

**Social Science at the Wildland Urban Interface: 2000 –
2010 Annotated Bibliography**

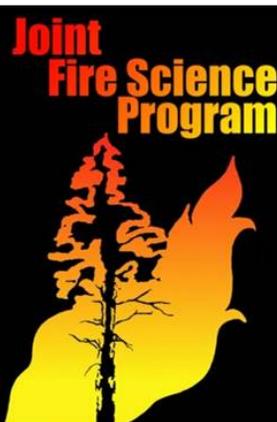
Eric Toman, The Ohio State University

Melanie Stidham, The Ohio State University

**Sarah McCaffrey, USDA Forest Service, Northern
Research Station**

Bruce Shindler, Oregon State University

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Introduction

Over the past decade, a growing body of research has been conducted on the human dimensions of wildland fire. The expanding body of research now addresses a wide range of topic areas including pre-fire mitigation and preparedness, community-agency dynamics, experiencing a wildfire, and policy/planning. As this research has matured, there has been a recognition of the need to examine the full body of resulting literature to synthesize disperse findings and identify lessons learned across studies. These lessons can then be applied to fostering fire adapted communities; those communities that understand their risk and have taken action to mitigate their vulnerability and increase resilience.

As part of a larger project funded by the Joint Fire Science Program, this annotated bibliography and accompanying subject area guide were created to support development of a compendium of social science research findings from 2000 – 2010 related to fire-adapted communities¹. In total, 242 articles were selected for analysis. Articles were included based on meeting the following criteria. 1) They addressed one or more issues related to fire management using an established social science approach (economic studies were excluded from the review due to fundamental differences in approaches and resulting data). 2) They were published in peer-reviewed or editor reviewed literature (including USDA Forest Service General Technical Reports and conference proceedings). Lastly, they were published or in “in press” status (indicated by †) between January 1, 2000 and December 31, 2010.

Using these criteria, literature searches were conducted using several online databases (e.g., Web of Science, Treesearch, Google Scholar) using pre-identified keywords (e.g., wildfire, social, public, perception, mitigation, community, thinning, prescribed burn, evacuation, communication). Searches were also performed on the most prominent social scientists active in studying fire management issues and in the journals that most often publish fire social science literature. The resulting database of articles was provided to an external group of scientists who reviewed for completeness. Through these efforts, the research team completed a review of more than 242 publications of research results authored by well over 100 individual authors.

Using an approach similar to grounded theory (a systematic methodology that applies a set of procedures to identify conceptual categories and their interrelationships—see Glaser and Strauss 1967), the research team reviewed each article, categorized key findings and identified twelve overarching themes: acceptance of fuels management and wildland fire use; perceptions of wildfire risk; community/homeowner preparedness and mitigation; community capacity; communication and outreach; community-agency interactions; trust in management agencies; community response to wildfire and post-fire recovery; wildfire impacts on recreation; institutional capacity and barriers; wildfire planning; and wildfire policy.

For the compendium, the themes were consolidated into five general topic areas. The subject area table, reflecting the original twelve themes, indicates the themes addressed in each article and provides a basic description of the methods used in each study (e.g., survey, interviews, synthesis of existing research). A basic summary of the findings for the twelve themes can be found in McCaffrey et al. 2012². Following the subject area guide, each paper is listed alphabetically with a full citation and abstract. In cases where no abstract was provided, the initial introductory paragraphs of the paper are provided to describe the article’s contents.

¹ Toman, Eric; Stidham, Melanie; McCaffrey, Sarah; Shindler, Bruce. 2012. **Social science at the wildland-urban interface: a compendium of research results to create fire-adapted communities**. Gen. Tech. Rep. NRS-xxx. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. XX p.

² McCaffrey, S.; Toman, E.; Stidham, M.; Shindler, B. 2012. Social science research related to wildfire management: an overview of recent findings and future research needs. *International Journal of Wildland Fire*. [online]. Available: <http://dx.doi.org/10.1071/WF11115>.

Author (see Bibliography for full citation)	General methods	Pre-fire mitigation/preparedness				Community-agency dynamics			Experiencing fire		Institutional considerations		
		Acceptance of fuels mgmt/ wildland fire use	Perceptions of risk	Preparedness / mitigation	Community capacity	Communication/ outreach	Community-agency interactions	Trust in mgmt agencies	Community response/ postfire recovery	Recreation	Institutional capacity/ barriers	Wildfire planning	Wildfire policy
Abrams and Lowe, 2005	Synthesis	x						x					
Absher and Vaske, 2011 [†]	Survey			x				x					
Absher and Vaske, 2006	Survey	x		x									
Absher et al., 2008	Survey	x											
Absher et al., 2006	Survey	x											
Absher et al., 2009	Synthesis	x		x									
Agrawal and Monroe, 2006	Survey			x	x								
Aplet, 2006	Policy review										x		x
Arvai et al., 2006	Workshop, surveys		x										
Bates et al., 2009	Survey			x									
Becker and Viers, 2007	Synthesis				x								x
Bell and Oliveras, 2006	Survey	x											
Black et al., 2008	Policy review										x		x
Blanchard and Ryan, 2007	Survey	x	x										
Blatner et al., 2001	Pre-post survey											x	
Bowker et al., 2008	Survey	x	x	x				x					
Brenkert-Smith, 2006	Interviews			x									
Brenkert-Smith, 2010	Interviews			x	x								
Brenkert-Smith et al., 2006	Interviews			x									
Bright and Burtz, 2006a	Survey			x									
Bright and Burtz, 2006b	Survey			x									
Bright et al., 2007a	Survey					x							
Bright and Newman, 2006	Survey	x											
Bright et al., 2007b	Survey	x											
Brown et al., 2008	Survey									x			
Brummel et al., 2010	Interviews				x		x						x

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Brunson, 2008	Survey	x						x					
Brunson and Evans, 2005	Survey	x											
Brunson and Shindler, 2004	Survey	x											
Burchfield, 2007	Synthesis								x				
Burns and Cheng, 2007	Q-methodology	x											
Burns et al., 2008	Synthesis						x		x				
Busenberg, 2004a	Policy review												x
Busenberg, 2004b	Policy review												x
Canton-Thompson et al., 2008	Interviews										x		
Carroll and Bright, 2009	Survey	x											
Carroll et al., 2007	Policy review												x
Carroll and Cohn, 2007	Synthesis						x		x				
Carroll et al., 2004	Interviews		x	x									
Carroll et al., 2005	Interviews								x				
Carroll et al., 2000	Interviews								x				
Carroll et al., 2006	Interviews								x				
Champ et al., 2009	Interviews									x			
Champ et al., 2010	Survey		x										
Cohn et al., 2006	Interviews								x				
Cohn et al., 2008	Interviews		x	x									
Collins, 2005	Survey			x	x								
Collins, 2009	Survey, property assessment			x									
Collins and Bolin, 2009	Historical analysis, participant observation, interviews			x	x								

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Corringham et al., 2008	Interviews											x	
Cvetkovich and Winter, 2008	Focus groups, survey	x	x	x				x					
Dale, 2006	Policy review	x											x
Daniel, 2007	Synthesis		x	x									
Daniel, 2008	Policy review		x	x									
Daniel et al., 2005	Synthesis	x											
Daniel et al., 2003	Visualization- comparison survey	x											
Davis, 2001	Policy review											x	x
Davis, 2006	Policy review												x
Deau and Vogt, 2004	Survey	x		x									
Dether and Black, 2006	Policy review											x	x
Doane et al., 2006	Survey										x		
Dombeck et al., 2004	Policy review												x
Downing et al., 2008	Synthesis					x			x				
Eriksen and Gill, 2010	Interviews, survey		x	x									
Eriksen et al., 2010	Interviews, survey		x	x									
Eriksen and Prior, 2011 [†]	Interviews, survey		x			x							
Faulkner et al. 2009	Survey		x	x									
Fleeger, 2008	Document analysis, Interviews			x								x	
Fleeger and Becker, 2010	Document analysis, Interviews			x			x					x	
Flint, 2007	Interviews, survey		x				x						
Flint and Haynes, 2006	Interviews, survey		x	x									
Flint and Luloff, 2007	Survey		x		x		x						

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Goldstein, 2007	Case study				x		x						
Goldstein and Butler, 2010a	Document analysis, participant observation, interviews						x					x	
Goldstein and Butler, 2010b	Document analysis, survey, interviews						x					x	
Gordon et al., 2010a	Interviews		x										
Gordon et al., 2010b	Interviews		x										
Gorte, 2003	Policy review												x
Gorte, 2006	Policy review												x
Grayzeck-Souter et al., 2009	Document analysis, interviews											x	
Gunderson, 2006	Focus groups, interviews	x											
Gunderson and Watson, 2007	Focus groups, interviews	x											
Haines et al., 2008	Document analysis, interviews												x
Hall and Slothower, 2009	Survey			x									
Hammer et al., 2009	Census data											x	
Haynes et al., 2010	Document analysis								x				x
Hodgson, 2007	Application of theory								x				
Hughes and Mercer, 2009	Document analysis										x	x	
Hull and Goldstein, 2006	Document analysis						x		x				
Jacobson et al., 2001	Document analysis, survey	x		x		x							
Jakes et al., 2007a	Interviews											x	
Jakes et al., 2010	Interviews		x	x			x		x				

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Jakes et al., 2007b	Interviews			x	x								
Jakes et al., 2004	Interviews			x			x						
Jakes et al., 2011 [†]	Document analysis, interviews											x	x
Jakes and Nelson, 2007	Synthesis			x	x								
Jarrett et al., 2009	Survey		x	x		x							
Jensen, 2006	Policy review												x
Johnson et al., 2009	Document analysis												x
Kalabokidis et al. 2008	Interviews												x
Kent et al., 2003	Workshop, interviews	x	x	x		x	x		x	x			
Kneeshaw et al., 2004a	Survey	x											
Kneeshaw et al., 2004b	Survey	x											
Knotek and Watson, 2006	Interviews	x										x	
Knotek et al., 2008	Survey	x								x			
Kolden and Brown, 2010	Survey											x	x
Kumagai et al., 2004a	Interviews, survey						x		x				
Kumagai et al., 2004b	Application of theory		x	x					x				
Kumagai et al., 2004c	Interviews, survey					x	x		x				
Kwon et al., 2008	Survey	x								x			
Kyle et al., 2010	Survey			x									
Laband et al., 2006	Document analysis	x											
Lang et al., 2006	Interviews			x	x								
Langley and Jones, 2005	Survey								x				
Lewis et al., 2011 [†]	Interviews											x	
Liljeblad and Borrie, 2006	Synthesis	x						x					
Liljeblad et al., 2009	Survey							x					

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Lim et al., 2009	Survey	x											
Liou et al., 2008	Survey	x											
Loomis et al., 2001a	Survey								x				
Loomis et al., 2001b	Survey	x				x							
MacGregor et al., 2008	Synthesis		x	x									
Martin et al., 2007	Survey		x	x									
Martin et al., 2008	Survey			x		x							
Martin et al., 2009	Survey		x	x									
Mayer, 2002	Document analysis										x	x	
McCaffrey, 2004a	Survey	x		x		x	x						
McCaffrey, 2004b	Synthesis		x	x		x							
McCaffrey, 2006	Synthesis	x											
McCaffrey, 2008a	Survey	x											
McCaffrey, 2008b	Focus groups		x										
McCaffrey and Graham, 2007	Synthesis											x	
McCaffrey and Kumagai, 2007	Synthesis			x									
McCaffrey et al., 2008	Survey	x				x							
McCaffrey and Rhodes, 2009	Synthesis								x				x
McCool et al., 2007	Synthesis								x				
McCool et al., 2006	Synthesis					x	x		x			x	
McDaniel et al. 2005	Interviews		x	x									
McFarlane, 2005	Synthesis		x	x									
McGee and Russell, 2003	Interviews		x	x									
McGee, 2005	Survey			x									
McGee, 2007	Survey	x	x										
McGee et al., 2009	Interviews		x	x									

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Miller and Landres, 2004	Workshop, survey										x	x	
Monroe, 2005	Synthesis					x							
Monroe et al., 2003	Workshop			x		x							
Monroe and Nelson, 2004	Interviews		x	x		x							
Monroe et al., 2006	Synthesis					x							
Morehouse et al., 2010	Interviews, mapping		x									x	
Morehouse and Sonnett, 2010	Newspaper analysis					x							
Moseley, 2007	Synthesis				x			x					x
Moseley et al., 2003	Document analysis				x								x
Moseley and Toth, 2004	Document analysis				x								x
Mozumder et al., 2008	Survey							x					
Muleady-Mecham et al., 2004	Survey	x											
Nelson et al., 2005	Interviews			x									
Nelson et al., 2004	Interviews		x	x									
Ojerio et al., 2011 [†]	Document analysis			x	x							x	
O'Laughlin, 2005	Conference panel										x	x	x
Olsen and Shindler, 2010	Survey	x						x	x				
Olsen and Shindler, 2007	Synthesis					x	x						
Ostergren et al., 2006	Survey	x											x
Parkinson et al., 2003	Pre-post test	x				x							
Paveglio et al., 2009a	Focus groups		x			x							
Paveglio et al., 2008	Synthesis							x					x
Paveglio et al., 2009b	Interviews			x	x							x	
Paveglio et al., 2010a	Interviews							x					x
Paveglio et al., 2010b	Interviews				x			x					x

