

**Project Title:** Affecting Risk: Improving Hazard Communication in the Wildland-Urban Interface

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## **I. Abstract**

Wildfire hazard is a growing problem in many areas of the United States, especially in the *wildland-urban interface* (WUI), where homes and other structures border or intermingle with forests, shrubs and grasslands. Despite years of educational outreach by fire management officials promoting effective and affordable mitigation strategies, research shows that residents, especially seasonal residents and those new to an area, still tend to under-invest in mitigation, even when they perceive their risk to be high. Meanwhile, the social and economic costs of wildfire have increased with fire size and intensity and far exceed the costs of mitigation. This problem has led to increased research on what factors influence wildfire hazard mitigation behavior, as well as how to improve communication and facilitate public involvement in strategic planning for wildland fire. Increasingly, researchers are uncovering the importance of the emotional relationships that residents have with certain places that, in turn, affect the perception, communication, and mitigation of risk.

This research from Truckee, CA addresses important questions about how emotion interacts with wildfire hazard perception in the WUI. A qualitative analysis of over 80 interviews with residents, fire, and community managers has revealed that WUI residents possess deep and complex emotional connections to “natural” spaces; that public opinion about and compliance with mitigation policy hinges on the way residents and risk managers define these spaces; and that the emotional characterization of wildfire hazard is very important in hazard communication. It also suggests that a focus on certain mitigation policies (like maintaining defensible space) over others (such as those that target the built environment), has led to a lopsided view on the part of residents as to what measures can and should be taken to reduce risk. Lastly, the research offers specific suggestions for fire managers on how best to work with the public to reduce community vulnerability to wildfire hazard.

## **II. Background and Purpose**

In recent decades, the wildland-urban interface has been the site of significant housing growth, in part reflecting residents’ affinity for open, rural spaces with access to natural amenities (Radeloff et al. 2005). WUI growth has been pronounced in the western U.S., particularly in forested areas and in areas adjacent to federal lands - of all new housing units built in California, Oregon and Washington in the 1990s, researchers found that 61 percent were located in the WUI (Hammer et al. 2007). Decades of fire suppression in many of these areas have led to heavy accumulation of understory fuels, substantially increasing the size and intensity of wildland fires that do occur. Climate change and insect and disease infestations in combination with continued housing growth are expected to exacerbate fire risk for communities in the WUI (Stewart et al. 2007).

Individuals and communities located in fire-prone regions have many choices available to them to mitigate the effects of wildfire hazard. At the individual level, homeowners can maintain a defensible space (an area of cleared or reduced flammable vegetation) around their homes; they can install fire-resistant materials on the exterior of their homes, or they can purchase fire insurance. Communities can support prescribed burning and mechanical thinning

to reduce fuel loads; they can maintain well-funded fire-response systems, and they can enforce planning measures (like steep-slope and road-width restrictions) to reduce individual exposure or promote effective response. Unlike other natural hazards, the physical dimensions of wildfire are such that vulnerability is to a certain extent shared throughout the community; residents' individual actions have the potential of reducing the risk of their neighbors. In turn, if some residents do not choose to individually act to mitigate the hazard, they are placing their neighbors at higher risk to a wildfire's increased intensity and extent. Individuals thus have a strong incentive to work together to reduce their risk as individuals and as a community. However, research shows that WUI residents, especially seasonal residents and those new to an area, still tend to under-invest in mitigation, even when they perceive their risk to be high (Radeloff et al. 2005, Davis 1990, McCaffrey 2004, Collins 2008). Meanwhile, the social and economic costs of wildfire have increased with fire size and intensity and far exceed the costs of mitigation. This problem has led to increased attention to what factors influence wildfire hazard mitigation behavior (Collins 2008), as well as how to improve communication and facilitate public involvement in strategic planning for wildland fire (Zaksek and Arvai 2004). Increasingly, researchers are uncovering the importance of the emotional relationships that residents have with certain places that, in turn, affect the perception, communication, and mitigation of risk (McGee et al. 2008). For instance, previous research has shown that WUI residents possess strong aesthetic preferences for thick, forested landscapes – landscapes that, according to fire managers, put structures at greater risk to wildfire (Nelson et al. 2005). Indeed, if many residents have moved to the WUI to be “close to nature,” it follows that their choices about how to manage this landscape would be influenced by their emotional attachment to these spaces. However, the training of risk managers tends to focus almost exclusively on the technical management of risk, and while they typically outperform residents in their understanding of the physical dimensions of wildfire hazard, risk managers tend to overlook social and emotional factors that might improve risk communication efforts (Zaksek and Arvai 2004). Risk perception specialist Paul Slovic points out that it is important to acknowledge that risk communication should be a two-way process between experts and nonexperts, noting that:

*Lay people sometimes lack certain information about hazards. However, their basic conceptualization of risk is much richer than that of the experts and reflects legitimate concerns that are typically omitted from expert risk assessments. As a result, risk communication and risk management efforts are destined to fail unless they are structured as a two-way process. Each side, expert and public, has something valid to contribute. Each side must respect the insights and intelligence of the other (Slovic 1987).*

Using qualitative methods (participant observation, interviews, and textual/visual analysis), this research addresses important questions about how emotion interacts with wildfire hazard perception to promote or hinder communication and subsequent mitigation in the WUI.

