WHAKARATONGA IWI

FIRE EMERGENCY NEW ZEALAND

ENGAGING OWNERS OF LIFESTYLE BLOCKS IN UNDERSTANDING AND MITIGATING WILDFIRE RISKS

Institute of Environmental Science and Research

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This research explores the barriers preventing lifestyle block owners from accepting wildfire risk and from making changes to reduce that risk. The research treated lifestyle block owner risk perception and response as a social dilemma rather than a matter of individual choice. The report proposes a customised model for constructive engagement with lifestyle block owners around their risk and mitigation actions.

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Engaging owners of life-style blocks in understanding and mitigating wildfire risk

THE SCIENCE BEHIND THE TRUTH

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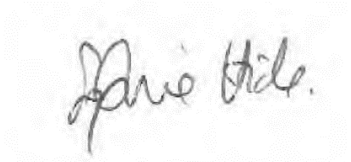

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EXECUTIVE SUMMARY

PURPOSE AND APPROACH

This report was commissioned by the New Zealand Fire Service Commission (FSC)[1] in order to better understand barriers preventing lifestyle block owners (LBOs) from accepting wildfire risk and from making changes to reduce that risk. The aim is that such understanding will enable authorities to modify social marketing and other practices in ways that improve behaviours of LBOs in relation to wildfire risk.

The research reported here was a small scale qualitative study carried out in two districts in Canterbury.

The project has produced a (provisional) customised model for constructive engagement with LBOs, and to make recommendations to inform the Fire and Emergency New Zealand (FENZ) in working with LBOs.

To develop the model for engagement we:

- Treated wildfire risk as a collective problem that can be made worse by individual decisions
- Undertook empirical research to develop a rich picture of the attitudes, practices and constraints influencing LBOs in regard to wildfire risk
- Applied insights from the extensive empirical work of Ostrom and others on how to improve outcomes in such social dilemmas (Ostrom, 2009a).

Two contributions to knowledge are offered. Firstly, we add to knowledge on how LBOs in New Zealand understand risks associated with their land management, and their basis for making decisions.

Secondly, our work focuses on the way social dynamics and attitudes influence perception of risk, the significance of risk mitigation and individual decision-making.

A distinguishing feature of this project is that we treat LBO risk perception and response as a *social dilemma* rather than simply a matter of individual choice. What we mean by treating LBO risk perception and decisions as a *social dilemma* is that LBOs may feel no need to take individual responsibility for reducing the likelihood and consequences of wildfire beyond their boundary, because that risk is shared, dependent on the behaviours of others, and managed by public authorities.

We also draw on international research on behaviour change and view LBO behaviours in regard to wildfire risk as *social practices*; that is, we look at the factors influencing LBO behaviour as if they are embedded cultural attitudes, practices and constraints. By understanding behaviours as social practices rather than individual responses we are able to propose more powerful interventions.

Finally, we view the task of understanding and influencing LBO attitudes and behaviours as an example of delving into the domain of social complexity.

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[1] Since the research was commissioned the fire service has been restructured into Fire and Emergency New Zealand (FENZ).

FINDINGS

Although LBOs understood there was a high fire risk in their neighbourhoods they mostly thought that their behaviour would not cause an out-of-control fire, and that any such fire would more likely come from a neighbouring property. Respondents discussed a variety of strategies to reduce fire risk on their properties and they displayed varying levels of fire risk knowledge. Respondents, mostly, seemed to think that a lot more could be done to increase LBOs' knowledge.

Most respondents agreed that there was a joint responsibility of both LBOs and local authorities to reduce fire risk. The majority thought it was the authority's job to educate, the LBO's responsibility to implement that education, and for the authorities to support implementation. Interviewees seemed to want more clarification on best practices. Improved working relationships with other parties such as neighbours and/or authorities was also seen as helpful and communication was seen as key to getting the message out about reducing fire risk.

There was no one favoured mechanism to deliver the message but it seemed that to be able to deliver the messages effectively there needed to be a variety of mechanisms.

Respondents made many suggestions for reducing fire risk, and again communication and information seemed to be key, along with education.

WILDFIRE AS A SOCIAL ISSUE

Viewing wildfire risk as a social dilemma is supported by our findings, and is likely to prove a powerful basis for planning interventions. LBOs proved very aware of potentially risky behaviour in their neighbourhood, but were often confident that their own actions were appropriate. LBOs may feel no need to take individual responsibility for reducing the likelihood and consequences of wildfire because that risk is shared, dependent on the behaviours of others, and managed by public authorities. We found this aligned with what we heard from respondents. It appeared easier for LBO respondents to see what improvements of practice others could make than for them to see improvements they could make themselves.

We argue that if wildfire risk is, in some sense, a social dilemma, then it is worth trying a social approach to changing behaviour. We suggest using the ideas of neighbours and neighbourhood to help LBOs to position themselves in a collective action approach to a shared dilemma. What is indicated, we believe, is a catalyst or tool to facilitate neighbourhood thinking and action on reducing wildfire risk. The model we propose in this report is such a tool.

We have treated wildfire risk mitigation by LBOs in terms of a social practice, rather than as an individual behaviour. That is, what if we look at the factors influencing LBO behaviour as if they are embedded cultural attitudes, practices and constraints that are part of the social environment of LBOs, not just personal. It may be hard for individuals to stand for change in their community, but if norms of behaviour and attitude are part of a social movement of change, then individuals can adopt and adapt practices more easily. Again, what seems to be indicated is some mechanism to seed and carry a shift in shared norms. The model we propose is designed with this in mind.

We have built a provisional collective action model (CAM) based on insights from interviewees, survey respondents and experienced rural fire personnel. The model still needs testing and refining.

A COLLECTIVE ACTION MODEL

The work of Shove et al (2012) provides a useful framework to understand social practice; social practices consist of configurations of materiality (stuff), capabilities (skills), and meaning (sense). We have adopted this framework for the rows of our model (Figure 1). The columns of the model are a way to capture the idea of stages of activity in relation to wildfire risk mitigation: preparedness, prevention practices, and participation and connectedness. Preparedness includes activities that anticipate a wildfire event and ensure that preparations are in place to reduce the impact and spread of the fire. Prevention practices include actions that will make wildfire less likely to happen in the first place. Participation and connectedness is seen as social infrastructure that will maintain both a sense of collective responsibility and capacity for more effective response to situations of wildfire threat.

The idea of the CAM is to act as an enabler of neighbourhood response to mitigating wildfire risk. It consists of nine boxes, each identifying important considerations in assessing how well a property and its owners are contributing to neighbourhood wildfire risk mitigation. The model comes with a schedule of how to score each box.

The CAM (Figure 1) is intended, firstly, a tool for self-assessment by LBOs; it can then be used as a vehicle for conversation with neighbours and/or as a basis for a neighbour to undertake a peer assessment. It could be offered as an interactive website or in hard copy.

RECOMMENDATIONS AND SUMMARY

The current project was quite limited in scale. The findings and the model it has produced are promising but need further testing and refinement. We recommend the following:

1. That FENZ consider the implications for social marketing and communications strategies of treating wildfire risk mitigation as a social dilemma.

2. That FENZ carry out or commission a trial in three or four districts of a collective action model for influencing LBO attitudes and practices in relation to wildfire risk. The model prototyped in the current report would provide a basis for such a trial.

3. That any trial of a collective action approach includes systematic developmental evaluation[2].

Our small qualitative study in two New Zealand districts suggests that LBOs are inclined to over-estimate their own preparedness for preventing and managing wildfire while recognising some vulnerability to the poor practices of others (neighbours and local authorities). We believe that viewing wildfire risk as a social dilemma opens up new avenues for promoting better practice among LBOs. By encouraging a sense of neighbourhood in relation to risk management, we believe, it will be possible to stimulate change in social practice. Elements that will support change will include enhanced social cohesion, a sense of mutual accountability, mutual trust, and some shared ways of considering and comparing practices within a neighbourhood.

We have developed a prototype CAM as a tool to support the elements for social change listed above. The current study is too small to have tested and refined the model and any protocols around its use, but we commend it as a promising direction for further development.

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[2] Developmental evaluation is an approach that enables learning throughout a programme Patton, M. Q. (2011). *Developmental Evaluation: Applying Complexity Concepts to Enhance Innovation and Use*. New York: The Guilford Press.

