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Insights Into Wildfire Mitigation Decisions Among Wildland–Urban Interface Residents

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In-depth interviews conducted with homeowners in five Colorado wildland–urban interface communities reveal that the homeowners face difficult decisions regarding the reduction of wildfire risk. Rather than seeing risk reduction as straightforward, homeowners appear to be involved in a complex decision-making process with social considerations. The interviews shed light on the social context in which homeowners make wildfire mitigation decisions, participants' perceptions of how the biophysical landscape near their residences affects mitigation, and participants' perceptions of wildfire mitigation options.

Keywords fuels treatment, homeowners, mitigation, wildfire risk, wildland–urban interface

In recent years, wildfire has captured the attention of the U.S. public. Despite substantial outreach efforts targeting residents in wildfire prone areas, many homeowners do not undertake the recommended risk reduction actions (Simons 2003). At the same time, the number of homes at risk from a catastrophic wildfire continues to increase as more people choose to live in the wildland–urban interface (WUI) to enjoy the associated amenities. As a precursor to designing effective outreach programs, it is necessary to understand how homeowners conceive of the wildfire problem and what factors influence efforts to reduce risk.

In this qualitative study we investigate how homeowners characterize their experience of living in a fire-prone area and the salience of the wildfire issue among study participants. More specifically, we focus on the decision-making processes of homeowners concerning the adoption of wildfire mitigation actions that affect their homes and the surrounding vegetation. This focus is a departure from the predominant emphasis of previous wildfire social science research on fuels treatment on public land.

Wildfire and the Wildland–Urban Interface

In Western states such as Colorado, the wildfire risk in the WUI poses a challenge with respect to public safety, financial responsibility, and natural resource integrity (Interagency Federal Wildland Urban Interface Working Group 2001). Federal policy that historically prioritized immediate suppression subsequently led to the buildup of fuels on public lands. Coupled with below-normal precipitation along Colorado's Front Range since 1998, the Colorado WUI has become particularly susceptible to wildfire (Graham 2003).

The increased concern with wildfire as a public policy issue has been the impetus for growth in related social science research focusing on aspects of public concern and acceptance of fuels management on public lands (Kneeshaw et al. 2004; Brunson and Shindler 2004). Most of this research, like much of the foundational social science wildfire research from the late 1980s and early 1990s, focused on public perspectives and acceptance of fuels treatment options on public land (Taylor and Daniel 1984; Gardner and Cortner 1988; Gardner et al. 1987). A few recent publications (McCaffrey 2002; 2004; Kumagai et al. 2004; Nelson et al. 2005) addressed homeowners' behaviors on private property or their perspectives on their roles in wildfire risk reduction. As the WUI population continues to grow, wildfire mitigation on private lands is becoming an increasingly important part of wildfire management and merits further exploration.

Context, Data, and Methods

This study focused on WUI residents in an effort to gain additional insight into the decision-making processes associated with mitigating wildfire risk on private property. We approached WUI homeowners with a general inquiry about the issue of wildfire. Our goal was to have homeowners define for us the most important issues associated with reducing the risk of their home being lost or damaged from a wildfire. Thus, we asked: *What are the most important issues regarding wildfire, wildfire risk, and wildfire mitigation for you as a resident in the wildland–urban interface?*

Interviews were conducted in five WUI communities in Larimer County, Colorado. Almost 50% of Larimer County is composed of public lands and since 1970, the county has nearly tripled in population (U.S. Census Bureau 1995; 2000; 2004). Target communities and initial key informants were chosen with the assistance of the Larimer County Wildfire Safety Specialist (CWSS). The CWSS's experience working in WUI communities provided insight into community characteristics, risk levels, and social dynamics. The CWSS also identified community leaders who could be contacted for initial interviews about wildfire and the communities. During these interviews, the community leaders provided contact information for residents who had engaged in differing levels of wildfire mitigation on their property. This purposive

sampling technique allowed the researchers to "select a sample on the basis of knowledge of a population and the purpose of the study" (Babbie 2001). The approach also facilitated recruitment of a group of study participants with a variety of perspectives who had engaged in mitigation at various levels.

