Letdowns, Wake-Up Calls, and Constructed Preferences: People’s Responses to Fuel and Wildfire Risks

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This article presents results from three studies, which seek to develop a better understanding of some of the difficulties faced by forest managers in making wildfire risk management decisions. Study 1 showed that both the experts and the public tend to emphasize uncontrollable factors when asked to consider the causes of wildfires. Study 2 revealed the large role played by emotional responses in judgments about wildfire risks. Study 3 showed that preferences for risk management options tend to be remarkably malleable in response to even slight shifts in framing. In contrast to previous studies that call for improved public education about wildfire, our results emphasize the need to introduce improved processes to inform both expert and public decisionmaking for fire risk management.

Keywords: wildland fire, decisionmaking, risk management, policy

Wildland fire is typical of many natural hazards (e.g., hurricanes, earthquakes, and floods) in that risks can be addressed both through direct response to exposure (i.e., suppression) and a variety of proactive measures aimed at hazard reduction (i.e., fuels management). Fire managers in the United States and Canada have a keen interest in promoting risk management efforts that address both elements. In the United States, however, funding for proactive management efforts trails that for suppression by a ratio of roughly 4:1; for fiscal year 2005, approximately $1.8 billion has been appropriated to thinning, prescribed burns, and other means to achieve hazardous fuel reduction (USDA Forest Service 2004). Depending on the severity of a given fire season, additional funds can be diverted to suppression from other forestry line items (e.g., research, planning, and others). In Canada, and particularly in the westernmost province of British Columbia, the situation is more dire; funding for proactive fuels reduction is almost nonexistent, and the vast majority of resources for fire management have been allocated to suppression.

This continued fixation on suppression and preparedness over proactive management is understandable in light of the strong desire of risk managers to protect life and property from destructive wildfires (Cortner et al. 1990, Beebe and Omi 1993) and themselves from blame and legal responsibility. Immediately after exposure to wildland fire, however, community residents and risk managers might be expected to be more sensitive to the need for conducting proactive management designed to address the root causes of wildfires and, thus, reduce the risks of future exposure. Just as individuals might seek out better building designs to protect their homes from the next earthquake or require better engineered bridges that will withstand the next large flood, so might people whose community has been subjected to a devastating wildfire actively support improved fuels management as a way to reduce the risks of future fires.

Purposeful interest in a wide range of proactive risk management efforts, however, does not tend to follow direct and destructive exposure to risks from wildfire (Gardner et al. 1987, Gardner and Cortner 1988). In the Canadian province of British Columbia, e.g., a high-visibility report was commissioned by the provincial government (British Columbia Auditor General 2001) after a spate of destructive interface fires, including 1994’s Garnet Fire and 1998’s Salmon Arm Fire. The report concluded that, despite the highest risk of interface fires in the nation, more than 50% of interface communities in the province possessed no overall strategy for reducing the risks of future wildfire. This lack of preparedness leaves these communities—many of which are located within close proximity of recent burns from which important lessons about wildfire risks ought to have been learned—more exposed to the property losses, injuries, and economic dam-

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ages that may result from future interface fires.

This characterization appropriately describes British Columbia during the abnormally dry, hot summer of 2003, which saw over 2,500 wildfire ignitions across much of the province. Several severe interface fires burned in the British Columbia interior; the most significant occurred in fuel-laden Oka-

nagan Mountain Park, an area where long-
term fire exclusion has created a significant fuel buildup, near the medium-sized city of Kelowna (approximately 150,000 resi-
dents). Others burned the smaller commu-
nities of Louis Creek and Barriere, Chase, Cranbrook, and Kamloops. By the end of the 2003 fire season, these fires had forced the evacuation of over 45,000 residents, de-
stroyed over 300 homes and many busi-
nesses (including virtually all of the busi-
nesses and homes in Louis Creek), and
claimed three lives (pilots of firefighting air-
craft). The total cost of the fires to the Pro-
vince was estimated to be $700 million (Filmon 2004).