#### *Research Questions:*

1. How are spaces of home, community, and nature produced and experienced in the WUI?

2. How is wildfire hazard produced and experienced in the WUI?
3. What is the impact of these constructions on the vulnerability of the people and environment in the WUI to wildfire hazard?

### III. Study Description & Location

This research was based in Truckee, California, a town located in the Sierra Nevada WUI, roughly 13 miles from Lake Tahoe, along the California-Nevada border. A popular destination for campers, skiers, hikers, and others, Truckee is home to approximately 16,000 permanent residents; however, approximately 46 percent of the town's roughly 11,000 housing units are second homes. Thus, during peak tourism periods in the summer and winter, Truckee's population can effectively double (Town of Truckee 2006). According to the California Department of Forestry and Fire Protection, Truckee is located in a Very High Fire Hazard Severity Zone (CalFire 2008). Over the past 30 years, the community has experienced a dramatic increase in housing development, in large part as a result of new and seasonal residents who have



purchased homes in Truckee to be near the ample natural amenities offered in its wooded landscape. Truckee's population largely reflects this position as a tourist destination - although there are some lifelong residents of Truckee, the permanent population of the town is largely made up of transplants - many of whom are former part-time visitors to the region who eventually chose to settle in Truckee full-time. This type of urban-to-rural residential movement, termed *amenity migration*, has characterized population growth in a number of areas in North America, especially in mountain regions, and according to Loeffler and Stenicke (2007), it is the driving force behind the current population and settlement growth in the Californian Sierra Nevada. Amenity migration is a useful contextualizing tool for understanding Truckee, because it sheds some light on who is coming to these areas, why and how they choose to be there, and how their presence changes the cultural and physical character of the place. For instance, Moss points out that the people engaged in this type of movement are not exactly tourists, who visit an area for a short time and do not intend to reside or earn a living in their destination, nor are they economic migrants, who relocate primarily for economic gain. Amenity migrants, in contrast, are drawn to an area based largely on "a greater perceived *environmental quality*" (Moss 2004, 19 - our emphasis). Unlike other types of migrants, by purchasing a home in that place, amenity migrants make a remarkable (financial and lifestyle) commitment to the greater environmental quality that they perceive - a commitment that is not driven by financial gain.

With the backdrop of this growing population and shift to an amenity economy powered by seasonal residents and transplants, Truckee's fire protection district has struggled to meet the increased service needs resulting from the town's growth (Truckee Fire Protection District 2008). In addition to fire preparedness and response activities, public education and outreach are important components of Truckee's wildfire mitigation strategy. While some homeowners

associations in Truckee have established their own policies and systems for enforcement (with varying degrees of success), fire management organizations in Truckee largely lack the resources and political will to adequately enforce existing state laws governing wildfire mitigation, including the creation and maintenance of defensible space in residential areas. Since fire managers in Truckee must rely on the majority of homeowners to voluntarily comply with these policies, public perception of forestry and fire management practices is extremely important in reducing community vulnerability to wildfire hazard. For these reasons, Truckee is an excellent location for an investigation into the role of emotion in wildfire mitigation.

This research used a qualitative approach including informal and semi-structured interviews, participant observation, and the collection of textual and visual documents. Over five months and two summers, more than 80 interviews with residents and community managers were conducted in Truckee. Resident participants included both full-time and part-time homeowners from several neighborhoods including Tahoe Donner, Sierra Meadows, Glenshire, Donner Lake and others. Since most housing in Truckee is organized into discrete developments, each with their own demographic profiles, fire mitigation policies, visual landscapes, and subtly different fire ecologies, it was important to meet with participants from a variety of neighborhoods. During the interview, which took place in residents' homes and averaged about an hour, each person (or, in some cases, each couple) was asked to describe their experience with the environment in and around Truckee, with wildfire, and with fire management officials. They were asked to identify wildfire management activities their household performs or supports, or any that it opposes. Finally, residents were asked to evaluate outreach materials (brochures, mailers, and pamphlets) commonly used for hazard communication in Truckee. With permission, each interview was recorded and transcribed. The identity of each interviewee was kept confidential. These interviews generated a rich description of the physical, social and emotional features that are important to residents, as well as their opinions of forestry and fire management practices in Truckee.



*The landscape in Truckee is varied: thickly-wooded mixed conifer in some neighborhoods, with grass and sage-brush in others*

In addition to residents, community managers and other stakeholders were also consulted for this research, including fire and forestry personnel, defensible space contractors, local government officials, and representatives from various homeowners associations. Furthermore, over a dozen meetings, activities, and events were observed, including fire district board

meetings, defensible space inspections, prescribed fire planning exercises, fire safe council meetings, community outreach events, a wildland firefighting exercise, and a wildfire summit in the nearby Lake Tahoe Basin. During the fieldwork period textual and visual documents were also collected, including government and organizational policy papers, wildfire educational materials, promotional materials, historical documents, newspaper articles and other forms of popular media. Copious notes were taken throughout the data collection period. After all recorded interviews were transcribed, NVivo9 qualitative analysis research software was used to aggregate, organize, and code the interview transcripts, visual/textual materials, and research notes for analysis based on common themes and patterns identified in the data. First and second-cycle coding methods included attribute coding, descriptive coding, emotion coding and evaluation coding. Each coding method allowed for the formation of different categories of analysis - different 'lenses' through which to view, deconstruct, and reconstruct the data and uncover different themes and patterns.