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Radeloff et al., 2005	Census data, land cover maps											x	
Raish et al., 2005	Synthesis	x											
Raish et al., 2007	Synthesis	x											
Rasmussen et al., 2007	Interviews				x								
Reams et al., 2005	Survey			x								x	
Renner et al., 2010	Interviews			x								x	
Rodriguez-Mendez et al., 2003	Interviews								x				
Rohrmann, 2003	Website evaluations					x							
Ryan, 2005	Synthesis	x											
Ryan, 2010	Survey		x	x									
Ryan and Hamin, 2008	Interviews, focus groups								x				
Ryan and Hamin, 2009	Interviews, focus groups								x				
Ryan and Hamin, 2006	Interviews, focus groups								x				
Ryan and Wamsley, 2008	Survey	x	x										
Ryan et al., 2006	Survey	x	x	x									
Schroeder and Schneider, 2010	Interviews									x			
Schulte and Miller, 2010	Survey		x	x									
Shindler, 2002	Synthesis	x											
Shindler, 2007	Synthesis	x											
Shindler and Gordon, 2005	Synthesis					x							
Shindler and Toman, 2003	Survey	x				x	x						
Shindler et al., 2009	Survey	x					x	x					
Shiralipour et al., 2006	Interviews			x		x							
Steelman and DuMond, 2009	Interviews, document analysis												x

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Steelman, 2008a	Interviews, document analysis			x									x
Steelman, 2008b	Policy review			x								x	x
Steelman and Burke, 2007	Policy review												x
Steelman et al., 2004	Document analysis, GIS mapping												x
Steelman and Kunkel, 2004	Interviews, document analysis			x	x							x	
Stephens et al., 2009	Policy review								x				x
Stephens and Ruth, 2005	Policy review												x
Stewart et al., 2007	Census data											x	
Sturtevant and Jakes, 2008	Interviews						x					x	
Sturtevant and McCaffrey, 2006	Interviews, document analysis			x		x							
Sturtevant et al., 2005	Synthesis						x					x	
Sutton et al., 2008	Survey					x			x				
Taylor et al., 2007	Focus groups, participant observation					x			x				
Taylor et al., 2008	Interviews, document analysis, focus groups					x			x				
Thapa et al., 2004	Survey									x			
Toman and Shindler, 2006a	Pre-post survey	x				x							
Toman and Shindler, 2006b	Survey					x							
Toman et al., 2008a	Survey					x			x				
Toman et al., 2006	Survey					x							
Toman et al., 2008b	Interviews					x							

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Toman et al., 2004	Pre-post survey	x				x							
Toman et al., 2011 [†]	Survey	x						x					
Trainor et al., 2009	Census data, interviews, focus group, participant observation, workshops, surveys	x		x	x		x						
Vaske et al., 2007	Survey	x						x					
Vining and Merrick, 2008	Survey	x											
Vogt et al., 2005	Survey	x		x									
Vogt et al., 2007	Survey	x							x				
Vogt, 2003	Survey	x		x									
Vogt, 2008	Survey	x		x									
Watson et al., 2009	Interviews, participatory GIS, focus groups	x											
Weible et al., 2005	Survey	x	x										
Weisshaupt et al., 2006	Focus groups	x											
Weisshaupt et al., 2005	Focus groups	x											
Weisshaupt et al., 2007	Focus groups	x	x	x									
Williamson, 2007	Survey										x	x	
Winter and Fried, 2000	Focus groups	x	x	x									
Winter et al., 2009	Focus groups			x									x
Winter et al., 2006	Survey	x		x									
Winter et al., 2004	Survey	x						x					
Winter et al., 2002	Focus groups	x											
Winter, 2003	Survey	x						x					
Winter et al., 2007	Synthesis							x					

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Winter and Cvetkovich, 2008a	Survey	x											
Winter and Cvetkovich, 2008b	Survey	x						x					
Winter and Cvetkovich, 2010	Survey	x	x	x				x					
Wise and Yoder, 2007	Policy review										x	x	x
Wise and Freitag, 2002	Policy review										x	x	x
Wolcott et al., 2007	Survey	x										x	
Zaksek and Arvai, 2004	Mental model		x			x							
Zimmerman and Bunnell, 2000	Policy review												x

Abrams, J. and K. Lowe (2005). Public perceptions of forest restoration in the southwest: A synthesis of selected literature and surveys. Flagstaff, AZ, Ecological Restoration Institute: 19 p.

The restoration of forest ecosystems is an important, yet sometimes controversial, practice. In recent years numerous studies have explored how the public perceives forest health, restoration, and fire; however, few analyses have summarized and compared results across studies. The purpose of this publication is to identify consistencies in the results of recent studies, assess the public's overall understanding of forest restoration issues, and evaluate areas of continuing controversy.

The information presented here is a synthesis of public survey research conducted throughout the country, with a primary focus on research conducted in the Southwest. We integrated a broad spectrum of literature in our evaluation, including peer-reviewed publications, gray literature, and unpublished studies. Each source was selected based on its focus and content area. We reached the following conclusions:

- Residents of the Southwest understand the ecological role of fire in southwestern forests, but many are uncomfortable with allowing wildfires to burn.
- The use of prescribed fire (fire introduced by managers under specified conditions to achieve management objectives) as a management tool is strongly supported.
- Residents of the Southwest are concerned about the possible impacts of smoke from prescribed fire and wildfire. However, most believe that smoke is an acceptable side effect of using prescribed fire to manage the region's forests.
- The use of mechanical thinning to reduce forest fuels and restore forest structure is widely supported.
- Residents of the Southwest are solidly opposed to old-growth logging and do not believe logging should drive the USDA Forest Service's budget. However, they are not consistently opposed to the removal of some larger trees during thinning operations.
- The Forest Service has earned a high level of public trust in its forest management, including the implementation of prescribed fire and mechanical thinning programs, in the Southwest.
- Government land managers and universities were chosen as top sources for public information regarding forest management.

Absher, J. and J. Vaske (2011[†]). "The role of trust in residents' fire wise actions." *International Journal of Wildland Fire* **20**(2): 318-325.

Residents' trust in the managing agency has been heralded as a necessary precursor to success in preventing wildland fire losses in the wildland-urban interface. Trust, however, is a complex concept. Homeowners' specific fire wise actions may not be easily linked to general measures of trust. This article uses two distinct trust indices to predict residents' intention to do fire wise actions to their house and adjacent site. Results of structural equation models using a survey of Colorado Front Range residents (n = 456) revealed strong explanatory power: 85% (house behaviors) and 72% (site behaviors) of the variation in intentions were accounted for by trust, previous fire wise behaviors and the perceived effectiveness of the actions. The trust measures, however, were not major influences. 'Trust in agency competence' weakly predicted perceived effectiveness for site behaviors; 'trust in agency information' weakly predicted past house behaviors. Neither trust variable directly affected intentions to perform these actions. We conclude that trust is best viewed as a broad precursor whose influence on behavioral intentions is mediated by other constructs (e.g., past behavior, perceived effectiveness). The implications for further work to understand the role of trust and the possible social mechanisms involved are discussed.

Absher, J. D. and J. J. Vaske (2006). An analysis of homeowner and agency wildland fire mitigation strategies. Proceedings of the 2005 Northeastern Recreation Research Symposium, April 10-12, 2005, Bolton Landing, NY; GTR-NE-341. J. G. Peden and R. M. Schuster, Eds. Newtown Square, PA, USDA Forest Service, Northeastern Research Station: 231-236.

Four homeowner and agency wildland fire mitigation strategies were empirically examined in relation to three sets of causal influences. Two agency actions (prescribed fire and mechanical thinning) and two homeowner actions (defensible space and firewise construction) were analyzed against socio-demographic, situational and psychological precursors. Data were from a survey of Colorado residents (n = 532) living in the wildland urban interface. Logistic regression indicated that the agency and homeowner actions had significantly different patterns of social causes and linkages. Results support the contention that socio-demographic, situational and psychological variables differentially influence support for agency or homeowner actions. Overall, the psychological measures were the most useful. Theoretically based models of natural resource policies can facilitate understanding the causal mechanisms that drive support for, or opposition to, wildland fire actions and improve policy development, situated communications and local community involvement strategies.

Absher, J. D., J. J. Vaske and A. D. Bright (2008). Basic beliefs, attitudes, and social norms regarding wildland fire management in Southern California. Fire social science research from the Pacific Southwest Research Station: studies supported by National Fire Plan funds; PSW-GTR-209. D. J. Chavez, J. D. Absher and P. L. Winter, Eds. Albany, CA, USDA Forest Service, Pacific Southwest Research Station: 45-56.

This study presents three measurement concepts (basic beliefs, attitudes, and social norms) for understanding and predicting public acceptance of wildland fire management. These concepts often drive agency wildland fire management policies and influence public behavior. Using cognitive hierarchy as an underlying theoretical framework, measures of fire-specific basic beliefs, attitudes, and situation-specific social norms toward wildland fire management were examined. Data were obtained from a mail survey sent to a random sample of visitors to the San Bernardino National Forest (SBNF). Analyses indicated the reliability of (a) five basic belief scales related to wildland fire management (biocentrism, anthropocentrism, freedom, capability/trust, responsibility), (b) an attitude indicator (wildland fire as benefit or harm), and (c) three situation-specific normative measures (put the fire out, contain the fire, let the fire burn) of acceptance of fire management. Regression analyses demonstrated that basic beliefs and attitude variables were useful in understanding public acceptance of fire management actions. Discussion of the relationships among these concepts provides insight regarding support of forest visitors for different fire management activities in the SBNF and offers some insight into further action needed to develop this line of research further.

Absher, J. D., J. J. Vaske, A. D. Bright and M. P. Donnelly (2006). "Ipsative crystallization effects on wildland fire attitude - Policy support models." *Society & Natural Resources* **19**(5): 381-392.

Understanding public attitudes toward wildland fire management policies is important for effectively managing natural resources and communicating with the public. Ipsative crystallization is a measure of individual attitude consensus. This article examines the utility of ipsative crystallization (IC) measures in better understanding attitudes toward and support for three wildland fire management policies (let the fire burn, contain the fire, and put the fire out). Data were obtained from a mailed survey of 1269 visitors to three national forests adjacent to large urban areas of the western United States. IC was operationalized as each respondent's standard deviation from repeated measures of policy support across a set of wildland fire scenarios, and ranged from 0 (high crystallization) to 3.21 (low crystallization). Results indicated

that between 41% (let the fire burn) and 53% (contain the fire) of the respondents were highly crystallized in their support for wildland fire policies. IC moderated the effect of attitudes toward wildland fire on support for each wildland fire policy. Results provide evidence that IC may be an important, unrecognized variable in ongoing efforts to affect wildland fire policy support.

Absher, J. D., J. J. Vaske and L. B. Shelby (2009). Residents' responses to wildland fire programs: A review of cognitive and behavioral studies. Albany, CA, USDA Forest Service, Pacific Southwest Research Station: 31 p.

A compilation and summary of four research studies is presented. They were aimed at developing a theoretical and practical understanding of homeowners' attitudes and behaviors in the wildland-urban interface (WUI) in relation to the threat from wildland fires. Individual studies focused on models and methods that measured (1) value orientations (patterns of basic beliefs) toward natural processes, (2) attitudes toward wildland fire policies, and (3) behavioral intentions to adopt defensible space activities or support agency policies/actions. This report presents some of the key findings from these studies, highlights the practical consequences of adopting a theory-based approach to understanding wildland fire management in urbanized areas, and suggests strategies for successful wildfire-prevention education programs.

Agrawal, S. and M. C. Monroe (2006). Using and improving social capital to increase community preparedness for wildfire. The Public and Wildland Fire Management: Social Science Findings for Managers; GTR-NRS-1. S. M. McCaffrey, Ed. Newtown Square, PA, USDA Forest Service, Northern Research Station: 163-167.

Key findings: This paper discusses findings that show the likely advantages for managers in developing wildfire education programs that also emphasize building social capital. Three key results are discussed:

- People who perceive greater social capital in their community are more likely to take action around their homes to create defensible space and reduce wildfire risk.
- People who perceive greater social capital in their community are more likely to participate in activities to increase their knowledge and skills on wildfire mitigation.
- People who stated that talking to neighborhood friends or to a community leader influenced them to take steps to reduce wildfire risk perceived greater social capital than those who did not credit friends and leaders.

Social capital is both an economic and non-economic benefit that individuals, groups, and communities get through the structure of their relationships. It is referred to as "social" because it grows out of relationships between people. It is a form of "capital" in that it helps individuals achieve things that they might not have been able to achieve otherwise (e.g., obtain job information, safer communities because of social norms, and reduced risk of wildfires). It can be assessed by the degree to which people participate in community activities and the strength of community ties and networks. In this study, social capital is defined as an individual's perception of the quality of relationships he/she holds with his/her neighbors and other people in the community, and community characteristics like community participation. These findings suggest that educational programs that strengthen social capital by fostering interaction between people will be more likely to motivate community members to take steps to reduce their wildfire risk.

Aplet, G. H. (2006). "Evolution of wilderness fire policy." *International Journal of Wilderness* **12**(1): 9-13. Just as wilderness ecosystems have been shaped by fire (and the condition of those ecosystems has shaped fire behavior), wilderness policy has been affected by fire policy (and vice versa). The Wilderness Act and subsequent wilderness bills have addressed fire, and policy has evolved to recognize the free play of fire as a natural process. Similarly, fire policy has evolved to accommodate the peculiar demands of wilderness.

This co-evolution has its origin in the confluence of ecological thought and wilderness philosophy that occurred in the late 20th century. For most of the century, fire was considered a universal threat to people, resources, and wildlands. Eventually though the observations of foresters like Aldo Leopold (1924) and Elers Koch (Arno and Fiedler 2005) added to the research of scientists such as Harold Weaver (1943) and Herb Stoddard (1935) to force realization of the role of fire in sustaining species and maintaining the character of ecosystems. In 1963 a panel of ecologists responded to the National Park Service's request for a management review with the suggestion that "The goal [of park management] is to maintain or create the mood of wild America" (Leopold et al. 1963). They recommended fire be restored to the national parks.

