

What Does “Wildfire Risk” Mean to the Public?¹

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Introduction

Risk is a subtle concept with many possible meanings. It is sometimes used as a synonym for a hazardous activity, sometimes used to mean probability, sometimes used to mean a consequence, and sometimes used to mean threat. (Slovic 1999a)

If managers are highlighting “high fire risk” to encourage defensible space or support for fuels treatments, it is important to understand if the public’s concept of high wildfire risk is the same as theirs. A common assumption is that if people understand how high the risk is they will naturally do something to mitigate the risk. But as the opening quote indicates, risk is a subtle notion, one that is not simply a scientific concept but also a cultural concept shaped by individual and societal values.

Perceived risk of a natural hazard is generally defined as how serious the threat is deemed to be coupled with the “subjective probability of experiencing a damaging environmental extreme” (Mileti 1994). Thus, perceived risk has much room for variation because different groups may consider a threat to be more or less serious and probability is a highly subjective calculation. Wildfire risk is no exception to this variability. “The phenomenon ‘fire’ has as many aspects as people who are dealing with it: fire managers and fighters, environmentalists, foresters, house and land owners, scientists, land planning organizations, etc. Based on their primary interests, each of these ‘communities’ has different notions of the term ‘wildfire risk’” (Bachmann and Allgoewer 2000). This paper provides some insight into what wildfire risk means to one segment of the various groups dealing with wildfire: members of the public living in high wildfire risk areas.

Key Findings

This paper will discuss results from discussions of wildfire risk during a series of 2004 focus groups held in five locations in the Western United States (Boulder, Colorado; Flagstaff, Arizona; Hamilton, Montana; Reno, Nevada; and San Bernardino, California).

¹ The article is an adaptation of a chapter in “Wildfire Risk: Human Perceptions and Management Implications” edited by Wade Martin, Carol Raish, Brian Kent; published by Resources for the Future.

- **People’s assessment of wildfire risk is a complex process.** Participants considered a wide array of factors—environmental conditions, ignition sources, and potential damage, to humans and to the environment—when assessing general area wildfire risk. Given the desire to clarify risk context and the variability of factors each person considered, managers may want to clearly define the definition of wildfire risk they are using, including timeframe, area extent, and specific type of damage. In addition, the strong initial emphasis on preconditions as a key part of risk assessment suggests that managers may want to pay particular attention to communicating fire risk when environmental conditions do not visually support the actual risk (e.g., green vegetation).
- **Public wildfire risk perception that managers may see as inappropriately low may not necessarily be a result of poor understanding but instead may be a result of self-selection and of mental balancing of benefits and risk.** Rather than focusing on raising risk perception levels, managers may instead want to focus on changing the perceived balance of risk and benefits—showing how efforts to decrease risk add to rather than subtract from the perceived benefits of living in fire-prone environments. This can take the form of showing specifically how actions such as vegetation management reduce likely damage from wildfire, but perhaps even more useful would be showing how such actions can actually increase the perceived benefits of living in wildland areas such as improved forest health and wildlife habitat.
- **Homeowners generally understand how to protect their homes from fire and many have taken steps to decrease their risk.**
- **“Current Fire Danger” signs are an effective means of communicating local fire risk status.** The signs were the most commonly referenced information source for current fire risk and helped ensure that people didn’t put the risk out of mind. However, because people also compare what the signs say to their own observations, it is important to keep the signs current throughout the year, not just to reflect actual fire risk but also to maintain their credibility.

Detailed Findings

In each of the five locations, three focus groups were held. Efforts were made in each location to have a representative sample of residents who lived in the intermix, in the interface, and in nearby areas unlikely to be directly threatened by a wildfire (vicinity). (Quotes are identified by the city and type of location—intermix, interface, or vicinity—of the speaker.) During the focus groups, participants were asked to rate the general fire risk of the area on a scale of 1 to 10. They were then asked to describe what they were thinking of in making that rating. Subsequently, participants were also asked to discuss their reactions to official messages about wildfire risk and to rate the wildfire risk for their house.

People's assessment of fire risk is a complex process.

Overall, participants saw the wildfire risk in their area as quite high, but it also was evident that risk is indeed a subtle concept. Several participants wanted clarification on the timeframe, the weather conditions, and the spatial extent to be considered as well as risk to whom.