In the aftermath of these experiences with destructive wildland fires, many ques-
tions have been raised about the reasons be-
hind the apparent lack of preventative risk management efforts. The research reported here, conducted between the summer of 2003 and the spring of 2004, explores this issue using insights from two related fields, judgment and decisionmaking and risk management. Specifically, the objective of the research was to obtain a better under-
standing of why people tend not to advocate a strong emphasis on proactive risk manage-
ment efforts at a time when such efforts would be expected to receive unusually high levels of support.

Decisionmaking and Wildfire Risks

While some elements of wildfire risk are measured and defined on a technical basis (e.g., forest fuel loadings and distribution and probabilities of experiencing defined threshold weather indexes), other elements are, by and large, social constructs that re-

fect the judgments and choices and percep-
tions that people make as individuals and as members of social groups. The field of judg-
ment and decisionmaking, which was devel-
oped more than 50 years ago, directly studies these latter elements of the risk domain. The field includes three main areas: the norma-
tive study of how decisions should be made,
the descriptive study of how people actually make decisions, and the prescriptive study of how better choices can be encouraged (Bell et al. 1988, Kleindorfer et al. 1993). This work underlies many of the recent advances in risk analysis and risk management, which focus on understanding sources of risk and encouraging reductions in the level of risk faced by society (National Research Council 1996).

Peoples’ judgments in the face of wild-
fire risks reflect their individual construction of events and conditions, in the sense of what is thought to contribute to increases or decreases in the probability of losses and the magnitude of certain types of damages. An individual’s view of management options also will reflect the particular way in which he or she makes decisions, which includes the types and sources of information they pay attention to, how they typically frame and weight this information, and what they perceive to be the range of appropriate man-
gement responses. Individuals’ judgments about management options also reflect their tolerance for risk and the factors that influence their perception of the degree of risk, such as the ability of managers to control the hazard or the degree to which exposure is voluntary (Slovic 1987).

Insights from recent work in the deci-
sion sciences and risk analysis can help to lay a foundation for understanding the deci-
sions that people might make when thinking about wildfire risk management alternatives. Three observations are particularly relevant. First, people are not the rational, individual maximizers of utility assumed by much of modern economics or the natural sciences. Instead, people routinely use simplifying rules of thumb, or heuristics, as a means of coping with complex cognitive demands; in many instances, these heuristics are quite helpful (in that they may yield reasonably close approximations to normative judg-
ments) but they also can result in judgmen-
tal errors. This research is associated most closely with work by Kahneman et al. (1982), who identified several heuristics (e.g., representativeness and availability) that can lead to systematic biases in judg-
ment.

Another well-known set of biases stem from ways in which individuals tend to make mistakes when evaluating the causes of specific actions or events (Kelley 1967). For example, Miller and Ross (1975) identified the “self-serving” bias in attribution, which suggests that people are more likely to accept responsibility for successes than for failures, in part out of a need to protect self-esteem and to avoid blame or responsibility. A related re-
for many choices simply do not exist; instead, they tend to be constructed—rather than revealed—by the selected elicitation procedure (Gregory et al. 1993). One implication of preference construction is that care needs to be taken in the development of questionnaires or other elicitation formats (e.g., stakeholder engagement efforts) because how questions are asked or input is sought will inevitably influence the responses of individuals. Preference construction also argues in favor of multiple elicitation metrics, so that hidden biases in procedures can be revealed through “triangulation” as a result of the often surprising variations in results obtained using different elicitation modes.

Given our previous work in other contexts—e.g., water use planning for hydroelectric facilities (Gregory and Failing 2002) and the cleanup of contaminated sites (Arvai and Gregory 2003)—we speculated that each of these three considerations could influence people’s preferences about fuels and wildfire risk management. To improve our understanding of these effects, we conducted three related studies in British Columbia and Oregon after the 2003 wildfire season.