Passage of the Wilderness Act in 1964 represented the culmination of the "fight for the freedom of the wilderness" begun by John Muir and sworn to by Robert Marshall (1930) and the other founders of The Wilderness Society in 1935. According to the Wilderness Act definition, "Wilderness [retains] its primeval character and influence [and] generally appears to have been affected primarily by the forces of nature" (emphasis added). It became clear that those "forces of nature" include fire.

The purpose of this article is to briefly review the policy history of wilderness fire, identify some barriers to its increased use, and propose some policy changes that could lead to more harmonious relations among people, fire, and wilderness.

Arvai, J. L., R. Gregory, D. Ohlson, B. Blackwell and R. Gray (2006). "Letdowns, wake-up calls, and constructed preferences: People's responses to fuel and wildfire risks." *Journal of Forestry* **104**(4): 173-181.

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

Bates, B. R., B. L. Quick and A. A. Kloss (2009). "Antecedents of intention to help mitigate wildfire: Implications for campaigns promoting wildfire mitigation to the general public in the wildland-urban interface." *Safety Science* **47**(3): 374-381.

The current investigation sought to examine the association between knowledge of the causes of wildfire in the wildland-urban interface (WUI) and intentions on the part of members of the public to help mitigate wildfire. In doing so, antecedents from the theory of planned behavior were employed to enhance our understanding of the relationships among wildfire knowledge, attitudes, subjective norms, perceived behavioral control, and intention to help mitigate wildfire in the WUI. Participants (N = 408) living in the WUI in Appalachian Ohio were sampled as a means of conducting formative research prior to developing messages promoting wildfire

mitigation. Our results reveal that, among the variables in the theory of planned behavior, the only paths that consistently explain individual's intention to help mitigate wildland fire in the WUI in protecting both homes and the environment are associations between knowledge about wildfire and perceived behavioral control and between perceived behavioral control and intention. Our findings are discussed with a focus on message design for wildland fire mitigation professionals and a focus on implications for the theory of planned behaviors for academics with interests in wildland fire and other environmental issues.

Becker, D. R. and J. Viers (2007). Matching the utilization of the by-products of forest fuel reduction with community development opportunities. *People, Fire, and Forests: A Synthesis of Wildfire Social Science*. T. C. Daniel, M. S. Carroll, C. Moseley and C. Raish, Eds. Corvallis, OR, Oregon State University Press: 157-170.

Introduction: Thinning of overstocked forests is believed to improve forest health and reduce the risk of extreme fire (Pollet and Omi 2002). Accordingly, scientists, policy makers, and the public are calling for extensive thinning across the western United States. Fuel-reduction projects will generate a tremendous volume of wood material and there is an increasing interest in and focus on the community development potential of thinning. Yet development opportunities may or may not be forthcoming depending on specific local or regional circumstances affected by the interaction among biophysical dimensions of wildfire risk reduction, economic and industry factors, and sociocultural preferences. One contemporary but non-traditional area of research is the utilization of fuel reduction by-products for community development. The many physical and social aspects of this relationship are touched upon here to provide a more comprehensive and action-oriented approach to opportunities in forest thinning-based development and research.

Bell, T. and I. Oliveras (2006). "Perceptions of prescribed burning in a local forest community in Victoria, Australia." *Environmental Management* **38**(5): 867-878.

The general perceptions of prescribed burning were elicited from forest users for an area that has been subject to this form of land management for at least 20 years. The largest group consisted of local residents living in and around the Wombat State Forest with two smaller groups of students from a nearby university campus and local professional land managers. A questionnaire was given to each participant in order to explore how the forest was used, to determine the level of knowledge of burning in the targeted forest and Victoria and the perception of the appearance, effectiveness of protection, and accessibility to the forest after prescribed burning. Generally all groups had similar responses with community members having stronger views on the effectiveness and practicalities of prescribed burning, whereas students were more neutral in their opinions. All participants claimed knowledge of prescribed burning activities within Victoria, but fewer had experience of planned fires in the Wombat State Forest. All groups agreed that areas that had not been recently burned had a better appearance than those that had, but this result may have included a range of value judgments. Land managers had a greater understanding of the ecological importance of season and timing of burning; however, some students and community members were equally knowledgeable. Prescribed burning did not impede access to the forest, nor did smoke from prescribed burns pose any great problem. The majority of the participants felt that the amount of prescribed burning done in the forest was adequate for engendering a feeling of protection to life and property, yet many were still suspicious of this management practice. These initial findings indicate several areas in which further research would be useful including the efficacy of education programs for community members and improved communication of burn plans by land managers.

Black, A., K. Sutcliffe, M. Barton and D. Dether (2008). "Assessing high reliability practices in the wildland fire community." *Fire Management Today* **68**(2): 45-48.

The Office of Inspector General's 2006 audit of Forest Service fire management operations added yet another voice to the growing chorus calling on the Federal wildland fire community to get more fire on the ground (OIG 2006). The 1995 National Fire Plan and the 2001 Implementation Plan identify the critical role of wildland fire use in reducing hazardous fuels conditions, reducing risk to property and natural resources, and reducing costs. Yet, meeting these goals poses significant organizational challenges, particularly when it comes to fire management's capacity to safely manage fire on the landscape.

Blanchard, B. and R. L. Ryan (2007). "Managing the wildland-urban interface in the northeast: Perceptions of fire risk and hazard reduction strategies." *Northern Journal of Applied Forestry* **24**(3): 203-208.

Much of the recent work in reducing wildland fire danger has occurred in the western and southeastern United States. However, high-risk areas do exist at the wildland-urban interface areas in the Northeast and very little work has been done to understand the fire management issues in this region. Therefore, this study used a survey of residents and landowners within the Plymouth Pine Barrens of southeastern Massachusetts to assess community members' perceptions of wildland fire risk and hazard reduction strategies. The research results indicate that residents have a low perception of wildland fire risk but support the use of fire hazard reduction strategies, including prescribed fire, mechanical removal of trees and brush, and construction of firebreaks. Previous experience with wildland fire was a major factor influencing respondents' perception of fire risk. Furthermore, participants' knowledge about specific fuel treatments positively influenced their support for those treatments. Overall, respondents believe that actions should be taken to reduce fire hazard within the study area and would like to be involved in the development of fire hazard reduction plans.

Blatner, K. A., M. S. Carroll, S. E. Daniels and G. B. Walker (2001). "Evaluating the application of collaborative learning to the Wenatchee fire recovery planning effort." *Environmental Impact Assessment Review* **21**(3): 241-270.

As a follow-up to an article published in this journal [Environ. Impact Assess. Rev. 16 (1996) 71±102.], we examine a case study application of the Collaborative Learning (CL) model to public participation in federal land decision making. As an innovation in public participation, CL combines elements of soft systems, alternative dispute resolution (ADR), and experiential learning theory in an effort to foster meaningful public dialogue within public participation. The particular case examined was a forest fire recovery effort on the Wenatchee National Forest (WNF) in Washington State. Participants responded to questionnaires before and after meetings. The questionnaires measured changes in perception of the Forest Service decision-making process, as well as responses to CL itself. The results indicate a positive response to the CL process and an increased expectation of quality in the resulting decisions. Respondents did not generally perceive a reduced probability of appeals and litigation relative to the decisions themselves, but their expectations of the "survivability" of the decisions in the face of appeals and/or litigation generally increased.

Bowker, J. M., S. H. Lim, H. K. Cordell, G. T. Green, S. Rideout-Hanzak and C. Y. Johnson (2008). "Wildland fire, risk, and recovery: Results of a national survey with regional and racial perspectives." *Journal of Forestry* **106**(5): 268-276.

We used a national household survey to examine knowledge, attitudes, and preferences pertaining to wildland fire. First, we present nationwide results and trends. Then, we examine opinions across region and race. Despite some regional variation, respondents are fairly consistent in their beliefs about assuming personal responsibility for living in fire-prone areas and believing that residents of such areas should follow government guidelines for managing fire risk. However, we find divergence of opinion on "trusting forest professionals" between African-American and Caucasian people. Across all survey questions related to fire management and public confidence, African-Americans appear to be relatively more concerned than Caucasian or Hispanic people.

Brenkert-Smith, H. (2006). "The place of fire." *Natural Hazards Review* **7**(3): 105-113.

As the wildland-urban interface (WUI) grows in size and density and increasing levels of funding are being directed toward education and outreach programs targeting residents in these communities, it is becoming increasingly important to investigate residents' responses to wildfire risk. This is particularly true because participation of WUI residents in reducing fire risk constitutes an important piece in the management of wildland fire problem. Few studies have examined how residents living in fire-prone areas feel about and adapt to increasing levels of wildfire risk. In this paper, I investigate "place" as a salient theme shaping the decision-making process around the implementation of wildfire risk reduction measures on private property. Insight into this process will be valuable to fire and forest managers who are increasingly charged with the responsibility of galvanizing WUI residents and communities to take part in wildfire risk reduction.

Brenkert-Smith, H. (2010). "Building bridges to fight fire: The role of informal social interactions in six Colorado wildland-urban interface communities." *International Journal of Wildland Fire* **19**(6): 689-697.

Property owners in fire-prone communities have been identified as key stakeholders in the wildfire dilemma. Although past research has examined stakeholder characteristics and their behaviours, less is known about how small-scale social processes among stakeholders might shape mitigation decision-making and related actions. This manuscript highlights the role informal social interactions play in building bridges among full-time and part-time residents that facilitate the spread of wildfire information and galvanise small-scale cooperative efforts to reduce wildfire risk. Data from in-depth interviews conducted with residents in six fire-prone Colorado communities indicate that these interactions create bridging capital that links those who are not likely to be the direct recipients of wildfire outreach efforts to those who are.

Brenkert-Smith, H., P. A. Champ and N. Flores (2006). "Insights into wildfire mitigation decisions among wildland-urban interface residents." *Society & Natural Resources* **19**(8): 759-768.

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.

Bright, A. D. and R. T. Burtz (2006a). "Creating defensible space in the wildland-urban interface: The influence of values on perceptions and behavior." *Environmental Management* **37**(2): 170-185.

We examined the effect that value orientation to forests and wildland fire management has on an individual's decision to create defensible space around his or her residence in the wildland-urban interface. Using data from a mail-back questionnaire, respondents in north central Minnesota were clustered by basic value-laden beliefs toward forest and wildland fire management and compared across a number of perceptions and behaviors related to creating defensible space around residences. Value orientation groups differed in attitudes, subjective norms, and perceived behavior control toward creating defensible space. In addition, relative effects of these perceptions on intention to create defensible space differed across groups. Implications lie in (a) understanding differences in motivations and reasons for support of strategies for managing fires near the wildland-urban interface, (b) developing information designed to address the perspectives of different groups related to creating defensible space, and (c) contributing to an improved integration of land management and public concerns and interests.

Bright, A. D. and R. T. Burtz (2006b). "Firewise activities of full-time versus seasonal residents in the wildland-urban interface." *Journal of Forestry* **104**(6): 307-315.

Increased migration to rural areas in and near the wildland-urban interface has increased the complexity of wildland fire management in these areas. Treating defensible space around one's home in the wildland-urban interface is one way residents can become involved in protecting their own homes from wildland fire. Using the theory of planned behavior as a conceptual framework, this study examined differences in perceptions of and behaviors regarding the creation of defensible space between full-time and seasonal residents of the wildland-urban interface. Although general support for firewise activities was positive for both resident groups, differences existed regarding the importance of beliefs, norms, and constraints in doing the activities around one's home in the wildland-urban interface.

Bright, A. D., A. W. Don Carlos, J. J. Vaske and J. D. Absher (2007a). Source credibility and the effectiveness of firewise information. Proceedings of the 2006 Northeastern Recreation Research Symposium, April 9-11, 2006, Bolton Landing, NY; GTR-NRS-P-14. R. Burns and K. Robinson, Eds. Newtown Square, PA, USDA Forest Service, Northern Research Station: 551-556.

Description: Understanding how residents of the Wildland-urban interface (WUI) react to information about firewise behavior can enhance efforts to communicate safety information to the public. This study explored the multiple roles of source credibility on the elaboration and impact of messages about conducting firewise behaviors in the WUI. A mail-back survey to residents of the wildland-urban interface in Colorado measured their response to information flyers about firewise behaviors for protecting homes. Using the elaboration likelihood model as the conceptual framework, source credibility, message clarity, elaboration, and behavior change were measured related to the flyers. Results indicated that source credibility was an important factor influencing the likelihood that information would change behavior and that the ability of respondents to understand the information influenced elaboration of that message. Implications include joint communication efforts across several agencies and development of messages that consider their clarity and the credibility of the source.

Bright, A. D. and P. Newman (2006). How forest context influences the acceptability of prescribed burning and mechanical thinning. *The Public and Wildland Fire Management: Social Science Findings for Managers*; GTR-NRS-1. S. M. McCaffrey, Ed. Newtown Square, PA, USDA Forest Service, Northern Research Station: 47-52.

Key Findings: If fire hazard is high or wildfire occurred recently, people want some mitigative action taken. People prefer use of prescribed fire in remote areas and thinning in more urban areas. Differences across study locations were small. The public may have some understanding that forest conditions have an effect on the probability and severity of wildfire in a given area, but that understanding may not be complex or accurate enough. The complexity of factors that may influence public perceptions shows the importance of creating information campaigns that describe the fire science around wildfire management and decisionmaking.

Bright, A. D., P. Newman and J. Carroll (2007b). "Context, beliefs, and attitudes toward wildland fire management: An examination of residents of the wildland-urban interface." *Human Ecology Review* **14**(2): 212-222.