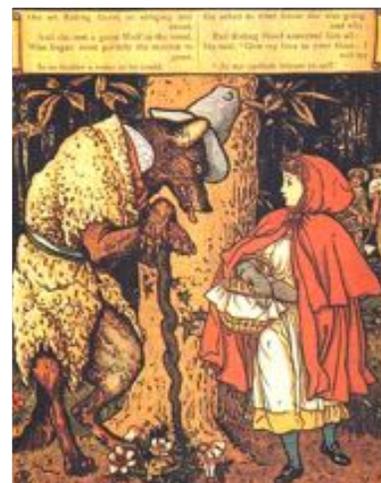
Following initial data analysis, a draft nontechnical summary for stakeholders was developed, detailing the major findings of the research. This draft was distributed widely - to all research participants and others in the wildfire management community. On a followup trip to Truckee in Summer 2012, the Co-PI verified and validated the analysis by seeking feedback and input from members of the community on the research findings via email, phone, small group meeting, personal interview, and at a Town Hall meeting held in Truckee. All information gathered was incorporated into the final stakeholder report, which was distributed widely to members of the study community, as well as to those in the greater wildfire and emergency management communities. A copy of the report was also made available on the Co-PI's research website.

#### **IV. Key Findings**

The qualitative analysis of over 80 interviews with residents and community managers, participant observation, and visual/textual materials, has revealed the following:

##### **A. WUI residents possess deep and complex emotional connections to 'natural' spaces, connections that influence their willingness to mitigate wildfire hazard**

In interviews, many Truckee residents articulated a Romantic view of nature. The Romantic Period was an artistic, literary, and intellectual movement that began in the late eighteenth century in reaction to the massive social, economic, cultural, and physical changes that occurred during the Enlightenment period. The massive population growth, urbanization, and industrialism of the time led to an effort to escape (in the imagination if not in reality) to simple, beautiful places beyond the reach of humankind. It was during this time that the western world's relationship to the external, 'natural' world fundamentally changed. Prior to the Romantic Period, natural places (especially the forest and mountains) were seen as dangerous, morally corrupt spaces that could only be redeemed



and made safe through civilized, rational use for human purposes. The fairy tales predating the Romantic Period offer a glimpse of this view of the wilderness as dark and threatening – Little Red Riding Hood, Hansel and Gretel and many other fairy tales take place in a foreboding wooded setting. The idiom “not out of the woods,” commonly used to describe a situation in which someone is not yet out of danger, alludes to this darker version of nature. But through the literary and artistic works of Emerson, Thoreau, Muir, Freidrich and others, the wilderness, forest and mountains began to be understood differently: as inspirational places of health, youth, freedom, and peace, where one could escape the corrupting influences of society and be closer to God:

*In the woods too, a man casts off his years, as the snake his slough, and at what period soever of life, is always a child. In the woods, is perpetual youth. Within these plantations of God, a decorum and sanctity reign, a perennial festival is dressed, and the guest sees not how he should tire of them in a thousand years. In the woods, we return to reason and faith. There I feel that nothing can befall me in life, no disgrace, no calamity, (leaving me my eyes) which nature cannot repair.*  
-Thoreau Nature

When asked to describe the landscape around Truckee, these Romantic themes were echoed time and again by residents - the terms “heaven” and “paradise” were frequently used, and residents, most of whom have migrated to the WUI from elsewhere, often described “falling in love” with the landscape. Some residents referenced Romantic authors specifically in describing their relationship with the forested area around their homes:

*So I've got one picture in my office...a photo of our back property, and it's just a little neat wooden frame and it's got a quote from Thoreau, so we've got the frame, got the picture, and all you see are trees. You know, you wouldn't really say a photographer took a beautiful picture that's got the stream and the mountains. It just looks like a mishmash of trees, but I saw this quote in a book and I liked it: “I went to the woods because I wished to live deliberately, to front only the essential facts of life and see if I could not learn what it had to teach and not, when I came to die, discover that I had not lived.”*

Significantly for fire management, the Romantic view of nature is one in which wilderness and civilization are sharply delineated – nature is understood as separate from culture, and wilderness is defined as a space uncontaminated by humankind. Previous research on the public perception of wildfire hazard has indicated that WUI residents possess a strong preference for privacy, however this project reveals an important nuance in residents’ relationships with the space around their homes: when homeowners indicate a preference for “privacy,” often they are not articulating an aversion to being seen by others, or even merely to seeing other people (indeed in some housing developments, neighbors in seasonal homes are rarely even present, let alone seen). Instead, residents are articulating their aversion to seeing any evidence of civilization that may shatter the “illusion of wilderness,” an illusion that allows them to access the positive emotions associated with the Romantic idea of nature:

(Interviewer): Why is it more meaningful for you to be in that space when there aren't a lot of folks around?

*I guess it ties back to what we talked about a few minutes ago, where my best feelings are the feeling of meditation and closeness to God, would be things where, if distracted by other people, I don't feel as close that way.*

*The only negative as far as I'm concerned is-- I'd like to be where I can't see my neighbors at all. I'd really like to be able to see nothing but woods in all directions, or lakes or something, and not any other houses...that's sort of what we have in [our other vacation home], we can't see any of our neighbors. They're there, but the trees cover them up. That's the only negative, I'd like to not see power lines, telephone cables, neighbors, roads. I'd really like this house kind of in the wilderness at the end of a very long, winding lane. That would be perfect, but it's pretty close.*

(Interviewer): How does it feel when you are in a natural place where you can't see any of the other houses or the roads, and how does that feel different?

