

Fighting Fire with Nature:

How homeowner attachment to 'natural' landscapes can be used to promote wildfire mitigation in the Wildland-Urban Interface

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INTRODUCTION

Wildfire hazard is a growing problem in many areas of the United States, especially in areas where homes and other structures border or intermingle with forests, shrubs and grasslands. Deemed the *wildland-urban interface* (WUI), such areas have been characterized by significant housing growth in recent decades, in part reflecting residents' affinity for open, rural spaces with access to natural amenities.¹ 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.² Decades of fire suppression in many of these areas have led to heavy accumulation of understory fuels (small trees and shrubs), 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.³

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.^{1,4,5,6} 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,⁶ as well as how to improve communication and facilitate public

involvement in strategic planning for wildland fire.⁷ 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.⁸ 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.⁹ 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 efforts⁷. 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.*¹⁰

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?

STUDY AREA

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.¹¹ According to the California Department of Forestry and Fire Protection, Truckee is located in a Very High Fire Hazard Severity Zone.¹² 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. Meanwhile Truckee's fire protection district has struggled to meet the increased service needs resulting from this growth.¹³ 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.

METHODS & ANALYSIS

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



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

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, each person 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.

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, a number of meetings 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 various textual and visual documents were 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.

RESULTS

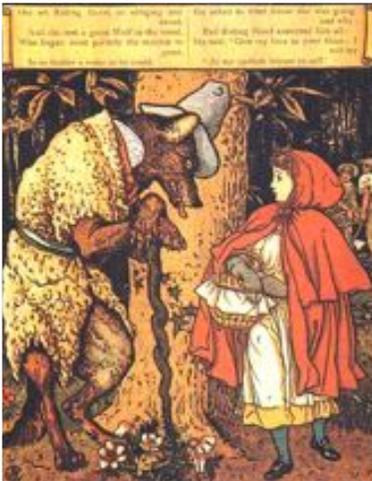
The qualitative analysis of over 80 interviews with residents and community managers, participant observation, and visual/textual materials, has revealed the following:

1. WUI residents possess deep and complex emotional connections to 'natural' spaces

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.

You know, right now we have a real sense of privacy down here, and so that would be one way to describe it. If you took out enough trees here, we'd lose that sense of privacy. And as a matter of fact, the trees here provide, you know, it makes you...feel like you're not in a housing development, which you are. You know, so it's to maintain the illusion of wilderness.

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.

2. 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 specifically¹⁴. 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.

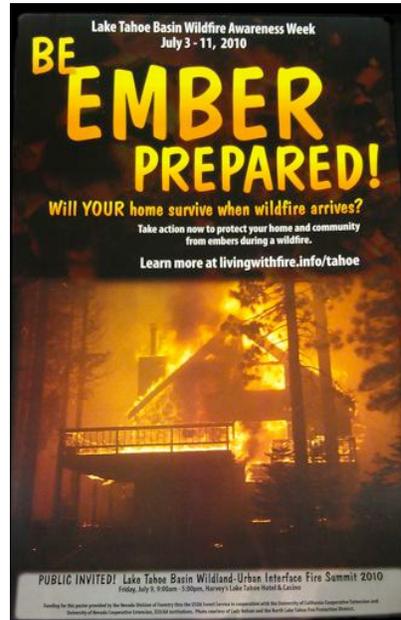
(Interviewer): But it felt like something you could feel good about doing?

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.

3. 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



Poster for public outreach event

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



Mailer sent to residents in the Tahoe Donner neighborhood

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 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.

4. 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.¹⁵ 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 for more information on these activities).¹⁶ 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. 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.

CONCLUSION

This research indicates that since so many of Truckee's residents have come from somewhere else, their relationship with Truckee as a place (and their choices about how they will change or reproduce that place according to their aesthetic preferences) is in part determined by their collectively held cultural views on other spaces - forest, mountain, home, and community, spaces in the cultural imagination. This project shows that understanding how these spaces operate to both enable and constrain behavior can help fire managers better connect with WUI residents. Specifically, this research suggests that managers should align their outreach efforts with residents' positive emotional attachment to 'natural' spaces; limit the use of fear-based communication strategies, particularly in the design of visual materials; and balance messages advocating defensible space with those targeting the built environment.