There are a number of benefits from wildland fire such as forest reproduction, habitat improvement, and reduction of threats from insects and diseases. However, along with these benefits are threats to human life, property and air quality. The trade-off between wildfire benefits and costs causes differences in public beliefs about fire management. We surveyed residents of the wildland-urban interface to determine the effects of contextual factors such as location of the forest, its primary use, wildfire history, and current fire conditions on acceptability of prescribed burning, mechanical thinning, and doing nothing. The current condition of the forest was the most important factor influencing support/opposition of management strategies for both individualists and non-individualists. The importance of forest proximity, wildfire history, and forest use depended on the management strategy under consideration and group. Results will help inform land managers in making fire management prescriptions and communicating with the public about those decisions.

Brown, R. N. K., R. S. Rosenberger, J. D. Kline, T. E. Hall and M. D. Needham (2008). "Visitor preferences for managing wilderness recreation after wildfire." *Journal of Forestry* **106**(1): 9-16.

The 2003 Bear Butte and Booth (B&B) Fires burned much of the Mount Jefferson Wilderness in the Deschutes and Willamette National Forests, Oregon. A question for managers is how best to manage recreation in fire-affected areas in ways that minimize adverse impacts on visitor experiences and the recovering landscape. To help address this question, we used onsite surveys (n = 221) asking visitors in the Mount Jefferson Wilderness about their past use and postfire changes in use and their preferences for managing recreation after fires. Results indicated that recreation use declined after the fires, but declines were less than those after recent policy and management decisions such as the Recreation Fee Demonstration Program. Visitor preferences for managing postfire recreation were mixed. Some visitors supported little or no management, some preferred access and use restrictions coupled with camping regulations, and some preferred either access and use restrictions or camping regulations alone.

Brummel, R. F., K. C. Nelson, S. G. Souter, P. J. Jakes and D. R. Williams (2010). "Social learning in a policy-mandated collaboration: Community wildfire protection planning in the eastern United States." *Journal of Environmental Planning and Management* **53**(6): 681-699.

Policies such as the US Healthy Forests Restoration Act (HFRA) mandate collaboration in planning to create benefits such as social learning and shared understanding among partners. However, some question the ability of top-down policy to foster successful local collaboration.

Through in-depth interviews and document analysis, this paper investigates social learning and transformative learning in three case studies of Community Wildfire Protection Planning (CWPP), a policy-mandated collaboration under HFRA. Not all CWPP groups engaged in social learning. Those that did learned most about organisational priorities and values through communicative learning. Few participants gained new skills or knowledge through instrumental learning. CWPP groups had to commit to learning, but the design of the collaborative-mandate influenced the type of learning that was most likely to occur. This research suggests a potential role for top-down policy in setting the structural context for learning at the local level, but also confirms the importance of collaborative context and process in fostering social learning.

Brunson, M. (2008). "Gauging the acceptability of fuels management: A matter of trust." *Western Rural Development Center Rural Connections* 1(3): 2-4.

Wildfire is an increasingly daunting issue for Western communities. The effects of fire on homes and livelihoods is increasing throughout our region as more and more people choose to live adjacent to fire susceptible landscapes such as national forests, BLM lands, ranches, and other lightly developed areas...

...Several factors have converged to cause the increase in wildfire size and significance. Two of the most important in the Great Basin are ongoing invasions of sagebrush-dominated rangelands by nonnative grasses such as cheatgrass and the expansion of woodlands dominated by junipers and pinyon pines. Both of these processes have increased the amount and flammability of dried plant materials ("fuels") that can accumulate in rangelands. The situation is most apparent on lands managed by the federal government...

...Public land managers have tools that can reduce the risk but sometimes there are barriers to using them. One significant obstacle can be citizen opposition to activities such as shrub mowing, prescribed burning, tree-felling and herbicide application...As part of the SageSTEP research project that is evaluating the various effects of alternative practices for rangeland restoration and wildfire risk-reduction (see related story, p. 7), social scientist Bruce Shindler of Oregon State University and I have been studying the social acceptability of different management options for Great Basin rangelands.

Brunson, M. W. and J. Evans (2005). "Badly burned? Effects of an escaped prescribed burn on social acceptability of wildland fuels treatments." *Journal of Forestry* 103(3): 134-138.

In Sept. 2003, a prescribed burn on the Uinta National Forest escaped, costing nearly \$3 million to extinguish while choking Utah cities with smoke for a week. When the incident drew harsh criticism from local officials and news media, fire managers worried that prescribed burning no longer would be feasible in northern Utah. Subsequently, we surveyed residents of three affected counties, including respondents to a 2001 survey, about acceptability of fuels management practices. Results suggest prescribed fire remains an acceptable tool for some situations but citizens doubt agencies' ability to use it effectively, especially near populated areas.

Brunson, M. W. and B. A. Shindler (2004). "Geographic variation in social acceptability of wildland fuels management in the western United States." *Society & Natural Resources* 17(8): 661-678.

Contemporary natural resource management requires consideration of the social acceptability of management practices and conditions. Agencies wishing to measure, respond to, and influence social acceptability must understand the nuances of public perception regarding controversial issues. This study explores social acceptability judgments about one such issue: reduction of wildland fuel hazards on federal lands in the western United States. Citizens were

surveyed in four locations where fire has been a significant ecological disturbance agent and public land agencies propose to reduce wildland fuel levels and wildfire hazards via prescribed burning, thinning, brush removal, and/or livestock grazing. Respondents in different locations differed in their knowledge about fire and fuel issues as well in their acceptability judgments. Differences are associated with location-specific social and environmental factors as well as individual beliefs. Results argue against using "one-size-fits-all" policies or information strategies about fuels management.

Burchfield, J. A. (2007). Community impacts of large wildfire events: Consequences of actions after the fire. *People, Fire, and Forests: A Synthesis of Wildfire Social Science*. T. C. Daniel, M. S. Carroll, C. Moseley and C. Raish, Eds. Corvallis, OR, Oregon State University Press: 124-140.

Although wildfire has historically provided the vehicle for forest formation and transformation in the western United States (Agee 1996; DeBano et al. 1998; Pyne 1982), the frequency of very large, forest-based wildfires has increased over the past two decades (Arno and Allison-Bunnell 2002). Lingering drought and increased fuel accumulations have been major contributors to this shift, along with other factors such as prior land use practices and insect infestations (USDA Forest Service 2003). In recent years, residents of rural, suburban, and exurban communities embedded in these fire-adapted ecosystems are being forced to respond to the multiple consequences of wildfires, even though people and agencies have not been well equipped to address these disturbance events in the wildland interface in the past (Cortner and Gale 1990). Current trends point to an unabated rise in human populations moving into these western ecosystems (Bradshaw 1987; Johnson and Fuguitt 2000), elevating the profile of wildfire risks and fomenting a political urgency for remedial actions.

This paper reviews the current literature on the consequences to human communities of a recent wildfire event, and it utilizes a three-dimensional framework of biophysical, social-demographic, and social-cultural impacts to describe the complexities of the wildfire phenomenon. Evident in this review is the paucity of research on the impacts of fire on human communities, arguing for a much more energized research agenda to understand how people may cope with this inevitable and frequently unwelcome summer visitor to their neighborhoods and communities. However, our current understanding points to a few important lessons for resource managers: (1) Continuing population growth in the interior West will burden agencies to supply wildfire rehabilitation and recovery. (2) Opportunities for management innovation, land use regulation, and institutional change within the wildland interface are highest in the aftermath of wildfires, since the salience of the event diminishes quickly and people will return to business as usual. (3) Community-level recovery from a wildfire is difficult to predict in the highly heterogeneous network of western communities. Fires affect exurban neighborhoods more directly than whole communities.

Burns, M. R. and A. S. Cheng (2007). "Framing the need for active management for wildfire mitigation and forest restoration." *Society & Natural Resources* **20**(3): 245-259.

We present results of a Q-methodology study of how diverse stakeholders in northern Colorado framed the need for immediate, active management on federal lands to mitigate wildfire risk and restore forest conditions. From the factor analysis of the Q-sorts, three significant themes emerged that represent distinct perspectives about active management: (1) The region's forests are unhealthy and should be actively managed; (2) active management should comply with existing laws; and (3) in-depth studies and public subsidies are needed before making decisions. Because the need for active management is not universally shared at the local level, agencies should not assume that issue frames are shared. A process of negotiation, shared learning, and

adaptation should be pursued to minimize stakeholder conflict and maximize collaborative opportunities.

Burns, M. R., J. G. Taylor and J. T. Hogan (2008). Integrative healing: The importance of community collaboration in postfire recovery and prefire planning. *Wildfire Risk: Human Perceptions and Management Implications*. W. E. Martin, C. Raish and B. Kent, Eds. Washington, DC, Resources for the Future: 81-97.

A common mandate in federal forest and fire management policies is the use of interagency cooperation and community collaboration to manage wildland fire and develop community preparedness. In these policies, however, it is often unclear to land managers how to facilitate collaboration or why collaborative efforts matter. Furthermore, recent years have seen a renewed interest in researching the human dimensions of wildfire, particularly with an emphasis on wildfire as a natural hazard. One aspect that is rarely discussed is how community collaborative efforts can aid in individual and community recovery from fire. Another critical role of collaborative processes is in assessing perceptions of risk in the community and shared visions of fire mitigation. Community-supported plans for mitigation and other preparedness activities can be instituted and developed through collaboration before a disaster strikes. This chapter examines the importance of community collaboration in both postfire recovery and prefire planning, using five case studies of postfire community collaborative recovery efforts.

Busenberg, G. (2004a). "Adaptive policy design for the management of wildfire hazards." *American Behavioral Scientist* **48**(3): 314-326.

Wildfire disasters threaten numerous communities and ecosystems in America today. An effective policy strategy to counteract the threat of wildfire disasters would entail the reduction of accumulated fuels (flammable organic materials) found across large areas in many American ecosystems. Major uncertainties surround this policy endeavor because fuel reduction has never been attempted on such large scales before. This study outlines an adaptive policy strategy designed to resolve these uncertainties through a systematic process of learning. An adaptive wildfire policy would employ fuel reduction experiments on large scales, with the goal of generating new knowledge to progressively improve the effectiveness of fuel reduction strategies over time.

Busenberg, G. (2004b). "Wildfire management in the United States: The evolution of a policy failure." *Review of Policy Research* **21**(2): 145-156.

Wildland fires constitute a major crisis in American environmental policy, a crisis created by a longstanding policy failure. This article explores the political processes that generated and reinforced this policy failure over time. The concepts of bounded rationality, punctuated equilibria, and self-reinforcing mechanisms are applied to study the evolution of American wildfire policy between 1905 and the present. This study finds that a self-defeating wildfire suppression policy was established in the period 1905 through 1911, and subsequently reinforced for more than five decades. This policy did not include a complementary program to counteract the gradual accumulation of flammable organic materials (fuels) that occurred in many ecosystems when fires were suppressed. The resulting fuel accumulations have greatly increased the risk of damaging, high-intensity wildfires in a range of American wildlands. A combination of fire suppression and fuel reduction programs will be needed to manage this risk in the future.

Canton-Thompson, J., K. M. Gebert, B. Thompson, G. Jones, D. Calkin and G. Donovan (2008). "External human factors in incident management team decisionmaking and their effect on large fire suppression expenditures." *Journal of Forestry* **106**(8): 416-424.

Large wildland fires are complex, costly events influenced by a vast array of physical, climatic, and social factors. Changing climate, fuel buildup due to past suppression, and increasing populations in the wildland-urban interface have all been blamed for the extreme fire seasons and rising suppression expenditures of recent years. With each high-cost year comes a multitude of fire cost reviews, suppression cost studies by federal oversight agencies, and new rules and regulations focused on containing or reducing suppression costs. However, largely ignored in many of these inquiries are the human factors and pressures outside (external to) the influence of the incident team managing a fire that are contributing to the problem. This article presents an in-depth examination of some external human factors that affect incident management team (IMT) decisionmaking and influence suppression costs. Data were collected during 2004 and 2005 through 48 in-depth interviews with IMT command and general staff members representative of each Geographic Area Coordination Center, all federal agencies, and many state agencies whose employees serve on teams. External human factors identified include risk management; interaction with agency administrators; policies, regulations, and rules; resource availability; and social-political pressure. Inattention to these factors can result in policies that adversely affect IMTs charged with managing highly volatile events in a safe, timely, and cost-efficient manner.

Carroll, J. and A. D. Bright (2009). "The integrative complexity of wildfire management scale: Are we there yet?" *Human Ecology Review* **16**(2): 211-221.

Integrative complexity is a measure of how complexly people think about an issue. A newly developed integrative complexity scale was applied in a study of perceptions of wildfire management. We explored the relationship between value-laden basic beliefs and attitudes, and integrative complexity's role as a moderator between them. The study data came from residents along the front range of Colorado, the Chicago metropolitan area, and Southern Illinois. While integrative complexity toward prescribed burning was not directly related to value-laden basic beliefs about prescribed burning, it was related to the direction and extremity with which people held attitudes toward prescribed burning. Also, the level of integrative complexity toward wildfire management moderated the relationship between value-laden basic beliefs and attitudes. Understanding the complexity with which people think about natural resource management issues such as prescribed burning can contribute to greater understanding of public perceptions regarding natural resource management strategies and policies. Additional information is also provided to guide further use and development of the instrument.

Carroll, M. S., K. A. Blatner, P. J. Cohn and T. Morgan (2007). "Managing fire danger in the forests of the U.S. inland northwest: A classic "wicked problem" in public land policy." *Journal of Forestry* **105**(5): 239-244.

