minds with practices involving human manipulation or intervention in natural resources, rather than with practices involving protecting or enhancing environmental values.

People were significantly *less* likely to find MFLR acceptable if they felt it was acceptable to (i) plant trees on good agricultural land for environmental purposes, and/or (ii) implement regulations that restrict farmers from clearing native vegetation. These two practices are

both focused on vegetation restoration in situations where that restoration reduces productive use of land. It suggests that those who value environmental attributes above human use attributes of resources are less likely to support MFLR.

Table 9 Acceptability of land use change and relationship with acceptability of MFLR

Acceptability of the following activities in the local area	% rural and regional Australians who found this land management activity acceptable ¹ , n	% urban Australians who found this land management activity acceptable ¹ , n	Relationship with acceptability of MFLR			
			n	Effect size and significance (<i>r_s</i> , <i>p</i>)	Significant relationship with acceptability of MFLR?	Nature of the relationship ²
Logging of native forests for wood production	19%, 10444	11%, 640	10982	0.35, 0.00	✓	Positive
Planting trees on good agricultural land for environmental purposes	76%, 10698	81%, 654	11180	-0.10, 0.00	✓	Negative
Open cut mining	17%, 10146	7%, 631	10696	0.23, 0.00	✓	Positive
Regulations restricting farmers from clearing native vegetation	52%, 10484	59%, 622	11006	-0.28, 0.00	✓	Negative
Growing of genetically modified crops	30%, 10230	27%, 619	10734	0.20, 0.00	✓	Positive

¹ A score of 5, 6 or 7 on a scale from 1 'not at all acceptable' to 7 'very acceptable'. Total n excludes those that indicated 'don't know'.

² Positive = Those who find the activity acceptable, are just as likely to also find MFLR acceptable; Negative: Those who find the activity acceptable, are less likely to find MFLR acceptable

Survey participants were also asked the extent to which they felt different environmental problems were an issue in their local region, including 'environmental degradation in general', 'soil erosion', 'feral animals', 'invasive weeds', 'loss of vegetation' and 'declining numbers of animals and birds'. These issues are all ones which have been raised in relation to perceived impacts of MFLR, and were asked about in part as it was considered possible that greater concern about these issues, couple with a view that MFLR may negatively impact on some of them, may predict lower acceptability of MFLR. As shown in Table 10, all but one did predict lower acceptability of MFLR (views about the extent of feral animal problems were not associated with views about the acceptability of MFLR). This suggests that higher perceptions of environmental problems is associated with lower acceptability of MFLR. In turn, this is likely to mean that if MFLR is not immediately considered likely to have a positive effect on any of these environmental problems, and also that if MFLR is perceived as having a negative effect on any of these issues it will be viewed as highly unacceptable by many people.

Table 10 Perceived environmental issues in the local region, and relationship with acceptability of MFLR

	Relationship with acceptability of MFLR
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Perceived environmental issues in local region	% rural and regional Australians who perceived this as a problem ¹	% urban Australians who perceived this as a problem ¹	n	Effect size and significance (r_s, p)	Significant relationship with acceptability of MFLR?	Nature of the relationship ²
Environmental degradation in general	41%, 8545	41%, 460	8799	-0.23, 0.00	✓	Negative
Soil erosion	44%, 8703	37%, 427	8912	-0.15, 0.00	✓	Negative
Feral animals	62%, 9386	46%, 457	9564	0.02, 0.12	✗	-
Invasive weeds	78%, 9415	75%, 494	9612	-0.03, 0.00	✓	Negative
Loss of vegetation	53%, 8885	53%, 477	9129	-0.26, 0.00	✓	Negative
Declining numbers of some native animals or birds (other than fish)	64%, 8044	67%, 423	8256	-0.26, 0.00	✓	Negative

¹ A score of 5, 6 or 7 on a scale from 1 'not a problem' to 7 'very big problem'. Total n excludes those that indicated 'don't know'.

² Positive = Those who perceive this as a problem, are just as likely to find MFLR acceptable; Negative: Those who perceive this as a problem, are less likely to find MFLR acceptable

Overall, these findings suggest that MFLR is more commonly associated with actions that involve human manipulation of nature than with actions that protect or enhance environmental values. This means it is highly likely to be considered unacceptable by those who have strong values about conserving the environment through protecting it from human intervention, and more likely to be considered acceptable by those who believe humans can best care for the environment through intervening to achieve particular outcomes. A greater proportion of people find actions consistent with conserving the environment acceptable compared to those who find actions involving human intervention acceptable, pointing to a greater potential for low than high support of MFLR if it was implemented on a broad scale and in ways associated with media articles describing it as an interventionist activity.

5.6.2 STAKEHOLDER WORKSHOP/INTERVIEW FINDINGS

In workshops and interviews, values were examined by analysing the criteria that different stakeholders prioritised when describing whether they would or would not support the use of MFLR in different circumstances. There was in workshops and interviews a clear distinction between two types of values that underpinned arguments made about the acceptability or unacceptability of MFLR.

On one hand, many ENGOs representatives and some NRM representatives strongly felt that MFLR was likely to have negative consequences for environmental health, particularly if the material removed was sold commercially. Their views suggest strongly held values about human intervention in nature: in particular, they viewed environmental protection as occurring when human intervention is reduced or removed, rather than when it is

increased. According to these values, optimal fire risk reduction is more likely to occur through use of natural processes or of processes that closely mimic natural processes. For example, some in this group pointed to restoration of native wildlife as a method of reducing fire risk, through increasing composting of groundcover by turning over leaf litter. Others preferred some types of fire to MFLR, arguing they more appropriately mimicked key types of natural processes. Previous sections contain direct quotes on these topics that demonstrate these views. These views were also associated with high skepticism about the effectiveness of human intervention for achieving outcomes other than environmental enhancement: this group of stakeholders commonly expressed a view that MFLR was unlikely to achieve significant or meaningful reduction in bushfire risk. For many, views about the ineffectiveness of human intervention went further, with a strongly held view that human attempts to intervene would likely result in perverse outcomes due to corruption of the intended action. In this case, this took the form of the view that commercial sale of product removed using MFLR would end up becoming the main driver for decisions about MFLR rather than the potential gain in terms of reduced bushfire risk driving decision making about MFLR.