ACKNOWLEDGEMENTS

In addition to the many people of Truckee who generously contributed their time to this project as participants, I owe an enormous thanks to the following people for their help and cooperation, and for providing letters of support that enabled the funding of this research:

- Dan Warren, Glenshire Homeowners Association
- Bill Houdyschell, Tahoe Donner Forestry
- Bob Belden, Truckee Fire Protection District
- Joanne Drummond, Nevada County Fire Safe Council
- Doug Rinella, CalFire
- Linda Ferguson and Joanne Roubique, USFS

This research was supported by the Association of American University Women, the Joint Fire Sciences Program, the Penn State Department of Geography, and the Sagehen Creek Field Station.

REFERENCES

- ¹Radeloff, V. C., R. B. Hammer, S. I. Stewart, J. S. Fried, S. S. Holcomb and J. F. McKeefry. 2005. The Wildland-Urban Interface in the United States. *Ecological Applications* 15 (3): 799-805.
- ²Hammer, R. B., V. C. Radeloff, J. S. Fried, and S. I. Stewart. 2007. Wildland-urban interface housing growth during the 1990s in California, Oregon and Washington. *International Journal of Wildland Fire* 16: 255-265
- ³Stewart, S. I., V. C. Radeloff, R. B. Hammer, and T. J. Hawbaker. 2007. Defining the Wildland-Urban Interface. *Journal of Forestry* June: 201-207.
- ⁴Davis, J.B. 1990. The Wildland-Urban Interface: Paradise or Battleground? *Journal of Forestry* January: 26-31
- ⁵McCaffrey, S. 2004. Thinking of wildfire as a natural hazard. *Society and Natural Resources* 17:509-516.
- ⁶Collins, T. W. 2008. What influences hazard mitigation? Household decision-making about wildfire risks in Arizona's White Mountains. *The Professional Geographer* 60(4): 508-526.
- ⁷Zaksek, M., and J. Arvai. 2004. Toward improved communication about wildland fire: Mental models research to identify information needs for natural resource management. *Risk Analysis* 24 (6): 1503-1514.
- ⁸McGee, T. K, B. McFarlane, and J. Varghese. 2009. An examination of the influence of hazard experience on wildfire risk perceptions and adoption of mitigation measures. *Society and Natural Resources* 22: 308-323.
- ⁹Nelson, K.C., M.C. Monroe, and J.F. Johnson. 2005. The Look of the Land: Homeowner Landscape Management and Wildfire Preparedness in Minnesota and Florida. *Society and Natural Resources* 18:321-336.
- ¹⁰Slovic, P. 1987. Perception of Risk. *Science* 236 (4799): 280-285.
- ¹¹Town of Truckee. 2006. "Population, Employment and Housing." *2025 General Plan*. p. 4.10-2
- ¹²CalFire. 2008. Nevada County Very High Fire Hazard Severity Zones in LRA as Recommended by CALFIRE. 24 November 2008. Accessed online 18 January 2010 at http://www.fire.ca.gov/fire_prevention/fhsz_maps/fhsz_maps_nevada.php
- ¹³Truckee Fire Protection District. 2008. Resolution of the Board of Directors of the Truckee Fire Protection District of Nevada County Acknowledging Responsibilities of

Planning for Growth on Services Provided, and Determining Preferred Offset. Resolution 35-2008.

¹⁴McCaffrey, S., J.J. Moghaddas, and S.L. Stephens. 2008. Different interest group views of fuels treatments: survey results from fire and fire surrogate treatments in a Sierran mixed conifer forest, California, USA. *International Journal of Wildland Fire* 17:224-233.

¹⁵Cohen, J. D., and R. D. Stratton. 2008. Home destruction examination–Grass Valley Fire. USDA Forest Service Report R5-TP-026b.

¹⁶Quarles, S.Q., Y. Valachovic, G.M. Nakamura, G.A. Nader, M.J. DeLasaux. 2010. Home Survival in Wildfire-Prone Areas: Building materials and design considerations. *Agriculture and Natural Resources*. University of California. Publication 8393.

NOTE: A draft version of this report was circulated widely and feedback was sought from all research participants. This final version incorporates participant input.

*This research was approved by the Penn State University Office of Research Protections
IRB#: 34187*

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Printed: November 1, 2012