In their classic article Allen and Gould (Allen, G.M., and E.M.- Gould. 1986. Complexity, wickedness, and public forests. *J. For.* 84(4):20 -24) stated that the most daunting problems associated with public forest management had a "wicked" element: "Wicked problems share characteristics. Each can be considered as simply a symptom of some higher order problem.... The definition is in the mind of the beholder.... Furthermore, there is no single correct formulation for a wicked problem, only more or less useful ones" (p. 22). This description seems to fit the difficulties associated with managing the increasing risk of wildland fire in the United

States. Using the Inland Northwest region of the United States as an example, we explore the dynamics of this issue as they relate to possible improvements and the inherent dilemmas. We conclude that any "solutions" to the problems associated with fire danger are best thought of in terms of long-term system improvements rather than short-term fixes.

Carroll, M. S. and P. J. Cohn (2007). Community impacts of large wildland fire events: Consequences of actions during the fire. *People, Fire, and Forests: A Synthesis of Wildfire Social Science*. T. C. Daniel, M. S. Carroll, C. Moseley and C. Raish, Eds. Corvallis, OR, Oregon State University Press: 104-123.

This paper portrays one segment of an event-driven model about the local community impacts of large residential-interface wildfire events. Beginning with the assumption that such events occur within a context framed by the biophysical setting, sociodemographic conditions, and the psychological-cultural context, this work reviews the scant published literature on the human-community impacts of wildfire and the more abundant hazards and disaster literature to distill key events and processes that occur within communities during wildfire events in light of the aforementioned contextual elements. Specifically, the paper examines: 1) events and processes during fires; 2) issues related to such events and processes; and 3) long-term impacts of events, decisions, and processes occurring during fires. We conclude by suggesting that although particular events and processes are inherent in community wildfire events, particular outcomes are not inevitable. By identifying key decision points, community and agency leaders can affect the outcome of fire events on communities in important ways.

Carroll, M. S., P. J. Cohn and K. A. Blatner (2004). "Private and tribal forest landowners and fire risk: A two-county case study in Washington state." *Canadian Journal of Forest Research* **34**(10): 2148-2158.

This study focused on the role of fire both as a perceived threat and a management tool of nonindustrial private forest and tribal forest landowners or managers in two counties in northeastern Washington State. Using qualitative social research methods and a risk perception conceptual frame, we identified distinct categories of landholders with different reasons and strategies for holding and managing their forest land. We found similarities in categories of landholders and managers in each county, ranging from those who actively manage for timber production and forage, to residential and recreational users who manage for wildlife, aesthetics, or fire safety, and those who don't manage at all. We also found that landowners in the different categories tended to be concerned about different kinds of risks. There were differences between landholders in the two counties over the perception of fire as a threat and measures taken to reduce the threat of fire as well as the use of prescribed fire (broadcast burning) as a management tool. These differences can be related to landholders' experiences with fire (wild and prescribed), land tenure, financial and physical restraints, and their reasons for holding the land.

Carroll, M. S., P. J. Cohn, D. N. Seesholtz and L. L. Higgins (2005). "Fire as a galvanizing and fragmenting influence on communities: The case of the Rodeo-Chediski fire." *Society & Natural Resources* **18**(4): 301-320.

Large wildfires that burn through the "forest-residential intermix" are complex events with a variety of social impacts. This study looks at three northern Arizona community clusters directly affected by the 2002 Rodeo-Chediski fire. Our analysis suggests that the fire event led to both the emergence of cohesion and conflict in the study area. Community cohesion was evident as residents "pulled together" to rebuild their communities. Examples of cohesion included managers of local businesses staying during evacuation to provide for the needs of firefighters, providing shelter and cleanup help for burned-out neighbors, and the emergence of locally

based assistance groups. Several types of conflict rooted in blaming and distribution of firefighting and disaster assistance resources were found: cultural, local versus federal, community versus community, intracommunity, and environmental. We suggest that these responses are most usefully understood using the lenses of social psychology (attribution theory) together with sociology (structuration theory). Issues and dynamics that resulted in controversy or were seen as locally constraining and those that resulted in cohesion tended to relate to specific local impacts and how outsider actions were either consonant or dissonant with the application of local knowledge, local autonomy, and locally desirable outcomes.

Carroll, M. S., A. J. Findley, K. A. Blatner, S. Rodriguez-Mendez, S. E. Daniels and G. B. Walker (2000). Social assessment for the Wenatchee National Forest wildfires of 1994: Targeted analysis for the Leavenworth, Entiat, and Chelan Ranger Districts; GTR-PNW-479. Portland, OR, USDA Forest Service, Pacific Northwest Research Station: 114

A purposive social assessment across three communities explored reactions of local residents to wildfires in the Wenatchee National Forest in north-central Washington. Research concentrated on identifying the diversity of fundamental beliefs and values held by local residents about wildfire and forest management. Particular emphasis was given to investigating community social structures and potential conflict dynamics surrounding fire recovery efforts. Semistructured interviews were conducted with people representing a diverse set of values, attachments to the National Forest, and beliefs about forest management. Complexity of the social context emerged through inductive methods of qualitative analysis. Twenty-six social entities were categorized as political coalitions, stakeholder groups, residency tenure distinctions, geographic divisions, or ethnic communities. For each of the three communities, an in-depth discussion described social dynamics surrounding fire recovery in the National Forest by juxtaposing the various value orientations and beliefs across 15 fire recovery issues. Conclusions targeted improving public involvement processes in the aftermath of severe ecological disturbances and traumatic human experiences.

Carroll, M. S., L. L. Higgins, P. J. Cohn and J. A. Burchfield (2006). "Community wildfire events as a source of social conflict." *Rural Sociology* **71**(2): 261-280.

The literature notes that natural disasters, including wildfires, that damage human settlements often have the short-term effect of "bringing people together." Less recognized is the fact that such events can also generate social conflict at the local level. This study examines the specific sources of such social conflict during and after community wildfire events. Examining qualitative data generated from six case studies of wildfires in the American West, we suggest that integrating the theories of Weber, Giddens, and Habermas with community interaction theory provides a context for understanding such conflict. Rationalized forms of interaction and problem solving imposed by extra-local organizations during and after wildfire events are often resisted by local actors who are also inhibited from acting due to local capacity limitations. Thus, conflict occurs when social relations are disembedded by non-local entities, and there is a perceived loss of local agency.

Champ, J. G., D. R. Williams and K. Knotek (2009). "Wildland fire and organic discourse: Negotiating place and leisure identity in a changing wildland urban interface." *Leisure Sciences* **31**(3): 237-254.

A lack of research on the conceptual intersection of leisure, place and wildland fire and its role in identity prompted this exploratory study. The purpose of this research was to gather evidence regarding how people negotiate identities under the threat of wildland fire. Qualitative interviews with 16 homeowners and recreationists who value leisure activities in undeveloped

places in Colorado's Arapaho-Roosevelt National Forest were conducted. Results show that wildland fire plays a varied role in the identities of many of the research participants. Three dominant discourses of nature (i.e., humanist, protectionist and organic) helped explain these identity-related reactions to wildland fire. An understanding of the multidimensional aspects of place and leisure identity highlighted in this research could help land managers particularly related to the organic discourse.

Champ, P. A., G. H. Donovan and C. M. Barth (2010). "Homebuyers and wildfire risk: A Colorado Springs case study." *Society & Natural Resources* **23**(1): 58-70.

In recent years, the threat that wildfire poses to homes has received much attention in both the mainstream press and academic literature. However, little is known about how homebuyers consider wildfire risk during the home-purchase process. In the context of a unique wildfire education program, we consider two approaches to examining the relationship between wildfire risk and home purchases. Results from a market-level analysis using home sales price data are compared to household survey results. The household survey validates the market-level analysis and provides further insight into homebuyers and wildfire risk. Specifically, we find that while homebuyers prefer locations near dangerous topography, they also prefer less flammable building materials. However, most homebuyers were unaware of wildfire risk when they made their home-purchase decisions.

Cohn, P. J., M. S. Carroll and Y. Kumagai (2006). "Evacuation behavior during wildfires: Results of three case studies." *Western Journal of Applied Forestry* **21**(1): 39-48.

Evacuation of rural communities threatened by wildfires is occurring more often, particularly in the western United States. Residents, public safety officials, community leaders, and public land managers are facing the issues and problems of this news experience. We used semi-structured interviews to elicit the evacuation experience from the viewpoint of evacuees and public safety officials in three case studies of wildfire evacuations in the western United States during 2000 and 2002. (Our interviews were conducted only with Teller County, residents and officials.) We identify and describe the stages of the evacuation process as experienced by evacuees, and the dynamics and dilemmas associated with each stage. We analyze these perceptions and dynamics using the sociological lenses of social construction of meaning and structuration. The results indicate that evacuees and public safety officials have different perceptions and concerns about the evacuation process. We derive lessons learned from these three cases for use in planning future wildfire evacuations.

Cohn, P. J., D. R. Williams and M. S. Carroll (2008). Wildland-urban interface residents' views on risk and attribution. *Wildfire Risk: Human Perceptions and Management Implications*. W. E. Martin, C. Raish and B. Kent, Eds. Washington, D.C., Resources for the Future: 23-43.

Catastrophic wildfires that impact human communities have become increasingly common in recent years. To reduce the potential for damage to human communities, wildland-urban interface (WUI) residents have been encouraged to perform mitigation or fire-safing measures around their homes and communities. Yet homeowners have not wholeheartedly adopted these measures, even after their communities have been struck by wildfire. Although some barriers to widespread adoption, such as the need for financial assistance and lack of knowledge, are being addressed, homeowner interest in adopting risk mitigation measures remains tepid...

...This chapter examines WUI residents' views on wildfire risk and the role of causal attribution in wildfire risk perception and response, both pre- and postfire. Social psychologists developed attribution theory in the 1970s to describe the kinds of causal explanations people give for

events and the effects these explanations have on their judgments about, among other things, success and failure (Weiner 1986). One general finding is that people have a psychological need to assign responsibility for important events, but their judgments about the underlying causality often minimize personal responsibility for negative outcomes. The question here is how these attribution tendencies influence residents' responses to wildfire risk. To this end, we examine the results of six qualitative case studies of communities or sets of communities in the U.S. West conducted in the wake of wildfire events and address the following questions: Where do homeowners place responsibility for prefire mitigation—on their actions or the actions of others? Where do homeowners place responsibility for wildfire damage (to both natural resources and built property)? To what do homeowners who have experienced wildfires attribute the fundamental cause of the wildfire—the actions of self, others (management, perceived suppression policy), or natural conditions (weather, topography)? And finally, where do WUI residents place wildfire risk in the spectrum of risks in their lives, and how does this affect willingness to engage in prefire mitigation measures?

Collins, T. W. (2005). "Households, forests, and fire hazard vulnerability in the American West: A case study of a California community." *Environmental Hazards* 6(1): 23-37.

Due to amplified biophysical risks, rapid population growth, and inadequacies of existing political mechanisms, wildland–urban interface (WUI) fire hazards have become increasingly acute throughout the American West. Using a case study approach, I test the applicability of four social determinants of household level WUI fire hazard vulnerability in the community of Forest Ranch, California. Previous studies have independently identified (1) risk perceptions, (2) amenity value conflicts, and (3) institutional incentive structures as determinants of household fire hazard vulnerability. I introduce (4) political economic constraints as determinants. Findings confirm the role of three social determinants in household risk management decision-making: while determinant (1) is not a significant correlate of household vulnerability, determinants (2)–(4) are significant correlates. Also, findings demonstrate that political economic theory offers concepts applicable to studies of WUI hazard vulnerability. These conclusions call into question current management interventions. The coexistence of affluence and underdevelopment in WUI areas of the American West sheds doubt on one-dimensional representations of residents, mutually exclusive interpretations of social determinants of hazard vulnerability, and thus, narrowly conceived or universal management prescriptions (e.g., interventions directed solely toward educating residents about biophysical risks).

Collins, T. W. (2009). "Influences on wildfire hazard exposure in Arizona's high country." *Society & Natural Resources* 22(3): 211-229.

Based on the case of wildfire hazards in Arizona forests, this article addresses the question: What influences hazard exposure? Like other locales in the U.S. West, the study area has developed as large wildfires have occurred with increasing frequency. Management interventions have traditionally been based on the hypothesis that unsafe conditions result from inadequate residential knowledge of wildfire hazards. Findings from a household-level multiple regression analysis using structured survey, hazard exposure, and secondary data provide little support for this approach and underlying hypothesis. Results reveal that other variables corresponding to amenity values, reliance on fire insurance, place dependency, and housing contextual factors are important predictors of household exposure to wildfire hazards. Findings have implications for theoretical understandings of wildfire hazards and hazard reduction efforts in private community landscapes.

Collins, T. W. and B. Bolin (2009). "Situating hazard vulnerability: People's negotiations with wildfire environments in the U.S. southwest." *Environmental Management* **44**(3): 441-455.

This article is based on a multimethod study designed to clarify influences on wildfire hazard vulnerability in Arizona's White Mountains, USA. Findings reveal that multiple factors operating across scales generate socially unequal wildfire risks. At the household scale, conflicting environmental values, reliance on fire insurance and firefighting institutions, a lack of place dependency, and social vulnerability (e.g., a lack of financial, physical, and/or legal capacity to reduce risks) were found to be important influences on wildfire risk. At the regional-scale, the shift from a resource extraction to environmental amenity-based economy has transformed ecological communities, produced unequal social distributions of risks and resources, and shaped people's social and environmental interactions in everyday life. While working-class locals are more socially vulnerable than amenity migrants to wildfire hazards, they have also been more active in attempting to reduce risks in the aftermath of the disastrous 2002 Rodeo-Chediski fire. Social tensions between locals and amenity migrants temporarily dissolved immediately following the disaster, only to be exacerbated by the heightened perception of risk and the differential commitment to hazard mitigation displayed by these groups over a 2-year study period. Findings suggest that to enhance wildfire safety, environmental managers should acknowledge the environmental benefits associated with hazardous landscapes, the incentives created by risk management programs, and the specific constraints to action for relevant social groups in changing human-environmental context.