	Preparedness to be prepared for wildfire event	**Prevention practices** to maintain property and conduct safe fires	**Participation and connectedness** to establish and sustain links and relationships
Stuff (infrastructure)	Access to the property for firefighting equipment Water – volume, accessibility Information on good fire practice and advice Fire extinguishers strategically placed Landscaping to defend houses and key infrastructure Communication options readily available Awareness package – what to notice, what to do Fire safety plan	Landscape design and management – to reduce fuel and avoid ignition Machinery precautions – to avoid accidental ignition Location and management of flammable items and substances Management of open fires	Neighbourhood communications plan – up to date Neighbourhood resources plan – up to date Neighbourhood fire safety plan – up to date Neighbourhood regular mutual audit
Skills (competencies)	Understanding of behaviour and nature of fires Awareness of response options and when to deploy them Physical and psychological capability to respond to a fire event Familiarity with neighbours' properties and protocols	Land and crop management to minimise risk Situational awareness – including issues of proximity, weather, seasonality Awareness of information sources and regulations Awareness of behaviour and nature of fires	Household plan and awareness (including children) Information sharing with neighbours
Sense (way of seeing the world)	Collective responsibility "We are in this together as a neighbourhood" "We understand there are times we will need specialist advice or help to be prepared" "We are realistic about our vulnerability to out-of-control fire"	"We know we are realistic about our vulnerability to out-of-control fire" "We see fire risk as a problem we can do something about" "We are in this together as a neighbourhood" Openness to expert and regulatory influence	New neighbours are actively engaged in neighbourhood fire awareness Fire prevention and management is a shared and neighbourhood responsibility

Figure 1: Provisional Collective Action Model

1. INTRODUCTION

1.1 PURPOSE AND SCOPE

The research reported here was commissioned by the New Zealand Fire Service Commission (FSC)[3] in order to better understand barriers preventing lifestyle block owners (LBOs) from accepting wildfire risk and making changes to reduce that risk. The aim is that such understanding will enable authorities to modify social marketing and other practices in ways that improve behaviours of LBOs in relation to wildfire risk.

The overall objective of the research is a safer New Zealand through supporting communities to manage their risk, and enabling fire and emergency authorities to have an improved understanding of their role in communities and what is important to those communities.

The research was a small scale qualitative study carried out in two districts in Canterbury. This report, firstly, outlines the background to the study and the theoretical approach we adopted. It then details the methods used and gives a summary of insights gained through the enquiry. Finally, the report introduces an innovative model to support a collective action approach to reducing wildfire risk among LBOs and makes recommendations on next steps.

1.2 BACKGROUND

Between 2002 and 2007, the total economic cost of wildfires in New Zealand was approximately $586.2 million (Wu, Kaliyati, & Sanderson, 2009). It is estimated that wildfires affect an average of 5826 hectares of land per year (Moffat & Pearce, 2013).

In New Zealand, Rural Fire Authorities[4] were charged with prevention, detection and suppression of vegetation fires. With increasing areas of rural land being converted to lifestyle blocks, and with little being known about what motivates LBOs when considering wildfire risk and its mitigation, the management of lifestyle blocks is likely to be increasingly important. Growth of lifestyle blocks is particularly a feature of some districts known to have elevated risks of wildfire (e.g. Canterbury, Marlborough, Hawkes Bay).

Since 2013 New Zealand has adopted a Wildfire Threat Analysis (WTA) system (Gibos & Pearce, 2007; National Rural Fire Authority, 2011) to identify the level of threat in a particular area. Threat is defined as a combination of risk (potential of ignition), hazard (potential fire behaviour) and values (what is important to the community that needs protection). Murray Dudfield (NZNRFA) is quoted as saying “managing fire related risk to land is fundamentally an issue of land management and not fire management” (Moffat & Pearce, 2013).

Wildfire is a significant threat to New Zealand forestry, rural developments, lifestyle blocks and critical infrastructure:

> Public education is an extremely important aspect of wildfire-risk reduction, given that people cause most wildfires. People living in high wildfire-hazard areas can make their properties more resilient by keeping a vegetation-free area around their house, clearing roofs and gutters of dead vegetation, and ensuring clear access for firefighters (OCDESC, 2007).

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[3] Since the research was commissioned the fire service has been restructured into Fire and Emergency New Zealand (FENZ).

[4] Now part of Fire and Emergency New Zealand (FENZ).

However, FSC has commented that in spite of the efforts of RFAs most LBOs “do not accept the risk is theirs to manage and that there are things they can do to reduce the likelihood and consequences of wildfires” (NZ Fire Service, 2015).

A more effective strategy for engaging with LBOs in relation to wildfire is, therefore, important for the safety of New Zealanders and to reduce adverse economic and social impacts of wildfire.

1.3 THE PROJECT

The project has enabled us to develop a (provisional) customised model for constructive engagement with LBOs, and to make recommendations to inform the Fire and Emergency New Zealand (FENZ) in working with LBOs.

To achieve these outputs, we:

- Treated wildfire risk as a collective problem that can be made worse by individual decisions. International evidence on decision-making in regard to a shared or common risk suggests there is considerable value in treating behaviour as social (a function of relationships) (Jakes, Kruger, Monroe, Nelson, & Sturtevant, 2007; Jamieson & Briggs, 2009; McFarlane, McGee, & Faulkner, 2011; Paveglio, Jakes, Carroll, & Williams, 2009)
- Undertook empirical research to develop a rich picture of the attitudes, practices and constraints influencing LBOs in regard to wildfire risk
- Applied insights from the extensive empirical work of Ostrom and others on how to improve outcomes in such social dilemmas (Ostrom, 2009a).

Our aim was to make two contributions to knowledge. Firstly, little is known of how LBOs in New Zealand understand risks associated with their land management, and their basis for making decisions. While studies have been done on some aspects of ownership and management of smallholdings (e.g., Fairweather et al., 2009; Lillis, Fairweather, & Sanson, 2005; Sanson, Cook, & Fairweather, 2004), they acknowledge the scarcity of research in this area and they do not specifically address risks of wildfire.

Secondly, other researchers have noted that lifestyle owners respond to risk quite differently than do fire risk experts (Meldrum et al., 2015), and draw some conclusions about elements that may account for that (McFarlane et al., 2011). However, our work focuses on the way social dynamics and attitudes influence perception of risk, the significance of risk mitigation and individual decision-making.

2. METHODOLOGY

2.1 APPROACH

A distinguishing feature of this project is that we treat LBO risk perception and response as a *social dilemma* rather than simply a matter of individual choice. We chose this approach as more likely to deliver value for money to the client than methods that treat LBOs as independent decision-makers and simply poll a sample of LBOs to understand their perceptions and decisions.

We build on the work of McFarlane et al (2011) and Jakes et al (2007; Paveglio et al., 2009) in understanding how LBOs actions may be "directed either at reducing the hazard on their own properties or as part of collective decisions and actions at a community level" (McFarlane et al., 2011). We apply such thinking to a New Zealand context.

What we mean by treating LBO risk perception and decisions as a *social dilemma* is that LBOs may feel no need to take individual responsibility for reducing the likelihood and consequences of wildfire because that risk is shared, dependent on the behaviours of others, and managed by public authorities. Heightened wildfire risk resulting from poor understanding or decisions of individual LBOs can be seen as a kind of 'tragedy of the commons'. As Nobel Laureate, Elinor Ostrom, puts it:

> Social dilemmas occur whenever individuals in interdependent situations face choices in which the maximization of short-term self-interest yields outcomes leaving all participants worse off than feasible alternatives. In a public-good dilemma, for example, all those who would benefit from the provision of a public good [such as reduced risk of wildfire] find it costly to contribute and would prefer others to pay for the good instead. If everyone follows the equilibrium strategy, then the good is not provided or is underprovided. Yet, everyone would be better off if everyone were to contribute (Ostrom, 1998, p. 1).

We also draw on international research on behaviour change and view LBO behaviours in regard to wildfire risk as *social practices*; that is, we look at the factors influencing LBO behaviour as if they are embedded cultural attitudes, practices and constraints. By understanding behaviours as social practices rather than individual responses we are able to propose more powerful interventions. As Hargreaves argues, "conventional, narrow models of individual behaviour change may need to be abandoned" (Hargreaves, 2011). We apply a social practice framework developed by Shove et al (2012) that conceptualises social practices as configurations of material items, capabilities and meaning.

Both of the above approaches, social dilemma and social practices, have previously been applied in the field of pro-environmental behaviour change (Ostrom, 2009b). They are also consistent with recent thinking in relation to risk governance and the development of stakeholder partnerships (Jamieson & Briggs, 2009).

Finally, we view the task of understanding and influencing LBO attitudes and behaviours as an example of delving into the domain of social complexity. We draw on the Cynefin framework (Snowden & Boone, 2007) to distinguish situations of social complexity from those that are merely complicated or obvious. When dealing with social complexity it is not meaningful to seek a comprehensive understanding of relevant dynamics, nor to imagine or design any intervention as if it were guaranteed to work. The best that can be attempted in

effecting change in the complex domain is to try safe-to-fail interventions[5], monitor emergent patterns of behaviour, and selectively reinforce desirable developments (Kurtz & Snowden, 2003; Snowden, 2005a, 2005b).