Study 1: Attribution of Wildfire Causes

Overview and Methods. Immediately after the British Columbia wildfires of 2003, we conducted a series of workshops with both local residents and provincial fire experts to learn more about their responses to wildfire exposure. One aspect of these workshops was aimed at eliciting perceptions of the causes of wildfires. Other questions asked about the role of local and provincial wildfire management agencies and the perceived vulnerability of communities to future wildfires. These workshops were held in two communities located in the Okanagan Valley of British Columbia. One community was directly exposed to the wildfires of 2003 (the city of Kelowna) whereas the other was not (the city of Vernon, located 51 km north of Kelowna). A total of 47 homeowners from an interface community in Kelowna and another 39 homeowners from an interface community in Vernon took part in separate workshops led by trained facilitators (the first authors, Arvai and Gregory). In a separate survey, responses also were elicited from 111 members of the British Columbia Forest Service’s Protection Branch, which is responsible for designing the province’s wildfire management policies and manages all aspects of firefighting operations.

Both of the public surveys (in Kelowna and Vernon) were conducted in a small group setting comprised of approximately 20 individuals per session. Participants were remunerated for their participation in the form of a free lunch and a donation (of $20 per person) that was made to a selected local charity. A short (10 minute) presentation summarizing the 2003 wildfire season (e.g., scale and timing of the wildfires and level of damages) was made by the facilitators and participants were referred to several wall-sized maps depicting the locations of the damaged areas. Then, a paper-and-pencil questionnaire was passed out to all participants, who completed the questions individually. Each session took, on average, 1 hour to complete.

In keeping with past studies of the attribution bias, we hypothesized that in the time immediately after a destructive wildfire, both expert and nonexpert subjects would downplay contributing factors that were under the direct influence of potential management efforts and look to largely uncontrollable, natural factors as a principal cause of the fire threat. Specifically, we posited that subjects would underemphasize factors such as inefficient silvicultural practices and a suppression-focused philosophy toward wildfire (both leading to fuel accumulation over time) and overemphasize climate change (global warming) and random weather events (e.g., unusually long dry periods) as the major contributing factors behind destructive wildfires. This would provide justification for not having implemented proactive management prescriptions, e.g., aimed at reducing fuel loads in high-risk areas.

To test this hypothesis, subjects responded to a series of questions asking them how likely they thought it was that a given factor “contributed to the forest fires in B.C. this past summer [2003].” Ten different contributing factors were presented and subjects responded on 10-point Likert scales where a value of 1 corresponded with “played a very small role” and a value of 10 corresponded with “played a very large role”; the midpoint was clearly identified and corresponded with “played a medium-sized role.” One of the index variables was composed of aggregate scores across five survey items deemed to be under the direct influence of provincial forest managers: the role played by inadequate detection, lack of firefighting resources, poor communication and coordination during the wildfire suppression responses, and fuel buildup from either past firefighting efforts or silvicultural practices. The second index variable measured factors deemed to be largely beyond the control of forest managers, including climate change, high summer temperatures, natural aging of the forest (leading to a fuel buildup), wind, and drought.

Results and Discussion. Results of this study of perceived wildfire causes are shown in Figure 1, with findings presented separately for each of the three groups (Kelowna public, Vernon public, and Protection Branch experts). A comparison of the mean differences between the two index variables was highly significant (two-sample $t$-test, $P < 0.0001$; Figure 1) across all three groups. In addition, the mean difference between the two index variables also was significant when we combined the three samples (Kelowna, Vernon, and Protection Branch).

The emphasis by risk managers on factors over which they could not exercise control is a recurring theme in ex post responses to hazards. This is due, in part, to the common view among people who recently experienced events with negative outcomes that they were unpredictable, not foreseeable, and hence not controllable (Mark et al. 2003). In the context of wildfires this observation can be tied to the seemingly random nature of exposure. For example, destructive wildfires commonly spare structures under even the most seemingly damning conditions (i.e., wildfires that destroy homes surrounded by 100 m of defensible space but skip seemingly vulnerable structures such as nylon tents or woodsheds). As a result, experience with direct exposure (or even a near miss) often leads to views of wildfire as the product of random, uncontrollable events (McCaflrey 2004).