Corringham, T. W., A. L. Westerling and B. J. Morehouse (2008). "Exploring use of climate information in wildland fire management: A decision calendar study." *Journal of Forestry* **106**(2): 71-77.

We conducted surveys of fire and fuels managers at local, regional, and national levels to gain insights into decision processes and information flows in wildfire management. Survey results in the form of fire managers' decision calendars show how climate information needs vary seasonally, over space, and through the organizational network, and help determine optimal points for introducing climate information and forecasts into decision processes. We identified opportunities to use climate information in fire management, including seasonal to interannual climate forecasts at all organizational levels, to improve the targeting of fuels treatments and prescribed burns, the positioning and movement of initial attack resources, and staffing and budgeting decisions. Longer-term (5-10 years) outlooks also could be useful at the national level in setting budget and research priorities. We discuss these opportunities and examine the kinds of organizational changes that could facilitate effective use of existing climate information and climate forecast capabilities.

Cvetkovich, G. T. and P. L. Winter (2008). The experience of community residents in a fire-prone ecosystem: A case study on the San Bernardino National Forest. PSW-RP-257. Albany, CA, USDA Forest Service, Pacific Southwest Research Station 42 p.

This report presents results from a study of San Bernardino National Forest community residents' experiences with and perceptions of fire, fire management, and the Forest Service. Using self-administered surveys and focus group discussions, we found that participants had personal experiences with fire, were concerned about fire, and felt knowledgeable about effective fire management. Consideration of future consequences, a measure of time orientation, was not found to be related to beliefs about and reactions to wildfire. Trust in the Forest Service was related to a number of fire-associated attitudes. Findings help shed light on the experiences of residents living in fire-prone communities and highlight the importance of trust in understanding public perceptions about fire management.

Dale, L. (2006). "Wildfire policy and fire use on public lands in the United States." *Society & Natural Resources* **19**(3): 275-284.

Current wildfire management policy succeeds in suppressing 99% of all fires on public lands. Indirect costs of this achievement include the development of dense vegetation in the absence of fire, and increasingly more intense fires when they do erupt. The result is a fire management system with rising costs and fire-dependent forests that are frequently characterized by declining health. Wildland fire use (WFU), the use of fire to accomplish specific pre-stated resource management objectives, is considered appropriate in many remote wildlands where a naturally ignited fire may safely be used to improve forest health. Ecological benefits associated with WFU include improved watershed conditions, enhanced wildlife habitat, and more resilient forested ecosystems. Economic benefits include reduced suppression and fuels treatment costs over the long term. Policy challenges are complex, however; land management agencies face increased planning requirements as well as the need to develop both institutional and public support before the full potential of wildland fire use can be realized.

Daniel, T. C. (2007). Perceptions of wildfire risk. *People, Fire, and Forests: A Synthesis of Wildfire Social Science*. T. C. Daniel, M. S. Carroll, C. Moseley and C. Raish, Eds. Corvallis, OR, Oregon State University Press: 55-69.

Wildfire risk managers often start with the assumption that wildfire is an important hazard that demands mitigation. But a review of literature reveals that wildfire has generally not been high on the list of concerns for the public nor has it attracted much attention from those charged with protecting the public against the wide range of hazards modern people face. Wildfire has essentially been ignored in the substantial risk-perception research literature. Wildfire may in fact not be among the most serious hazards for modern humans, especially for the largest numbers who live in highly developed urban areas. Moreover, even for those who live in higher-risk areas the objective probability of a wildfire causing serious damage to any particular individual property can be quite small. To mitigate the low-probability risk of uncertain amounts of damage from wildfire in the future people are asked immediately and in perpetuity to exert effort, pay costs, and accept sacrifices in return for uncertain and incomplete protection. Faced with such unattractive trade-offs, it is not surprising that many individuals who are at risk from wildfire fail to fully embrace and implement recommended fuels reduction, defensible space, and other mitigation programs. To be successful, wildfire risk-management programs must be designed and presented with greater appreciation of the perspectives of at-risk individuals, for whom fire risk must compete with an array of more salient and more pressing concerns, and whose commitment to wildfire risk-mitigation efforts can be expected to be limited.

Daniel, T. C. (2008). Managing individual response: Lessons from public health risk behavioral research. *Wildfire Risk: Human Perceptions and Management Implications*. W. E. Martin, C. Raish and B. Kent, Eds. Washington, DC, Resources for the Future: 103-116.

This chapter selectively reviews the research literature in the fields of health and medical risk and risk communication to find models and approaches that might be applicable to wildfire risk management. Wildfire risk is clearly different from the risks of smoking, heart disease, or cancer. Why then look to the health risk literature to find ways to more effectively manage wildfire risk? One answer is that research on health risks and methods for managing those risks is vastly larger, better financed, and more fully developed than the currently meager and sporadic research literature on wildfire risk behavior. Sustained medical and social science research programs provide a substantial scientific foundation for methods to identify and communicate

medical risks and individual risk factors, encourage early diagnosis and consistent monitoring, curb risky behaviors, properly use medication, alter diets, and promote appropriate exercise. Health risk reduction methods have been subjected to systematic evaluations, including large random trials that directly measure and compare outcomes on thousands of subjects over years. It is unlikely that wildfire risk management will ever achieve a comparable scientific basis.

Another justification for looking to the health risk literature is that from a social-psychological science perspective, all risks share some important common features and processes. All risks involve the potential of negative outcomes (cost, damage, loss, injury, illness, death) at some time in the future, as well as the possibility that preemptive actions might avoid or reduce those negative outcomes. From a psychological perspective, actions implemented in the interest of avoiding, postponing, or reducing anticipated negative outcomes are motivated by fear. For preemptive risk-reducing actions to occur, fear of the future negative outcome must outweigh the costs, effort, and sacrifices of other values required by those actions. A major complication in this trade-off calculus is uncertainty. Future negative outcomes are rarely certain to occur, and if they do occur, it is rarely certain exactly when or who will be affected or how bad the outcome will be. Moreover, prescribed risk-reducing actions are almost never certain to provide complete protection, and often the ability of the actors to carry out the prescribed actions fully and effectively is also in question.

Whether the hazard is wildfire, flood, radioactive waste, auto accident, infectious disease, or cancer, the psychological processes involved in recognizing that one is at risk, acknowledging vulnerability, and accepting and implementing prescribed risk-reducing actions may be fundamentally similar...

...The balance of this chapter is devoted to reviewing mostly secondary literature focused on internal factors that influence individuals' perceptions, decisions, and actions that affect the success of efforts to mitigate health risks...

Daniel, T. C., M. Valdiserri, C. R. Daniel, P. Jakes and S. Barro (2005). Social science to improve fuels management: A synthesis of research on assessing social acceptability of fuels treatments. GTR-NC-259. St. Paul, MN, USDA Forest Service, North Central Research Station: 52 p.

When making decisions about fuels treatments, managers assess the biophysical impacts expected from the treatment. In planning and other decision processes, managers must also evaluate the treatment's social impacts. One general measure of social impacts is social acceptability. Social acceptability is based on value judgments by people, their notions of "goodness/betterness." For example, managers may be interested in answering the question "Do stakeholders judge treatment X to be more socially acceptable than treatment Y for reducing hazardous fuels?" An alternative question might focus on the management goal rather than the means of achieving that goal, for example: "Is it more socially acceptable to manage for fuels reduction or ecosystem restoration?" In this document we synthesize research relevant to evaluating the social acceptability of fuels treatments in the dry forests of the inland West.

Daniel, T. C., E. Weidemann and D. Hines (2003). Assessing public tradeoffs between fire hazard and scenic beauty in the wildland/urban interface. Homeowners, Communities, and Wildfire: Science Findings from the National Fire Plan, Proceedings of the 9th International Symposium on Society and Resource Management, June 2-5, 2002, Bloomington, IN, GTR-NC-231. USDA Forest Service, North Central Research Station, St. Paul, MN, pp. 36-44.

Wildfire risk management efforts have historically emphasized prevention of ignitions or, failing that, rapid suppression. Currently emphasis is increasingly being placed on preemptively managing the fuels that feed catastrophic wildfires. Support for fuel reduction strategies hinges

on public perception and evaluation of a complex set of tradeoffs among uncertain and potentially conflicting values. For example, if at-risk publics fail to perceive the hazard represented by existing (or projected) vegetative fuels, while perceiving the aesthetic consequences of proposed fuel management treatments to be substantial and negative, they are unlikely to support that treatment. The research reported here explored public perception and evaluation of fire hazard/aesthetic value tradeoffs represented by alternative fuel reduction treatments. In particular, relationships were investigated between changes in natural vegetative fuels and public perceptions of scenic beauty and fire hazard in hypothetical forest homesites.

Davis, C. (2001). "The West in flames: The intergovernmental politics of wildfire suppression and prevention." *Publius* 31(3): 97-110.

This research examines changes in the intergovernmental policy arrangements governing the control of wildfires in the western United States. For much of the twentieth century, the policymaking structure resembled Deil S. Wright's inclusive authority model whereby fire policy was dominated by the U.S. Forest Service with the states playing a supporting role. More recently, the states have become increasingly important in the decision-making process because of changes in residential patterns and land-use preferences that require greater intergovernmental coordination in presuppression and suppression activities within urban/wildland intermix areas, the rise in the number of large wildfires within national forests, and the willingness of Congress to approve institutional arrangements that give more weight to local community interests. Thus, the current approach increasingly resembles the overlapping authority model where multiple governmental jurisdictions share decision-making responsibility on wildfire control policies.

Davis, C. (2006). "Western wildfires: A policy change perspective." *Review of Policy Research* 23(1): 115-127.

My research objective in this article is to analyze policy change affecting wildfire suppression programs administered by the United States Forest Service and the United States Department of the Interior. Using a variant of the punctuated equilibrium approach, a content analysis of New York Times stories dealing with wildfires over the past two decades was examined in relation to both administrative and legislative policy changes. I conclude by suggesting that administrative shifts were undertaken by federal land administrators in response to crises and media attention to protect decisional autonomy as well as forest resources, while the architect of legislative change was a president taking advantage of the combined effects of increasingly intense wildfire seasons, demographic shifts involving the movement of people and structures to the high-risk wildland urban interface areas, greater media scrutiny, and pressure to act from wildfire weary constituencies.

Deau, G. and C. A. Vogt (2004). The impact of wildland fire reduction techniques on attitudes toward fuels mitigation: A comparison of special use cabin permittees and other homeowners living near a national forest Proceedings of the 2003 Northeastern Recreation Research Symposium. Gen. Tech. Rep. NE-317. J. Murdy, Ed. Newton Square, PA, USDA Forest Service, Northeastern Research Station.: 128-133.

This study examines the impact of fuel mitigation and fire prevention programs on homeowners' attitudes toward and approval of fuel reduction techniques. This research is relevant to resource managers, from fire to recreation, who are responsible for a multitude of land uses and conditions. A mail questionnaire was used to collect data from three types of homeowners in the Big Bear Lake area of the San Bernardino National Forest, in San Bernardino County,

California. Based on a half-day meeting with fire managers from federal and local authorities and a focus group with local residents many of whom were active in Fire Safe councils, we learned about various educational and mitigation programs offered and/or enforced by the appropriate authorities. The Forest Service implemented a fire safety program with special use cabin permittees that enforced defensible space standards, primarily through a periodic home and property inspection. Special use cabin permittees were required to comply or be subjected to fines. Permanent and seasonal homeowners in the area were not targeted with the same fire safety program; although many fire safety and fuel mitigation programs were administered locally. The results of this research shows special use cabin permittees, most of who are seasonal home users, and permanent homeowners who live in the area full-time have high levels of experience with defensible space. These two types of homeowners exhibit strong positive attitudes toward defensible space over mechanical fuel reduction and prescribed burning. However, when asked if defensible space should be implemented in the local area all homeowner types held fairly high levels of approval for this fuel reduction technique.

Dether, D. and A. Black (2006). "Learning lessons from escaped prescribed fires: Lessons for high reliability." *Fire Management Today* **66**(4): 50-56.

Meeting national goals for hazardous fuels reduction and ecosystem restoration would be difficult if not impossible prescribed fire. Suspension of prescribed fire programs, as often happens following an escape, limits federal capacity to meet programmatic, social, and ecological goals. Thus, meeting our goals requires that fire programs (both prescribed and Wildland Fire Use) operate with 'high reliability' – that is with less than their fair share of accidents (Weick and Sutcliffe 2001). In this paper, we summarize a recent review (Dether 2005) of escaped prescribed fires from the perspective of 'high reliability' in order to understand how to improve future performance. Our intent is to identify potential 'weak signals' or "early warning signs" fire use practitioners may want to pay particular attention to as they prepare for future events (prescribed fire, Wildland Fire Use, even suppression events).

Doane, D., J. O'Laughlin, P. Morgan and C. Miller (2006). "Barriers to wildland fire use." *International Journal of Wilderness* **12**(1): 36-38.

American society has a general cultural bias toward controlling nature (Glover 2000) and, in particular, a strong bias for suppressing wildfire, even in wilderness (Saveland et al. 1988). Nevertheless, the Federal Wildland Fire Management Policy directs managers to "allow lightning-caused fires to play, as nearly as possible, their natural ecological role in wilderness" (FWFMP 2001). Each year, however, approximately 85% of natural fire ignitions in national forest wilderness areas are suppressed (Sexton 2004).

