# THE PRESCRIBED BURNING DEBATE IN AUSTRALIA: CONFLICTS AND COMPATIBILITIES

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*Abstract*

Following the unprecedented series of bushfires in Victoria (Australia) over the past decade, public debate is fierce over the use of prescribed burning to reduce wildfire hazard. These deliberations are full of uncertainties over effectiveness and consequences, reflecting a lack of high level evidence-based debate, and appear polarised between people prioritising asset protection and others prioritising biodiversity. Using a textual analysis of submissions to a parliamentary inquiry, we investigate how people frame the risks of prescribed burning, the certainty of its outcomes, and what values they evoke in order to justify their views. We find that differences do not necessarily arise from divergent priorities about nature, people, or assets, but instead from contrasting views about whether humans or nature are voluntarily or involuntarily exposed to wildfire risk.

**Keywords:**
Wildfire, prescribed burning, risk perception, uncertainty, values, Victoria (Australia)

1. **Introduction**

Shortly after the disastrous 2009 Victorian bushfires, debates that had been in the public sphere since the 2003 Alpine fires were given fresh impetus. A key topic in these debates is prescribed burning. Advocates assert that more prescribed burning could avoid such losses to life and property, and blame environmental activists for blocking the use of this important tool (Bachelard & Fyfe 2009; Wallace 2009). Detractors claim that prescribed burning could not have prevented these wildfires, and that nature should be allowed to run its own course. Both sides to the debate summon science and expertise to demonstrate legitimacy (Felmingham 2009; Siobhain 2009; Buxton et al. 2011).

Prescribed burning is a complex tool involving many uncertainties: its effectiveness in reducing wildfire risk is not precise, and its effects on the ecosystem and climate are complex at best. It can also be risky, in that fires may escape control. In addition, prescribed burning can involve trade-offs between different goals, such as protection of property, biodiversity conservation, air quality, or non-intervention in nature (Whittaker & Mercer 2004).

Given this complexity, how do people decide which position to support? Research on decision-making in situations of uncertainty points to the importance of familiarity, underlying values, and framing effects in evaluating uncertainty and shaping decision-making (Tversky & Kahneman 1974; Baron 2008). For instance, a vivid description of wildfire damage tends to lead one to overestimate the risk, while stressing survival stories would lead to an underestimation of the risk. Others emphasise value differences as important determinants in decision-making. For example, the Victorian Emergency Commissioner has commented that the debate surrounding prescribed burning in Australia is often explained by essential differences in values (Esplin et al. 2003).

Our study examines the ways in which participants in the public debate over prescribed burning in Victoria frame the risks associated with this use of fire, and what values they call upon to validate their positions. We do so in order to shed more light on how uncertainty is framed in debates over resource management. As the public debate draws not just on evidence, experiences, and arguments of interest, but also on value judgements and on harnessing ambiguous, complex rhetorical concepts like 'nature', we seek to move beyond the view propagated in some reports and in the media that the debate over prescribed burning boils down to irreconcilable differences in values between those who favour a wild nature and those who value humans and their property. Our findings suggest otherwise and lead to a number of policy recommendations.

2. **Background**

We begin below by outlining the context within which this debate occurs, introducing readers to the wildfire situation of Victoria and the contours of scientific debate about prescribed burning. We then introduce the main values that different interest groups within the Australian public bring to the bushfire question.

2.1. *Wildfire in Victoria*

The State of Victoria is particularly predisposed to fires due to the regional flora, topography, and climate regime (Pyne 1992). Periodic hot, dry, and strong desert winds from the north create dangerous fire condition; these are then complicated by subsequent wind shifts, often south-westerly, which massively expand the size of a fire and make it difficult to control. About one third of the state is public land, including 3.4 million hectares of state forest and 4.2 million hectares of conservation areas (ENRC 2008); much of the rest is agricultural. On average, about 600 wildfires happen on public land per year, burning about 120,000 hectares, however certain years see much

more fire than others (DSE 2009). Lightning strikes lead to the largest area burnt on public land (46%), yet form only a quarter of ignitions. Another quarter of ignitions is arson, contributing about 14% of burnt area. Escapes from prescribed burns also cause wildfires, although these constitute less than 2 percent of all fires and burn less than 5 percent of the total affected land (DSE 2009).

Over 35 disastrous conflagrations are documented in Victoria, dating back to the "Black Thursday" of 1851. A spate of wildfires from 2003 through 2007 collectively burned 10 percent of the state, resulting in loss of 6 lives, destruction of 149 houses and 17,141 livestock (ENRC 2008). The February 2009 wildfires were the most calamitous in the contemporary history of Australia. The human toll reached 173 with numerous others injured (Brendan & Stephen 2009). Although the exact economic and ecological tolls will be unknown for some time the consequences are projected to be unprecedented. The fires adversely affected the air quality, wildlife, plant life, pastures, and water catchments. Communities also reported psychological damages, such as trauma, grief, fear, and loss of confidence in safety (Stark 2009). The main reasons for the wildfires were attributed to extreme weather conditions, particularly the high wind and weeks of sustained high temperature and low humidity, building on top of 12 years of drought (Bachelard & Fyfe 2009).