On the other hand, members of the forest industry, and to a lesser extent some stakeholders involved in fire management, felt that human intervention was an appropriate means to achieve desired outcomes in forest areas, whether those desired outcomes be environmental enhancement, reduced fire risk, or simply a more aesthetically pleasing forest area. They felt that without these interventions, forest health would be damaged and that many expressed views consistent with holding values about humans having a responsibility to intervene to achieve specific desired outcomes. The values held by this group include high trust in humans being able to achieve positive outcomes through direct intervention in nature, and also a sense of moral obligation for human intervention to achieve these outcomes, with a strong belief that without intervention, there may be worsening of conditions. In other words, in this world views humans are viewed as morally required and as having the required competence to act successfully to achieve specific outcomes through intervention in natural systems, including through use of MFLR.

These two value systems have been described here in their extreme forms, and different stakeholders in reality did not fall at two ends of the spectrum on which the sets of values fall. Instead, most stakeholder views fell somewhere on a spectrum between (i) having complete trust in the ability of humans to achieve positive outcomes through deliberately changing natural systems, versus having no trust in this type of human action; and (ii) between having a belief that natural systems will function best if not 'interfered with' by humans and a belief that human intervention is needed or else natural systems will not function effectively.

These findings suggest high potential for social conflict about the use of MFLR if it is applied on a large scale, given the reasonably high polarisation between these differing values.

5.7 PAST EXPERIENCES

Acceptability of different land management practices can be influenced by positive and negative past experiences with that practice, as well as by having no prior experience by which to judge the practice. This was explored in the survey, by asking about past experience of bushfire. It was not examined in workshops and interviews with stakeholders, for two reasons: first, it was considered likely that the more detailed understanding of fire risk many stakeholder participants had would fundamentally change their views about acceptability and dominate over personal experiences in shaping their views. For example, while having been affected personally by bushfire in the past may trigger higher support for MFLR in the general public, a person who discusses bushfire management as part of their day to day work is unlikely to need the ‘trigger’ of being personally affected by fire to have a view about acceptability of actions proposed to reduce fire risk. Second, in focus groups we elected not to ask about personal experiences of fire, which can be a sensitive issue some participants do not wish to discuss in front of others.

5.7.1 SURVEY FINDINGS

Survey respondents were asked whether their household had been directly affected by a bushfire in the last 10 years, using a scale from 1 ‘not at all affected’ to 7 ‘very severely affected’. A majority of rural and regional Australians (61%) and urban Australians (69%) had not been affected by a bushfire in the last 10 years (those with a score of 1) (Figure 11). A higher proportion of rural and regional Australians indicated they had been affected by bushfires in the last 10 years compared to urban Australians: 11% of rural and regional residents and 9% of major city residents had been somewhat affected by bushfire in the last 10 years (score of 2), 14% of rural/regional and 12% of major city residents had been moderately affected (score of 3 or 4), and 14% of rural/regional and 10% of major city residents had been severely affected (score of 5, 6 or 7).

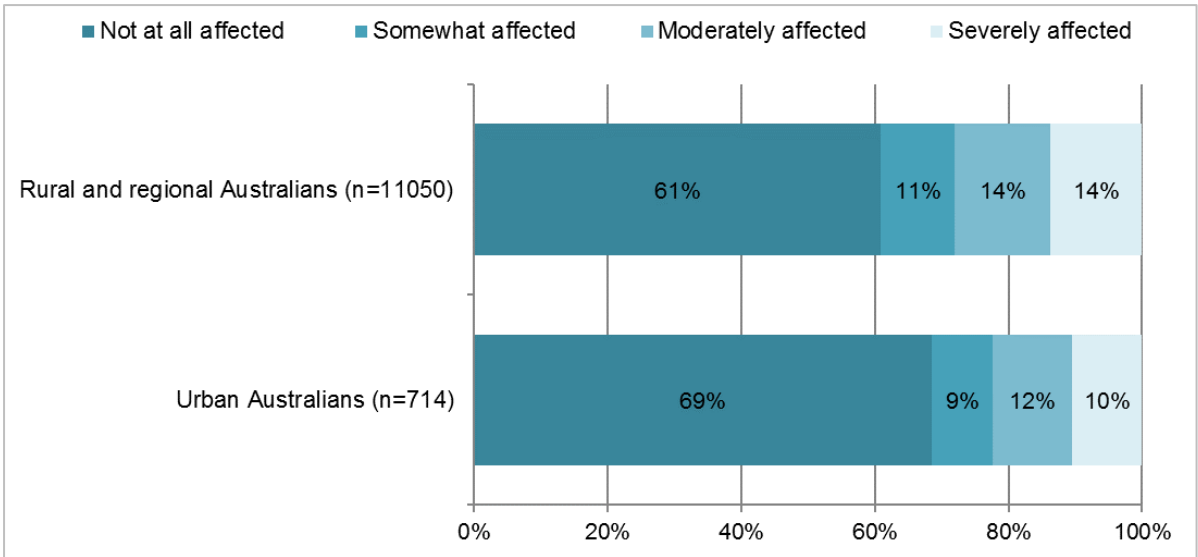


Figure 10 Past experiences with bushfire

Those who had been more severely affected by a bushfire in the last 10 years were significantly more likely to find MFLR acceptable ($r_s=0.03$, $p=0.00$, $n=11145$) (Figure 12).