Twenty-nine interviews were conducted with 35 study participants representing 30 households. The age of participants (years) varied from mid 30s to mid 70s with an average age in the early 50s. All participants were White, with one Hispanic.[1] Nineteen of the participants were women and 16 were men. While most of the interviews were one-on-one, five couples were interviewed together.

Interviews lasted from 45 minutes to 2 hours and were tape-recorded and later transcribed. Most of the interviews were conducted in the participants' homes, which had the added benefit that participants were able to not only describe but also to show and explain wildfire-related property details such as fuel conditions.

While the initial interviews were pursued with a set of semistructured questions that had been developed before going into the field, the research was approached as an emergent research question, meaning that as issues arose in interviews they were incorporated and pursued in subsequent interviews (Fontana and Frey 1994). This approach allowed for the emergence of themes that could not have been predicted and were not initially considered in the interview guide. As with most qualitative studies, these data do not allow us to make inferences about the broader WUI population.

The qualitative software tool NVivo 2.0 was used to manage the data. Each of the article authors read the interview texts and independently identified general concepts and ideas that emerged from the interviews. Open coding was used to capture these concepts and ideas and to organize them into initial categories (Strauss and Corbin 1998). The interview text associated with codes that recurred frequently was compared and contrasted by the authors in an effort to understand the dimensions of the issue associated with the developing categories. Within these categories, subcategories were developed as a means to indicate either degree of importance or nuance of description. As the process of data collection and analysis progressed, selective or focused coding was used to further develop and refine categories (Lofland and Lofland 1995; Strauss and Corbin 1998). These categories form the basis of the findings presented next.

Findings

The discussion here focuses on the three strongest themes that emerged from the interviews: (1) the social contexts in which wildfire risk and mitigation options were considered; (2) perceptions of the biophysical landscape; and (3) perceptions of risk reduction options. To illustrate each of these themes, we provide direct quotes from the interviews. Quotes were chosen because they are articulate examples of beliefs, ideas, and concerns shared by participants.[2] All names included are pseudonyms.

Social Context

The importance of social context in mitigation decision making was demonstrated on three levels: community expectations, informal social interactions that facilitate knowledge sharing and action related to wildfire mitigation, and within-household negotiations regarding implementation of risk reduction measures.

Community Expectations

During the course of the interviews, it became clear that each community's unique characteristics, dynamics, and discourses shape the ways in which wildfire risk is addressed. For example, the discourse in one community primarily characterized wildfire risk as something that should be reduced to prevent a wildfire event. Residents in this community tended to be focused on mitigation strategies focused primarily on fuels treatment, such as organizing community chipping and slash-collection days.

Another community focused primarily on actions that should be taken in the event of a fire. This community focused primarily on fire response rather than prevention or mitigation and has successfully organized an extensive response system that includes within-community communications and liaisons with the local fire responders. Further, the community has a fire siren, a flag communication system, and volunteers whose responsibility it is to meet the fire trucks and escort them in to the fire site. Though residents interviewed in this community have not completely rejected the idea of mitigation strategies, including fuels treatment, their actions are consistent with the community discourse of response.

In other words, discourse in one community defined wildfire as a prevention issue while the other defined it as a response issue. Participants interviewed in these two communities consistently reiterated the discourse of their community, and their fire-related behaviors reflected these discourses.

One expectation, however, that was shared across communities was self-reliance. Participants consistently indicated their understanding that wildfire risk on their property was their responsibility. Janette, a 4-year resident, explained:

> If you live here, you have a responsibility for the land. It is part of the larger, National, Forest picture, sure the public should pay some, but if it is about community mitigation, it would be nice to get some outside source but that responsibility should probably be ours.

Echoing the importance of community responsibility and mitigation, a resident of 9 years, George, asserted:

> If one person [treats fuels on] their property, I mean, that isn't going to do a lot of good, because you have everything surrounding. So, you all have to work together.