More than a dozen Federal and State government inquiries were instigated after the recent series of fires, including the 2007 Inquiry into the Impact of Public Land Management Practices. The latter concluded the following:

> The scale and intensity of the 2002/03 and 2006/07 bushfires were the result of inappropriate fire regimes, and in particular, of an insufficient level of landscape-scale prescribed burning (ENRC 2008, p. xxvii).

Currently, prescribed burning on public land in Victoria is administered by the Department of Sustainability and Environment (DSE). The DSE has an annual target for prescribed burning of 130,000 hectares, increased in 2003 from 100,000 hectares. In 2008, actual prescribed burns covered 156,000 hectares, or 2 percent of public lands (DSE 2009). However, such extents are well below the 385,000 hectares recommended by the 2007 Inquiry (ENRC 2008).

## 2.2. *Uncertainty in fire science*

The technical and ecological literature on prescribed burning shows that, despite considerable advances, high levels of uncertainty remain. Indeed this uncertainty may be inherent to fire. The occurrence of fire is contingent on the production of enough fuel (i.e., vegetation), on climatic cycles that dry the fuel, and on ignition sources, whether human or natural. Climate patterns and human activities shape vegetation type, moisture content, and biomass growth. Daily weather, topographic features, and vegetation structure all influence fire behaviour, complicating prediction (Catchpole 2002; Keeley 2004; Pyne 2006; Keeley 2008; Iniguez et al. 2008; Bowman et al. 2009).

The effects of fire on the environment depend upon the characteristics of the fire regime, including the type of fire (ground, surface, crown), its temporal nature (rate of spread, seasonality, and frequency), and spatial pattern (size, patchiness, and spot-fire patterns) (Catchpole 2002; Bowman et al. 2009). Fire effects vary across flora and fauna species, particularly by functional types (Gill et al. 2002). For some Australian biota fire is important, particularly for regeneration of certain species and maintenance of landscape level biodiversity (Keith et al. 2002). Aftermath studies of large fires show that some species of flora and fauna are adapted to fire and some even dependent on fire, while others are sensitive to fire (Gill & McCarthy 1998; Burrows 2008; Williams et al. 2008). Adaptation to fire, however, is not a simple division between fire-tolerant species and others: different species are adapted to different types of fire regime (i.e. different intervals, intensities, or patchiness); while individual species have different tolerances throughout

their life cycle or in different topographic locations.  As a result, a regime suitable to one species may not be suitable to another (Burrows 2008).

Fires generally have a short-term impact on soil erosion and water quality (Shakesby et al. 2007).  While one study has suggested that the rural Victorian public is not overly concerned with smoke pollution (Bell & Oliveras 2006), other studies suggest that complaints about smoke pollution frequently hamper land managers' intentions of planned fires (McCormick 2002; Scherl 2005; Bushfires CRC 2006).  Both prescribed and unplanned fires release toxic gases and particles that impact air quality in the short term (Reisen & Brown 2009), and public health research increasingly documents an association between bushfire smoke and harm to respiratory health (Bowman & Johnston 2005; Dennekamp & Abramson 2011; Weinhold 2011).  Increased prescribed burning may reduce wildfires and the severe pollution associated with them, but the smoke from prescribed burns is a non-negligible health issue that is likely to increasingly attract negative attention.

Prescribed burning can be used to establish a particular fire regime thought to be beneficial to certain flora or fauna. By reducing the amount of flammable vegetation, it can also play an important role in wildfire risk management.  It can be directed to reduce the intensity, size, and occurrence of large wildfires, and facilitate fire suppression (Bradstock et al. 1998; Agee & Skinner 2005; King et al. 2006; Burrows 2008).  Prescribed burning, however, is less effective on certain topographic features, does not reduce wildfire risk in extreme fire weather, and does carry a risk of escape.  The appropriate frequency of prescribed burning depends on management goals, local climatic conditions, topographic features, land use, rate of fuel accumulation, and vegetation type, varying for example from annual to 20 years (Bradstock et al. 1998; McCaw et al. 2002).

Both prescribed burning and wildfires affect the fire history of a region, forming a part of its fire regime.  Because of the immense economic, environmental, and human losses caused by wildfires, fire management is invariably directed towards reducing the impact of big fires. Of the measures to mitigate wildfire risk through fuel reduction over large areas, prescribed burning is thought to be the most efficient method, as opposed to mechanical thinning (Williams 2007). While some studies take a view that fulfilling the combined objectives of biodiversity conservation and fire hazard management is unfeasible (Morrison et al. 1996; Potts & Stephens 2009), others contend that a well planned variable fire regime is capable of fulfilling both objectives (Keith et al. 2002; Burrows 2008).

## 2.3. *Values and prescribed burning in Australia*

The application of prescribed burning to Australian public lands evokes a variety of public responses. These responses are shaped by the changing values of different parts of society with respect to the environment. Historian Stephen Pyne (2006) traces how Australian society's relationship to fire has transformed over the centuries.  He reviews how Aborigines practised a "cleansing" type of prescribed burning out of sense of their duty to the land, which had both moral and biological functions.  Early European settlers used fire to domesticate the land, clear pasture, and cultivate fields.  Economic priorities like farming, pastoralism, or forestry determined the approaches of most European Australians to fire, either using it as a tool or controlling it to safeguard assets. Over the past half-century, environmentalism introduced new values centred on biodiversity and wild nature.  As a result, modern Australian conceptions of 'nature', more so than in places like Europe, tend to sharply separate a nature seen as wild, or without human influence, from other areas, like agriculture, where human influence is strong (Saltzman et al. 2011).