2.2 METHOD

The project consisted of three phases:

1. Field work and analysis: interviews and an online survey to identify attitudes, practices and constraints that influence LBOs, review of previous related research, and thematic analysis
2. Developing a customised 'collective action model' (CAM) for engaging LBOs in a realistic appreciation of wildfire risk and responsible action
3. Reporting our findings and recommendations in a way that can inform practice.

Participants for interviews and the online survey were recruited from two districts in Canterbury (Selwyn and Waimakariri) that have high numbers of lifestyle blocks and high risk of wildfire.

Field work interviews followed an exploratory (in-depth) interview method (Johnson, 2002) using a guide (Appendix B) to draw out interviewees on attitudes, practices and constraints influencing behaviour in regard to wildfire risk. Interviewees were recruited using notices on Facebook, flyers in public libraries, notices in district council bulletins, and by word of mouth. The invitation to participate (Appendix C) directed respondents to a URL[6] that gathered demographic and categorical data before giving participants the opportunity to continue with the online survey or volunteer for an interview or focus group.

We conducted the on-line survey on the SurveyMonkey platform (Appendix D) to collect descriptive data on respondents and structured qualitative data. Respondents were asked to provide naturalistic narrative as well as being given opportunity to categorise their own insights and to use rating scales on key propositions.

Survey and interview data has been analysed using hybrid (inductive and deductive) thematic analysis (Fereday & Muir-Cochrane, 2006). Data management and analysis used the Dedoose platform[7 for] qualitative and mixed methods research.

We conducted 22 one-to-one interviews, 13 from the Selwyn district, and nine from the Waimakariri district. Two interviews were face-to-face; the rest were by phone. Twelve interviewees were men and 10 were women. Just over half (12) of the 22 interviewees were aged 45-54, six were in the 55-64 bracket, three were 35-44 and one was 25-34. All owned rural properties, and the most common property size was between two and five hectares. The main use of participants' land was grazing, and the key reason for people living on the land was lifestyle.

There were 44 respondents to the online survey (28 from Selwyn; 16 from Waimakariri), with most completing all questions. Median age range, with 15 respondents (34%), was 45-54

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[5] A 'safe to fail' intervention is one where the efficacy of the intervention is unproven, but the consequences of failure are acceptable.
[6] An internet address for the survey.
[7] http://www.dedoose.com/

years old, with 12 respondents older and 17 younger. 74% of respondents were female. Over 75% of respondents owned or shared the ownership of the land they lived on. Over 86% described their land as “lifestyle block (not intended as a business)”; just on 16% described their land as “small farm or other productive unit”. Some 55% (24) of respondents had between two and five hectares; 14% (6) of the properties were smaller, and 31% (14) were larger. The vast majority (83%) of respondents used their land for grazing.

All survey responses, and all but three of the interviews, were held prior to the 2017 wildfires on the Canterbury Port Hills (that started on 13 February). All recruitment of participants preceded those fires. There were no other notable contemporary events that have might influence responses.

CAM development was done through dialogue within the research team while drawing on experience of rural fire personnel gained at a focus group of personnel in the Selwyn fire district. Input to the model development was derived from findings of our empirical research and from frameworks derived by Ostrom et al (2009a), and social practice theory (Reckwitz, 2002; Shove et al., 2012).

3. FINDINGS

We have structured findings from interviews and survey responses into the following sections:

- Perception of fire risk
- Current strategies undertaken by LBOs to reduce fire risk
- Current ways of learning about fire risk
- Comfort level of own actions to reduce fire risk
- Comfort level of neighbour's actions to reduce fire risk
- Responsibility for reducing fire risk
- Ways of better informing decisions around reducing fire risk
- Mechanisms to inform communities of fire risk
- Suggestions for reducing the risk of out-of-control fires

These perspectives are supported with direct quotes from the interviews and online survey responses.[8]

3.1 PERCEPTION OF FIRE RISK

There was a good understanding from the interviewees that there was a real fire risk in their area. Respondents spoke of factors such as the flat geography of the area, lack of rain, large fuel load with long grass and trees, high winds and the contribution of climate change. Also, nearly half of the interviewees had experienced out-of-control or accidental fires in recent times, and this had heightened their awareness of the risk. One interviewee said:

> "… nor'westers, lifestyle blocks, … burn offs, and the nature of the scrub and fences; you can see it starting two or four or five kilometres away and it's spreading with a nor'west through the hedges. You can see people having burn offs but you can see how it could spread through dry hedges, like we've got dry hedges around us, and in this Canterbury summer it's a pretty deadly environment so, yeah."

Another risk factor noted by a few interviewees was the behaviour and lack of awareness of risky behaviour by some LBOs. One survey respondent also noted the impact of greater land ownership by "town people" with a "lack of understanding or respect for fire". An interviewee said;

> "I'm surrounded by three other lifestyle block owners, all of which display incredibly dangerous behaviour with open fires; they use chainsaws in hot weather, they have fires during the summer. It's just, they've got no understanding of fires."

There were only two interviewees who thought there wasn't really a risk to out-of-control fires. One said there weren't many trees near where they lived, and another said it was quite swampy where they were, and there were lots of people living in the area so any fire would quickly be noticed and the fire brigade would be called.

With the survey respondents, on a weighted average, respondents thought that it was more likely that an out-of-control fire could enter or cross their land (29 out of 44 chose 'highly

[8] Note that the online survey invited qualitative comment and was not designed for quantitative analysis. Quantitative analysis of the characteristics of survey participants is included in the Method section above.

likely''; others chose 'possible but not likely') than other risks that were listed. The next highest sense of what was most likely was buildings and/or equipment on their land being vulnerable to wildfire in the neighbourhood. This was followed closely by the likelihood of their home being vulnerable to out-of-control fire. The occurrence they considered least likely to happen was, 'A fire on your property could get out of control and cause loss to you or your family?'.

3.2 CURRENT STRATEGIES TO REDUCE FIRE RISK

There were many strategies that interviewees and survey respondents undertake to reduce fire risk on their properties. We have grouped them into 10 categories. The most talked about were strategies to reduce fuel load in case there is a fire, and strategies regarding conducting rubbish fires.

Reducing fuel load

- Mowing paddocks or having livestock eating the grass to keep it down.
- Clearing rubbish to reduce fuel load.
- Taking up the power company's offer for them to cut down trees on their property.
- Not having trees near power lines.
- Neighbours helping out with mowing or providing animals to eat grass.
- Not having vegetation around the house (defendable area).
- Cutting trees down and topping trees.
- Trimming hedges and taking away the offcuts.
- Plant appropriate (less likely to burn) trees and shrubs.
- If not grazing, make hay or lease land to local farmer.
- Keep road verges free of gorse & broom, and mow long grass on them.
- Not storing flammable items such as hay next to the house.
- Cleaning up fallen trees after a windstorm.

Conducting rubbish fires

- Watching rubbish fires, do not leaving them unattended.
- No fires during fire ban.
- Raking fires after they have gone out and dousing them in water.
- Not lighting fires when you need a permit (see it as too risky).
- Rubbish fire location is isolated from flammable material.
- Lighting fires near a water source and/or having a fire extinguisher on hand.
- Burn rubbish in a deep hole.

- Dampen surrounding areas of fire thoroughly with a hose in case a spark gets caught in the wind.
- Have age restrictions on who can start and manage a rubbish fire.
- Spraying off vegetation around a fire pit so it is just dirt.
- Only lighting fires in winter.
- Always check Metservice for weather conditions before lighting fires and check weather outside.

Equipment to fight fires

- Fire extinguishers on hand.
- 2,000 litre tank on trailer with a fire pump and hoses to be able to control any fire.
- Extensive hoses around the property.
- Sacks and towels by water to dampen any flare ups if they were to happen.
- Have a 50mm fire hose (not just a garden hose) attached to a water tank.
- Have a portable fire pump that you can take to the house and pump out of the swimming pool.
- Battery backup for pumping water if power goes out.

Vehicles

- Put fire mufflers on your motor bikes.
- Don't drive around paddocks in dry conditions.
- Maintaining vehicles/machinery/equipment so they don't have oil leaks or cause sparks.
- Checking machinery like tractors for birds' nests etc.

Mowing

- Only mowing when it is damp, after rain or early in the morning.
- Not having the grass too short so that it can go green.
- Getting on top of growth before the dry season hits as mowing can cause a fire.
- Checking the weather conditions and not mowing if windy.

Access

- Making the property accessible for fire engines.
- Leaving a clear entrance way at the gateway (e.g. no overhanging trees).
- Clear and easy access to water tanks.

Communication

- Talking to new neighbours about fire risk.