In interpreting these results, we do not wish to minimize observed individual differences. Obvious among these are the responses from the Protection Branch sample who—understandably—viewed the role played by inadequate detection, a lack of firefighting resources, and a lack of communication or coordination as relatively small when compared with lay respondents in Kelowna and Vernon (analysis of variance with Tukey’s posttest, $P < 0.001$). In addition, we do not wish to suggest that natural
factors such as drought and wind are unimportant contributing variables to wildfire risk. We do worry, however, that a systematic overemphasis on factors that are largely beyond the control of forest managers will lead to an underemphasis—from a risk management standpoint—on factors for which managers should have direct and relatively straightforward control.

**Study 2: Affective Influences**

**Overview and Methods.** Past research involving people’s perception of risk after exposure reveals two contrasting trends. One involves what could be called a *postexposure wake-up call*, which leads to greater risk awareness, heightened risk perception, and a strong desire to take proactive measures to better understand and mitigate future exposure. In the aftermath of the terrorist attacks of Sept. 11, 2001, e.g., individuals in the United States generally have felt more at-risk (Slovic 2002, Lerner et al. 2003), as witnessed by the keen interest in a national threat-rating system and the widespread purchase in 2003 of duct tape and heavy-duty plastic sheeting to protect homes from a potential chemical weapons attack. The national response to terror threats—undertaken to reduce the level of uncertainty surrounding a future attack—has included stepped-up domestic policies (e.g., the creation of the new Department of Homeland Security, greater oversight for immigration, and others) as well as aggressive intelligence gathering efforts and military incursions abroad. Contrasting sharply with the wake-up call phenomenon is another (and often unexpected) type of experience, this time a *postexposure letdown*. Here, people generally tend to feel safer after heightened risk exposure; they perceive themselves to have been the victims of an unfortunate low-probability event and there is a perception that the worst is over (i.e., the basis for the argument that “lightning doesn’t strike in the same place twice”). As a result, people tend to be less likely to invest in potentially costly (both financially and temporally) measures that may help them to lower their future risks or to better understand the best response strategy in the face of future exposure. Previous studies have shown that natural hazards (e.g., tornadoes, floods, forest fires) commonly elicit this latter type of response, as observed by the tendency to rapidly rebuild communities in previously affected areas (Francaviglia 1978) and to misread probabilities as predictions (e.g., so that the near-term occurrence of two 1-in-100-year floods leaves residents feeling safe for at least the next century).

We believe that these letdown and wake-up responses are the result of the affective conditioning of risk perceptions. We hypothesize that, relative to unexposed communities who we expect to display a postexposure wake-up call, those who recently experienced a wildfire directly, will feel that their bad luck has passed and consequently experience a sense of relative safety and relief (i.e., a postexposure letdown), resulting in dampened perceptions of risk. To test this idea in the context of wildfire management, we asked homeowners—as part of the same workshops noted in study 1—a series of questions designed to help us determine the relationship between affective variables and their risk perceptions. One set of questions asked during this portion of the workshops was aimed at eliciting from interface residents their affective reactions to wildfires. Subjects were asked to provide responses (on bipolar, seven-point Likert scales) to questions that asked them about how calm (or upset), safe (or at risk), confident (or unconfident), at ease (or worried), and optimistic (or pessimistic) they felt when thinking about the threat of wildfire. Follow-up questions asked subjects to rate both their levels of concern about future wildfires and motivation to reduce wildfire risks. A second set of questions asked for judgments (again on closed-ended Likert scales) about both the probability and the consequences (across concerns related to environmental health, the economy, and recreation) of a future wildfire, similar in scale to the one that burned in Okanagan Mountain Park.