*I just feel much more connected to nature. It's almost a spiritual sense, connected more to God and creation. And that's not to say that being connected to people isn't also important, but that's the feeling I have, it's a much more natural, individual, almost an original feeling, that's the way life was originally intended to be. That's the feeling I get. That's not the right way to feel or the only way to feel...It's kind of like a Thoreau, almost like a Walden communing with nature. It's just me and nature, and that's all it needs to be. I know it needs to be more than that, that's probably not quite enough, but that's the feeling I get.*

This relationship to 'natural' spaces explains many residents' strong reluctance to remove vegetation that screens their view of nearby roads and houses. For the homes in Truckee, most of which are located on small, subdivided lots often separated by only a thin border of trees and brush, this attachment to Romantic nature translates into a formidable barrier to implementing wildfire mitigation policies that focus on vegetation removal.

In contrast to many residents who preferred to think of their homes as being alone in the woods, the fire managers interviewed were more likely to view Truckee as a series of neighborhoods or subdivisions, akin to a suburban landscape with yards to be managed. In addition, unlike residents who articulated an almost entirely positive view of nature, fire managers tended to use more negative associations in describing nature:

*At that point there's nothing we can do. Mother Nature's winning the battle and will win the battle until the weather changes, the wind stops blowing or the fire runs into the Pacific Ocean or a patch of snow or whatever.*

*I don't think they even understand what Mother Nature has in store.*

The various and often contradictory conceptions of “Mother Nature” by residents and risk managers as both knowable and mysterious, benevolent and indifferent, vengeful and vulnerable, threatened and unstoppable; each of these examples serve to highlight the differences in the way residents and managers perceive and experience the WUI landscape, and provide important context for understanding the complexity of hazard communication.

### **B. Public opinion about and compliance with mitigation policy hinges on the way residents and risk managers define the spaces of home, community, and nature**

Surprisingly, in interviews, the vast majority of residents indicated that they were satisfied with their interactions with Truckee’s fire managers, even those in which residents were asked to remove trees and vegetation. When asked to describe these exchanges, many residents described being given careful explanations of the impact of decades of fire suppression, how large trees were competing with small trees for resources, of the importance of selecting for the success of certain tree species, and that disease (as well as fire) could be prevented through these techniques. These findings corroborate previous research indicating that WUI residents are more likely to support mitigation policies for reasons related to ecological or forest health, as opposed to fire management specifically (McCaffrey et al. 2008). Fire managers, for their part, have learned to tailor their verbal messages to residents' Romantic attachment to natural spaces. As one manager explained:

*A lot of the people here are, I don't want to say Sierra Clubbers, but that's on their minds. "We know that we've bought this house and we've changed the environment by plopping it down here. We drive up here and use gas and we don't feel good about that, but we're doing our part to improve the health of the forest in our little world." And I think a lot of them feel good, especially when they see what it's supposed to look like. And I refer to a book that was written a number of years ago by George Gruell: Fire in the Sierra Nevada Forests. Perfect examples. And I met a couple yesterday who are obviously very interested in it and I refer them to this book. "You folks take a look at this book and then call back and we'll talk some more." They are one of those people that have such thick tree growth that you couldn't even go in there and mark trees for them. There were so many little tiny lodge pole pines everywhere. And you're going, "This is awful. This looks horrible right here. What kind of privacy are you getting?" So it took a while to battle with them, because they didn't want to cut anything down: "Oh my God, I'm killing this thing." "Well if you don't do it now a fire will come kill it or bugs will come in and take all the big trees with it."*

In interviews, residents themselves indicated that they were largely more responsive to communication strategies that stress the importance of forest health, over that of fire risk reduction or community responsibility:

*As I recall, there were basically three kinds of levels, and they said you can do A, B, or C. And A was, dead trees are going to fall, and they constitute a current hazard, and you don't have very many of them but you do have some. And you just need to take care of that, that's part A. Part B is, for lack of a better term, I'll call fire management, and there are trees that are too close together, there are dead limbs, there are things overhanging your house, there's stuff like that...and then there's C, which is the health of the forest, and the health of the forest requires that you take out small trees so the big trees can get bigger, or you take out big trees so the small trees can get bigger, but basically you manage the forest floor and you manage the available light so that trees can get strong and too many trees are not competing for the same limited resources, and that you can do whatever you want about. Don't feel any obligation. So, they kind of had that, and I said good, now mark the trees red, white, and blue, or whatever colors you want so I know what you're talking about, and we ended up doing all three.*

(Interviewer): And why did you decide to go with the forest health side as well as the fire side?

*You know, it felt like an obligation. It feels like this is a beautiful area, you don't want to leave it less beautiful than it was, you don't want to leave it less healthy than it is. If anything, you want to try and improve on that. And that's kind of, there's nothing in it for you, whereas the others you can argue it's a safety issue, but for that part, it's just kind of taking care of the land that you've been privileged to occupy and use. So, I'd like to think we're making it more beautiful. It's hard to imagine making it more beautiful, it's so pretty the way it is.*

(Interviewer): But it felt like something you could feel good about doing?