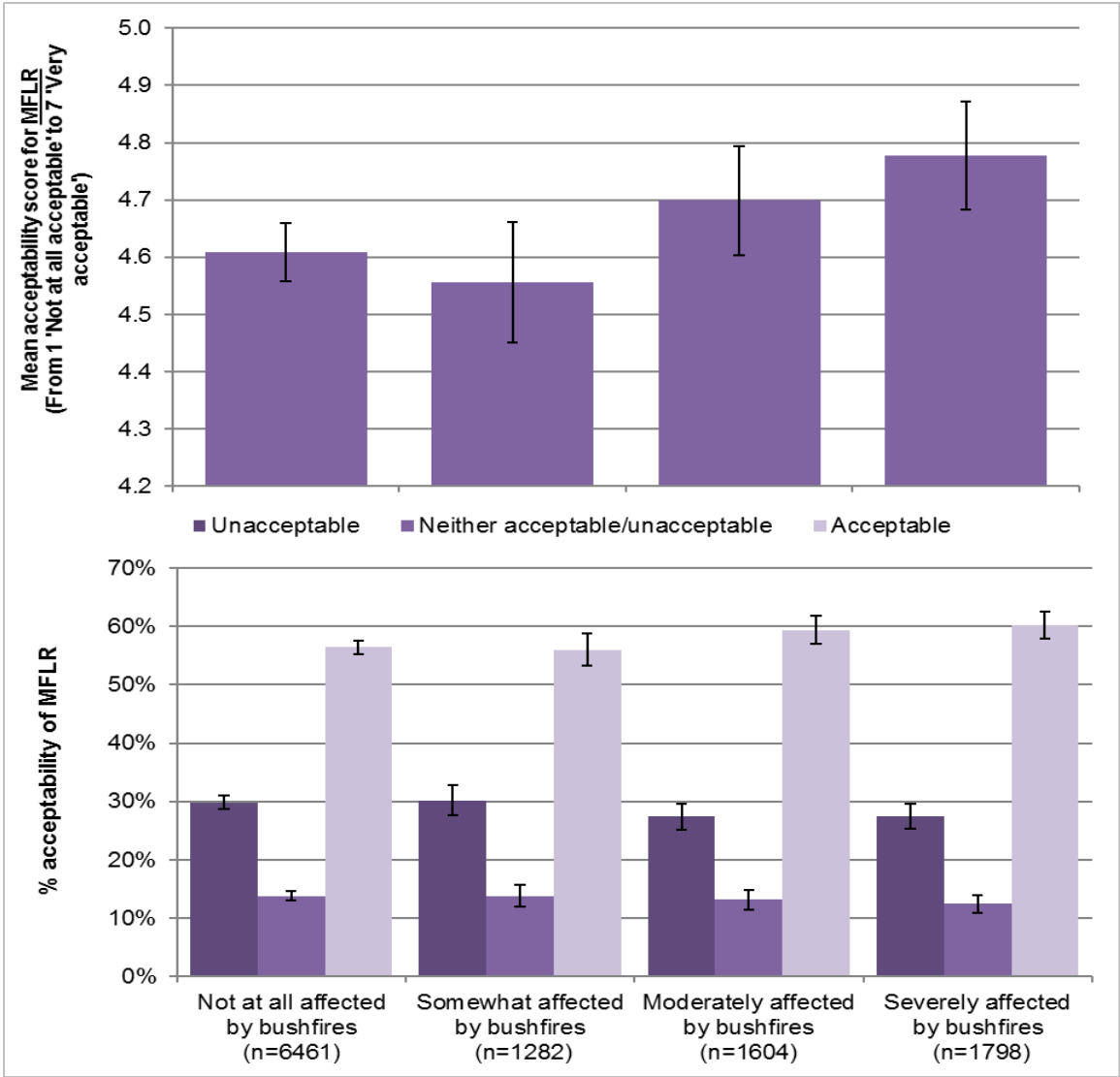


Figure 11 Past experiences with bushfire and relationship with acceptability of MFLR

6. INFORMATION NEEDS AND ACCESS

Previous sections have highlighted multiple views about the types of information stakeholders expect to be available about MFLR before they can form a view about whether they would find it acceptable. This section examines information needs and access further. Survey participants were asked how they preferred to access information about natural resource management issues in general, but were not asked about the types of information they most wanted. Instead, this was identified through focus groups and interviews, with this section focusing in particular on the types of information stakeholders wanted produced from the trials and from other processes about MFLR.

6.1 SURVEY FINDINGS

Survey participants were asked how they preferred to access information about land and water management in their region (Figure 13). For both rural and regional Australians and urban Australians, the three most preferred ways of accessing information were a website they could check every now and again, an email sent to them and the television. Twitter and farming organisations were the least preferred ways of accessing information about land and water management.

Preferences for accessing information varied between groups (Table 11 and Appendix 3). In general, websites and email and to a lesser extent TV were less preferred by those living in rural and remote areas, farmers and older people. ABC radio was more often preferred by older people. Local newspapers were preferred by older people and by people living in some specific regions, and less preferred by those living in major cities. Mailed materials were preferred by farmers, those living on rural properties and those who were older. Facebook was more preferred by those who were female, younger, living in towns, and those with higher levels of education. Notices in local businesses and shops were more often preferred by those in very remote areas who lived in towns, and women.

These findings highlight that any information sharing about MFLR as a practice needs to use more than one information delivery method to successfully reach different groups.