**Results and Discussion.** As shown in Table 1, the results largely support our hypotheses. For four of the five survey items (items 1–5) measuring affect, respondents in Vernon (unaffected by the wildfires of 2003) displayed more negatively charged emotional responses compared with average respondents from Kelowna (which was exposed directly to the wildfires of 2003). Similarly, respondents from Vernon reported a higher level of (1) motivation to take personal action aimed at property risk reduction (item 7) and (2) concern about wildfire risks as compared with other types of natural hazards (e.g., floods or landslides) that are common in the area (item 6).

With respect to the second part of this study—homeowners’ perception of future
wildfire risk (Table 2)—we detected no significant difference (two-sample t-test, \( P > 0.05 \)) in homeowners from Kelowna and Vernon ratings of the probability of future wildfires over both the near (over the next 5 years) and the longer terms (over the next 30 years). In addition, we did not detect any significant differences (two-sample t-test, \( P > 0.05 \)) across homeowners’ ratings of several key consequences, such as the amount of time that would be required to restore both preburn levels of environmental health and recreation values and rebuild homes that may be destroyed. We did, however, detect significant differences across the economic consequences of a future wildfire. Respondents from the unexposed community (Vernon) rated the economic impacts of a future wildfire as more severe both in terms of immediate consequences (two-sample t-test, \( P < 0.01 \)) and in terms of the amount of time that would be required for the economy to be restored to preburn levels (two-sample t-test, \( P < 0.001 \)).

These results echo those from previous work by Kunreuther et al. (1978), who showed clear postexposure letdowns (measured in terms of levels of concern about, and motivation to address the prospect of, future exposure) among homeowners who recently had been exposed to natural disasters (e.g., floods). In the context of wildfire specifically, our findings also are similar to those obtained in the mid-1980s from San Bernardino County, California, which showed lower levels of citizen awareness about the risks from wildfire in recently exposed areas (Gardner et al. 1987, Gardner and Cortner 1988). Our results build on these previous studies and provide further insight regarding the basis for the observed judgments about future exposure. Specifically, our findings suggest that affective reactions to risk do indeed play an important role in conditioning individuals’ cognitive judgments. To test this idea further, we compared subjects’ affective responses with their perceptions of future wildfire risks. We observed a highly significant correlation (Pearson’s correlation, \( P < 0.0001 \)) in responses from subjects in Vernon between an aggregate variable describing mean affective responses (comprised of items 1–5 in Table 1) and each of the items shown in Table 2. The same analysis performed on responses from Kelowna, however, revealed no significant correlation (Pearson’s correlation, \( P > 0.05 \)). These findings suggest that more strongly negative affective responses in Vernon (relative to feelings of relief in Kelowna) may be responsible for the observed wake-up call and letdown reactions.

**Study 3: Constructed Preferences**

*Overview and Methods.* Recent research in judgment and decisionmaking has shown that for many relatively unfamiliar decision contexts and, particularly, those involving difficult tradeoffs across several desirable objectives, people’s preferences are

### Table 1. Homeowners’ self-ratings of affect (items 1–5; midpoint = ‘neutral’ in all cases), and levels of concern and motivation in an exposed (Kelowna) and unexposed community (Vernon).

| Survey item | Kelowna | | Vernon | | | |
|-------------|--------|----------------|--------|----------------|
| 1. Calm versus upset (1 = very upset, 7 = very calm) | 2.80 (0.16) | | 2.62 (0.26) | | NS |
| 2. Safe versus at risk (1 = very much at risk, 7 = very safe) | 3.58 (0.25) | | 2.62 (0.30) | | 0.05 |
| 3. Confident versus unconfident (1 = not at all confident, 7 = very confident) | 3.51 (0.22) | | 2.86 (0.27) | | 0.05 |
| 4. Optimistic versus pessimistic (1 = very pessimistic, 7 = very optimistic) | 5.67 (0.21) | | 4.08 (0.32) | | <0.0001 |
| 5. At ease versus worried (1 = very worried, 7 = very at ease) | 3.80 (0.24) | | 2.68 (0.22) | | 0.001 |
| 6. Level of concern about future fires (1 = low, 7 = extreme) | 5.51 (0.19) | | 6.16 (0.19) | | 0.05 |
| 7. Level of motivation (1 = low, 7 = high) | 4.89 (0.21) | | 6.11 (0.20) | | <0.0001 |

Responses were provided on seven-point Likert scales. Comparisons between the two samples were made using a 2-sample t-test. NS, not significant.