Roughly 20% of all national forest wilderness lands have been significantly altered from historical ecological conditions (Miller 2003), and the risk of losing key ecosystem components within these altered landscapes is high (Schmidt et al. 2002). Current management practices favoring suppression of natural ignitions cannot sustain the functional role of fire in wilderness areas (Cole and Landres 1996). Although concerns and issues that influence fire management decisions on U.S. federal lands have been identified (Miller and Landres 2004), to our knowledge there has not been a systematic national assessment to identify and measure Wildland Fire Use (WFU) barriers.

Dombeck, M. P., J. E. Williams and C. A. Wood (2004). "Wildfire policy and public lands: Integrating scientific understanding with social concerns across landscapes." *Conservation Biology* **18**(4): 883-889.

Efforts to suppress wildfires have become increasingly problematic in recent years as costs have risen, threats to firefighter safety have escalated, and detrimental impacts to ecosystems have multiplied. Wildfires that escape initial suppression often expand into large, high-intensity summer blazes. Lost is the legacy of smaller fires that likely burned outside extreme weather and fuel conditions and resulted in less severe impacts. Despite the recognized need for modifications to existing policies and practices, resource agencies have been slow to respond. The spread of exotic species, climate change, and increasing human development in wildlands further complicates the issue. New policies are needed that integrate social and ecological needs across administrative boundaries and broad landscapes. These policies should promote a continuum of treatments with active management and reduction of fuel hazard in wildland-urban interface zones and reintroduction of fire in wildlands. Management goals should focus on restoration of the long-term ecological health of the land. Projects that reduce fuel loads but compromise the integrity of soil, water supplies, or watersheds will do more harm than good in the long run. Despite significant ecological concerns, learning to live with fire remains primarily a social issue that will require greater political leadership, agency innovation, public involvement, and community responsibility.

Downing, J. L., R. W. Hodgson, J. G. Taylor and S. C. Gillette (2008). Fire information for communities at risk in interface wildfires: Lessons learned from the 2003 Southern California megafires. Fire Social Science Research from the Pacific Southwest Research Station: Studies Supported by National Fire Plan Funds. PSW-GTR-209. D. J. Chavez, J. D. Absher and P. L. Winter, Eds. Albany, CA, USDA Forest Service, Pacific Southwest Research Station: 135-152.

Community residents and other people whose interests are threatened by wildland-urban interface wildfires need immediate and continuing information to protect themselves, their families, and property and to cope with the health, psychological, social, and economic dangers that wildfires and other disasters present. Studies during the 2003 wildfires near San Bernardino, California, highlighted shortcomings in incident information and suggested ways to correct them. Practical recommendations to improve communication with people and communities at risk during interface wildfires are described here. Most important among the findings is that information must be provided continuously as the incident unfolds. People demand and need real-time information.

Eriksen, C. and N. Gill (2010). "Bushfire and everyday life: Examining the awareness-action 'gap' in changing rural landscapes." *Geoforum* **41**(5): 814-825.

In this paper we use the notion of 'everyday life' to critically examine an apparent 'gap' between bushfire risk awareness and preparedness amongst diverse landholders in rural landscapes affected by amenity-led in-migration in southeast Australia. Landholders were found to bring their own agency to bushfire preparedness in the relationships between everyday procedures, dilemmas, and tradeoffs. Consequently, regardless of landholders' awareness levels, attitudes towards bushfire and natural resource management influence if, how, and to what extent landowners prepare for bushfires. We argue that not only is the 'gap' complex but also paradoxical in that it is both evident in, and constituted by, landholder attitudes and action and simultaneously dissolved in their practices and decision-making in everyday life. Three dilemmas of everyday life in particular were found to underpin these attitudes: costs (in terms of monetary and time values), gender roles, and priorities. Using a mixed-methods research approach, this simultaneous cultural construction and material nature of bushfire in everyday

life is mapped out through landholders' narratives and actions that embody living with fire on the land. The place of bushfire in landholders' everyday life has direct relevance to recent international discussions of the vulnerability of the growing number of people living in bushfire-prone rural–urban interface areas.

Eriksen, C., N. Gill and L. Head (2010). "The gendered dimensions of bushfire in changing rural landscapes in Australia." *Journal of Rural Studies* **26**(4): 332-342.

This paper examines gender differences in awareness, preparedness and attitudes towards bushfire amongst landholders in rural landscapes affected by amenity-led in-migration in southeast Australia. It considers the potential of conceptualising bushfire not as a gender-neutral natural phenomenon but as an important means by which traditional gender roles and power relations within rural landscapes are maintained. Landholders were found to uphold conventional views of bushfire management as "men's business" despite changing social circumstances. Consequently, key gender differences exist within landholders' bushfire risk awareness, bushfire knowledge, the perceived need for bushfire preparedness measures, the willingness to perform certain tasks, and the belief in personal capacity to act. We argue that covert and less visible as well as overt gender roles and traditions are important factors in understanding landholders' engagement with bushfire management. When gendered dimensions of bushfire are investigated in the context of hegemony, a paradox emerges between women choosing not to take control of their own bushfire safety and women being denied the opportunity to take control. The complex and contradictory actions and attitudes to bushfire that materialise through an analysis of gendered social experiences complicate attempts to create more gender-sensitive frameworks for bushfire management. The tenacious and embedded nature of gender role divisions within both public and private spheres was furthermore found to act as economic, social and political stumbling blocks for empowerment opportunities. Using a mixed-methods research approach, this paper maps out gendered dimensions of bushfire through landholders' narratives and actions. The implications of these dimensions for bushfire management have direct relevance to recent international discussions of the vulnerability of the growing number of people living in bushfire-prone rural–urban interface areas.

Eriksen, C. and T. Prior (2011[†]). "The art of learning: Wildfire, amenity migration and local environmental knowledge." *International Journal of Wildland Fire* **20**(4): 612-624.

Communicating the need to prepare well in advance of the wildfire season is a strategic priority for wildfire management agencies worldwide. However, there is considerable evidence to suggest that although these agencies invest significant effort towards this objective in the lead-up to each wildfire season, landholders in at-risk locations often remain under-prepared. One reason for the poor translation of risk information materials into actual preparation may be attributed to the diversity of people now inhabiting wildfire-prone locations in peri-urban landscapes. These people hold widely varying experiences, beliefs, attitudes and values relating to wildfire, which influence their understanding and interpretation of risk messages - doing so within the constraints of their individual contexts. This paper examines the diversity of types of Local Environmental Knowledge (LEK) present within wildfire-prone landscapes affected by amenity-led in-migration in southeast Australia. It investigates the ways people learn and form LEK of wildfire, and how this affects the ability of at-risk individuals to interpret and act on risk communication messages. We propose a practical framework that complements existing risk education mechanisms with engagement and interaction techniques (agency-community and

within community) that can utilise LEK most effectively and facilitate improved community-wide learning about wildfire and wildfire preparedness.

Faulkner, H., B. L. McFarlane and T. K. McGee (2009). "Comparison of homeowner response to wildfire risk among towns with and without wildfire management." *Environmental Hazards-Human and Policy Dimensions* **8**(1): 38-51.

Few studies have examined the relationship between wildfire management by government agencies and homeowner wildfire risk mitigation. The goal of this paper is to compare perception of the wildfire risk, attribution of responsibility for mitigation, awareness of wildfire and mitigation, and adoption of wildfire mitigation activities among homeowners in towns where wildfire management activities have been completed by government (management group) and towns where no activities have been completed (no management group). Data were collected by mail survey of homeowners in six communities in Alberta, Canada during 2007. Results showed the people in the management group expressed higher levels of perceived risk and greater awareness of wildfire and mitigation than those in the no management group, but they did not attribute greater responsibility for mitigation to the homeowner nor complete more mitigation activities on their properties.

Fleeger, W. E. (2008). "Collaborating for success: Community wildfire protection planning in the Arizona White Mountains." *Journal of Forestry* **106**(2): 78-82.

In 2003, Congress passed the Healthy Forest Restoration Act encouraging communities to develop Community Wildfire Protection Plans (CWPPs) to guide wildfire mitigation efforts on both federal and nonfederal lands. This article provides a case study of the development and implementation of a CWPP for the at-risk communities of the Sitgreaves National Forest in Arizona. This case study reveals a past history of collaboration to address the issue of wildfire along with high levels of cooperation among all levels of government and community stakeholders. The communities of the Sitgreaves National Forest successfully established an inclusive and multi-jurisdictional planning process and effective procedures for intergovernmental cooperation to mitigate the wildfire risk. The Sitgreaves CWPP provides an excellent example of an effective community-based planning effort to mitigate the wildfire threat.

Fleeger, W. E. and M. L. Becker (2010). "Decision processes for multi-jurisdictional planning and management: Community wildfire protection planning in Oregon." *Society and Natural Resources* **23**(4): 351-365.

Recently national fire policy has been redirected from a primary focus on suppression towards a more integrated and comprehensive approach developed at the community level. As part of this policy shift, Congress passed the Healthy Forest Restoration Act (P.L. 108-148) in 2003 encouraging communities to develop Community Wildfire Protection Plans (CWPPs) to guide wildfire mitigation efforts on both federal and nonfederal lands. This research examines U.S. Forest Service and community collaboration in the development of CWPPs through a case study analysis of two CWPP efforts in Oregon. A decision process framework is used to examine the effectiveness of each community's planning effort to address the wildfire problem. Findings indicate that communities lack effective multi-jurisdictional decision processes and fail to adequately address all of the decision functions necessary to successfully mitigate the wildfire threat.

Flint, C. G. (2007). "Changing forest disturbance regimes and risk perceptions in Homer, Alaska." *Risk Analysis* **27**(6): 1597-1608.

Forest disturbances caused by insects can lead to other disturbances, risks, and changes across landscapes. Evaluating the human dimensions of such disturbances furthers understanding of integrated changes in natural and social systems. This article examines the effects of changing forest disturbance regimes on local risk perceptions and attitudes in Homer, Alaska. Homer experienced a spruce bark beetle (*Dendroctonus rufipennis*) outbreak with large-scale tree mortality and a 5,000-acre fire in 2005. Qualitative interviews and quantitative analysis of mail surveys are used to examine community risk perception and relationships with land managers pre- and post-fire. Results show a decrease in the saliency of the spruce bark beetle as a community issue, a coalescence of community risk perceptions about fire, and conflicting findings about satisfaction with land managers and its relationship with risk perception.

Flint, C. G. and R. Haynes (2006). "Managing forest disturbances and community responses: Lessons from the Kenai Peninsula, Alaska." *Journal of Forestry* **104**(5): 269-275.

Managing forest disturbances can be complicated by diverse human community responses. Interviews and quantitative analysis of mail surveys were used to assess risk perceptions and community actions in response to forest disturbance by spruce bark beetles. Despite high risk perception of immediate threats to personal safety and property, risk perceptions of broader threats to community and ecological well-being were found to be more likely to influence participation in community action. Results imply that increased dialogue between resource managers and local community residents contributes to broader risk assessment and prioritization of risk mitigation strategies. Identifying community risk perceptions, tapping into local capacities for action, and accepting controversy facilitate sound decisionmaking and give voice to local concerns regarding risk mitigation after forest disturbance.

Flint, C. G. and A. E. Luloff (2007). "Community activeness in response to forest disturbance in Alaska." *Society & Natural Resources* **20**(5): 431-450.

Community theorists have long grappled with the question of whether or not communities collectively respond to threats. Community, risk, disaster, and natural resource management theories all inform an understanding of community action. Here, a conceptual model of community activeness is empirically tested using survey data from six Kenai Peninsula, Alaska, communities. Data analysis revealed that socioeconomic and biophysical vulnerability, proximity to hazard, experience, risk perception, and local interactional capacity significantly influenced community activeness on the part of residents in response to forest disturbance associated with an outbreak of spruce bark beetles. Implications for theory, forest management and policy, and natural resource-based communities are advanced.

Goldstein, B. E. (2007). "Skunkworks in the embers of the Cedar Fire: Enhancing resilience in the aftermath of disaster." *Human Ecology* **36**(1): 15-28.

A coalition of environmental activists and professionals created the San Diego Fire Recovery Network (SDFRN) while the largest wildfire in California history was still burning at the city's edge in October 2003. Acting quickly while the citizenry questioned governmental ability to protect their rapidly growing region, SDFRN proposed to reduce fire risk in a way that altered residential knowledge practices and identity while reshaping governance relationships. While this effort stalled after governmental agencies restored public confidence through massive fire prevention initiatives, SDFRN's efforts may not have been in vain. Retained within collective memory, SDFRN contributed to community resilience by diversifying possible responses to

environmental change and uncertainty. In this way, flexible, informal learning organizations such as SDFRN may serve as “skunkworks,” seizing on disaster in order to incubate social–ecological relationships that might avert greater tragedies to come.

Goldstein, B. E. and W. H. Butler (2010a). "Expanding the scope and impact of collaborative planning." *Journal of the American Planning Association* **76**(2): 238-249.