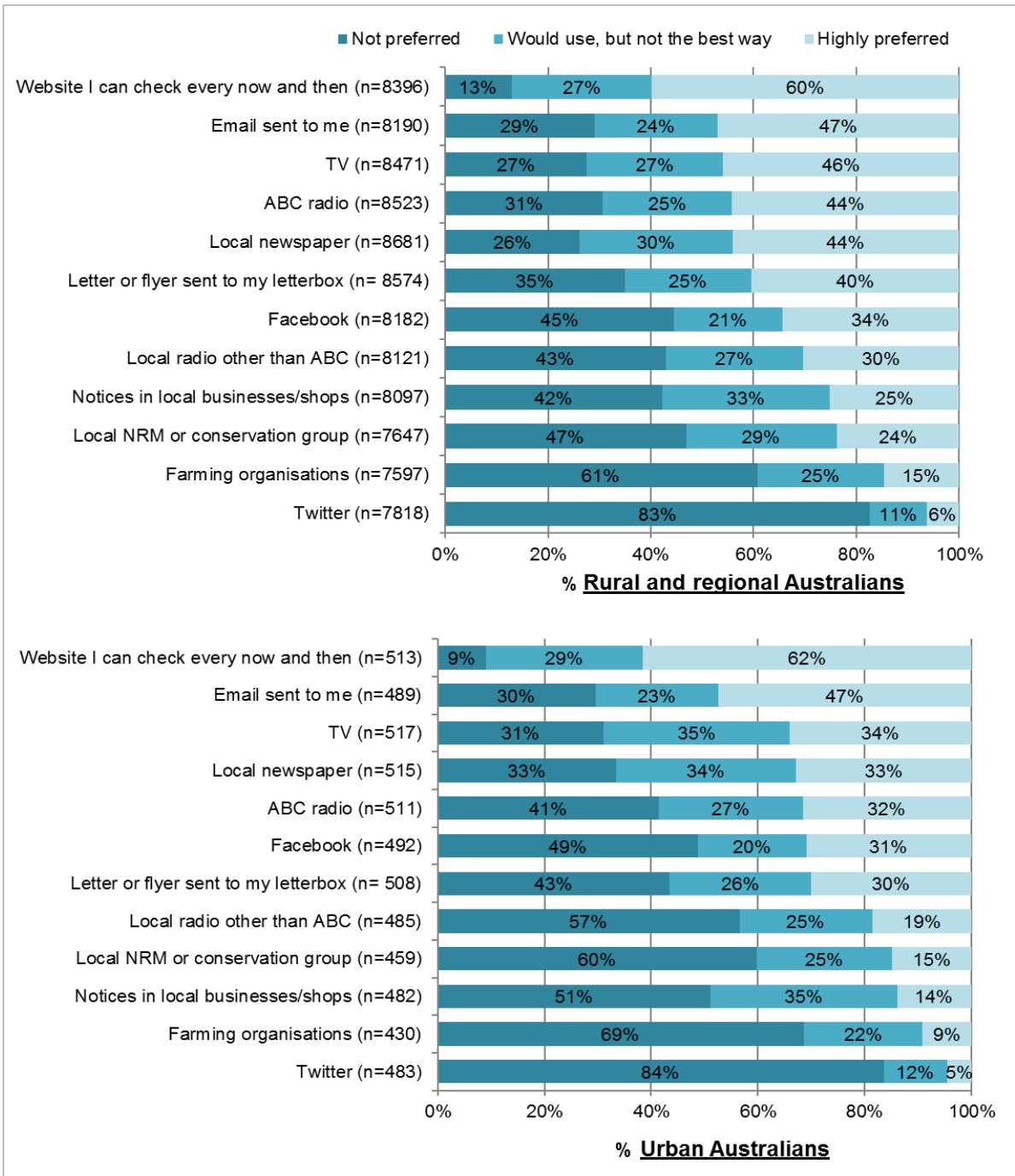


Figure 12 Preferred information mediums delivering information about land and water management

Table 11 Preferred ways of accessing information by different groups

Ways of accessing information about land and water management	Groups MORE likely to rate this as a preferred way of accessing information, compared to the average for rural and regional Australia	Groups LESS likely to rate this as a preferred way of accessing information, compared to the average for rural and regional Australia
Website I can check every now and then	<ul style="list-style-type: none"> - Lives in a town, suburb or village - Is not a farmer - Aged 40-54 years - Highest level of formal education: University degree, or none 	<ul style="list-style-type: none"> - Lives in remote Australia - Lives on a rural property - Is a farmer - Aged 65 or over - Is male - Highest level of formal education: Year 12 or equivalent
Email sent to me	<ul style="list-style-type: none"> - Lives on a rural property - Highest level of formal education: none 	<ul style="list-style-type: none"> - Highest level of formal education: Year 12 or equivalent
TV	<ul style="list-style-type: none"> - Lives in a town, suburb or village - Is not a farmer - Aged 65 or older - Highest level of formal education: Year 12 or equivalent, or University degree 	<ul style="list-style-type: none"> - Lives on a rural property - Is a farmer - Aged 18-54 - Is male - Highest level of formal education: None
ABC radio	<ul style="list-style-type: none"> - Lives in WA - Aged 65 or older 	<ul style="list-style-type: none"> - Aged 18-54 years
Local newspaper	<ul style="list-style-type: none"> - Lives in Victoria - Lives in WA - Lives in Gippsland RDA (Vic) - Lives in a town, suburb or village - Aged 65 or older - Highest level of formal education: Year 12 or equivalent 	<ul style="list-style-type: none"> - Lives in Tasmania - Lives in a major city of Australia - Lives on a rural property - Aged 18-54 years - Highest level of formal education: None
Letter or flyer sent to my letterbox	<ul style="list-style-type: none"> - Lives in QLD - Lives in Tasmania - Lives in outer regional Australia - Lives on a rural property - Is a farmer - Aged 65 or over - Highest level of formal education: Year 12 or equivalent or Certificate or diploma 	<ul style="list-style-type: none"> - Lives in NT - Lives in a major city of Australia - Lives in a town, suburb or village - Is not a farmer - Aged 18-54 years - Is male - Highest level of formal education: none
Facebook	<ul style="list-style-type: none"> - Lives in NT - Lives in a town, suburb or village - Is not a farmer - Aged 18-54 years - Is female - Highest level of formal education: University degree 	<ul style="list-style-type: none"> - Lives in WA - Lives on a rural property - Is a farmer - Aged 55 or older - Is male - Highest level of formal education: Year 12 or equivalent
Local radio other than ABC	<ul style="list-style-type: none"> - Lives in a town, suburb or village - Highest level of formal education: Year 12 or equivalent, Certificate or diploma, or University degree 	<ul style="list-style-type: none"> - Lives in a major city of Australia - Lives on a rural property - Is a farmer - Highest level of formal education: None

Ways of accessing information about land and water management	Groups MORE likely to rate this as a preferred way of accessing information, compared to the average for rural and regional Australia	Groups LESS likely to rate this as a preferred way of accessing information, compared to the average for rural and regional Australia
Notices in local businesses/shops	<ul style="list-style-type: none"> - Lives in WA - Lives in very remote Australia - Lives in a town, suburb or village - Is female - Highest level of formal education: Year 12 or equivalent, or University degree 	<ul style="list-style-type: none"> - Lives in a major city of Australia - Lives on a rural property - Is a farmer - Is male - Highest level of formal education: None
Local NRM or conservation group	<ul style="list-style-type: none"> - Lives in WA - Lives in SA - Lives in very remote Australia - Lives on a rural property - Is a farmer - Aged 65 or older 	<ul style="list-style-type: none"> - Lives in Tasmania - Lives in a major city of Australia - Lives in a town, suburb or village - Is not a farmer - Aged 18-39 years
Farming organisations	<ul style="list-style-type: none"> - Lives in WA - Lives in SA - Lives in outer regional Australia, remote Australia or very remote Australia - Lives on a rural property - Is a farmer - Aged 65 or older - Is male - Highest level of formal education: Year 12 or equivalent, or certificate or diploma 	<ul style="list-style-type: none"> - Lives in Victoria - Lives in Tasmania - Lives in Gippsland RDA (Vic) - Lives in a major city of Australia or inner regional Australia - Lives in a town, suburb or village - Is not a farmer - Aged 18-54 years - Is female - Highest level of formal education: None
Twitter	<ul style="list-style-type: none"> - Lives in a town, suburb or village - Aged 18-54 years 	<ul style="list-style-type: none"> - Lives in NT - Lives on a rural property - Is a farmer - Aged 65 or older

6.2 STAKEHOLDER WORKSHOP/INTERVIEW FINDINGS

In interviews and workshops, many participants discussed the types of information they felt should be available about MFLR. Much of this has been reported in previous sections: participants in particular wanted information identifying the effectiveness of MFLR for reducing bushfire risk, particularly when designing MFLR in different ways; impacts on biodiversity and environmental health more broadly in different local contexts; cost effectiveness in different situations; and specific guidance on appropriate use of MFLR in differing contexts. Ideally, this would be situated in information about addressing bushfire risk more generally, enabling better identification of when and in what circumstances MFLR was appropriate compared to other strategies for addressing bushfire risk.