Several researchers have investigated the perceptions and attitudes of the modern Australian public towards wildfires.  Many of these studies point to underlying differences in values – rooted in broad social factors – as a key contributor to disparate attitudes (Gill 1994; Whittaker and Mercer

2004; Bell & Oliveras 2006; Ockwell 2008). More recently, others have looked more closely at how the context of everyday lives – money, gender roles, and priorities – shape attitudes and actions (Eriksen & Gill 2010; Eriksen et al. 2010), and at how these attitudes, together with the political economy of urban and regional planning, impede action (Buxton et al. 2011).

As far as prescribed burning in particular, views tend to be divided simply along the lines of either "more" or "less" prescribed burning, yet the values implicated are more diverse (Ockwell 2008). The most frequently discussed value difference is that between biodiversity conservation and protection of people and property (Esplin et al. 2003). The fire zoning policy of the Victorian public lands management agency clearly operationalizes this distinction in its fire management zones, which directly oppose fire protection outcomes against ecological outcomes (DSE 2011). Academic studies go further than this simplified split found in policy discussions and media portrayals, arguing that these disputes over fire reflect broader tensions over the changing culture and politics of land management. In particular, the emergence of biodiversity values, often implemented by centralised and bureaucratic government agencies, has increased the perceived marginalisation of some rural communities dependent on agriculture and forestry (Gill 1994; Whittaker & Mercer 2004; Uggla 2010). Fire management is clearly a political issue, not just an objective risk calculation task.

## 3. Research approach

In order to go beyond depictions of the prescribed burning debate as primarily a clash between those concerned with asset protection and those prioritising a wild nature, we unpack the positions of supporters and detractors as presented in the texts of public submissions to a parliamentary inquiry. We investigate their position statements, identifying how they evaluate the outcomes of prescribed burning, how they frame the certainly of that evaluation, and what values they elicit to justify their position. This allows us to identify whether different views are due to different normative evaluations of prescribed burning outcomes, different perceptions about the certainty of these outcomes, or of different underlying values. Before presenting the methods in detail, we first review the theoretical bases of this approach.

### 3.1. *Risk outcomes, uncertainty, and values*

Research has shown that decision-making involving risk and uncertainty is shaped by many perception-shaping factors (Sandman 1993). The perceptions of the **outcomes** of prescribed burning will be shaped by factors such as personal experience, the ways in which others communicate information, and the values held. For instance, a personal experience or vivid portrayal of a disaster leads to an overestimation of its likelihood compared to a brief report, which leads to an underestimation of the risk (Tversky & Kahneman 1974; Sandman 1993; Donovan et al. 2011); while local and recent experience tends to outweigh considerations of a broader temporal or spatial nature (Preston et al. 2009). Likewise, selectively emphasising positive or negative attributes of a risky decision consistently influences evaluation of the risk and risk taking behaviour (Levin et al. 1998). For instance, patients' consent to a surgery was more likely when the outcome was described in terms of probability of survival rather than probability of death (Wilson et al. 1987). However, such "framing" may not always have the intended effect, as people's reactions to partial information may be affected by their political and social context, as Seijo (2009) documents for government anti-fire media campaigns in Spain. In such cases, deeply-held values can influence whether an outcome is perceived negatively or positively, though some cognitive research suggests that values are fluid, formed during an elicitation process, not prior to it (Kahneman & Tversky 1984; Kahneman 2003; Bartels 2008).

**Uncertainty** is an important factor shaping perceptions. Sandman (1993) argues that higher levels of uncertainty contribute to higher perceptions of risk. It is also the idea behind "Prospect Theory", which asserts that people's preferences for risk tend to change depending on how a problem was framed in terms of its uncertainty and outcomes. Specifically, people tend to prefer certain gain when a problem is framed in terms of gains (risk averse behaviour), but prefer uncertain loss when the problem is framed in terms of its losses (risk seeking behaviour) (Kahneman & Tversky 1979). This theory is generally accepted as a powerful demonstration of a framing effect on decision-making in conditions of uncertainty (Levin et al. 1998).

**Values** – or relatively abstract and generalized standards or principles of what individuals in a society consider good and desirable (Sekulic 2007) – can play a major role in shaping different individuals' outlooks on complex and risky resource management decisions. While some researchers argue that values may be mistakenly ascribed for preferences that were shaped by the ways in which information was framed (Kahneman & Tversky 1984), others assert that values are resistant (Levin et al. 1998). Researchers emphasizing the importance of values have looked at the impact of moral prescriptions such as "Do not hurt others" or "Do not steal" on decision-making (Baron 1993, 2008). Some values are more or less universal, like justice and honesty; others are quite specific to certain cultural or social groups, such as the *Adat* traditions, norms, dispute resolution systems in Indonesia (Schwartz 1992; Tetlock 2003; Baron 2008). Baron (1993) argues that a set of values is a useful tool for decision-making under different types of situations because of its efficiency. However, some real-world examples and experiments show that values can be selectively elicited to cause a shift in preference (Viscusi 2000, Sunstein 2005).