### Table 2. Risk perceptions (based on judgments about both probabilities and consequences) elicited from homeowners in an exposed (Kelowna) and unexposed community (Vernon) after the 2003 fire season.

| Survey item | Kelowna | | Vernon | | Corresponding value | | Corresponding value | | P |
|-------------|--------|----------------|--------|----------------|----------------|----------------|----------------|---|
| Probability of future fire (5 yr) | 4.76 (0.21) | | Prob. = 0.65 | | 4.86 (0.26) | | Prob. = 0.65 | | NS |
| Probability of future fire (30 yr) | 5.96 (0.17) | | Prob. = 0.75 | | 5.95 (0.19) | | Prob. = 0.75 | | NS |
| Economic impact | 1.76 (0.10) | | Moderate | | 2.56 (0.17) | | High | | <0.01 |
| Restoration time—economy | 3.80 (0.17) | | 1–3 yr | | 4.76 (0.25) | | 5–25 yr | | <0.001 |
| Restoration time—environment | 3.13 (0.14) | | 25 yr | | 3.17 (0.15) | | 25 yr | | NS |
| Restoration time—recreation | 3.40 (0.11) | | 40 yr | | 3.51 (0.15) | | 40 yr | | NS |
| Restoration time—homes | 1.69 (0.07) | | 1–3 yr | | 1.86 (0.08) | | 1–3 yr | | NS |

Since the starting, mid-, and end points for each of the seven-point Likert scales varied by question, the narrative value that corresponds with the mean response to each is shown also.

Prob., probability; NS, not significant.

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not preexisting. As a result, elicitations that ask individuals to articulate their values or choices, e.g., during public consultations, will provide cues to the participants that, in turn, help them to construct their preferences across options (Payne et al. 1993). Because of the complexity of wildfire management choices and the relative inexperience of most people in making decisions that involve dimensions of value as different as cost, safety, esthetics, and biodiversity, we anticipated that preferences over different risk management options would be quite labile in response to different framings of a question. If true, this would have implications for how these questions should be asked and for the role of stakeholder input as part of the development of defensible wildfire management strategies.

To explore these issues, we developed a between-subject experiment to test for the relative stability of wildfire management decisions. The experiment was conducted during August 2003 in Eugene, Oregon, while the B and B Complex fire (requiring the community of Camp Sherman, Oregon, to evacuate) was burning. Participants were assigned to one of three treatment conditions: A, B, or C (with 50 subjects per condition). In each condition, subjects were presented with a graph that depicted 10 fuels management options, each of which involved some level of prescribed burning. Option 1 involved maintaining the status quo. The remaining nine options depicted a linear relationship between risk reduction over 10 years alongside some level of increased risk of a moderately sized wildfire this year (as a result of an escaped prescribed fire). The outcome associated with each of the options was described as certain (i.e., promised levels of long-range risk reduction—and their associated short-term increases—would take place with certainty). In each treatment condition, subjects were asked to select which of the 10 hypothetical fuels management options they preferred.

Depending on the option considered in treatment A (Figure 2A), the probability of a wildfire this year ranged from 0.008 to 0.062 whereas the decrease in probability over the next 10 years ranged from 0.013 to 0.067. In treatment B, 10 management options were plotted on the same distribution of risks and benefits but with one important difference: the distribution was truncated such that the tail of the risk benefit distribution was removed (Figure 2B). Treatment C followed the same pattern (i.e., 10 options presented) but with the risk-benefit distribution truncated further (Figure 2C).