- Have a fire plan (what to do if there is a fire) residents and animals e.g. letting neighbours know its ok to open up gates to let animals out if you are not at home and there is a fire.

Water supply

- Having water set up to create a fire break (water race for firefighting).
- Have a Fire Service coupling in every water tank.
- Have extra water tanks.

Irrigation

- Watering and keeping the grass green around the house (green belt).
- Have plenty of irrigation and watering equipment available.

Miscellaneous

- Leaving bolt cutters in strategic places to cut fences to let animals out.
- Making sure there is no reflective rubbish around (e.g. glass bottles).

3.3 CURRENT WAYS OF LEARNING ABOUT FIRE RISK

When interviewees were asked what was done in their area that informs them or others to reduce fire risk in the area the answers were varied. Some could think of nothing apart from the fire risk sign beside the road. Others said, besides the sign, that there are sometimes advertisements or articles in their local newspapers that were useful. However, it was unclear what information was given in those advertisements and articles as the interviewees could not remember the details; they just remember seeing something to do with fire risk. This quote from an interviewee when asked what was currently done in their area that informs them to reduce the risk of out-of-control fires, demonstrates this vagueness:

> "It's a good question. I don't know. I think there's probably, from time to time, emails; particularly as we're getting into the hot season. I seem to recall something from councils around that. I think they do a bit of advertising in papers somewhere. I think that's what I remember. I don't know whether I've just made that up or not."

A couple of interviewees mentioned getting messages via text or emails, and a few said there were notices put on Facebook. One interviewee said they knew that their local power company will send out notices for people to cut their trees down if they deem them a fire risk. Overall it was felt more could be done. One interviewee said:

> "They could do more…It shouldn't just be, I know [our power company] put it out there every now and then about keeping trees back and bits and pieces like that; but it could be put out there, leaflet drops, certainly once or twice in the spring, or the ones that are on emails linked up with…there's an email alert system that they send out on hot weather days; … at least they used to send it out….I haven't received one recently. I've seen it through Facebook but last time we actually used to get an email saying …, "Hey, today is an extreme weather day, don't do anything like this, blah, blah, blah", which is great, but I haven't received those this year for some reason."

A couple of other interviewees said they did their own research online, with one interviewee citing Australian websites as particularly useful. They said:

> "[Australia has] got really good websites that people can go onto and download the list of things that you should prepare. And there's things like, preparing your animals, painting things onto your horses so you can identify them. All those sorts of things that -. We should spend more time actually doing the prep work, because we do get fires … I mean, maybe somebody like the council or the Fire Service finding out how Australia or some of those states got to where they are; because I'm sure they probably started out in a sort of a just a brochure-type way….How did they manage to get up to that next level of awareness and compliance?"

3.4 COMFORT LEVEL OF OWN ACTIONS TO REDUCE FIRE RISK

The vast majority of the interviewees said they were comfortable with their ability to reduce the risk of out-of-control fire on their property. This was also reflected in the results of the survey respondents as all survey respondents were either 'very comfortable' or 'OK' with their own actions to reduce risk of out-of-control fires affecting their own property or neighbours'. The main reason given by the interviewees that they were comfortable was that people said they were very aware of the fire risks and took precautions such as having water on hand, or extra water tanks or water races where they can access extra water in case of a fire. Other reasons given were, they kept their property green and make sure the area for their rubbish fire is damp. Other interviewees said they discuss fire risk with their partners and/or have a fire plan. One interviewee went as far as to get a trailer built with tanks that hold 2000 litres of water and a petrol engine with hoses for pumping water:

> "Very comfortable. Because I've actually taken the time to get a tender built that is effective, that I can move …, and I can get water very fast, you know, under high pressure, to a fire. I commissioned someone to build it. You can buy the fire pump. Davies Products make them. You can actually just go online, do a Google search for fire pump, you know, and you can see. They're about $1,000 to $1,500 to buy the little unit with a wee petrol engine and then I just commissioned the trailer. Got a guy to build the trailer for me with the containers on it."

Others were unsure, or said they were not comfortable, about their ability to control the risk out-of-control fire on their property. There were a variety of reasons. One said it was because accidents can always happen; another said, if they had no electricity then they would have no way of pumping water to fight the fire. Another cited low water pressure as being a problem, and another that they only had fire extinguishers and a back-pack water sprayer, which wouldn't be enough to fight an out-of-control fire. Another concern was the lack of knowledge on what to do if they were caught in an out-of-control fire and could not leave the property:

> "[I am] reasonably comfortable. I mean it's hard to – if there was an out-of-control fire, what do you do? Well if there was a major fire coming towards our house, how can I protect the house? It's not like my backpack sprayer or my fire extinguisher…it's not going do anything, is it? Really, it's just like: how do we get out of this alive? Which you could do because you'd jump in the middle of the lawn perhaps, you'd be safe from the fire. The grass, the green area, that wouldn't catch fire….The smoke and the flames, yeah, I'm just trying to think. So it's really important, so what would you do, you'd hop in the creek? You could do that?"

3.5 COMFORT LEVEL OF NEIGHBOUR'S ACTIONS TO REDUCE FIRE RISK

The majority of the interviewees were either not comfortable or only comfortable with some of their neighbour's ability to reduce the risk of out-of-control fires in their neighbourhood. In

the survey results, respondents were also not comfortable with their neighbour's actions to reduce the risk of out-of-control fires. 16 of the 44 respondents were 'very uncomfortable', with a further 25 respondents feeling only 'OK' with their neighbours actions to reduce the risk of out-of-control fires in their neighbourhood.

The reasons the interviewees gave as to why they were not comfortable was because of fuel load; not mowing grass or having many trees or a large stockpile of wood. Lighting fires at inappropriate times, such as hot windy days, was another reason; or their neighbours were not educated about fire risk and did not have the necessary equipment to fight a fire if one were to break out. One interviewee said their local council was their neighbour, who they were not happy with because of the fuel load of a tree plantation next door to them. Another interviewee also complained about their local council as they said the grass verges were often not cut, and that, after digging out drains the spoils were often not taken away, and so added to the fuel load. One interviewee described some risky behaviour and lack of comprehension of fire risk of her neighbours:

> "I'm deeply uncomfortable….just complete lack of understanding…I have had conversations. A couple of years ago there was a chap that started a fire with, I think sparks off; he was sharpening something. And I remember having a conversation with the neighbours about that, and they were just completely, like, there was just no comprehension. There was this blank look on their faces. And it's not the first time our neighbours have gone away, and we've looked out and we've seen a fire that they've had going has sparked up, and we've gone over there with our tractor and buried it again. You know? It's just it's really dangerous behaviour, and there's a lot of it going around."

The reasons given as to why interviewees were happy with their neighbours ability to reduce fire risk in their neighbourhood was neighbours watering their lawns, lighting fires only when permitted, well educated about fire risk, reducing fuel load, such as cutting down trees, and keeping neighbours informed if there is a fire in their area. They also talked about having good relationships with their neighbours so that if problems did arise they could talk to them about the fire risk and give them a hand to reduce it if needed. One interviewee said:

> "Yeah, they [the neighbours are] great. And if they think it's too bad, we all have a barbeque, and they say, "Well, we'll come round with our mowers and mow your paddock". So that happens all the time. It's not too bad. It's quite a good community."

Another interviewee said:

> "Oh, yeah very, they [the neighbours are] good, yeah. Oh, one of them actually gave me the tips about watering, because I don't like wasting the water at this time of year; and she pointed out that you really need to do some watering, just to keep that green area, and that, that'll stop the fires and things so, yeah."

3.6 RESPONSIBILITY FOR REDUCING FIRE RISK

Most respondents saw responsibility laying with both the individual property owner and the fire service. People felt it was up to the individual property owner to reduce fire risk on their own property, but it was the responsibility of the fire service to provide information and education on fire risk, especially for those who have not lived rurally before and may not be aware of fire risk mitigation strategies. However, it was the responsibility of the property owner to implement these strategies. One interviewee said:

> "Yeah, yeah, it's a mixture of both, definitely. One, getting the awareness out there of what they can do; but the primary thing of [the] actual occupier of the land or the person doing the work on the land needs to help themselves."

Some people were keen to see the fire service work with the council so that mitigating fire risk information could go out with the rates. Another interviewee thought that it was the responsibility of the community to band together and work with the fire service

> "I think it's up to the community, with the assistance of Rural Fire, I guess…Because I think at the end of the day fire safety comes down to individuals; oh, and Rural Fire often [say] to the community, it's the responsibility of neighbours to look out for each other and to protect each other."

Some respondents also saw a role for other authorities such as the local council or power company. They thought the council should be responsible for the mowing of grass verges to keep fuel load down, especially since they have the proper equipment to do it. Some thought the local power company should work with residents to chop down trees near power lines.