### 3.2. *Methods*

The review above suggests that a debate over prescribed burning will likely not just represent conflicting values (i.e., nature conservation versus protection of assets and people), but be shaped by peoples' experiences, information available, levels of uncertainty, and the way in which all of these are framed. As a result, we developed a three-part analytical method to examine how people evaluate and communicate risks and uncertainties in order to influence decision-making and policy, particularly with respect to the trade-offs between nature, people, and assets.

We analysed submissions to the Victorian Parliament's Inquiry into the Impact of Public Land Management in Victoria (ENRC 2008).[1] The Inquiry was established to investigate the impact of public land management practices on the frequency, scale and intensity of wildfires in Victoria. Prescribed burning was an important topic of the Inquiry, with the first Term of Reference focussed on prescribed burning extent, timing, resourcing and effectiveness, and the third Term of Reference on the impacts of prescribed burning on biodiversity, wildlife, and natural assets. Using a random number generator, we generated a sample of 69 submissions (out of the 257 in total).

First, we analysed how submissions framed the outcomes of prescribed burning (i.e., as good or bad), and furthermore how the certainty of this outcome was framed (i.e., certain or uncertain). We began by developing a model of all possible combinations of framings of the impacts of prescribed burning on wildfire danger to assets and on natural ecosystems (see Table 1, columns 2 and 3). Based on this model, the most straightforward resulting recommendations occur when prescribed burning is judged to only have good (or bad) effects (e.g. lines 1, 2, 5, 6, 11, 12, and 15-24). Where the effects of prescribed burning are a mix of good and bad effects, we expect people's values and other factors to influence which option they recommend (e.g., options 3, 4, 7-10, 13, 14).

We populated the model (columns 4 to 6) by classifying the sampled submissions according to how they framed the effects of prescribed burning and its certainty. If a submission stressed both costs and benefits, we relied on the overall tone and number of arguments to determine whether it

was coded as "good", "bad", or "balanced".  Surprisingly, none of the submissions fell into the intermediate category.  The certainty of the effects (uncertain vs. certain) was determined by textual analysis.  For example, the use of "likely", "unlikely", "chance", or descriptions of both adverse and beneficial effects were coded to imply uncertainty, whereas assertions involving "is", "are", "does", "was" were coded to imply certainty or near certainty if used without qualifiers or description of opposite effects.

Second, we undertook a thematic analysis (Braun & Clarke 2006) of values and moral principles evoked by submissions to validate their framings of the prescribed burning debate.  We coded all discussions relating to prescribed burning.  If a coding appeared in 4 or more submissions, it was regarded as a "theme", or a sufficient level of patterned response or meaning within the data set.  Third, based on the above, we group the submissions into "narrative groups" (Braun and Clarke 2006; Forsyth & Walker 2008), or clusters of submissions that rely on similar sets of coherent arguments and values about cause, effect, and recommended policy options.

## 4. **Findings**

Out of the sample of submissions, 19 (28%) argued for less or no prescribed burning, 25 (36%) argued for more prescribed burning, 8 (9%) discussed the importance of prescribed burning but did not express a view on increasing or decreasing it, and 17 (27%) did not discuss prescribed burning. The latter group was omitted from the present analysis.

### 4.1. *Narrative Group A:  Decrease prescribed burning*

This group, which included rural residents, fire fighters, farmers, recreational users, public land managers, local councils, and wildlife organisations, suggested a decrease in or elimination of prescribed burning because it does not work.  A majority of the arguments took a pathway simplified as "Prescribed burning does not prevent wildfires (nearly certain) and has bad effects on the ecosystem (nearly certain), thus we should decrease or eliminate prescribed burning".  None of the arguments necessitated a trade-off between values, as all were framed in a way that led to a straightforward conclusion against prescribed burning. All but one of the submissions asserted certain, bad effects of prescribed burning on natural ecosystems, and most (11 of 19) asserted certain negative effects on wildfire prevention.

The submissions assert a variety of disadvantageous consequences of not reducing or stopping prescribed burning:  frequent escapes, creation of more fuel by stimulating re-growth of flammable materials, increase in fire risk and flammability due to drying of the forest floor, and loss of forest density leading to faster spread of fire. While submitters acknowledged uncertainties in such effects, the arguments produce an impression of higher certainty by accumulating uncertain, bad effects.

Submissions in this group also contend that prescribed burning had been ineffective in stopping wildfires, citing areas of the 2003 and 2007 fires that burned in areas previously subjected to prescribed burns, and citing the recent increase in wildfires.  A few submissions mentioned the benefits from reducing prescribed burning, citing the creation of a dense, damp forest, and the reduction of carbon emissions.  Lastly, authors criticised their opponents' reliance on an argument that prescribed burns could re-establish indigenous (Aboriginal) burning regimes, given the lack of historical evidence of the nature of indigenous burning and change in the fuel structure since European settlement.