Rather than repeat these findings, this section focuses on identifying what this means in terms of information stakeholders would expect to see coming out of the trials, and out of

processes of designing proposed implementation of MFLR post-trials; and whether they felt the trials would produce the types of information they are seeking.

In general, the trials were viewed as useful, but their short-term nature meant many stakeholders felt they would not produce the information they felt was needed for robust decision making, particularly due to the limited time for assessment prior to applying treatments on sites, and limited time for monitoring outcomes:

My main take on it was that I'm fully supportive of the trial and the research going on, and I suppose the disappointing aspect for me is that it's only got three year funding...and really I'd like to see at least a monitoring situation continue for a lot longer than that ... Bushfire – 6

I guess my main comment about the experiment is the temporal scale of it, that one snapshot before and after just, it doesn't cut the mustard either from a biological aspect. It's going to take time for those ecosystems systems to rearrange themselves and come to some new stability, and that's what we need to see, what that outcome is going to be like. But even from the fuel reduction side of things, how much effort is required to keep those systems managed to a state that meets the standards. That's going to take years to get those full metrics out.... the temporal scale, one before, one after, it just doesn't cut the mustard at all. NRM - 5

Others were concerned about what they felt was the limited scope of some of the characteristics being monitored in the trials, and in particular wanted a broader suite of environmental attributes monitored, to see high robustness of trial science with appropriate peer review, as well as more specific recommendations out of the trials about what type and amount of MFLR treatment would be needed over time to be effective in bushfire risk mitigation:

[A]nd if it was going to be used practically, what ongoing maintenance regime would need to be implemented...? But certainly, if we can prove that it's effective and it's a low-cost maintenance regime that provides a good degree of risk management...Bushfire – 6

... there's science and there's science.... So the actual design of the trial should go through some sort of peer-review process... Basically you know, well I don't know how its set up, but it sounds to me that the biodiversity thing is not really- doesn't strike me as something that is particularly well designed to answer real questions. ENGO-4

More generally, several stakeholders, particularly ENGO representatives, lacked trust in the information from the trials due to a lack of trust in the motivation for the trials:

... I'm concerned that the whole project and trial and the lead-up to the project was promoted and put forward by people whose basic interest is for this to go ahead, think it's a good idea, and so well we all know how these things work, if that's what they think it's a good idea, then that's what happens. ENGO - 5

Overall, while most stakeholders agreed that trials of MFLR were a useful action to invest in, and many supported the specific trials undertaken in this study, many felt that on their own these trials would not be sufficient to answer the question of whether, when, and under

what circumstances MFLR is an appropriate method to use to reduce bushfire risk. Several specifically identified a need for longer term funding for trials, particularly an extension of time for monitoring of the three sites, and ideally funding for longer term experiments with MFLR applied at differing temporal scales and with a wider range of vegetation removal designs, to better understand the implications of variations in design. Some also felt a wider range of case study sites was needed, and that a broader range of environmental attributes should be monitored at each site.

Overall, the interview and workshops discussions suggest that information produced from the trials will be useful, but is unlikely to substantially change existing views about the acceptability of MFLR.

7. CONCLUSIONS

This study examined whether and under what circumstances MFLR would be supported as a practice used to reduce bushfire risk. MFLR is not generally considered to be in and of itself an unacceptable practice: most people would support MFLR if they felt it was being undertaken in the right way. This means there is potential to develop forms of MFLR that have widespread stakeholder and community support. However, while MFLR is considered acceptable in principle by many people, that acceptance is highly conditional on how MFLR is applied. This means that some forms of MFLR would have high levels of social acceptance, while other forms would be highly likely to attract high levels of opposition and active protest. To be viewed as an acceptable practice, the concerns of stakeholders about particular aspects of the practice – particularly potential environmental impacts, effectiveness in reducing fuel loads and fire spread, and frequency of application required – need to be adequately addressed. More broadly, to be supported by a wide range of stakeholders, decisions about MFLR need to be driven by priorities of both bushfire risk reduction and protecting environmental health, and not by commercial drivers related to sale of removed materials.

The factors that most influence whether MFLR is considered acceptable or unacceptable include who is managing and implementing MFLR, where it is being used, the scale at which it is used, the type and scope of vegetation removed, how frequently it occurs, and what is done with the removed materials. Overall, small-scale application of MFLR in proximity to at-risk assets such as houses and high value assets was considered more acceptable and large-scale landscape scale application less acceptable. MFLR is considered more acceptable when undertaken as part of an integrated bushfire risk reduction plan, guided either by bushfire management agencies or multi-stakeholder committees, and less acceptable when undertaken by forestry agencies without being part of broader bushfire risk reduction strategies. Sale of removed materials increases the unacceptability of MFLR substantially for some stakeholder groups, with concerns about how this sale affects the way decisions are made about MFLR.

Views about acceptability will be influenced by the findings of the trials, particularly around how environmental attributes of the sites and fuel loads change with application of MFLR, however the short-term nature of the trials limits the extent to which they will provide the types of evidence being sought by many stakeholders. Stakeholders predominantly support the concept of robust research into MFLR, but want to see longer-term research, particularly longer-term monitoring of outcomes at the trial sites and monitoring of a wider range of attributes at trial sites, to enable the trials to produce data they feel can better inform making recommendations about whether, when and how to design and implement MFLR.

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APPENDICES

APPENDIX 1 SURVEY ITEMS

Acceptability of different industries, land and water uses

Sometimes we find some land or water use practices more acceptable than others, and some industries and land and water management practices are more controversial in rural areas than others. What are your views?