Thus, community discourses and expectations often color the ways in which wildfire risk is addressed within that community. Some expectations, in this case of self-reliance, may cut across communities and provide insight into more widely held expectations that could be helpful in galvanizing community action.

Informal Social Interactions

Within the broader context of the community and its dynamics, informal social interactions appear to play an important role in risk reduction decisions. Homeowners described informal discussions with neighbors and other community members about wildfire risk and mitigation options. These informal conversations were particularly common among neighbors that share an adjoining property boundary.

Kate, who grew up in Colorado and has lived in the WUI for almost 10 years, explains: "we have all talked about that." She goes on to explain: "I have been asking everybody who to talk to and I would love some good education to reach out to people like us that do live in these areas."

Sometimes residents used these informal interactions to galvanize small-scale fuels reduction projects. For example, Mark explained:

> I've already talked to [my neighbors] about [mitigation]. ... The ones that I think would impact me, it is the same canyon but further down. It would actually be a ways to get up there. They have a place and it is very far away from their house, but it is a pretty steep area and I have talked to them about maybe trying to organize a little thing of neighbors that would really be about six different families, that we all get together and spend, like a half a day, and we could do a good bit of work and it would help everybody's house and they were very willing to do that. So, we will probably be doing that next spring.

These informal social contexts are important because they illustrate the ways in which homeowners address the wildfire issue on a scale beyond their property but not necessarily at the entire neighborhood or community level. Rather, homeowners identified sources of risk near their homes and used informal social relationships to broker agreements and cooperative efforts to address sources of immediate risk.

Negotiated Outcomes within Families

Participants, particularly those interviewed with their domestic partners, revealed that mitigation actions were the result of negotiations that occur within households. Fuels treatment decisions that involved altering the landscape, in particular, appear to be negotiated outcomes among couples who may have differing levels of risk aversion, varying attachments to the landscape, and varying degrees of trust in the information available about both wildfire risk and wildfire risk reduction options.

For example, Penelope, the wife of a volunteer fire fighter, explained to us:

> When you see flames and smoke, it is motivation. And [my husband] had been telling me. . . but I kinda had this tree-hugger attitude about me and no, no, I don't have my deck with a tree in the middle of it, but it was almost that bad.

Penelope explained that she had allowed some pruning and cleanup on her property on a regular basis but had neglected the kinds of fuels treatment that had been recommended because of her identity as a "tree-hugger" and "liking the back-to-nature look."

Richard and Mary, a retired couple who had been living in their community for 10 years and have 112 acres, explained that while they were in agreement with how the majority of their property should be managed, they had serious disagreements about fuels treatment when it came to specific landscape details around the house:

> Mary: There is a tree that is just outside the kitchen window that my bird-feeders hang on and he says that it should go. But I said that "if it goes, I

go." … It is right outside the window! I don't know if it is a beautiful
tree, but the birds are beautiful. I like that.
Richard: You just shouldn't have any trees that close to the house. And it
is right next to the house. Just because it is a fire problem, but it is also,
when it is that close to the house… there are a lot of needles that fall
from the trees to the roof.

Decisions to implement fuels treatment appear to involve negotiation within
households. Family members may have differing perspectives on what constitutes
a threat and what actions should be taken. Outcomes at the structural and landscape
levels may reflect negotiations that seek to bridge these differences. Such within-
household negotiations merit further investigation.

Perceptions of the Biophysical Setting

It is clear from these interviews that homeowners' perceptions of the biophysical
environment are central to their decision making around wildfire risk. Trish, a recent
Volunteer Fire Department recruit, explains:

I think regardless of how much mitigation I did, because I back to
National Forest that if [a wildfire] happened to either above my property
or below it, I might not be in good shape. I mean, I have the road as a
good firebreak but if it gets past the road to my house it is just going
to go like a huge torch.