The purpose of this experiment was to determine the extent to which homeowners are sensitive to the specific risks and benefits associated with a given risk management option under conditions of certainty. If respondents carefully considered the relationship between risk and benefit, we would expect to observe consistency in their preferences across the three treatment types. For example, if subjects were willing to increase the probability of a wildfire this year to 0.026 in return for a reduction in the probability of a wildfire over the next 10 years from 0.067 to 0.049, they would select option 4 in treatment A, option 6 in treatment B, and option 10 in treatment C.

**Results and Discussion.** Subjects exhibited remarkably consistent behavior in responding to the questions but, because the questions were altered as noted previously, this resulted in the expression of remarkably inconsistent preferences (with respect to the risk-benefit tradeoff that they were willing to make). As shown in Figure 3, option 5 was the median response in all three treatments with a mean of 4.6 (SE = 0.4) in treatment A, 5.0 (SE = 0.4) in treatment B, and 4.1 (SE = 0.4) in treatment C. None of these means were significantly different from one another (analysis of variance with Tukey’s posttest, P > 0.05) and corresponded with risk now/benefit later relationships of 0.029/0.046, 0.024/0.051, and 0.014/0.061 for treatments A through C, respectively.

These results suggest that, in this context, subjects do not have well-formed opinions about fuels management options and instead construct their preferences in response to available cues. Specifically, subjects seem to prefer midrange options in all three treatments to options that represent either of the extreme views (i.e., option 1 or 10). These results are supported by other studies that show that people often hold imprecise opinions about risk management options such that their preferences are largely constructed (rather than revealed) during deliberations (Payne et al. 1992, Slovic 1995).

**Figure 2. (A–C) Graphic representation of the 10 risk management options presented to subjects assigned to treatments A, B, and C in study 3. Panels B and C are truncated versions of panel A (as shown by the vertical hatched lines in panel A). On panels A, B, and C, the solid line represents the increased probability of a wildfire this year (due to the potential for an escaped prescribed fire); the hatched line represents the corresponding decreased probability of a wildfire in 10 years (due to fuel reduction). Subjects were asked to select their preferred management option depicted on the x-axis; e.g., selecting option 10 in treatment A implies that a subject was willing to increase the probability of a wildfire this year from 0.008 to 0.062 in exchange for a decrease in probability over the next 10 years from 0.067 to 0.013.
General Discussion Structuring Wildfire Management Decisions

Results from the three studies reported in this article show some of the difficulties faced by forest managers in making defensible wildfire management choices. In contrast to many studies of the so-called “human dimensions” of fuel or wildfire management, which conclude with calls for improved public education about wildfire risks and greater levels of stakeholder involvement in risk management decisions (e.g., Cortner et al. [1984, 1990], Gardiner and Cortner [1988], Beebe and Omi [1993], and Daniels et al. [1996]), these results emphasize the need for improved capability in decisionmaking and risk management. Although we do not disagree with the need for improved stakeholder understanding of risks or the importance of participation, we see neither as solutions to the problems identified in our research.

For example, study 1 suggests it is unlikely that improved understanding of wildfire causes—or even efforts to enhance public-expert deliberations—alone will help to overcome the relative overemphasis on suppression-oriented responses (which address the outcomes of a wildfire regardless of its cause) and relative underemphasis on proactive management prescriptions (e.g., aggressive efforts to reduce fuel loads in certain high-risk areas) noted earlier. As we discuss in our introduction, the United States Forest Service (which has in its employ some of the world’s finest wildland fire managers and access to up-to-date scientific knowledge about wildfire causes and consequences) routinely emphasizes wildfire response (suppression) over proactive management efforts such as fuel control. A more recent example—and one directly tied to one of our study areas—comes from British Columbia. In April 2004, the provincial government announced an appropriation of additional funds (33 million) for local communities across the province to improve emergency planning and if funds remained, to address the problem of interface fuel management (British Columbia Ministry of Forests 2004). In contrast, it has been estimated that an annual expenditure of approximately $150–250 million would be required for a minimum of each of 5 years to begin to address effectively the needs of community-based initiatives seeking to reduce fuels buildup as a means to reduce the risks of interface fires.