As to the effect on natural ecosystems, the majority of submissions described negative consequences. Prescribed burns were described as too hot and too frequent.  They were alleged to damage habitat and food for small animals, such as logs and leaves in the understorey, to impose

risks on wildlife during prescribed fires, to scorch forests, and to lead to loss of regenerative capacity of the forest. Assertions of certain and uncertain effects on the ecosystem were combined to create an impression of near certainty.

A common assertion was that controlled burning led to a homogenous environment or loss of biodiversity. Selective highlighting of fire-vulnerable species, such as the tuan (brush-tailed phascogale, *Phascogale tapoatafa*) and the snow gum (*Eucalyptus pauciflora)* allowed submissions to conclude that current prescribed burning does not account for different plants' and animals' needs. Other damaging effects cited included impacts on water quality, water quantity, soil erosion, air pollution, and climate change. Doubts about the legitimacy of current burning were commonly voiced, by asserting that current prescribed burning practice were not based on science, or that "ecological burning" is not actually ecological. Some added that in order for prescribed burns to be effective against wildfires, much larger areas and much more frequent burning were needed, and that this would be far too detrimental for the environment.

There were also acknowledgements of contrary evidence, but many of these were attributed to luck or seen as an exception:

> The fires immediately became intense - not the cool burn that we were naively anticipating... Luckily the westerly wind change which was expected did not occur... It was luck not good management which avoided us and our neighbours again being burnt out. (J. Weatherly)

The thematic analysis of values and moral principles showed that submissions in this group tended to follow the principle "one should not value assets over nature". They asserted that the environment needed protection from the destructive effects of prescribed burning, with an implied rule of "One should protect, not destroy, the environment":

> Other than a few very senior residents from birth who would have accumulated environmental knowledge over the years, it seems clear that communities in general are primarily interested in protecting individual assets. Such minority interests should not drive the agenda for public lands which in fact belong to all (Stone).

> …why is the government doing more prescribed burning in climate change - when we need to be protecting wildlife, promoting moisture and water saving in the natural world instead of drying it further? (Ryan).

Many proponents in this group referred to fire as 'natural', but with different implications. Some stated that wildfire was natural and beneficial for regeneration, so people should not suppress them. However, others declared that wildfires were natural, random, and unpreventable and so, prescribed burning would not help anyway.

This group argued that people who live in wildfire-prone areas were choosing to take a risk, while nature was having risk imposed on it by prescribed burning:

> Increasingly, people are choosing to live in closer proximity to the bush. The greater risk that this entails should fall squarely on the people that make that decision, not on the bush itself. (R. Weatherly).

> Men have pumps, fire trucks, mobile phones, water bombers and a myriad of other tools to help in fighting bushfire. What have the creatures and plants of the bush got? (Gay)

Overall, this group of submissions disapproved of prescribed burning, opposing interference in nature.

### 4.2. *Narrative Group B: Increase prescribed burning*

Authors in this group – different rural residents, fire-fighters, farmers, recreational fishing and four wheel driving interests, timber and forestry associations, local councils, and government departments – suggested an increase in prescribed burning. Many of their arguments took a pathway that could be simplified as follows: "Prescribed burning contributes to wildfire prevention (nearly certain) and has good effects on natural ecosystems (nearly certain)". A significant number of submissions, however, also acknowledged uncertainty in these positive effects. None of the arguments necessitated a trade-off between values. The argument pattern resembled the one used by the Narrative group A. Following various assertions of the good effects of prescribed burning, a number of moral principles were presented to strengthen the argument.

The utility of prescribed burning in reducing wildfire risk was often asserted by describing the consequences of not increasing prescribed burning, including increased fuel loads, larger and hotter wildfires, and the disastrous effects of wildfires on people and property. Submissions cited studies confirming that lack of prescribed burning was a major factor in wildfires. A common complaint was that the current level of prescribed burning was inadequate to reduce the risk of events like the 2003 Alpine and 2007 Great Divide bushfires. This group referred to indigenous burning practices as evidence that prescribed burning was used successfully for many centuries previously. Overall, proponents in this narrative group concluded that risks of prescribed burning were more bearable than the risks of wildfires:

> Remember a fire in the cooler months, even larger than desirable, is better than a hot summer fire (Broome).

Most supporters of this narrative were also concerned with the effect of fire on the ecosystem. If prescribed burning was not increased, many argued, wildfires would cause devastating effects on the environment. Previous major wildfires and their catastrophic effects were cited, recounting impacts upon biodiversity, wildlife, forest, regenerative capacity of the forest, soil erosion and water quality. Some mentioned that weeds and aggressive species competed with "good" plants after wildfire, while others mentioned that native vegetation suffered from lack of fire. In addition, many submissions delineated lists of benefits of prescribed burning for the environment. For some, prescribed burning was a key solution to protect the environment. Others maintained that prescribed burning limited biodiversity loss, or that it had no damage on the environment.

The theme of "Luck" was evident in this group just as in Narrative A, but with opposite implications, i.e., that prescribed burning should be increased because surviving a major wildfire was an unlikely event dependent on luck:

> We have had 2 major fires in the area last year and it was only LUCK that saved us from any major damage and I'm sick and tired of all the stress we have to go through (Siddle, emphasis in original).