Concerns regarding nearby unmitigated private and public land consistently
arose during interviews. The fact that all the communities targeted are surrounded
by a National Forest was a factor that was repeatedly echoed. Bob, a WUI resident
of 7 years, explained:

We could all have our homes completely vacant of trees and that
National Forest comes this way, the firestorm is not going to care about
my little 300 foot boundary, it is gonna come over.

This perspective of the wildfire threat that public land brings to private property
was an important theme in many of the interviews.
Despite being able to identify sources of wildfire risk, many participants did not
want to alter their landscapes unnecessarily. These residents reported having
developed emergency fuels treatment plans in addition to emergency evacuation
plans. These last-minute plans involve last-minute fuels treatment to deal with trees,
brush, and other fuels that would pose a risk to their homes in the event of a wildfire.
Participants recognized the threat but were not willing to deal with it until the threat
was imminent. George, the volunteer fire fighter quoted earlier, explained:

So, we purposively have left some trees, as you see out this window, uh,
that is probably slightly closer than the 30–35 feet that they recommend
and I haven't actually taken my tape measure out there yet, but we pur-
posively left that. We figured, if we get threatened, those two trees both
have to go.

These plans indicate that attachment to landscape preferences may lead to unwillingness to compromise certain landscape characteristics in order to reduce wildfire risk. These plans also implicitly assume that during a wildfire event and evacuation homeowners will have time to address the remaining sources of wildfire hazard. Several participants acknowledged that this may be a gamble that they might lose if they are not at home during an evacuation or if there isn't enough time to implement the planned emergency fuels treatment actions.

Perceptions of Risk Reduction Options

The risk of wildfire was an important issue for all the participants interviewed. There was, however, a wide variety of perspectives on the appropriate responses to wildfire risk. All participants were aware of the wildfire risk in their area and several stressed that wildfire risk is a constant part of their experience living in the WUI, particularly in the summer. A 17-year WUI resident, Sara, explains:

> You are always aware of it. I mean, in the winter I am clearing and in the summer I am weed-whacking and . . . making sure I have everything prepared and in between we are [laughing], getting stuff filed and organized and getting pictures on disk so that, you know, if there is a fire, we can get out fast.

Sara's approach involves fuels treatments and emergency preparedness strategies. Participants engaged in a wide variety of wildfire responses, much of which did not involve fuels treatment. Risk reduction options that involve changes to structures were generally readily adopted by those interviewed. Participants explained that changes to homes such as siding, roofing, and windows were preferred tactics and the items had been or would eventually be replaced, usually on a timeline dictated by personal finances. Basic risk reduction actions such as moving the wood pile away from structures, putting house numbers up, raking pine needles, and mowing grasses were readily adopted as commonsense measures. These generally low-cost, low-effort options appear to be accepted as reasonable and necessary to reduce the likelihood of major losses in the event of a fire.

Most of those interviewed saw wildfire risk reduction that involved fuel treatments as a multiyear task, rather than an all-or-nothing effort that had to take place immediately. In fact, many expressed having felt trepidation when first introduced to possible fuels treatment options. Several of those who had been hesitant to implement fuels treatment explained that once they had done a little, doing a little more didn't seem as daunting.

Fuels treatments on the land surrounding structures appeared to cause much more debate, and variation in degrees of implementation and interpretation of recommendations was evident. Concern does not necessarily appear to map evenly onto risk reduction efforts. For example, Lindsey, a relatively new resident to the WUI community (3 years), has done considerably less fuels treatment than other residents interviewed in her community. Yet when asked how often she thinks about the threat of wildfire, she expressed the constancy of her concern:

> In the summer it is daily. I work from home, so in the summer, if I have to go out to go grocery shopping or something like that, I think about:

> "Is [my husband] going to be home in case there is a fire or should I tell
> one of my neighbors that I am going to be gone for a few hours in case
> there is a fire."

Many indicated that resistance to implementing some fuels treatments was due to the perceived need to better tailor the treatments specifically for their landscape, their particular community, or the location of their property within the community. For example, many participants struggled with applying formulaic fuels treatment instructions to their private property, particularly when the recommendations did not match the biophysical reality they were facing. For example, Carrie, who operates a business out of her home, explains:

> Some of the properties are really small. I mean if they [other community
> members] did the twenty-foot [fire] break all the way around the house,
> they'd literally have no trees around that property. You know and that's
> not why people live in this area.