How acceptable do you find the following activities in your LOCAL area? <i>If they don't currently happen locally, indicate how acceptable you would find them if they did occur</i>	NOT AT ALL acceptable							VERY acceptable		Don't know
	①	②	③	④	⑤	⑥	⑦			
Subdivision of agricultural land for 'rural residential' development (sometimes called 'hobby farming')	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Establishment of 'solar farms' (large areas of solar panels)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Planting trees on good agricultural land for environmental purposes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Planting trees on good agricultural land to produce wood and paper products	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Logging of native forests for wood production	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Controlled burning to reduce bushfire risk	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Reducing bushfire risk by removing vegetation with heavy machinery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Establishment of wind farms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Coal-seam gas extraction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Open cut mining	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Underground mining	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Regulations restricting farmers from clearing native vegetation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Growing of genetically modified crops	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Using water for 'environmental watering'	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Intensive livestock production e.g. chickens, pigs, feedlots	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

Your views about managing bushfire risk

Managing bushfire risk is an important issue across Australia. Traditionally, controlled burning and firebreaks have been common ways of reducing bushfire risk in forested areas. Recently, some government inquiries have recommended also using 'mechanical fuel load reduction', particularly near residential areas. This is the use of machinery to remove some of the vegetation in a forest, reducing the

amount of potential fuel for a bushfire. Mechanical fuel load reduction is used in some other countries, but hasn't been used much in Australia.

What are your views about use of controlled burning and mechanical fuel reduction?	Strongly DISAGREE					Strongly AGREE		Don't know
	①	②	③	④	⑤	⑥	⑦	
	There is a high risk of bushfire near where I live	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
I worry about the potential impacts of bushfires on my property or business	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fuel loads are too high in forests/woodlands in my local region	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I support the use of controlled burning in my local region	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would support use of mechanical fuel reduction to reduce bushfire risk in my local region	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I might support use of mechanical fuel reduction, but it would depend on how/when it was done	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would not support use of mechanical fuel reduction in my local region under any circumstances	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I support use of controlled burning near my residence	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would support use of mechanical fuel reduction near my residence	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I worry about the health effects of smoke from controlled burning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I worry about the effects mechanical fuel reduction could have on human health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Controlled burning is good for forest and vegetation health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mechanical fuel reduction is likely to be good for forest/vegetation health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Controlled burning harms animal and bird populations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mechanical fuel reduction is likely to harm animal and bird populations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There is a high risk of controlled burns getting out of control in my region	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It's difficult to get enough controlled burning done in this region	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would support sale of the timber removed from forests using mechanical fuel reduction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How much do you trust the following organisations to conduct CONTROLLED BURNING to reduce bushfire risk near your residence?	DO NOT trust					HIGHLY trust		Don't know
	①	②	③	④	⑤	⑥	⑦	
Government-owned forestry agency/business e.g. Forest Products Authority, VicForests, Forestry Tasmania, Forestry Corporation of NSW	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
National Parks and Wildlife Service	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rural & volunteer fire brigade e.g. CFA, RFS	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Farmers doing burning on their own land	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Private forestry companies/logging contractors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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How much would you trust the following organisations to conduct MECHANICAL FUEL LOAD REDUCTION to reduce bushfire risk near your residence?	DO NOT trust					HIGHLY trust		Don't know
	①	②	③	④	⑤	⑥	⑦	
Government-owned forestry agency/business e.g. Forest Products Authority, VicForests, Forestry Tasmania, Forestry Corporation of NSW	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
National Parks and Wildlife Service	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rural & volunteer fire brigade e.g. CFA, RFS	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Farmers doing mechanical fuel reduction on their own land	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Private forestry companies/logging contractors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Are any of the following problems for the health of the environment in your local region at the moment?	NOT a problem					VERY BIG problem		Don't know
	①	②	③	④	⑤	⑥	⑦	
Environmental degradation in general	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Salinity (in soil or waterways)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Water quality problems other than salinity, in rivers, lakes or waterways	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Soil erosion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Poor soil health other than soil erosion e.g. soil compaction, loss of soil structure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feral animals e.g. pigs, goats, wild dogs, rabbits	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pest fish species e.g. carp	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Invasive weeds	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Loss of vegetation (trees, shrubs)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Declining numbers of native fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Declining numbers of some native animals or birds (other than fish)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What are your views about the community you live in?	Strongly DISAGREE	Strongly AGREE	Don't know
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	①	②	③	④	⑤	⑥	⑦
I like the environment and surrounds I live in	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There are attractive natural places in my community e.g. parks, bush	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Past experiences

Has your household been directly affected by any of the following in the last 10 years?	NOT AT ALL affected			VERY SEVERELY affected			
	①	②	③	④	⑤	⑥	⑦
Bushfire	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Socio-demographics and geographic variation

<p>Where do you live?</p> <p>We ask this because we analyse and produce results for every community where enough people participate in the survey. To do this, we need to ask you where you live. We make sure to protect the privacy of our survey participants when we report results.</p> <p><i>If you live in more than one place, please put in your primary residence</i></p>	<p>State / territory you live in: <i>e.g. VIC, SA</i> _____</p> <p>Rural locality, town or suburb you live in: _____</p> <p>Postcode you live in: _____</p>
<p>Is the place where you live most or all of the time</p> <p><i>Select one</i></p>	<p><input type="radio"/> In a town, suburb or village</p> <p><input type="radio"/> On a rural property</p>

<p>Do you identify as...</p> <p><i>Select one</i></p>	<p><input type="radio"/> Female</p> <p><input type="radio"/> Male</p> <p><input type="radio"/> Other e.g. gender fluid, inter-gender or don't identify with a gender</p> <p><input type="radio"/> Prefer not to answer</p>
<p>How old are you?</p>	<p>Years: _____</p>
<p>Have you completed any of the following formal qualifications?</p> <p><i>Select ALL that apply</i></p>	<p><input type="checkbox"/> Year 12 of high school or equivalent</p> <p><input type="checkbox"/> Certificate or diploma from TAFE</p> <p><input type="checkbox"/> University degree (undergraduate or postgraduate)</p> <p><input type="checkbox"/> None of these</p>