*Yeah, it felt like just taking care of the thing that you'd been given.*

These examples provide a glimpse into the complexity and impact of people's emotional relationship to community, nature and wildfire hazard – on the one hand, residents' Romantic relationship with natural spaces serves as a logical barrier to hazard mitigation: if residents prefer to believe that they are alone in the wilderness, appeals to public safety or neighborly citizenship are less effective messages, because they rely on an entirely different view of that space. On the other hand, if managers appeal to residents' strong attachment to nature and the ethos of environmental stewardship, this barrier can be effectively overcome, and residents will feel positively about their choice to remove vegetation from around their homes.

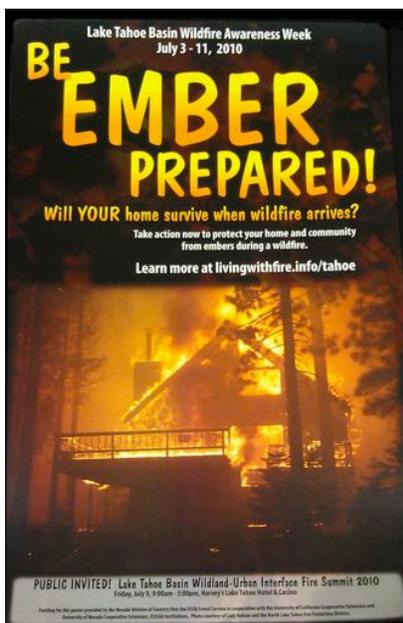
### **C. The emotional characterization of wildfire hazard is very important in hazard communication**

While Truckee's fire managers have largely aligned their verbal messaging strategies with residents' positive emotional relationship to natural spaces, in contrast, the visual communication materials (brochures, flyers, and handouts) used for public outreach in Truckee tend to rely primarily on fear-based communication. Photos of flaming houses and burned out forests adorn most of the materials mailed or handed out to residents in Truckee. Despite deploying more nuanced, positive messaging in personal interactions with residents, several

fire managers argued in interviews that people “just don’t care” about wildfire, that that fear is the only way to catch people’s attention and motivate change. Noting that mitigation behavior on the part of residents tends to increase in the aftermath of an actual wildfire threat, managers appear to be attempting to instill a similar sense of urgency through their visual communication methods. Findings from this project indicate, however, that while fear-based materials do resonate for some residents, others are repelled, distracted, and annoyed by such strategies, which are then discounted as “scare tactics.” In contrast to the urban areas where many WUI residents originate, Truckee is overwhelmingly viewed as a safe community. Residents have deep and longstanding positive associations with the area, using emotive words such as calm, content, free, fun, happy, healing, peaceful, relaxing, serene, spiritual and especially *love* to describe their feelings about living in Truckee. Given these findings, this



*Mailer sent to residents in the Tahoe Donner neighborhood*



*Poster for public outreach event*

research suggests that managers should take care to recognize the potential impact of the emotional characterization of wildfire on their audience. Fear appeals should be used thoughtfully, strategically, and as a complement to more positive visual messaging that leverages people’s strong attachment to the landscape. To the degree possible, visual materials should reflect the local context, be interactive, and incorporate the history and ecology of the area. As opposed to implicitly constructing mitigation behavior as a reaction to a low-probability extreme event by using dramatic images of the “worst-case scenario,” visual materials should normalize wildfire mitigation practices as just another part of living in (and properly caring for) a forested, mountain landscape – akin to staining a deck, shoveling snow, and placing garbage in bear boxes. Lastly, community managers should make a special effort to connect with residents when they are new to the area and beginning to establish their habits of seasonal home and yard maintenance, since residents tend to be more receptive to messages during that time.

**D. A focus on certain mitigation policies over others has led to a lopsided view on the part of residents as to what measures can and should be taken to reduce risk**

In interviews, Truckee residents were largely familiar with the policy of defensible space and were able to describe the activities required to create and maintain it around their homes with varying degrees of accuracy. This suggests that various outreach efforts to date have oriented residents to the importance of managing the vegetation surrounding their homes. When asked

how they learned what they know about wildfire mitigation, residents often referred to homeowners association newsletters, newspaper articles, and personal interactions with fire management personnel. However, residents were almost entirely unaware of what activities they could be doing to the home itself to protect against wildfire (with the exception of replacing a shake roof). Recent research suggests that many activities can be done to reduce a home's structural vulnerability to wildfire, especially given that many WUI structures are lost not from direct flame contact, but via ember intrusion into vents, eaves, open windows and garage doors, or by the ignition and combustion of flammable materials located on and around decks and roofs (Cohen and Stratton 2008). Such activities include simple, inexpensive projects most homeowners could easily do on their own, like replacing venting materials with finer-gauge mesh, adding angle flashing to gaps between roof sheathing and fascia boards, and covering woodpiles with fire-resistant materials; to larger-scale activities like upgrading decking material and boxing-in eaves (see [firecenterbeta.berkeley.edu/bwmg](http://firecenterbeta.berkeley.edu/bwmg) for more information on these activities) (Quarles et al. 2010). In their interactions with residents, however, fire managers in Truckee tended to focus almost entirely on defensible space activities targeting vegetation, ignoring many of these other structural adjustments. The orientation toward vegetation is understandable given the background and expertise of the forestry personnel who play a prominent and positive role in targeting behavior change in the Truckee area. However, interview data suggest that for WUI residents, many of whom may have the interest and resources to invest in these incremental structural improvements, balancing messages advocating defensible space with those targeting the built environment could have a major impact. It is important to mention that structural improvements to the home should be seen as a compliment to, and not a substitute for vegetation reduction policies. In the interest of reducing net community vulnerability to wildfire, however, a unidimensional focus on vegetation is most certainly excluding the potential benefit of these activities.