She clearly felt that some of the standard fuels treatment prescriptions were not appropriate in her community.

Insights such as these tell us that not only are some WUI residents struggling with the possible impacts on the aesthetic quality of their property to which they are attached, but they may also understand risk reduction options as inflexible, an all-or-nothing effort. Understanding the degree of acceptance of the various wildfire risk reduction options and perceptions of the appropriateness and efficacy of available options may help improve understandings of the behavior of those facing the risk of wildfire.

Conclusions

The interviews in this study provided depth and insight into the actual context of wildfire mitigation decisions in which homeowners weigh the risk of wildfire against the costs and efficacy of wildfire risk reduction efforts. This qualitative approach was productive for understanding some aspects of the decision-making process and allowed us to realize issues that we did not conceive of prior to the study. Importantly, it illuminates some of the more salient issues for homeowners.

We found that the social context in which wildfire risk, mitigation options, and implementation strategies are discussed and negotiated is important. Community expectations provide a framework that helps shape the appropriateness of certain types of response. Community discourse that focuses more on response to wildfire rather than on prevention may lead to different types of fire risk response strategies. Community wildfire programs should be cognizant of this issue and designed to set the appropriate tone.

Informal social interactions and networks are important as homeowners explore what types of mitigation options to implement. They also provide opportunities for homeowners to collaborate with neighbors about implementing fuel treatment strategies on a scale smaller than the community level. Further, within the household, there may be yet another set of social interactions that shape outcomes. Mitigation actions appear to involve negotiations within the household about what types of actions to prioritize, accept, or implement.

As with any research approach, there are limitations that must be acknowledged. Most importantly, it was difficult getting individuals who did not adopt any type of risk reduction strategy to participate in the interviews. While several participants described neighbors who had ''let it burn'' attitudes, it was difficult to solicit contact information for these individuals; thus, the voices of WUI residents who outright refuse to take any steps to reduce wildfire risk have not been heard through this study. Importantly, we found that those facing wildfire risk may not be easily grouped into categories of adopters and nonadopters of risk reduction strategies. It is clear that WUI homeowners are positioned on a continuum, adopting varying levels and types of response. Residents appear to engage in a wide variety of risk reduction activities, ranging from small-scale nonfuels treatment options to extensive fuels treatment strategies. Some actively participate in community programs, while others address the issue only on their parcel or with those who own neighboring properties. Understanding this continuum and the factors that contribute to the ways in which homeowners position themselves upon the continuum may be a more productive line of inquiry than relying on polarized groupings of WUI homeowners as either adopters or nonadopters of risk reduction strategies.

Perhaps one of the most interesting insights was of homeowners' perceptions of wildfire risk reduction options. Some participants did not want to change the landscape around their homes until a wildfire was actually threatening their home. They were very attached to the current landscape and did not want to alter it unnecessarily. This attitude implicitly assumes that there will be time to implement an emergency fuel treatment plan during a wildfire event. In light of this situation, wildfire information programs may want to stress how rapidly evacuation is likely to occur and the infeasibility of implementing an emergency fuel treatment plan.

Most study participants considered wildfire mitigation to be a multiyear task. They expressed trepidation when first introduced to possible fuel treatment options described as daunting all-or-nothing efforts. Community wildfire programs may be more effective if they describe mitigation actions, particularly landscape changes, as continuous activities that can start on a small scale. Likewise, changes to structures appeared to be more palatable to study participants than landscape changes. Perhaps this is also related to perceptions that landscape changes need to be all-or-nothing. Homeowners found information specific to their property to be most useful and likely to move them to taking action.

Notes

1. Larimer County is 93% White and Colorado is 83% White, according to U.S. Census (2000).
2. Quotes may have been shortened or edited to ease reading. Omissions of text are indicated by ellipses.

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