Another role some respondents thought a regulatory authority should conduct was that of monitoring fire risk in their area and to inform people of that fire risk, and to have some sort of consequence or enforcement if people did not follow up on reducing that risk.

> "I think its individual property owners. There's no doubt about that. But it may well be that there needs to be some sort of regulatory authority from the council to actually enforce that it happens, because it's clearly not working at the moment."

3.7 WAYS OF BETTER INFORMING DECISIONS AROUND REDUCING FIRE RISK

Interviewees were asked what would better inform their decisions about reducing fire risk. They were given the option of: more investigation and analysis about fires and risk; clarification of good practice and/or local fire policies; and improved working relationships with other parties, such as neighbours or authorities.

Interviewees advocated most for clarification of good practice and/or local fire policies with only one interviewee saying this would not help. One interviewee talked about safe practice in reducing fires, they said:

> "Maybe it's just safe practice, you know? Don't mow when it's blimmin' hot and dry, don't smoke cigarettes in the blinkin' hay barn, you know? Just kind of common sense, but, hey, those kind of things perhaps could be propagated by e-mail or, you know, leaflet or something, just to say, "You know, here are some good practice guidelines, perhaps, for reducing fires"."

Another said it was important because there are a lot of residents who have previously lived in urban situations and therefore may not be aware of fire risk.

> "Yes, I think that would be very useful. Yeah because, really, it's – you know, the only thing that is ever talked about is fire bans, and I think that more information could be really useful. I mean, I think about it in terms of grasses and dead wood and things like that because I think of my upbringing. I'm not sure that everybody thinks that. A lot of people in the area, especially lifestyle owners, … are city dwellers and don't know beans; know even less than me, and I don't know much."

Improved working relationships with other parties, such as neighbours or authorities was the second most favoured way of informing LBO decisions. Some noted it has to be a

collaborative approach and things can only improve with better communication and information sharing.

> "Just getting people talking about it. If it's a subject that's talked about, people have got to be more informed and thinking about it more. If your neighbour says to you, "Hey, hey, you shouldn't be doing that" or whatever, you're more inclined to think about it…So just thinking about it and having that relationship with the Fire Service and the council in terms of those sort of bits and pieces, yeah, it would help."

The least favoured option was *investigation and analysis about fires and risk*, with only half of the interviewees supporting that option, whereas other interviewees felt there was already enough information about fires and risks it was more of a matter of communicating it well if people were not already aware. Most felt they already knew what the risks were, and therefore it was not needed.

The survey respondents were also asked to rate each of the three preferences for informing their decisions. The survey results reflected the results from the interviewees. The least favoured preference was more investigation and analysis. Clarification of good practice, and improved working relationships were seen as almost equally preferable.

3.8 MECHANISMS TO INFORM COMMUNITIES OF FIRE RISK

Interviewees were asked what would be the best mechanism to inform them and their neighbours about reducing the risk for out-of-control fires. They were given four options: advertising on TV/radio; advertising via brochures; information evening or information stall at community events; or something else.

A clear majority of the interviewees said they did not think TV or radio was the best mechanism to get fire risk messages out to the public. A few did say no to TV but yes to local radio and the local newspaper. The reasons given were that they do not watch TV or they watch TV programmes through different mechanisms such as MySky where they can skip through advertisements. One interviewee added that it would be difficult to do through TV as fire risk was localised to different areas so the messages would have to vary around the country. Others noted that the fire risk messages need to be targeted and personal, and that TV is not a good medium on which to do this.

Of those that did think TV and radio was a good mechanism, they said the advertisements would need to be targeted to when most people would be watching TV however they acknowledged that this could be expensive.

One interviewee said any forum was good and the messages just needed to get out and be repeated often, through multiple channels:

Most interviewees said fire risk information through brochures/leaflets could be an effective mechanism to get the messages out. However, the timing of a mail drop was seen as important. Some said the ideal time would be in spring as things started to get drier and heat up. Information sent out during the winter would be untimely and not relevant. Others said a brochure with your rates would be effective.

Most interviewees also said that they would visit an information stall at a community event or attend an information evening in the community.

The only other thing people suggested as a mechanism to inform people about reducing the risk for out-of-control fires was social media, such as Facebook.

> "I think a more effective mechanism and a more reliable one would be, you know, social media, Facebook. There's an awful lot of people on the local Facebook page and that appears to be very, very effective at getting messages across immediately, so I think, social media would probably be more effective than radio or television and probably a lot cheaper, too."

3.9 SUGGESTIONS FOR REDUCING THE RISK OF OUT-OF-CONTROL FIRES

The LBOs interviewees and the survey respondents made many suggestions for reducing the risk of out-of-control fires for authorities. The most were for the Fire Service, however they also suggested ideas for authorities such as the local council or the local power company.

We have grouped suggestions into six categories. Most suggestions were around communication and information to communities; this was closely followed by suggestions on how to educate the community on reducing fire risk.

Fire Service

Communication and information

- Keep reminding lifestyle block holders of the fire risks and how to reduce the risk.
- Use local community Facebook page to highlight risk factors - praise groups that are working together to protect residents etc.
- The most important action authorities can do to reduce the risk of out-of-control fires is with fire bans, provide more information like what behaviour is acceptable and how to mitigate the risk of out-of-control fires.
- Have an information evening.
- More information of what is the best way to approach an out-of-control fire if you are in one. Do you cut and run and if you are stuck and have to stay, what do you do?
- Texting people when the fire risk is high.
- Family day at the fire station.
- Sending something out with your rates in spring.
- Have someone go into schools late spring to talk about fire prevention.
- Highlight the liability side if you cause the fire.
- Fire risk awareness package to be given to new owners of small blocks.
- Develop and support a system very similar to Neighbourhood Watch but have it as a Fire Watch where people band together to actually keep an eye out for fire risk.
- Put fire risk message out in farming magazines (there is one that comes out with the Northern Outlook paper)

Education

- Run a controlled burn course for farmers but especially lifestyle block owners so they understand the process from lighting it to how to deal with ash piles.

- Encourage local districts/communities to engage in a fire risk analysis of their community by running workshops in the local hall.
- Telling people's fire stories to get the message across and people can relate (make it personal). Tell people how it has impacted them economically and from a family point of view.
- Conduct a fire risk assessment on individual people's properties and give people suggestions on how they can reduce their fire risk.
- Give people a demonstration of how quickly an out-of-control fire can happen (in a controlled area).
- Tap into local networks e.g. the Association of Anglican Women, the Country Women's Institute, schools etc. and go and give them fire risk educational talks.

Monitoring and compliance

- Prosecute reckless offenders.
- Compulsory property checks & make enforceable otherwise there are consequences.
- Fire officer site visit and detailed discussion on permit conditions.
- Monitor fire restrictions.
- Develop a fire risk preparedness list that LBOs can tick off, could be developed into a certificate that could then also be used to reduce insurance levies. Or alternatively a Fire Prevention or firefighting certificate that you can obtain once you have completed a course that could reduce your insurance levies.

Fuel load

- Clean out Cam River by allowing stock to graze excess grass growth.
- Helping people with big burn offs (e.g. paddocks).

Miscellaneous

- The Fire Service should put a Fire Service coupling in every accessible tank. It should be in the permit when you get a tank.
- Fire service should have a map of water tanks on properties in their area.
- Make it mandatory to have a fire fighting water tank on property (Otago has this).

Other authorities

- Farm supply outfits such as Farmlands could have a promotion on fire extinguishers and hoses and gear like that in November/December when things getting hotter and drier.
- Power companies could promote generators for when you have no power during a fire to pump the water.

- Be clear on who is responsible for cutting back trees near power lines. Not sure whether it's the power company or another authority.
- There are no real consequences for property owners who do not cut back/down their trees. This needs to be reinforced or they need to be told that they're liable for any fire damages the trees may cause (e.g. trees falling onto power lines during high winds and causing fires).
- Council to have rubbish collection as part of their rates (would reduce need for rubbish fires).
- Council should be putting information into a "Welcome Pack" for new owners of lifestyle blocks about the responsibilities, and fire risks.
- Council to manage grass on road sides to reduce fuel
- Encouraging improved practices, communication and controls by local authorities
- Community education (in relation to the law, good practice, and the imposition and lifting of fire restrictions).

One respondent drew a connection between environmental impacts of rural fires and wild-fire risk. They called for more intervention from the regional council in relation to farming practices that involve burning stubble and shelter belts. Another respondent suggested community workshops to "engage in fire risk analysis of their community".