## **V. Management Implications**

This research shows that far from acting as impartial authorities on fire policy, fire managers are active in constructing and framing fire as a hazard, and are also embedded in an institutional and cultural context that helps or hurts their ability to connect with residents. On the one hand, forestry personnel can employ detailed information about ecosystem needs and vulnerabilities that may convince a resident to remove vegetation, and fire officials may command respect as community leaders. However, disregarding homeowners' experiences and strong emotional attachment to the land can squander the common ground that is inherently built into the relationship between fire managers and the public: shared commitment to a common place. In interviews, fire managers often articulated a frustration with the public for not "doing what they are supposed to be doing" with regards to the land. Several managers identified "homeowner apathy" as a major barrier to wildfire mitigation, lamenting time and again that "they just don't care." On the other hand, these same managers criticized homeowners for their attachment to trees and nature - calling them "tree huggers" and "Sierra Clubbers." It seems the issue isn't so much that homeowners "don't care," but rather that they don't care about the same things that fire managers do - or care in the same way that fire managers do. The qualitative exploration of this "caring" - this emotional relationship with the space of the WUI, and with wildfire hazard, points to several policy implications:

### **A. Outreach should focus on the ecological basis for fire mitigation**

This research suggests that amenity migrants in WUI areas are far more receptive to communication techniques that emphasize the ecological value of vegetation treatments to the environment around the home, rather than those that focus on the importance of protecting the house or neighborhood. Furthermore, in their interactions with managers, residents in Truckee had a great interest in understanding the need to remove trees and vegetation. This suggests that in planning outreach efforts, fire managers should budget time and resources to provide this type of detailed, locally-specific ecological information to residents. Also, managers should forge partnerships with other environmentally-oriented organizations and movements, like nurseries, local native plant chapters and watershed councils, to combine efforts to reach the public. To improve message efficacy, they should leverage the strong environmental stewardship ethic possessed by many residents, and frame their messages as protecting, conserving, and restoring WUI areas.

### **B. Interactions should be interactive, collaborative, and respectful of resident experiences**

It is important for fire managers to recognize in working with residents that even though many people may have purchased a home fairly recently, they often have longterm relationships with the area - as childhood visitors, seasonal renters, or even as part of a broader cultural association with forested or rural spaces. Although they may be lacking certain information, residents do possess important knowledge about the area - knowledge that should be engaged in order to build trust. To build trust between managers and the public, it's important for residents to feel heard. Residents' experiences, memories and connection to the land should not be trivialized as "aesthetic preferences," but acknowledged as a fundamental reason for their existence in the space to begin with. The cultural connection to Romantic nature is longstanding, but this research shows that it is not incompatible with fire management activities. Managers should use care in attempting to change residents' view of the landscape (i.e. "it's not really natural," "this is a neighborhood, not a forest"). Instead, managers should try to see the landscape the way residents do, and determine what message would work best with that vision. For instance, in anticipation of resident resistance to removing vegetation screening nearby houses, a greater effort could be placed on promoting ecologically-appropriate, fire-resistant screening materials (i.e. willow, aspen, etc) for WUI subdivisions, so that residents will be more comfortable with trimming between houses. In facilitating defensible space inspections and marking trees for removal, managers should budget time to listen to resident concerns, and build common ground with residents by emphasizing their common connection to forested spaces and their commitment to forest health.

### **C. Interactions should balance the built environment with vegetation management strategies**

A heavier incorporation of detailed built environment guidelines should be incorporated into all messaging, but especially in face-to-face interactions with residents. Since structures make up a large part of the "fuel" in WUI forests, forestry and fire management personnel and local contractors in the area should be trained to provide detailed advice regarding the points of

structural vulnerability to flames and embers on the exterior of the home, much as they would provide if they were instructing a homeowner which trees should be thinned. Managers should be trained to provide recommendations as to what activities residents can do at various levels of effort and investment, with a special focus on retrofitting existing homes. Especially accessible activities include replacing vent mesh with a finer grade, adding angle flashing to the gap between roof and fascia-boards, and encouraging residents to use a fire-resistant woodpile cover. In alpine areas like Truckee, some retrofit projects would have the double benefit of providing more durability to harsh elements. For instance, upgrading decking or siding to a fire-resistant material would not only lower structural vulnerability, but also improve maintenance and durability. In California, since 2007 all new construction in wildfire-prone regions is required to abide by strict fire codes regulating what materials may be used on the exterior of the home (CBC Chapter 7A). As a result of the growing demand and competition spurred by the law, the cost of fire-resistant materials is continuing to drop into a more accessible range. This represents an opportunity for fire managers and local contractors to present building upgrades as an affordable and worthwhile investment.