Study 2 shows that management problems stem in part from the absence of a risk management approach that encourages participants to both think (i.e., cognitive appraisals) and feel (i.e., affective appraisals) carefully about the different pros and cons of policy options and then, once their own priorities are in order, to be involved meaningfully in the selection of a recommended alternative. In the absence of approaches that encourage this balance between both modes of judgment, we can continue to expect fluctuations between exposed and unexposed populations in their perceptions of risk (Alhakami and Slovic 1994), levels of concern and motivation, and preferences for risk management options (Hsee 1998, Loewenstein et al. 2001). To address this problem, management efforts must be structured such that they help decisionmakers to better balance affective and cognitive modes of judgment. As noted in previous studies, structuring in this sense goes well beyond inviting a cross section of people to receive and respond to technical information about a specific problem (Arvai et al. 2001). There also must be mechanisms in place to improve participants’ ability to recognize and comprehend key facets of the problem—both technical and affective—and then make difficult choices about how wildfire management efforts should proceed.

Study 3 shows that, within the specific context of wildfire management, people do not seem to have well-formed opinions about alternative management options and instead construct their preferences on the basis of cues (or presumed cues) received during the elicitation process. The fact that subjects in all three conditions in this study tended to prefer midrange options, with little regard for the tradeoff between levels of risk and benefit gained when choosing one option over another, is indicative of poorly constructed preferences (Payne et al. 1999) for wildfire management options. Addressing this problem will require that resource managers provide much needed structure (to help decisionmakers to more thoughtfully address risk/benefit and intertemporal tradeoffs) in what to date have been rather loosely organized risk management processes.

Overall, this research highlights the challenges facing those wildfire managers who feel that a drastic increase in the utilization of proactive interventions such as fuels management and prescribed burning relative to suppression-oriented responses are both necessary and justifiable. Yet, it is important to note that the challenges identified in these three studies are not unique to the context of wildfire management; similar challenges have been observed in a wide variety of other resource and environmental management contexts (e.g., environmental...
restoration, watershed planning, and others). What does set wildfire management apart from many of these other contexts is the fact that, in many cases, established debiasing approaches and decision-aiding tools have not been applied to help decisionmakers (including representatives from agencies and local communities) formulate more thoughtful judgments about risks and risk management options. For example, the concept of adaptive impact management (Riley et al. 2003) draws on decision analysis (Klein dorfer et al. 1993, Clemen 1996) to help decisionmakers better understand and address the causes and consequences of human-wildlife conflicts. Experimental and case studies aimed at enhancing evaluability, i.e., methods for improving the comparative frame of reference between two or more alternatives (Hsee 1996), have helped decisionmakers to strike a better balance between cognitive and affective modes of judgment when choosing among competing risk management options; and structured decision-aiding approaches (based on findings from behavioral decision research and decision analysis) have been used in a variety of contexts to help decisionmakers construct more thoughtful preferences by better addressing the tradeoffs inherent in choosing among risk management options (Gregory et al. 2001).

Despite the availability of these and other methods for improving the quality of risk management decisions, however, many wildfire risk management efforts instead proceed based on rather vague notions of what constitutes an effective decisionmaking process (e.g., involving the “right” people and information), the observations of agency personnel (e.g., that people in an affected area seem to be in agreement about what actions to take—or not to take), or the self-reports of individuals (e.g., people who feel generally satisfied with the response of their community). Given the results of the three studies reported here, we believe that continued reliance on these approaches—without careful attention to substantially improving the quality of the process by which risk management decisions are made—will lead to a continued fixation on primarily reactive risk management efforts and, in time, lead to disastrous consequences in many interface communities. In the end, these communities will care little about whether their burned homes and parks are due to judgmental biases or ineffective management treatments; all that will matter is that the associated losses, at least in many cases, could have been foreseen and prevented.

**Literature Cited**


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