3.10 SUMMARY OF INTERVIEWS AND SURVEY

Although LBOs understood there was a high fire risk in their neighbourhoods they mostly thought that their behaviour would not cause an out-of-control fire, and it would more likely come from a neighbouring property. Respondents discussed a variety of strategies to reduce fire risk on their properties and they displayed varying levels of fire risk knowledge. The interviewees ranged from an ex-volunteer fire fighter, to new LBOs who were learning as they went. How the interviewees learnt about how to reduce fire risk was also varied and there did not seem to be one clear mechanism at present. They mostly seemed to think a lot more could be done to increase LBOs knowledge.

Most respondents agreed that there was a joint responsibility of both LBOs and local authorities to reduce fire risk. The majority thought it was the authority's job to educate, the LBOs responsibility to implement that education, and for the authorities to support implementation. Interviewees seemed to want more clarification on best practices and some form of monitoring by authorities on best practices regarding reducing fire risk. Improved working relationships with other parties such as neighbours and/or authorities was also seen as helpful and communication was seen as key to getting the message out about reducing fire risk.

There was no one favoured mechanism to deliver the message but it seemed that to be able to deliver the messages effectively there needed to be a variety of mechanisms. This is consistent with a finding by Langer and Hart (2014, p. 10); they state, "A 'one size fits all' approach is not effective. Fire managers need to have a carefully considered communications policy, at both the national and local level. Fire communication is most effective if relevant messages are targeted at each specific audience, rather than all messages communicated to the community as a single entity."

Respondents made many suggestions for reducing fire risk and again communication and information seemed to be key, along with education. This is supported in national and

international literature that suggests that involving the community in wildfire mitigation is important in building community resilience in reducing fire risk. Bones (2005, p. 23) noted, “Greater community education and community involvement in fire management is required in New Zealand…Fire authorities need to educate and raise community awareness. Improved communication and good interagency relations between fire authorities, and between fire authorities and other emergency services is crucial.”

3.11 WORKSHOP WITH SELWYN RURAL FIRE PERSONNEL

We held a workshop with rural fire personnel from Selwyn district to present provisional findings, test some interpretations, and begin to populate a useable model for engagement with LBOs. We focused on three aspects from our interviews and survey:

- How did people see risk?
- Current strategies and practices of LBOs for mitigating fire risk
- Suggestions of LBOs for further mitigation of fire risk

Some of the comments given by rural fire personnel regarding fire risk included, that they found LBO’s risk assessment as a bit insular. They observed that LBOs think that if they have not had a fire incident, then that supports what they are currently doing and that they will be fine; however, that may not be the case. Workshop participants felt that LBOs have little comprehension of risk assessment; for instance, sometimes LBOs believe that the fuel load of a forest is a risk whereas it is people’s risky behaviour that is a risk to the forest, not the other way around. Additionally, peoples’ perception around risk was considered to be limited; for instance, LBOs do not understand that it is the ash that is left over, not just the naked flame, that can be the threat. With a strong northwest wind, fires can reignite long after they are thought to be extinguished. Participants thought there was a lack of education around fire management. They also believed there were low levels of ownership by LBOs of appropriate equipment to fight a fire.

Around fire management, the Selwyn personnel would like to see LBOs keeping fires small and feeding them (instead of lighting a large fire). They would also like to see neighbours being more active around fire risk and management. Access was also mentioned; they stated that this was still an issue for the fire service, and some people even padlocked their gates. Another issue raised was that insurance companies should work more with people on what happens if they start an out-of-control fire. There are different insurances such as fire suppression and public liability, and some people think they are covered for both, but may not be.

After presenting the draft preliminary findings participants assisted in populating the Collective Action Model. Each box in the model was discussed among the participants and key insights noted. The provisional model presented in the Discussion below (Figure 2) builds on insights from the Selwyn rural fire personnel, as well as drawing on the findings of the interviews and survey.

4. DISCUSSION

4.1 WILDFIRE AS A SOCIAL DILEMMA

Viewing wildfire risk as a social dilemma is supported by our findings, and is likely to prove a powerful basis for planning interventions. LBOs proved very aware of potentially risky behaviour in their neighbourhood, but were often confident that their own actions were appropriate. As we suggested earlier, LBOs may feel no need to take individual responsibility for reducing the likelihood and consequences of wildfire because that risk is shared, dependent on the behaviours of others, and managed by public authorities. We found this aligned with what we heard from respondents. It appeared easier for LBO respondents to see what improvements of practice others could make than for them to see improvements they could make themselves.

We argue that if wildfire risk is, in some sense, a social dilemma, then it is worth trying a social approach to changing behaviour. We suggest using the ideas of neighbours and neighbourhood to help LBOs to position themselves in a collective action approach to a shared dilemma. What is indicated, we believe, is a catalyst or tool to facilitate neighbourhood thinking and action on reducing wildfire risk. The model proposed below is intended to be such a tool.

4.2 WILDFIRE MITIGATION AS SOCIAL PRACTICE

We also introduced above the idea of wildfire risk mitigation as a social practice, rather than an individual behaviour. That is, what if we look at the factors influencing LBO behaviour as if they are embedded cultural attitudes, practices and constraints that are part of the social environment of LBOs, not just personal. It may be hard for individuals to stand for change in their community, but if norms of behaviour and attitude are part of a social movement of change, then individuals can adopt and adapt practices more easily. Again, what seems to be indicated is some mechanism to seed and carry a shift in shared norms. The model we propose is designed with this in mind. The work of Shove et al (2012) provides a useful framework to understand social practice; social practices consist of configurations of materiality (stuff), capabilities (skills), and meaning (sense). We have adopted this framework for the rows of our model (Figure 2). The columns of the model capture the idea of stages of activity in relation to wildfire risk mitigation: preparedness, prevention practices, and participation and connectedness. Preparedness includes activities that anticipate a wildfire event and ensure that preparations are in place to reduce the impact and spread of the fire. Prevention practices include actions that will make wildfire less likely to happen in the first place. Participation and connectedness are seen as social infrastructure that will maintain both a sense of collective responsibility and capacity for more effective response to situations of wildfire threat.

4.3 MODEL DEVELOPMENT

We have built a provisional collective action model (CAM) based on insights from interviewees, survey respondents and experienced rural fire personnel. The model still needs testing and refining.

The CAM (Figure 2) is firstly a tool for self-assessment by LBOs; it can then be used as a vehicle for conversation with neighbours and/or as a basis for a neighbour to undertake a peer assessment. While we see a role for FENZ in refining and promoting the CAM, the model is designed by community use independently of FENZ.

4.3.1 Collective Action Model (provisional)

	Preparedness to be prepared for wildfire event	**Prevention practices** to maintain property and conduct safe fires	**Participation and connectedness** to establish and sustain links and relationships
Stuff (infrastructure)	Access to the property for firefighting equipment Water – volume, accessibility Information on good fire practice and advice Fire extinguishers strategically placed Landscaping to defend houses and key infrastructure Communication options readily available Awareness package – what to notice, what to do Fire safety plan	Landscape design and management – to reduce fuel and avoid ignition Machinery precautions – to avoid accidental ignition Location and management of flammable items and substances Management of open fires	Neighbourhood communications plan – up to date Neighbourhood resources plan – up to date Neighbourhood fire safety plan – up to date Neighbourhood regular mutual audit
Skills (competencies)	Understanding of behaviour and nature of fires Awareness of response options and when to deploy them Physical and psychological capability to respond to a fire event Familiarity with neighbours' properties and protocols	Land and crop management to minimise risk Situational awareness – including issues of proximity, weather, seasonality Awareness of information sources and regulations Awareness of behaviour and nature of fires	Household plan and awareness (including children) Information sharing with neighbours
Sense (way of seeing the world)	Collective responsibility "We are in this together as a neighbourhood" "We understand there are times we will need specialist advice or help to be prepared" "We are realistic about our vulnerability to out-of-control fire"	"We are realistic about our vulnerability to out-of-control fire" "We see fire risk as a problem we can do something about" "We are in this together as a neighbourhood" Openness to expert and regulatory influence	New neighbours are actively engaged in neighbourhood fire awareness Fire prevention and management is a shared and neighbourhood responsibility

Figure 2: A Collective Action Model to reduce wildfire risk

The CAM could be offered as an interactive website (e.g., Google Sheets), phone app or in hard copy. We envisage the model being supported by explanatory and educative material linked to specific boxes and items. However, exact interpretations are less important than the awareness and dialogue that the model promotes.

Using the CAM

1. Each box in the model is used to produce a grade for how well a property demonstrates the desirable elements: grades A – D (Table 1). That process results in three grades per row (stuff, skills and sense).
2. For each row in the model the property is then given the lowest grade in that row.
3. The overall rating of the property is determined by the lowest of the row grades, and interpreted by Table 2.

A worked example of the CAM is provided in Appendix A.