In addition to working with homeowners directly, community and regional fire organizations should also balance strategies targeting the built environment with those geared toward vegetation management. Fuels treatments have long been a primary target of funding appropriations made available to local entities like Fire Safe Councils. Regional and state granting agencies should consider calling for proposals to fund public outreach projects targeting awareness about the built environment - for instance, a program sponsoring a community giveaway of flashing material, subsidy of deck replacement costs, or brochures that are geared toward retrofitting homes. Viewing local fire management successes merely based on “total acres treated” adds to the misperception that the only fuels in the forest are brush, trees, and pineneedles. Expanding this understanding to include the complete human-environment must involve the fire management community at all scales.

#### **D. Improvements can be made in visual communication with stakeholders**

Visual marketing efforts (brochures, handouts, mailers, billboards, public service announcements, websites, etc) intended to induce behavior change should be purposeful in their use of all visual elements. Fear appeals should be used sparingly, and photos of flames and burned areas should be instructive (for instance, showing the flame height from dried pine needles), and not merely decorative, or a way to “capture attention.” Bright red and yellow fonts and dramatic phrases would be better substituted with calming, organic palettes advocating reasoned action. To normalize wildfire management practices, developers of visual materials should consider combining guidelines for wildfire management with other advice about living in and properly caring for a home in a wildland area. Given the growth in the number of new residents in WUI areas, and the receptivity of new residents to information and advice about, in effect, ‘how to be a mountain person,’ a welcome-wagon booklet including tips for seasonal home maintenance, dealing with wildlife, and hardening the yard and home against wildfire might be an especially powerful tool. Such a booklet could be distributed by local real estate agents, insurance agents, or homeowners associations, and could include contact information for local contractors approved to consult on projects needed around the home.

Materials should focus on the ecological role and history of fire, and explain that fire management activities are intended to replicate and restore the function of natural ecosystems, not just protect communities and homes. In interviews many participants articulated a desire to know where landscape photos were taken, as a way to evaluate whether the accompanying information was applicable to them. As a result, we suggest that visual materials be as locally-specific as possible, taking into account local cultural norms and barriers (for instance, a photo from Southern California may not only be ineffective in a Northern California publication, but may perhaps even backfire). Materials that are developed for regional or statewide use might benefit from conversion to a template that local fire management organizations can populate with their own photos of the local landscape.

Lastly, to the degree possible, materials designers should leverage peoples' strong and longstanding relationship with the environment around their home. In interviews, several participants shared fond memories of seasonal family work weekends or "pine needle pickup parties" held throughout a resident's life. Managers can build positive associations by encouraging seasonal residents to organize seasonal family or neighborhood gatherings to work on the property. Visual and photographic themes can frame these activities as opportunities to create memories and strengthen the connection between home, family, and nature.

## **VI. Relationship to Other Recent Findings and Ongoing Work on this Topic**

This research informs and relates to a number of ongoing research themes in the wildfire mitigation literature:

As discussed in the original proposal for this research project, studies of wildfire perception and communication have traditionally applied quantitative, survey-based approaches to collecting data. While these methods are excellent for describing broad patterns and identifying characteristics, they are less equipped to provide the texture and explanatory power necessary to understand intangible concepts like love, fear, safety, home, and community. In its deeply qualitative approach, this research unpacked the relationship between people and the nature that underpins many residents' choices to mitigate wildfire in the WUI. Other studies have indicated, for instance, that WUI residents are more responsive to messages advocating wildfire mitigation policies when managers emphasize their ecological benefit (Weisshaupt et al. 2005, McCaffrey 2008). A new study out of The Ohio State University specifically advocates the use of messages that frame fuel management as necessary "to restore lost forest health" (as opposed to maintaining or improving forest health) (Wilson, Ascher and Toman 2012). The qualitative approach implemented in our research project suggests an explanation for this pattern - the affinity of WUI residents for a Romantic conception of nature as being vulnerable, under threat, and worthy of protection, conservation, and restoration. We believe this context may allow managers to better understand and relate to residents in their efforts to change mitigation behavior in the WUI.

Recently, other researchers have begun working in this deeply qualitative vein - Christine Erikson from the University of Wollongong, Australia, has recently written several pieces (and a forthcoming book) on gender and wildfire, and the role of local environmental knowledge in

building resilience to wildfire. She has used both qualitative and mixed-methods approaches, within a critical feminist framework (Erikson and Prior 2011; Erikson forthcoming). Briony Towers at the Royal Melbourne Institute of Technology also recently completed research using semi-structured interviews to explore how children in southeastern Australia understand wildfire hazard (Towers 2012). Although the subject matter of the research may differ, there is a lot of theoretical and methodological overlap between these research studies and our own, suggesting an encouraging growth in the application of this type of thick qualitative inquiry to studies of wildfire perception and understanding - especially out of Australia. While the popularity of qualitative and mixed methods studies may be growing, the wildfire literature in the United States is still largely bereft of critical qualitative research - both on its own, and as a complement to quantitative approaches.