"Exceptions" emerged as a theme more in this narrative group than for group A. This included acknowledgement of the chance of prescribed burns escaping control, the presence of fire sensitive areas, and the existence of inappropriate days when prescribed burning was not to be applied. But these were cited in the sense of a minor deviation from the suggested practice:

> I should stress that the number of prescribed burns that do escape is small - less than 2 percent, however, such escapes can have an impact on public confidence, and can destroy private and public assets and have an undesirable ecological impact (Esplin).

> We need to be more flexible and if the odd one "gets-away" or there is smoke over the road or town, let's live with it as a small price to pay for having a larger area burnt (Baxter).

Narrative Group B's approach to the conflict in values between people, property and environment was not straightforward. While a few stated that asset protection was important, many stressed human safety and ecological values:

> Viable fire regimes are not about "burning the bush" to control the buildup of fuels. That might be the objective if protection of human life and property were the only priority. Viable fire regimes are about maintaining ecosystem processes which will lead to fuel reduction over the public land estate as a desirable "spinoff" (Tolhurst)

> Our assets are just as important as state assets. What happened to duty of care with neighbours of the state forest? (Ellen)

A common statement of this group was that due to the lack of prescribed burning, people were being exposed to a risk of wildfire. Thus the same rule of "One should not impose undue risk on others" applied by Narrative Group A is evoked with opposite intent, implying that the government should protect the public:

> ... I'm sick and tired of all the stress we have to go through. It's bad enough having to live with the knowledge we have a fire bug in the area without the added stress of knowing we have a time bomb on our back door or a Government body who won't do their job (Siddle)

Like Narrative Group A, this group also evoked a "fire is natural" claim. However, in contrast, they stated that while fire was natural, big wildfires were not natural and were preventable. These statements were further strengthened with reference to the duty of care owed by the government to the public. When taken together with the statements regarding public safety and illustrations of risks borne by the community, a theme of "One should not ignore one's duties", or "One should not ignore people for environment" rule can be discerned.

### 4.3. *Narrative Group C: Uncertainty but accepting of prescribed burning*

Narrative C includes those submissions that did not advocate increasing or decreasing the current scale of prescribed burning, but that accepted an important yet uncertain and complex role for prescribe burning. This narrative group represented the views of some government departments such as national parks and water catchment management authorities, as well as some rural residents. In many instances, both disadvantages and advantages featured in somewhat equal weight, resulting in a stark sense of uncertainty. After weighing the uncertainties, all but one concluded that, overall, prescribed burning was beneficial for the environment and effective in mitigating the wildfire risk:

> The flora and fauna change continually in response to their various experiences, or absences, of fire - in ways that are often long-term and complex. When inappropriate, fire can cause harm to biodiversity. However, when appropriate, fire can also be critical to the health of our fire adapted and dependent ecosystems (Harris).

> Fire both as a management tool and wildfire can have long lasting effects. Sometimes a fine line exists. For example we are still living with the effects of the 1939 fires. Sometimes too frequent burning in zones, say zone 1 Asset Protection can wipe out species of plant, even ones that depend on fire to reproduce. Overall though I believe that prescribed burning is far preferable to wildfire (Lasham)

Some agreed that the current scale of prescribed burning was preferable, while others had ambiguous positions. Interestingly, moral appeals other than "fire is natural" were absent in all but one submission.

5. **Discussion**

The findings above suggest some useful insights into how pro- and anti-prescribed burning submissions vary in perceptions about outcomes, about certainty, and in their reliance on values and moral prescriptions to justify their positions. Below we identify and elaborate on these insights.

Unsurprisingly, the views of each submission to the Inquiry on prescribed burning's impacts match well with its recommendations (Table 1). Less obviously, however, the Table reveals an absence of argument streams necessitating a trade-off between negative and positive effects. That is, all but one of the submissions argued that prescribed burning is good for both wildfire prevention and the ecosystem, or bad for both. Given the diverse arguments made, it would have seemed possible to argue that prescribed burning is good for wildfire prevention but bad for nature (or vice-versa), but this path is not followed. This may be explained as a rhetorical strategy by proponents of strong views. Such evasion of a direct trade-off is a known strategy in political and policy studies (Fiske & Tetlock 1997; Tetlock 2000).

A striking feature of the submissions is their disagreement over the **outcomes** of prescribed burning. All narrative groups call upon personal experience, observation, and science to justify the facts they marshal. They state opposing conclusions with authority. For example, the three narrative groups' evaluations of the likelihood of wildlife survival during prescribed burning represent a broad spectrum of difference:

> Narrative A: "Controlled burns are having a deleterious effect. The removal of large areas of habitat doesn't mean that fauna just wanders off to live somewhere else. It means that they either die immediately, or they compete with others in neighbouring areas until either they or the previous residents die" (R. Weatherly)

> Narrative B: "Prescribed burning does not stop summer's fires but makes them easier to control and ensures that they burn at a lesser temperature than where there has been no bushfire prevention work... Animal habitat is not totally incinerated and many animals and birds survive the cooler fires, forming the new wildlife colonies" (MacAlister)

> Narrative C: "A greater impact (both good and bad) of fire on biodiversity occurs when the incidence of fire (or paradoxically fire absence) repeats over time and across the landscape. Though individual plants and animals variously thrive and die during and after a fire, they also do so in fire absence" (Harris)

Likewise, the evaluation of the effectiveness of prescribed burning was much lower in group A than group B.