Table 1: Grading scale for particular elements

Grade	Interpretation
A	"This property has got all the elements in this box fully covered."
B	"This property has the elements in this box adequately covered. Some areas could be improved, but these areas are unlikely to increase the neighbourhood risk of wildfire."
C	"This property needs to make changes to one or more elements in this box to lower the risk to the neighbourhood of wildfire."
D	"This property is an immediate risk to the neighbourhood because important elements in this box are not in place."

Table 2: Grading scale for a property

Grade	Interpretation
A	"This property is an exemplar of good practice in reducing the risk of wildfire. Very little improvement in practices on this property are likely to make a positive difference to wildfire risk."
B	"This property is well prepared to prevent and to deal with wildfires. Only minor improvements are suggested."
C	"This property lacks some important elements of good practice in reducing the risk of wildfire."
D	"This property is poorly prepared to prevent and deal with wildfires. Significant improvements of practice are needed."

The idea behind this model is that it promotes social action simultaneously with promoting good individual practice. The grading system is intended to provide a simple heuristic to show when improvement is needed and the focus of that improvement. Grading gives an easy shared language between neighbours, and can stimulate an element of competition to drive social change. The interpretation statements in Tables 1 and 2 are intended to communicate in plain language and stimulate relevant sense of achievement or social obligation.

The CAM is envisaged as a resource to be disseminated for voluntary use by LBOs. It is not intended, or suitable, as a regulatory or formal audit device. The aim is to stimulate responsible social practices, not a compliance mentality. The mechanism for change is the

combination of awareness raising and social accountability among neighbours. The role of FENZ would be to test and improve the CAM, and then to promote its use. Such promotion could be through engagement with the public at rural events (A & P shows and the like) and through websites and social media sites used by LBOs. Once some neighbourhoods have adopted the use of the CAM media interest could be prompted.

5. RECOMMENDATIONS

The current project was quite limited in scale. The findings and the model it has produced are promising but need further testing and refinement. We recommend the following:

1. That FENZ consider the implications for social marketing and communications strategies of treating wildfire risk mitigation as a social dilemma.
2. That FENZ carry out or commission a trial in three or four districts of a collective action model for influencing LBO attitudes and practices in relation to wildfire risk. The model prototyped in the current report would provide a basis for such a trial.
3. That any trial of a collective action approach includes systematic developmental evaluation (Patton, 2011; Patton, McKegg, & Wehipeihana, 2015).

The significance and power of adopting a social practice approach to engaging with LBOs cannot be established through qualitative interviews, surveys and recourse to theory. Bringing about change in situations of social complexity is not a matter of applying interventions as if they have a simple cause and effect way of working. In situations of high social complexity, the most that can be attempted is to design and try promising interventions in an effort to *influence* patterns of behaviour. As Snowden & Boone have argued (2007), in the complex domain the task is to undertake 'safe-to-fail' probes (promising interventions), and monitor for desired change in patterns.

We suggest that the recommendations above constitute 'safe-to-fail' probes. Our study strongly indicates that a social practice approach is likely to be worthwhile, but will only be proven useful, or improved, by real-world trialing with appropriate evaluation.

We commend developmental evaluation for this purpose because it is suited to situations of high complexity and uncertainty. The design and implementation of the CAM are not yet stable, and each implementation will need to incorporate adaptation and learning from feedback. Developmental evaluation is a form of structured feedback and learning for programmes that are, by their nature, experimental and developing (Patton, 2011, 2012).

6. CONCLUSION

The approach adopted in this project is innovative because it uses insights from management of common-pool resources (Ostrom, 2009a) to understand the complex relationship between land owners, public authorities (McFarlane et al., 2011) and the community with whom they share the risk environment.

Our small qualitative study in two New Zealand districts suggests that LBOs are inclined to over-estimate their own preparedness for preventing and managing wildfire while recognising some vulnerability to the poor practices of others (neighbours and local authorities). We believe that viewing wildfire risk as a social dilemma opens up new avenues for promoting better practice among LBOs. By encouraging a sense of neighbourhood in relation to risk management, we believe, it will be possible to stimulate change in social practice. Elements that will support change will include enhanced social cohesion, a sense of mutual accountability, mutual trust, and some shared ways of considering and comparing practices within a neighbourhood (Ostrom, 1998, 2007).

We have developed a prototype CAM as a tool to support the elements for social change listed above. The current study is too small to have tested and refined the model and any protocols around its use, but we commend it as a promising direction for further development.

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GLOSSARY

CAM	Collective action model
FENZ	Fire and Emergency New Zealand
FSC	Fire Service Commission
LBO	Lifestyle block owner
RFA	Rural Fire Authority
WTA	Wildfire Treat Analysis

APPENDIX A: COLLECTIVE ACTION MODEL: A WORKED EXAMPLE

The following is a hypothetical example of applying the CAM. It is based on field observations of a cluster of properties in the Selwyn District.

1. Each box in the model is used to produce a grade for how well a property demonstrates the desirable elements: grades A – D (Table 1). That process results in three grades per row (stuff, skills and sense).

Stuff:

The property in question had most of the infrastructure in place, but lacked a documented fire safety plan (preparedness) and there is no neighbourhood regular audit (participation and connectedness).

This means that two of the three boxes in the 'Stuff' row had to be graded 'C'.

Skills:

The property occupants lacked some important skills: they had no familiarity with neighbours' properties and protocols (preparedness), little awareness of where to find information and regulations about fires (prevention practices), land and crop management did not take account of fire risk (prevention practices), there is no information sharing with neighbours (participation and connectedness). The land and crop management was considered sufficiently serious that it was graded 'D'. The other boxes in the row were graded 'C'.

Sense:

Fire prevention and management was not fully seen as a shared and neighbourhood responsibility (participation and connectedness), but there was some awareness. Therefore, one box in the Sense row was graded 'B'.

2. For each row in the model the property is then given the lowest grade in that row.

> As the lowest grade for the boxes in the ‘Stuff’ row is C, the grade for the whole row is C.
>
> > “This property needs to make changes to one or more elements in this row to lower the risk to the neighbourhood of wildfire.”
>
> The lowest grade for the boxes in the ‘Skills’ row is D, so the grade of the whole row is D.
>
> > “This property is an immediate risk to the neighbourhood because important elements in this row are not in place.”
>
> The lowest grade for boxes in the ‘Sense’ row is B, so the grade of the whole row is B.
>
> > “This property has the elements in this row adequately covered. Some areas could be improved, but these areas are unlikely to increase the neighbourhood risk of wildfire.”

3. The overall rating of the property is determined by the lowest of the row grades, and interpreted by Table 2.

> The lowest of the row grades is the D for Skills. Therefore, the property as a whole received a D grade:
>
> > “This property is poorly prepared to prevent and deal with wildfires. Significant improvements of practice are needed.”

From the above worked example it becomes clear where immediate improvements can be made: land and crop management can be improved to take account of fire risk. This would lift the overall rating of the property to C [“This property lacks some important elements of good practice in reducing the risk of wildfire”].

Further improvements could then focus on the Stuff row: documenting a fire safety plan, and participating in a regular neighbourhood audit. With those issues addressed the property could be graded B [“This property is well prepared to prevent and to deal with wildfires. Only minor improvements are suggested”].

APPENDIX B: INTERVIEW GUIDE

Interview questions: Fire Risk

About the property and owner

1. How would you describe your relationship with the land you live on in this district?

(e.g., own the land, manage or have responsibility for the use of the land and/or live on the land)

2. Can you describe the type of land you have in this district?

(Lifestyle block – not intended as a business, small farm or other productive unit)

   a. How big is it?

   b. Dominant land use other than dwellings?

3. What are your key reasons for living on your block of land?

(Lifestyle, good place to bring up children, farming or business, space for animals etc.)

Fire risk perceptions

4. Do you think there is a real risk of out-of-control fires in your area and why?

5. In your opinion, how likely is it:

   a. A fire started on your property could get out of control and affect others and why?

   b. A fire started on your property could get out of control and cause loss to you or your family and why?

   c. A fire started elsewhere could enter or cross your property and why?

6. Is your home/buildings or equipment vulnerable to an out-of-control fire in your neighbourhood? Why is this?

7. Are there any landscape features important to you that are vulnerable to an out-of-control fire?

8. How important is each of these concerns to you and why?

    a. The health of yourself and your family to you?

    b. Employment and/or income?

    c. Maintaining and/or improving the appearance of your property?
    d. Maintaining and/or improving the value of your property?
    e. Business interests?
    f. Recreation on your land?
    g. Protecting your property from out-of-control fires in your neighbourhood?
    h. Protecting your neighbours from out-of-control fires?

9. How comfortable are you with the following and why?
    a. Your own actions to reduce the risk of out-of-control fires affecting your property?
    b. Your own actions to reduce the risk of out-of-control fires affecting neighbours?
    c. Your neighbour's actions to reduce the risk of out-of-control fires in your neighbourhood?