I didn't know if you were asking how likely do you think a fire is to happen, in which case, it happens every year around here, so it's highly likely. Or how likely is it for a fire to kill somebody or burn down lots of houses. (Hamilton vicinity)



However, as discussion progressed, a distinct and fairly logical pattern of wildfire risk assessment emerged. First, participants generally thought about environmental conditions that would affect odds of a fire breaking out and influence its likely behavior. Next, they thought of ignition sources. Although lightning was mentioned, the most common ignition source discussed was human actions, usually in the guise of “stupid people.”

Homeowners generally understand how to protect their homes from fire and many have taken steps to decrease their risk.

I think of a really dry forest. I picture a fire about to happen. Mostly it's the condition of the forest because stupid people are always around. (Boulder vicinity)

Female 1: I think of bitterbrush and manzanita that's packed up to each other with the dry, dead trees and cheat grass coming from the highway. I can just see it light....

Male 1: I think of my dad, jogging around the basin, coming to visit me and throwing a cigarette out the window. (Reno intermix)

The San Bernardino interface and intermix groups were an exception to the general pattern of considering environmental conditions first in determining wildfire risk. Two-thirds of these participants had had to evacuate their residences as a result of the large fires of the previous fall. For these two groups, wildfire risk first brought to mind likely human impacts, including emotional responses.

Moderator: When you see the words “wildfire risk,” what do you generally think of?

Male 1: Evacuation.

Male 2: Fear.

Male 3: *Panic, because people don't have escape routes.*

Female 1: *Or how fast that the fire can come, depending on the vegetation.*

Male 4: *I think of dry brush (San Bernardino interface).*

After ignition sources, participants considered likely damage, first in terms of human costs—houses, health, lives—and then in terms of damage to the forest and wildlife. At this point participants began to more openly acknowledge the contextuality of risk, that risk was not just about probability but about consequences.

Well, the thing I think was missing in the previous discussion was risk to dwellings. I don't think any of us would be concerned about a wildfire in the jungles in Ghana, for instance. We would be maybe a little bit more concerned about the risk of a wildfire in the Lost Horse Drainage, for instance. But it starts getting to be personal when you can see the fire. So it really gets to be a crisis when it is encroaching on your property and threatening your house. (Hamilton interface)

Although overt discussion of negative impacts generally emerged after consideration of environmental conditions and likely ignition sources, there was implicit consideration of negative impacts from the start as the environmental factors were discussed mostly in terms of the amount and dryness of the fuel and other variables that would contribute to a less controllable and more damaging fire. That negative consequences were an underlying part of most people's definition of risk came out clearly when they were asked to differentiate between high risk versus medium risk wildfires. Answers focused on environmental factors—such as wind speed, humidity, combustible fuel, and topography—that would increase likelihood of a fire being uncontrollable and more damaging.

Moderator: *In what ways would a high wildfire risk situation differ from a medium risk situation?*

Male 1: *One uncontrollable.*

Female 1: *It would spread easily.*

Female 2: *How deeply it would burn if you have a wildfire that burns so hot that it burns all the organic matter, so things can't grow back. That's the extreme.*

Female 3: *Risk to residences.*

Male 2: *Of course the wind factor.*

Male 3: *A wildfire doesn't have any natural breaks that slow it down, you know, it just keeps going in the crown.*

Male 2: *Evacuate from the area. (Flagstaff interface)*

I think the other thing that I think of when I see high risk, is it going to be really difficult to get under control. That's just my initial thought is if it is really high risk, that if something does take off, then we are at risk for greater damage. (Boulder vicinity)

The strong initial emphasis on preconditions as a key part of risk assessment suggests that managers may need to pay the most attention to communicating about fire risk when environmental conditions do not visually support the actual risk (e.g., lack of dry and dead vegetation). In addition, the fact that a significant number of participants asked for clarification about what was meant by area risk suggests that managers may want to clearly define the definition of wildfire risk they are using, including time-frame, area extent, and specific type of damage.

Public wildfire risk perception that managers may see as inappropriately low may not necessarily be a result of poor understanding but instead may be a result of self-selection and of mental balancing of benefits and risk.

When participants were asked to rate the wildland fire risk for the general area on a scale of 1 to 10, an interesting pattern emerged. Participants who lived in the vicinity consistently had a higher wildfire risk rating for the area than those who lived in the intermix or interface. Although the focus groups were not structured in a way that made it possible to clearly establish why this distinction existed, analysis of the focus group discussions indicates that part of the difference may be a result of self-selection. This kind of decision process was evident among participants in Flagstaff, Boulder, and Reno.