> Narrative A: "As has been clearly shown in the 2003 and 2006 Alpine fires, and the 2005 Grampians fires, the history of prescribed burning has been of little use in major, large scale fire events. This is demonstrated in the number of times that fires have been reported to "jump" containment lines, or weather patterns change shifting the fire front in new directions... Prescribed burning is a false security and ultimately leads to poor preparation and Increases the fire risk and hazard" (Goonan)

> Narrative B: "The importance of this model is that fuel modification brought about by previous fire or other forms of fuel modification will be most effective under Low to Very High fire danger conditions" (McCarthy & Tolhurst). "This is usually about 95% of the time" (Tolhurst).

In these cases, evidence is clearly being framed and selected to support a particular view. Contributors highlight selective examples and omit contradictory evidence (or write it off as luck or exceptions).

Another striking difference between the groups is the level of **(un)certainty** with which they qualified the alleged outcomes of prescribed burning. Narrative Group A, which opposed prescribed burning, only indicated uncertainty 12% of the time, while Group B indicated uncertainty 32% of the time (Table 1). That is, the negative effects of prescribed burning on wildfire prevention and ecosystems were stated with more certainty than the positive effects. Group C, unsurprisingly, indicated uncertainty 75% of the time.

Despite being strongly polarized over prescribed burning, the submissions displayed no overt clash of **values** with respect to nature, people, and assets. This contradicts common caricatures of the pro-burning lobby being purely focused on people and property, and the anti-burning lobby solely interested in wild nature. Most submissions expressed a concern both for the environment as well as for people and their assets, as expressed by a simple metaphorical statement in one of the submissions: "Public safety and biodiversity security are different sides of the same coin" (Tolhurst). While one might argue that these are rhetorical strategies designed to camouflage real interests (c.f. Lehrer & Becker 2010), taking the submissions at face value suggests that all interest groups value people, assets, and nature, but that they understand and use these concepts in different ways. Uggla (2010), for example, has shown how biodiversity is an ambiguous term put into practice in particular ways by different interests. As others have demonstrated, different interest groups can express concern for "the environment" and "nature" but still clash due to incongruous ideas about what that concern means, about the kind of nature – such as wild, or human-shaped – to be valued (Gill 1994; Saltzman et al. 2011).

Rhetorical strategies can illustrate these clashes. <u>Discussions of the effects of prescribed burning, particularly in government documents (e.g., Esplin et al. 2003; DSE 2011)</u> tend to lump "people" and "property" (or "assets") together, and oppose them to "nature". However, all of these terms mask numerous meanings and can be used strategically. Our thematic analysis showed that Group A, in frequently evoking rules like "One should not value assets over nature", makes the defense of people and property look less important, less morally defensible, by calling it "assets". Meanwhile, Group B, in evoking rules like "One should not ignore people for the environment", uses the word "people" to add importance and claim a higher moral ground.

Our most important observation is that underlying the contrasting positions of Narrative Groups A and B there is a strong disagreement over the voluntariness of risk exposure. Research on the risk perceptions of individuals has shown that the distinction between voluntary and involuntary risk in conditions of uncertainty affects risk acceptability (Sandmann 1993; Fischhoff et al. 2000; Slovic et al. 2000). In our case, the Inquiry submissions comment on whether the hazards caused by prescribed burning (or by not doing such burns) are voluntary or involuntary, and for whom (or what). Narrative Group A asserts that people who live in wildfire-prone areas voluntarily choose to live there. They stress the availability of insurance, building codes, and other tools to help mitigate risk of wildfire (c.f. Buxton et al. 2011). On the other hand, they maintain that wildlife and plants are involuntarily risk imposed by human activities like prescribed burning. They describe how wildlife is incinerated, trapped, and marginalised by people and their settlements. They explicitly and implicitly evoke moral rules along the lines of "One should not impose preventable risk on others". In contrast, while supporting the same moral rules, Narrative Group B asserts that it is people who are involuntarily being exposed to risk and dependent on government's activities to reduce risk of wildfire. Descriptions of major wildfires, lucky escapes, and emotional anguish are common. Some point out that fire fighters are also risk imposed, having to fight large wildfires in areas without prescribed burning.

This contrast suggests that while the people who wrote submissions more or less ascribe a common set of values to the things that can be affected by fire (people, property, nature), they fundamentally differ on their interpretation of the ethics of risk imposition in the use of prescribed

burning. Those against prescribed burning discount the value of assets built in fire-prone areas, viewing them as voluntary risk exposure, in contrast to those advocating more prescribed burning, who see themselves (and their property) as involuntarily at risk from wildfires worsened by a lack of prescribed burns. This is a new insight, in that it shows that competing ideas of wild versus managed nature are manifested most clearly through the ethics of risk exposure.