10. Is there anything you would say to your neighbours about reducing the risk of out-of-control fires in your area?

Fire risk responsibility

11. Who do you think has the main responsibility for reducing the risk of out-of-control fires, individual property owners and/or local authorities and why?

12. What has been the most important action you have done or could do, to reduce the risk to your property from an out-of-control fire?

    a. How easy and effective was it to implement it (or could be)?
    b. How effective was it or could be?

13. What has been the most important action your neighbour has done or could do, to reduce the risk to your property from an out-of-control fire?

    a. How easy and effective was it to implement it (or could be)?

    b. How effective was it or could be?

14. What has been the most important action local authorities (council and fire authority has done or could do, to reduce the risk to your property from an out-of-control fire?

    a. How easy and effective was it to implement it (or could be)?

    b. How effective was it or could be?

15. What is currently done in your area that informs you and your neighbours and/or visitors to reduce the risk of out-of-control fires?

16. In your opinion, what would better inform your decisions about reducing risk to your property of out-of-control fires?

    a. More investigation and analysis about fires and risks?

    b. Clarification of good practice, and/or local fire policies?

    c. Improved working relationships with other parties, such as neighbours or authorities?

    d. Anything else?

17. What would be the best mechanism in which to inform you and you neighbours about reducing the risk for out-of-control fires?

    a. Advertising on TV/radio?

    b. Advertising via brochures?

    c. Information stalls at community events?

    d. Something else?

18. Is there anything further you would like to add in relation to what would help reducing the risk of out-of-control fires in your area?

APPENDIX C: INVITATION TO PARTICIPATE

Invitation to be heard

Life-style and small rural land owners

If you live on a block of land in the Selwyn District, your viewpoint on wildfire risk could be important.

The New Zealand Fire Service Commission has contracted researchers to help them understand attitudes and behaviours of small block owners in managing wildfire risk. The findings will enable the Fire Service to improve social marketing and other practices in relation to wildfire risk.

The researchers from a Crown Research Institute, the Institute of Environmental Science and Research (ESR). The study is being conducted in the two districts of Selwyn and the Waimakariri.

The research team is looking for volunteers to participate in any of the following ways:

- be available to be contacted for an interview
- be available to be invited to a focus group
- do a short on-line survey

If you are interested in participating, please go to the link

below: https://www.surveymonkey.com/r/firenz9

Also, if you know of anyone who may be interested in participating in the study please forward the link to them.

Contact:

Graeme Nicholas

Senior Scientist: Service Innovation

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APPENDIX D: ONLINE RECRUITMENT AND SURVEY

Wildfire Risk

Welcome

Thank you for your interest in our research on wildfire risk.

We are undertaking a study for the New Zealand Fire Service Commission (FSC) to understand attitudes and behaviours of small block owners in managing wildfire risk. The findings will enable the FSC to improve social marketing and other practices in relation to wildfire risk.

FSC has contracted a Crown Research Institute, the Institute of Environmental Science and Research (ESR) to undertake this study. The study is being conducted in the two districts of Selwyn and the Waimakariri.

We hope you will participate in any of the following ways:

- be available to be contacted for an interview
- be available to be invited to a focus group
- do a short on-line survey

Please consider how you could be involved. After a few questions on the next page we will ask you how you would like to participate in our study. Your point of view will help us understand the issues around small block owners managing wildfire risk.

If you wish to know more about the research, please contact Graeme Nicholas at ESR (phone 03 351 0134; email graeme.nicholas@esr.cri.nz).

Wildfire Risk

Some things about you

1. Please tell us which district you live in on a block of land.

- ◯ Selwyn District
- ◯ Waimakariri District
- ◯ Other (please specify)

2. Please tell us which age group you are in.

3. What is your gender?

- ◯ Male
- ◯ Female
- ◯ Other

4. How would you describe your relationship with the land you live on in this district? (Tick all that apply)

- ☐ I own the land, or share the ownership of this land
- ☐ I manage or have responsibility for the land use of this land
- ☐ I live on this land
- ☐

5. Please describe the land you have in this district.

- ◯ Lifestyle block (not intended as a business)
- ◯ Small farm or other productive unit
- ◯ Other (please specify)

6. Please tell us about the land you live on.

	Size (hectares)	Dominant land use other than dwellings
Your block of land		
Other (please specify)		

7. Please rank your reasons for living on your block of land.
(1=most important; 4=least important)

☐	Lifestyle	☐ N/A
☐	Good place to bring up children	☐ N/A
☐	Farming or business	☐ N/A
☐	Space for animals	☐ N/A

Wildfire Risk

How would you like to participate?

There are three ways to get involved: an interview, a focus group, or an online survey.

If you are willing and invited to do an interview, it will be arranged for a time and place (or phone) that is convenient to you. An interview will take 45 – 60 minutes.

If you are willing and invited to join a focus group, it will take about two hours and will involve discussion in a group of 5-10 people.

Not all volunteers will be needed; it depends on getting a good spread of people so we get a range of viewpoints.

To supplement interview and focus group notes, discussion will be audio recorded (with your consent) and transcribed by a professional transcribing service for later analysis. The notes and transcripts will remain confidential to ESR and any comments will not be attributed to identifiable persons/companies.

The online survey is available on this site. If you choose this option you will be taken to the survey page.

You are, of course, free to decline to be interviewed or to withdraw from the interview at any time.

* 8. How are you willing to share your views?

- ◯ I am willing to be contacted to be interviewed by phone or in person
- ☐ I am willing to be invited to a focus group discussion
- ☐ I am willing to be invited for an interview or a focus group
- ☐ I am willing to complete an online survey
- ☐ I am sorry, I am not available for this study

Wildfire Risk

Interview preference

9. Please tell us your preference:

- ◯ I would prefer to be interviewed by phone
- ◯ I would prefer to be interviewed in person
- ◯ I am willing to be interviewed by phone or in person

Wildfire Risk

Availability and contact

10. Please tell us when you are likely to be available:

- [ ] During the day on week days
- [ ] Early evening on week days
- [ ] Other (please specify)

11. Please tell us at least one way to contact you:

Day time phone number

Email address

Wildfire Risk

Thinking about wildfire risk

12. In your opinion, how likely is it that ...

	Very unlikely	Possible, but not likely	Highly likely	N/A
A fire on your property could get out of control and affect others?	○	○	○	○
A fire on your property could get out of control and cause loss to you or your family?	○	○	○	○
A fire started elsewhere could enter or cross your property?	○	○	○	○
Your home is vulnerable to out-of-control fire in your neighbourhood?	○	○	○	○
Buildings and/or equipment on your land is vulnerable to out-of-control fire in your neighbourhood?	○	○	○	○
Landscape features important to you are vulnerable to out-of-control fire?	○	○	○	○

13. How important is each of these concerns are to you?

	Not important	Sort of important	Important	Very important
Health of yourself and your family	○	○	○	○
Employment and/or income	○	○	○	○
Maintaining and/or improving the appearance of your property	○	○	○	○
Maintaining and/or improving the value of your property	○	○	○	○
Business interests	○	○	○	○
Recreation on your land	○	○	○	○
Protecting your property from out-of-control fires in your neighbourhood	○	○	○	○
Protecting your neighbours from out-of-control fires	○	○	○	○

14. How comfortable are you with ...

	Very comfortable	OK	Very uncomfortable	N/A
Your own actions to reduce the risk of out-of-control fires affecting your property?	○	○	○	○
Your own actions to reduce the risk of out-of-control fires affecting your neighbours?	○	○	○	○
Your neighbours' actions to reduce the risk of out-of-control fires in your neighbourhood?	○	○	○	○

15. What would you like to say to neighbours about reducing the risk of out-of-control fire in your area?

16. What is the most important action you have done, or could do, to reduce the risk to your property from out-of-control fire?

17. Looking at your answer to the last question -

	Implemented?	Easy?	Effectiveness?
The action to reduce risk:			

18. What is the most important action your neighbours have done, or could do, to reduce the risk to your property from out-of-control fire?

19. Looking at your answer to the last question -

	Implemented?	Easy?	Effectiveness?
The action to reduce risk:			

20. What is the most important action local authorities (council and fire authority) have done, or could do, to reduce the risk to your property from out-of-control fire?

21. Looking at your answer to the last question -

	Implemented?	Easy?	Effectiveness?
The action to reduce risk:			

In your opinion, what would help you make better decisions about reducing risk to your property of out-of-control fires?

22. More investigation and analysis about fires and risks

0 10

23. Clarification of good practice, and/or local fire policies

0 10

24. Improved working relationships with other parties, such as neighbours or authorities

0 10

25. You are welcome to add any further comment:

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