Female 1: We aren't allowed to burn at all at my house. (Flagstaff intermix)

Female 2: Well, you are in a canopy. You are right there in a canopy. That's one reason we didn't buy up there, I was terrified. (Flagstaff vicinity)

Female 1: We are a 7 risk and that's why we didn't sell that house, and just move away. We want our kids to experience living on a piece of beautiful, beautiful land that is not, it is relatively undisturbed by society. You can go out on the trail, right from your door, and see wildlife and be right in nature. So that risk is worth that....

Moderator: Is having a wildfire risk of 7, is that acceptable to you?

Female 1: Oh, you know; you still have everything else. Although, I guess I should 'fess up, we also bought a condominium in Boulder. (laughter) So, I have to tell you, my husband would deny this, but for me part of the fear is about wildfire. I do

not want my kids out on the street without a place to be. So, there's a lot of other reasons why we did it, but we have a separate home. (Boulder intermix)

I think there's something to be said about living out rural or in the country. I don't want that taken away from me. Even if there's brush around and there's a potential for fire, I think we take that into consideration when we buy our houses. (Reno interface)

The first two quotes indicate that part of the self-selection is based on emotional responses. Both participants reference powerful negative emotions to explain their decision to have a residence outside of the interface or intermix, thus indicating how their risk perception is not a simple utilitarian calculation based on probability plus outcomes. Apparently, those with lower risk tolerance are choosing not to expose themselves to the risk.

Another likely dynamic, illustrated by the last two quotes, is that people who live in the intermix and interface are making conscious tradeoffs. The open discussion of the positive benefits of living in these areas and the lower risk ratings of people living in them parallel findings from other risk research that higher perceived benefits are associated with lower risk perception (Alhakami and Slovic 1994). This dynamic is linked with a person's overall positive or negative emotional (or affective) response to a hazard; a positive emotional reaction is associated with a lower risk perception. The need for cognitive consistency means that having decided that living in or near wildland areas is desirable, individuals engage in mental strategies that minimize the risk and highlight the benefits, making the tradeoff acceptable. Although Alhakami and Slovic's study was in relation to risks and benefits at the societal level, these findings suggest that a similar process exists at the personal level.

The fact that those living in the intermix and interface have a lower sense of general fire risk than those living in less exposed areas is intriguing. Although further research is needed to clearly understand this dynamic, these findings suggest one reason why increasing wildfire risk perception does not necessarily lead to behavior change. Residents in these areas appear to have already recognized the risk in some manner and have decided, consciously or unconsciously, either that they are unwilling to tolerate the risk and so choose not to live in the WUI or that the benefits outweigh the risks. Thus, public wildfire risk perception that managers may see as inappropriately low may not necessarily be a result of poor understanding, as is often assumed, but instead may be a result of self-selection and of mental balancing of benefits and risk. If this is the case, efforts to raise risk perception levels may be misdirected. Instead managers may need to focus on changing the perceived balance of risk and benefits—showing how efforts to decrease risk add to rather than subtract from the perceived benefits of living in fire-prone environments. This can take the form of showing specifically how actions such as vegetation management reduce the likely damage that the house or landscape will suffer, but perhaps even more useful would

be showing how such actions can actually increase the perceived benefits of living in wildland areas such as improved forest health and wildlife habitat.

Homeowners generally understand how to protect their homes from fire and many have taken steps to decrease their risk.

Participants' ratings for the wildfire risk for their house followed a more predictable pattern than that found with area risk: intermix residents had the highest risk rating and vicinity residents the lowest. Views of house risk were uniformly lower than assessments of area risk. Notably, for house risk there was a significant difference in risk assessment by gender: women had a higher house risk rating than men. This matches findings in other risk research that women tend to have a higher sense of risk than men (Slovic 1997), although there was no such gender difference for ratings on area risk.

Responses indicate that participants generally had a good picture of what factors increased their risk including shingle roofs, thick vegetation and ladder fuels, flying embers, unraked pine needles, and topography.

*I said 5 because we live on a hill. We get the winds almost as bad as Washoe Valley. Of course, we have a cement roof, that's a good thing, we have defensible space, but we also have a lot of natural brush around our house, all around our home. All our 6 acres and the adjacent area. If the wind is right and the fire in the right place, we could be in trouble.
(Reno interface)*

Most intermix and interface participants indicated they had done some type of mitigation work, particularly vegetation management and replacement of shingle roofs. Several indicated they felt their house risk was lower as a result of these actions.