## 6. **Conclusion**

The individuals concerned enough about prescribed burning policies to write a submission to a government Inquiry have much in common. All three narrative groups present detailed discussions of the effects of prescribed burning, marshal various kinds of evidence and experiences, implicate a number of shared moral principles, and seem to genuinely care about its impacts on the environment, human lives, and assets. Yet they radically differ in their interpretations of their experiences and examples, and the positions to which they come.

Our analysis suggests that important, overlooked contributors to the different viewpoints represented in the pro- and anti- prescribed burning lobbies are contrasting interpretations of the voluntariness of risk exposure, and a divergent sense of the certainty with which one can ascertain the positive or negative outcomes of prescribed burning. Those opposing prescribed burning discount the risk worries of their opponents due to a perception that people building in bushfire-prone areas are voluntarily exposing themselves to risk, and state with a high sense of certainty the negative impacts of prescribed burning. Proponents of controlled burns see people and assets as involuntarily exposed to wildfire dangers exacerbated by a lack of prescribed burning, though they admit more uncertainty in their descriptions of the positive contributions of this practice. Both sides then unsurprisingly build their arguments with the use of selective framing, appealing only to facts and examples that support their position.

What do these divergent views mean for government policies to mitigate the impacts of natural hazards like wildfires? Our study suggests that policymakers focus on the questions "What is the level of certainty of prescribed burning in being effective?", "Are we risk takers or are we risk-imposed?", and "What kind of nature do we want?". The first question suggests that the government promote on-going research on prescribed burning as well as dissemination of the knowledge produced, for, as the submissions showed, Australia has not yet reached a high level of evidence-based debate (c.f. Halliday et al. 2011). The debate would also be enhanced through research on not only the effectiveness of different prescribed burning regimes, but comparisons (qualitatively and quantitatively) of the trade-offs between the impacts of these regimes on all pertinent outcomes – including wildfires, biodiversity, water resources, human health, and the economy. The second question suggests that governments – through debates over land use planning, zoning, and potential buy-backs of risky sites[2] – address the kinds of risks society is willing to support in open, democratic debate both at the national level and in community groups (Everett & Fuller 2011). Finally, the third question suggests more research into the human role in and views of "nature" and "natural" fire regimes (Bowman et al. 2011; Saltzman et al. 2011), the dissemination of such research and other creative outputs in ways accessible to the public, enabling on-going engaged and well-informed deliberations in the public sphere.

**Notes**

[1]    Submissions to the Inquiry were accessed online at http://www.parliament.vic.gov.au/enrc/inquiries/article/1145. Authors of quotations we cite from these submissions are indicated in brackets following the quote. The resulting inquiry report is ENRC (2008).

[2] The Royal Commission following the 2009 bushfires produced just such recommendations, widely discussed in the media following debates that – as far as prescribed burning is concerned – echoed those we found in the 2008 Inquiry.  The government accepted all of the Commission's recommendations except the proposal to buy back properties in risky sites.

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**Table 1.** Classification of Inquiry submissions based on their views of the effects (and their certainty) of prescribed burning on wildfire danger and natural ecosystems, and based on their ultimate recommendation (which determines the narrative groups discussed in the text). Numbers reflect the number of case studies in each category.

| | Effect on mitigating wildfire damages to assets and people | Effects on natural ecosystem | Recommendation for policy (Narrative group) | | |
|---|---|---|---|---|---|
| | | | A: Decrease prescribed burning | B: Increase prescribed burning | C: Ambig-uous |
| 1 | **Good (certain)** | **Good (certain)** | | 10 | |
| 2 | **Good (certain)** | **Good (uncertain)** | | 2 | 1 |
| 3 | Good (certain) | Bad (certain) | | | |
| 4 | Good (certain) | Bad (uncertain) | | | |
| 5 | **Good (uncertain)** | **Good (certain)** | | 2 | |
| 6 | **Good (uncertain)** | **Good (uncertain)** | | 2 | 2 |
| 7 | Good (uncertain) | Bad (certain) | | | |
| 8 | **Good (uncertain)** | **Bad (uncertain)** | | | 1 |
| 9 | Bad (certain) | Good (certain) | | | |
| 10 | Bad (certain) | Good (uncertain) | | | |
| 11 | **Bad (certain)** | **Bad (certain)** | 10 | | |
| 12 | Bad (certain) | Bad (uncertain) | | | |
| 13 | Bad (uncertain) | Good (certain) | | | |
| 14 | Bad (uncertain) | Good (uncertain) | | | |
| 15 | **Bad (uncertain)** | **Bad (certain)** | 4 | | |
| 16 | Bad (uncertain) | Bad (uncertain) | | | |
| 17 | **Good (certain)** | | | 3 | 1 |
| 18 | **Good (uncertain)** | | | 4 | 2 |
| 19 | **Bad (certain)** | | 1 | | |
| 20 | Bad (uncertain) | | | | |
| 21 | | **Good (certain)** | | 1 | 1 |
| 22 | | **Good (uncertain)** | | 1 | |
| 23 | | **Bad (certain)** | 4 | | |
| 24 | | Bad (uncertain) | | | |
| Total | | | 19 | 25 | 8 |