<p>In 2015-16, about how much was your <u>household</u> income before tax? Select one</p> <p><i>This includes income earned by everyone in your household. Include income from government pensions, investments/dividends, and paid work. The categories below may look odd – they let us compare our survey results to those from the national census, so we can't change them.</i></p>	<input type="radio"/> Negative or nil income	<input type="radio"/> \$62,400-77,999
	<input type="radio"/> \$1-10,399	<input type="radio"/> \$78,000-103,999
	<input type="radio"/> \$10,400-20,799	<input type="radio"/> \$104,000-124,999
	<input type="radio"/> \$20,800-31,199	<input type="radio"/> \$125,000-155,999
	<input type="radio"/> \$31,200-41,599	<input type="radio"/> \$156,000-207,999
	<input type="radio"/> \$41,600-51,999	<input type="radio"/> \$208,000-259,999
	<input type="radio"/> \$52,000-62,399	<input type="radio"/> \$260,000 or more

<p>What ways are you involved in farming or work related to agriculture?</p> <p><i>Select all that apply</i></p>	<input type="checkbox"/> I own or co-own a farm business	
	<input type="checkbox"/> I manage a farm business (this can be in partnership with others)	
	<input type="checkbox"/> I assist in the management of a farm business (whether paid or unpaid)	
	<input type="checkbox"/> I work on a farm, but don't help manage it	
	<input type="checkbox"/> I work in agricultural contracting	
	<input type="checkbox"/> I am in other agriculture-related work	
<p>Do you earn salary or wages from any of the following industries other than agriculture (which we asked about above)?</p> <p><i>Select all that apply</i></p>	<input type="checkbox"/> Mining	<input type="checkbox"/> Tourism
	<input type="checkbox"/> Forestry	<input type="checkbox"/> Retail or hospitality
	<input type="checkbox"/> Fishing	<input type="checkbox"/> Government
	<input type="checkbox"/> Food/agriculture manufacturing	<input type="checkbox"/> Education
	<input type="checkbox"/> Wood/paper manufacturing	<input type="checkbox"/> Health, healthcare, social services
	<input type="checkbox"/> Other manufacturing	<input type="checkbox"/> Professional services e.g. banking, legal, accounting
	<input type="checkbox"/> Transport	<input type="checkbox"/> Other
	<input type="checkbox"/> Building / construction	

Thinking about your own life and personal circumstances, how satisfied are you with the following?	Completely DISSATISFIED										Completely SATISFIED	
	0	1	2	3	4	5	6	7	8	9	10	
Your life as a whole	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

How would you rate your general health? *Select one*

- Excellent
 Very good
 Good
 Fair
 Poor

Information needs

How do you prefer to access information about land and water management in your region?	Not preferred	Would use, but not the best way	Highly preferred	Don't know
Email sent to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Website I can check every now and then	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Letter or flyer sent to my letterbox	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local newspaper	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local NRM or conservation group e.g. Landcare, catchment group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ABC radio	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local radio other than ABC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
TV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Farming organisations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Notices in local businesses/shops	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Facebook	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Twitter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX 2 INTERVIEW SCHEDULE

1. What questions do you have about mechanical fuel load reduction?

Please note, we may not be able to answer these but we want to know what questions, concerns, suggestions and information needs you have initially. This will help us identify what types of information and action are needed to answer common queries people have about the use of MFLR.

2. What benefits/positive impacts do you think the use of mechanical fuel load reduction could have & when?

Under what circumstances would these happen? What would need to occur for these benefits to happen, and what could prevent these benefits happening

3. What costs/negative impacts do you think the use of mechanical fuel load reduction could have & when?

Under what circumstances would these happen? What would need to occur for these negative outcomes to happen, and how could this be prevented?

4. What types of information would you like to have access to about mechanical fuel load reduction?

What types of information do you want? Which organisations would be most appropriate to produce this type of information?

5. If mechanical fuel load reduction is implemented as part of the suite of practices used to reduce bushfire risk in forested areas, what is needed to ensure good practice?

6. What do you think are the best approaches to managing bushfire risk in your region?

What works and what doesn't? What are appropriate types of action to take to reduce bushfire risk, and what are not?

7. We will finish with an open discussion of any other topics you would like to discuss about either mechanical fuel load reduction, or methods of reducing bushfire risk more generally

APPENDIX 3 PREFERRED WAYS TO OBTAIN INFORMATION

Group		n	Preferred way to get information about land and water management in the local region (% indicated 'highly preferred' ± the confidence interval)																							
			Website		Letter		Email		TV		ABC radio		Local News-paper		Facebook		Local radio		Notices		NRM group		Farming org		Twitter	
			%	CI	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI
All respondents		8230	54.9	1.0	45.4	1.0	47.8	1.1	43.0	1.0	43.0	1.0	47.0	1.0	25.1	0.9	28.7	1.0	23.9	0.9	29.7	1.0	26.4	1.0	4.5	0.4
State	NSW	2110	54.4	2.1	43.7	2.0	48.7	2.1	43.5	2.0	43.5	2.0	44.1	2.0	24.9	1.8	30.2	1.9	21.7	1.7	28.9	2.0	28.5	2.0	4.4	0.9
	VIC	2260	55.7	2.0	44.9	2.0	47.0	2.0	40.7	2.0	40.7	2.0	52.0	2.0	25.9	1.8	28.7	1.8	23.9	1.7	28.5	1.9	21.5	1.7	4.7	0.9
	WA	726	51.6	3.5	42.5	3.5	49.1	3.6	41.8	3.5	41.8	3.5	51.9	3.5	21.1	2.9	27.7	3.2	28.6	3.2	37.9	3.6	32.1	3.5	4.7	1.6
	QLD	1311	53.7	2.6	49.2	2.6	48.7	2.6	42.9	2.6	42.9	2.6	44.4	2.6	24.5	2.3	27.2	2.4	25.0	2.3	28.8	2.5	29.0	2.5	3.7	1.0
	SA	997	54.8	3.0	45.8	3.0	46.4	3.0	45.3	3.0	45.3	3.0	47.9	2.9	25.4	2.6	30.0	2.8	26.2	2.7	34.0	3.0	31.1	2.9	5.1	1.4
	TAS	691	58.1	3.5	50.4	3.5	47.5	3.6	46.3	3.5	46.3	3.5	39.0	3.5	26.6	3.2	26.0	3.2	21.5	3.0	23.6	3.2	19.7	3.0	4.8	1.6
	NT	105	60.6	8.5	31.0	8.1	47.8	9.2	41.9	8.7	41.9	8.7	40.3	8.7	35.0	8.5	32.2	8.4	24.1	8.0	24.1	8.2	19.0	7.7	0.9	2.9
Regional Development Australia (RDA) region	Gippsland (VIC)	487	54.6	4.3	45.0	4.2	42.8	4.3	40.6	4.2	40.6	4.2	57.5	4.2	25.3	3.8	29.9	4.0	20.9	3.6	30.2	4.2	19.7	3.6	4.5	1.9
	Mid North Coast (NSW)	133	48.1	7.9	50.6	7.9	49.0	8.1	48.4	7.9	48.4	7.9	42.2	7.7	24.0	6.9	34.6	7.6	25.3	7.1	28.4	7.5	26.3	7.6	6.9	4.5
	South West (WA)	213	49.8	6.6	48.9	6.5	50.4	6.6	41.3	6.5	41.3	6.5	47.7	6.4	23.1	5.6	24.3	5.7	28.9	6.0	32.7	6.5	24.4	5.9	3.2	2.6
Remoteness	Major cities of Australia	430	58.5	4.3	32.9	4.2	49.3	4.5	41.6	4.3	41.6	4.3	41.6	4.3	24.6	3.9	22.3	3.8	17.0	3.4	19.4	3.7	10.0	2.9	4.3	1.9
	Inner regional Australia	3576	56.3	1.6	44.3	1.6	48.0	1.6	42.5	1.6	42.5	1.6	46.7	1.5	26.2	1.4	28.0	1.4	22.2	1.3	28.5	1.5	23.0	1.4	4.7	0.7
	Outer regional Australia	3438	54.0	1.6	48.2	1.6	47.2	1.6	44.0	1.6	44.0	1.6	48.1	1.6	23.7	1.4	29.7	1.5	25.5	1.4	31.2	1.6	30.1	1.6	4.3	0.7
	Remote Australia	510	48.6	4.2	42.8	4.2	47.4	4.3	39.5	4.2	39.5	4.2	47.1	4.2	26.8	3.8	28.2	3.9	28.6	3.9	31.6	4.1	32.7	4.1	3.4	1.7
	Very remote Australia	210	52.4	6.6	47.2	6.5	52.3	6.7	42.9	6.5	42.9	6.5	42.8	6.6	30.7	6.2	33.5	6.4	33.0	6.3	38.4	6.8	35.7	6.6	4.5	3.1