I said 4 or 5 because on our own particular lot, we've taken out half the trees that were there when we bought the lot and we built the house at least 15 feet from the closest trees. We rake pine needles incessantly, so there's no cover on the ground. And, we are on the edge of A-1 Mountain, the foothills, and they just this last winter they thinned it. Especially near our house. They took out 2/3 of the trees for a 100 yards back of our house. So I think compared to 7 years ago, I would have said a 7 or 8; now we are at a 4 or 5. And our house partly has a fireproof siding and a steel roof. (Flagstaff intermix)

Conversely, there was evidence that people had increased their house risk rating as a result of information they had received about the wildfire hazard. However, there also was evidence that individuals could understand wildfire dynamics and still deny the risk. Both of these are illustrated in the following exchange.

Two years ago I would have said [that my house risk was] zero. Until you see the footage of the wildfire that took the camp out up by... in the middle of a meadow. It is just amazing, the winds that get generated by a wildfire come across the flats and nothing is safe.

I said zero, but we live up in Corvallis, and when we had the big fires in 2000 up Dutch Hill, way up there by Pinesville, we found big embers in our yard where the wind had blown them down there. So it might not have been in the middle of a wildfire, but it could have been our house that was on fire from it. (Hamilton vicinity)

Ironically, this last person rates her house as having no risk but then goes on to describe a very logical way the house could in fact be lost to wildfire. Such apparently illogical justifications were more prevalent in explanations of house risk ratings than they were for area risk. Loewenstein *et al.* (2001) argue that a key part of lay risk response is linked to the immediate visceral reaction to the risk, which is closely linked with the vividness of the mental imagery associated with the risk. Losing one's house to wildfire likely engenders more vivid imagery than a more general wildfire in the area, which may encourage people to engage in mental heuristics to minimize their personal sense of risk. This possible dynamic may provide some explanation for why some homeowners may have an accurate assessment of the overall area risk but still not engage in any defensible space measures.

“Current Fire Danger“ signs are an effective means of communicating local fire risk status.

In terms of official wildfire risk messages, most participants generally felt little disjuncture between their perception of the wildfire risk and the various public messages they were getting about the risk. A few felt wildfire risk was understated, while others felt it was overemphasized to generate firefighting funds. The most consistently mentioned information source was the roadside signs that indicate the current fire danger. More than half of the focus groups mentioned the signs, often describing their location, and several participants said the signs were what they first thought of when they heard the term wildfire risk.

I think of the signs....there's I guess some type of fire prevention sign right there, but a barometer that goes to the different shades. When I see it go into the orange I know that...It's frightening, I hear that and feel fear. (Boulder interface)

Male 1: We see the signs on the road, she's referring to. Today the fire danger is low.

Female1: Elevated, kind of like what they use for Homeland Security.

Male1: Everybody sees those signs, it does make you conscious. (Reno intermix)

I personally don't think about it until I pass our Ranger Stations and it says on the sign, "Extreme Risk of Fire." And that is a subtle reminder that, "Hey, this is a danger area."
(San Bernardino intermix)

These last two comments show the importance of the signs not just in terms of recognition but as a means of ensuring that residents don't put the risk out of mind. The recognition also highlights the importance of keeping the signs current. It was evident that people paid attention to the signs in part because they trusted the messenger but also because the signs supported their own observations.

I agree with it (the sign) because they wouldn't be making it up. And it looks dry and we haven't had rain and I would go with that. (Boulder vicinity)

I usually agree, but the other day I rode my bike out there and the sign said low. This was a week ago. We've had some rain, but I still don't think it is very low. (Boulder intermix)

The attention given to the "Current Fire Risk" signs suggests the importance of keeping them current throughout the year, not just for actual fire risk understanding but also for their credibility.

Background—Different Approaches to Understanding Risk

Over time initial assumptions that people's actions would be directly related to the probability of the event and the magnitude of its consequences have been proven problematic: "apparently minor risk or risk events, as assessed by technical experts, sometimes produce massive public reactions" (Kasperson *et al.* 1994: 113). To more fully understand what shapes public perceptions of risk, researchers have examined the following questions:

- Do lay people see risk as a combination of probability and consequences or do they consider only probability, and what combination most influences decisions to mitigate (Sjoberg 1999a, Slovic 1999a)?
- Are there differences in expert and lay calculations of risk and is risk, in fact, perceived differently by the two groups (Johnson 1993, Rowe and Wright 2001, Sjoberg 1999b)?
- How do hazard characteristics influence risk perception (Slovic 1997)?