## **VII. Future Work Needed**

It is generally understood in the wildfire management community that face-to-face interactions between fire managers and residents are the most effective way to influence resident behavior (McCaffrey 2004b). However, limited resources continue to constrain the ability of individual managers to work one-on-one with residents. For that reason, it is important for the fire management community to optimize their messaging through other media - be they visual, social, or informal. While this research suggests areas for improvement in the construction of visual media, it's crucial for the impact of this media to be measured, tested, and itself improved. Studies are needed that test the efficacy of newly-designed campaigns and messages, be they local or national, like the Fire-Adapted Communities Campaign and the FireWise Communities Campaign. Given that visual information is often distributed instead of, or as a complement to face-to-face interactions with residents, the systematic improvement of this material and its delivery is an area for potential growth that has considerable research value.

As a way to balance the focus of wildfire mitigation efforts on both the built environment and vegetation, more interdisciplinary research should be conducted and disseminated that tests and prioritizes what points of structural vulnerability are most important for retrofitting an existing structure in a WUI context. While there are many studies of who is treating acreage, how, and why, more information is needed as to who is retrofitting their homes, how, and why. The role and potential role of the insurance industry in promoting retrofitting in WUI areas should also be explored. Given resident reluctance to remove vegetation (especially trees), research comparing receptiveness of homeowners to certain messages targeting the built environment versus those targeting vegetation could be useful for optimizing message efficacy. In addition, Landscape Architects could play an active role in planning and testing strategies for maintaining healthy and safe vegetation densities in WUI subdivisions, while also preserving a viewshed that minimizes the view of homes and other markers of civilization.

In interviews, while residents were largely familiar with the concept of defensible space as referring to the removal of vegetation from around their homes, they were less certain as to exactly how far around their homes they should treat the land, how high up they should cut branches, etc. For their part, fire managers in the area had varying definitions of what constituted adequate defensible space, but they generally agreed that the state law of 100 feet

around the home was draconian, and not applicable to a Truckee context. Residents were often confused by the mixed messages they received from managers and handouts. Although it was beyond the scope of this project, more research is needed into exactly how “defensible space” is defined in practice, which definitions are adequate, and how these definitions impact homeowner behaviors.

### VIII. Deliverables Cross-Walk

| <b>Deliverable Type</b>                | <b>Description</b>   | <b>Status</b>   |
|--|--|---|
| <b>Invited academic presentations</b>  | <ul style="list-style-type: none"> <li>(1) Presentation at the Annual Association of American Geographers Meeting, NY. Item #10219</li> <li>(2) Presentation at the 3rd Human Dimensions of Wildland Fire Conference, Seattle. Item #10219</li> <li>(3) Presentation at the FEMA Emergency Mgmt in Higher Education Conference, Emmitsburg, MD. Item #10219</li> </ul>   | <ul style="list-style-type: none"> <li>(1) Completed</li> <li>(2) Completed</li> <li>(3) Completed</li> </ul>       |
| <b>Non-refereed publications</b>       | <ul style="list-style-type: none"> <li>(1) Aman, D.D. (non-technical summary of results for stakeholders). “Fighting Fire with Nature.” Item #10207</li> <li>(2) Aman, D.D. (extended abstract). Fighting Fire with Nature. <i>Proceedings of the 3rd Human Dimensions of Wildland Fire Conference, 2012</i>. Item #10208</li> </ul>   | <ul style="list-style-type: none"> <li>(1) Completed</li> <li>(2) In press</li> </ul>                               |
| <b>Poster/handout</b>                  | <ul style="list-style-type: none"> <li>(1) Aman, D.D. (informational flyer for stakeholders). “Fighting Fire with Nature: How homeowner preference for ‘natural’ landscapes can be used to promote wildfire mitigation in the Wildland-Urban Interface.” Item #10209</li> </ul>  | <ul style="list-style-type: none"> <li>(1) Completed</li> </ul>   |
| <b>Stakeholder outreach activities</b> | <ul style="list-style-type: none"> <li>(1) Invited research talk at Sierra Club, Clair Tappan Lodge, Truckee, CA: July, 2011. Item #10222</li> <li>(2) Invited research talk at USFS headquarters, Washington DC: May, 2012. Item #10223</li> <li>(3) Town Hall stakeholder outreach presentation, Truckee, CA: Aug, 2012. Item #10224</li> </ul>  | <ul style="list-style-type: none"> <li>(1) Completed</li> <li>(2) Completed</li> <li>(3) Completed</li> </ul>       |
| <b>Referred publication(s)</b>         | <ul style="list-style-type: none"> <li>(1) Aman, D.D. (manuscript). Tree-huggers and Firefighters: Affecting risk in the wildland-urban interface. <i>Emotion, Space, and Society</i>.</li> <li>(2) Aman, D.D. (manuscript). Fighting Fire with Nature: Improving hazard communication in the wildland-urban interface. <i>International Journal of Wildland Fire</i>.</li> <li>(3) Aman, D.D. (manuscript). Toward a Feminist Study of Natural Hazards. <i>Journal of Natural Hazards</i>.</li> </ul> | <ul style="list-style-type: none"> <li>(1) In progress</li> <li>(2) In progress</li> <li>(3) In progress</li> </ul> |
| <b>Ph.D. Dissertation</b>              | <ul style="list-style-type: none"> <li>(1) Aman, D.D. (manuscript). Affecting Risk: Improving Hazard Communication in the Wildland-Urban Interface. Planned doctoral defense: March, 2013</li> </ul>   | <ul style="list-style-type: none"> <li>(1) In progress</li> </ul>   |

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