Group		n	Preferred way to get information about land and water management in the local region (% indicated 'highly preferred' ± the confidence interval)											
			Website	Letter	Email	TV	ABC radio	Local News-paper	Facebook	Local radio	Notices	NRM group	Farming org	Twitter

Group	n	Preferred way to get information about land and water management in the local region (% indicated 'highly preferred' ± the confidence interval)																								
		%	CI	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI	
Lives in a town, suburb or village	4314	59.2	1.4	41.0	1.4	45.8	1.4	48.9	1.4	48.9	1.4	49.5	1.4	31.5	1.3	31.5	1.3	26.3	1.3	26.0	1.3	17.3	1.2	5.7	0.7	
Lives on a rural property	3859	49.6	1.6	50.8	1.6	50.6	1.6	34.9	1.5	34.9	1.5	43.4	1.6	17.1	1.2	25.0	1.4	20.8	1.3	33.9	1.5	36.4	1.5	3.0	0.6	
Farmer	3284	45.7	1.7	52.5	1.7	49.0	1.7	34.1	1.6	34.1	1.6	45.3	1.7	13.9	1.2	25.0	1.5	20.5	1.4	37.1	1.7	44.6	1.7	2.9	0.6	
Non-farmer	4742	60.5	1.3	41.1	1.3	47.1	1.4	47.7	1.3	47.7	1.3	47.6	1.3	32.0	1.3	30.5	1.3	25.8	1.2	25.0	1.2	13.9	1.0	5.5	0.6	
Age	18-39 years	1201	56.4	2.7	40.8	2.7	49.2	2.8	37.8	2.7	37.8	2.7	38.1	2.7	51.5	2.8	28.1	2.5	26.9	2.5	19.6	2.3	18.4	2.2	7.7	1.5
	40-54 years	2054	60.8	2.0	41.2	2.1	47.5	2.1	38.5	2.0	38.5	2.0	43.4	2.1	32.6	2.0	28.4	1.9	24.0	1.8	28.1	2.0	22.5	1.8	6.5	1.1
	55-64 years	2319	56.7	2.0	44.1	1.9	48.5	2.0	42.2	1.9	42.2	1.9	46.7	1.9	20.2	1.6	28.5	1.8	23.3	1.7	31.3	1.9	27.2	1.8	3.6	0.8
	65+ years	2612	47.9	1.9	51.9	1.8	47.0	1.9	49.2	1.8	49.2	1.8	53.9	1.8	11.2	1.2	29.4	1.7	23.3	1.6	34.0	1.8	32.3	1.8	2.1	0.6
Gender	Female	4491	57.3	1.4	45.3	1.4	47.4	1.4	45.3	1.4	45.3	1.4	48.4	1.4	34.1	1.3	30.1	1.3	26.8	1.3	28.9	1.3	20.8	1.2	5.4	0.7
	Male	3653	51.7	1.6	45.9	1.6	48.6	1.6	40.1	1.6	40.1	1.6	45.4	1.6	13.2	1.1	27.0	1.4	20.3	1.3	30.7	1.5	33.3	1.6	3.4	0.6
Highest level of formal education	Year 12 or equivalent	1298	43.8	2.6	58.5	2.5	37.4	2.6	51.3	2.6	51.3	2.6	58.0	2.5	19.4	2.1	37.5	2.6	29.0	2.4	31.9	2.6	38.6	2.7	3.4	1.0
	Certificate or diploma	996	51.1	3.0	52.5	3.0	44.4	3.1	46.4	3.0	46.4	3.0	50.3	3.0	23.1	2.6	33.0	2.9	25.3	2.7	31.1	2.9	33.1	3.0	4.8	1.4
	University degree	2650	58.0	1.8	46.1	1.8	48.4	1.9	47.1	1.8	47.1	1.8	47.1	1.8	29.5	1.7	32.2	1.7	27.3	1.7	30.3	1.8	27.9	1.7	4.8	0.8
	None of these	3257	57.9	1.6	37.1	1.6	52.5	1.7	34.9	1.6	34.9	1.6	41.2	1.6	24.5	1.5	20.7	1.4	18.8	1.3	28.0	1.6	18.1	1.4	4.5	0.7