A more recent focus has been on understanding how emotions play into risk perception, including how negative or positive emotional assessments associated with exposure to a hazard influence risk perception (Slovic 1999b) and the role of visceral emotional response to risk and uncertainty (Loewenstein *et al.* 2001).



Many WUI residents recognize the fire risk, but have decided that the benefits of living in the woods outweigh the risks.

It is not entirely surprising that definitions of risk differ. The dynamics of risk perception are complicated. In essence, efforts to determine risk exposure are an attempt to bring some level of certainty to an uncertain and threatening situation. Technical experts develop a set of protocols, generally using mathematical calculations, of ways to deal with this uncertainty. “After identification of the failure or damage scenarios (what can go wrong?) the questions are: what are the potential consequences and their likelihoods? The risk can then be quantified by a probability distribution of the potential outcomes, or by the relevant moments of that distribution” (Pate-Cornell 1996).

Although the above quote makes technical risk assessment sound like a straightforward process, this is not necessarily the case. Such an assessment can provide different results for the same concern depending on how the negative consequences are defined and how probability is calculated. For instance, defining a risk in terms of accidental deaths per product unit versus accidental deaths per number of employees can yield very different outcomes (Fischhoff *et al.* 1984).

Given the lack of agreement among experts, it is unlikely that lay individuals will be any more consistent in their risk assessments, nor will they be likely to have the time or desire to engage in complex mathematical calculations. Instead, lay individuals have been found to use various mental strategies—such as denying a risk or attributing complete protection to an adjustment (such as flood levees) that only provides partial protection—to minimize the uncertainty (Slovic *et al.* 1990). In the process, misinformation and bias are often introduced into the risk estimate (Slovic *et al.* 1987). Further, individuals will emphasize different aspects in determining risk; one person may focus on probability while another may emphasize specific negative consequences.

In relation to wildfire risk, the story appears to be no different. Within the fire community itself, definitions of wildfire risk vary. Notably, most formal definitions tend to treat the term as solely about probability. The Canadian Committee on Forest Fire Management defines fire risk as “fire probability or chance of fire starting determined by the presence and activation of causative agents” (Bachman and Allgoewer 2000). A recent General Accounting Office report on the need to systematically assess the environmental risks of wildfires defined risk as: “the probability that an event such as a wildland fire

will occur” (U.S. GAO 2004). Neither of these definitions includes consideration of consequences. In fact, in their analysis of how wildfire risk is treated in the literature, Bachman and Allgoewer (2000) found “very few examples” that took “both aspects of risk—probability and outcome—into account.” This narrow focus on probability is particularly problematic when, as this paper indicates, the public definition of wildfire risk generally takes more into account than just probability.

Methods

Fifteen focus groups were conducted from May to July 2004 in five fire-prone areas of the Western United States: Boulder, Colorado; Flagstaff, Arizona; Hamilton, Montana; Reno, Nevada; and San Bernardino, California. The overall purpose of the study was to examine public views on fire management. One section of the focus group discussion explored risk perception—particularly what was considered in determining wildfire risk. Participants were recruited via phone calls using a geographically targeted sample list. Because the purpose was to obtain perceptions of the general population rather than those with a particular interest in wildfire issues, all participants were screened to not be employed by a government agency with jurisdiction over forestry or air quality, an organization with any affiliation with the logging or timber products industry, or any firefighting organization. Quotas were established to ensure an appropriate cross-section of the population.

Three focus groups were conducted in each location. The intention was to have one group of residents who lived in the wildland intermix (where houses are dispersed throughout native vegetation), one of residents living in the interface (areas on the edge of town or with moderated levels of native vegetation), and one of vicinity residents who lived in town or in predominantly agricultural areas. Respondents were assigned to a group based on their identification of the landscape where they lived. However, during the focus groups, it became evident that individuals living in the same neighborhood and even on the same street could characterize their surrounding landscape very differently.² Therefore, for analysis, addresses were mapped and, based on field assessments at the time of the focus groups and use of satellite photos (via TerraServer), participants were assigned to the appropriate “landscape” group. Focus groups ranged from 8 to 15 participants with an average size of 11 and a total of 171 participants. All groups were recorded and transcribed to allow detailed analysis of the focus group discussion data.

² An interesting dynamic and one that merits further analysis.

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