Problem: As planners grow increasingly confident that they have settled on the right concepts and methods to conduct stakeholder-based collaboration, they are not considering what can be achieved through other collaborative approaches. Purpose: We aimed to explore how creating a network of place- and stakeholder-based collaboratives using communities of practice could strengthen individual collaboratives and achieve network synergies. Methods: Using a case study approach, we draw out lessons for collaborative planning from our research on the U.S. Fire Learning Network (FLN), a collaborative initiative to restore ecosystems that depend on fire. We analyzed data from over 140 interviews, hundreds of documents including restoration plans, newsletters, meeting summaries, maps, and various other reports, and observations at more than a dozen regional and national meetings. Results and conclusions: We conclude that the FLN nurtures expertise in ecological fire restoration and collaborative planning by linking multi-stakeholder collaboratives to regional communities of practice. Moreover, this linkage creates and sustains a network of collaboratives that amplify the potential for fundamental change in the culture and practice of fire management. Takeaway for practice: A community of practice is an effective approach to collaboration in situations where the purpose is to expand expertise rather than to resolve conflict and reach consensus. Moreover, a community of practice can link stakeholder-based collaboratives to create a whole greater than the sum of its parts. Realizing this potential requires questioning the universality of some of the core principles of stakeholder-based collaborative planning and diversifying the collaborative planning toolkit. Research support: This research was supported by the Northern Research Station of the U. S. Forest Service and The Nature Conservancy.

Goldstein, B. E. and W. H. Butler (2010b). "The U.S. Fire Learning Network: Providing a narrative framework for restoring ecosystems, professions, and institutions." *Society & Natural Resources* **23**(10): 935-951.

Through the U.S. Fire Learning Network (FLN), The Nature Conservancy and federal land management agencies are attempting to reorient fire management from fire suppression toward ecological restoration and community protection. In its first 2 years, the FLN linked place-based collaboratives at a national scale. Using structured planning exercises, the FLN mediated between central coordination and collaborative autonomy by guiding partners through construction of place-based and mutually coherent narratives. These narratives situated landscape partners within an arc of conflict, crisis, and resolution, aligning partners with the goals of FLN's sponsoring organizations while enhancing community solidarity and shared purpose. FLN's narrative framework placed fire managers in a heroic role of restorationist, legitimized multiple professional ways of knowing, and built collaborative capacity, thus charting a path from crisis to renewal for ecological and human communities and for fire management itself.

Gordon, J. S., D. Matarrita-Cascante, R. C. Stedman and A. E. Luloff (2010a). "Wildfire perception and community change." *Rural Sociology* **75**(3): 455-477.

Given increasing political and financial commitments to wildfire preparedness, risk policy demands that risk identification, assessment, and mitigation activities are balanced among

diverse resident groups. Essential for this is the understanding of residents' perceptions of wildfire risks. This study compares wildfire-risk perceptions of Pennsylvania residents with those of Minnesotans living in natural-amenity-rich communities. Natural-amenity-driven migration shifts land-use patterns and social conditions, making it important to understand if and how such changes affect residents' perceptions of wildfire. Key informant interviews suggest land use and contrasting values associated with sociodemographic shifts were intertwined with wildfire-risk awareness, concern, and mitigation. In both study areas, local social interactions were impaired by geospatial and sociocultural barriers related to land use and population change. Barriers included perceived threats to quality of life, conflicting needs for economic development, and homes built in isolated locations. As a result, residents did not agree on community-wide notions of wildfire risk and response. Further, residents' ideas about the potential for a wildfire disaster did not correspond to those of risk managers. Although some places were attempting to overcome these challenges, many informants said their communities were overwhelmed with the effects of change. Finding common notions of wildfire risk is critical precisely because resident participation is crucial to hazard management. In these localities, rural community development can facilitate capacities to address wildfire risk in the context of landscape and social change.

Gordon, J. S., R. C. Stedman and A. E. Luloff (2010b). "West Virginia Wildland Fire as Latent Social Discontent." *Society & Natural Resources* **23**(12): 1230-1243.

This research explores community perceptions of wildland fire risk in two fire-prone West Virginia counties. We employed community field theory and key informant interviews to observe how the local context, including sociocultural heritage, influenced risk perceptions, and meanings of fire. In contrast with expert risk assessments, residents did not view fire as a probability of harm. Residents' familiarity with local ecology was important in attenuating risk perceptions. In addition, informants alluded to wildfire as a latent symbol of resentment toward social effects of resource dependency. Thus, the symbolic meaning of fire revealed a cultural adaptation used to communicate inequitable power relations in these resource-dependent communities. Our approach helps explain what some experts argue as the inability of communities to "accurately" assess and mitigate risk. Implications of the research suggest risk managers and others need to integrate cultural analysis, as well as local residents, into their community risk mitigation programs.

Gorte, R. W. (2003). Policy Response. Humans, fires, and forests: social science applied to fire management; Workshop summary H. J. Cortner, D. R. J. Field, P. Jakes, and J. D. Buthman, Eds. Flagstaff, AZ, Ecological Restoration Institute: 59-63.

Goals seem like a good place to start. What are the goals of wildfire management? Three different goals are commonly articulated: (1) preventing loss of life and damage to property and resources; (2) preventing catastrophic/crown fires; and (3) restoring natural fire regimes. Are these goals compatible? Not in all circumstances. In some ecosystems, for example, the natural fire regime is periodic crown fire, often at long return intervals; in this situation, goals 2 and 3 could not both be achieved. Even the relative simplicity of goal 1 is not without ambiguity. This is the standard goal of federal wildfire management, as established in the 1995 Federal Wildland Fire Management Policy and Program Review. At that time, the policy was revised to balance property and resource protection, following fire control efforts in Washington in 1994 where substantial timber volumes were apparently sacrificed to protect a few houses. Preventing loss of life and property damage strongly implies a focus on the wildland-urban interface (WUI), but protecting resources implies a broader focus on wildlands with resources that can be damaged

by wildfire (typically timber). This raises the question of whether protection efforts in the WUI should take precedence for federal efforts and money over broader wildland protection. Defining the goals and priorities, with possible variations for different ecosystems as well as with involvement of the public, seems like a necessary first step for wildfire management.

Gorte, R. W. (2006). CRS Report for Congress: Forest fire/wildfire protection. RL30755, Congressional Research Service: The Library of Congress: 27.

Congress continues to face questions about forestry practices, funding levels, and the federal role in wildland fire protection. Several recent fire seasons have been, by most standards, among the worst in the past half century. National attention began to focus on wildfires when a prescribed burn in May 2000 escaped control and burned 239 homes in Los Alamos, NM. President Clinton responded by requesting a doubling of wildfire management funds, and Congress enacted much of this proposal in the FY2001 Interior Appropriations Act (P.L. 106-291). President Bush responded to the severe 2002 fires by proposing a Healthy Forests Initiative to reduce fuel loads by expediting review processes.

Many factors contribute to the threat of wildfire damages. Two major factors are the decline in forest and rangeland health and the expansion of residential areas into wildlands — the urban-wildland interface. Over the past century, aggressive wildfire suppression, as well as past grazing and logging practices, have altered many ecosystems, especially those where light, surface fires were frequent. Many areas now have unnaturally high fuel loads (e.g., dead trees and dense thickets) and an historically unnatural mix of plant species (e.g., exotic invaders).

Fuel treatments have been proposed to reduce the wildfire threats. Prescribed burning — setting fires under specified conditions — can reduce the fine fuels that spread wildfires, but can escape and become catastrophic wildfires, especially if fuel ladders (small trees and dense undergrowth) and wind spread the fire into the forest canopy. Commercial timber harvesting is often proposed, and can reduce heavy fuels and fuel ladders, but exacerbates the threat unless and until the slash (tree tops and limbs) is properly disposed of. Other mechanical treatments (e.g., precommercial thinning, pruning) can reduce fuel ladders, but also temporarily increase fuels on the ground. Treatments can often be more effective if combined (e.g., prescribed burning after thinning). However, some fuel treatments are very expensive, and the benefit of treatments for reducing wildfire threats depend on many factors.

It should also be recognized that, as long as there is biomass, drought, and high winds, catastrophic wildfires will occur. Only about 1% of wildfires become conflagrations, but which fires will “blow up” into catastrophic wildfires is unpredictable. It seems likely that management practices and policies, including fuel treatments, affect the likelihood of such events. However, past experience with wildfires are of limited value for building predictive models, and research on fire behavior under various circumstances is difficult, at best. Thus, predictive tools for fire protection and control are often based on expert opinion and anecdotes, rather than on research evidence.

Individuals who choose to build homes in the urban-wildland interface face some risk of loss from wildfires, but can take steps to protect their homes. Federal, state, and local governments can and do assist by protecting their own lands, by providing financial and technical assistance, and by providing relief after the fire.

Grayzeck-Souter, S. A., K. C. Nelson, R. F. Brummel, P. Jakes and D. R. Williams (2009). "Interpreting federal policy at the local level: The wildland-urban interface concept in wildfire protection planning in the Eastern United States." *International Journal of Wildland Fire* **18**(3): 279-289.

In 2003, the Healthy Forests Restoration Act (HFRA) called for U.S. communities at-risk of wildfire to develop Community Wildfire Protection Plans (CWPPs) requiring local, state and federal actors to work together to address hazardous fuels reduction and mitigation efforts. CWPPs can provide the opportunity for local government to influence actions on adjacent public land, by establishing local boundaries of the Wildland-Urban Interface (WUI), the area where urban lands meet or intermix with wildlands. This paper explores local response to HFRA and CWPPs in the Eastern U.S., specifically if and how communities are using the policy incentive to identify the WUI. We conducted document review of Eastern CWPPs, as well as qualitative analysis of in-depth interviews with participants in four case studies. We found tremendous variation in local response to HFRA, with plans completed at multiple scales and utilizing different planning templates. The WUI policy incentive was not used in all CWPPs, suggesting that the incentive is not as useful in the Eastern U.S., where public land is less dominant and the perceived fire risk is lower than in the West. Even so, many communities in the East completed CWPPs to improve their wildfire preparedness.

Gunderson, K. (2006). "Understanding place meanings for wilderness: Personal and community values at risk." *International Journal of Wilderness* **12**(1): 27-31.

Information about human relationships with wilderness is important for wilderness management decisions, including decisions pertaining to the use of wildland fire. In a study about meanings attached to a national forest, local residents were asked to identify places they valued on the forest, why they valued them, and how fuel treatments affected those values. Local residents attach many meanings to the wilderness part of the landscape and they have opinions about the use of wildland fire as a fuel treatment there. Understanding the meanings humans attach to wilderness and how it influences their perceptions of fire and fuels management there can help managers anticipate public response to planned activities.

Gunderson, K. and A. Watson (2007). "Understanding place meanings on the Bitterroot National Forest, Montana." *Society & Natural Resources* **20**(8): 705-721.

This study describes local personal and community relationships with the Bitterroot National Forest, Montana. Using a rapid appraisal research approach, a range of personal and community values was identified. Participants were asked to identify places they valued on the forest and why they valued them. Study results indicate that local relationships exist on several scales. First, people differentiate the set of values they ascribe to places they have visited from those places they have not. Two sets of values, at two very different scales, emerged in their descriptions of places they visit and those they do not. Community residents were also asked about things that influence their response to fuel management treatments. Managers and planners can benefit from understanding local relationships with public lands through narratives that describe why some locations are more important to residents than others and anticipate reactions to planned projects that may alter those relationships.

Haines, T. K., C. R. Renner and M. A. Reams (2008). A review of state and local regulation for wildfire mitigation. *The Economics of Forest Disturbances: Wildfires, Storms, and Invasive Species*. T. P. Holmes, J. P. Prestemon and K. L. Abt, Eds., Springer Netherlands. **79**: 273-293.

Wildfire may result from natural processes or as the result of human actions (Ffolliott 1988, Mees 1990). As a natural phenomenon, it is important in sustaining forest health in fire-

dependent ecosystems. While some wildfire may be ecologically beneficial, it poses a threat to residential communities located within or adjacent to the forest. Wildfire is considered a hazard when it endangers things that people value, such as life, property and cultural values (Burton et al. 1978). Each year the challenge of protecting Wildland-Urban Interface (WUI) communities captures headlines in American newspapers, as wildfire forces the evacuation of homes. State governments have been granted police powers to protect the health, safety and welfare of their citizens by the Constitution. With regards to land use policy, the states pass this power to local governments enabling them to adopt regulations to control situations that pose a threat to life and property. In response to wildfire-related losses in the WUI, two states and numerous county and local governments have established regulatory programs to reduce wildfire hazards in high risk areas.

Hall, T. E. and M. Slothower (2009). "Cognitive factors affecting homeowners' reactions to defensible space in the Oregon Coast Range." *Society & Natural Resources* **22**(2): 95 - 110.

This study used constructs from the theory of planned behavior and protection motivation theory, along with past experience, to predict wildland-interface homeowners' willingness to implement defensible space and their interest in a consultation program aimed at reducing their risk from wildfire. Self-administered surveys (n=112) from four small Oregon Coast Range communities revealed neutral attitudes about defensible space as a whole. Regression analysis revealed that interest in the consultation program was a function of the perceived effectiveness of defensible space, past experience with fire, and perception of wildfire risk. Willingness to implement defensible space was predicted by the perceived effectiveness of and attitude toward defensible space. However, these two models left much of the variation in behavioral intention unexplained. Results demonstrate the value of integrating different cognitive constructs to predict behavioral intentions. They also highlight potential avenues for communication campaigns to increase homeowners' involvement in protecting themselves from wildfire.

Hammer, R. B., S. I. Stewart and V. C. Radeloff (2009). "Demographic trends, the wildland-urban interface, and wildfire management." *Society & Natural Resources* **22**(8): 777-782.

In this article, we provide an overview of the demographic trends that have impacted and will continue to impact the "wicked" wildfire management problem in the United States, with particular attention to the emergence of the wildland-urban interface (WUI). Although population growth has had an impact on the emergence of the WUI, the deconcentration of population and housing, amenity-driven population growth in select nonmetropolitan counties, and interregional population shifts to the West and Southeast have had and will continue to have much greater impacts. In the coming decades, we can expect the retirement of the baby boom generation to exacerbate these trends.

Haynes, K., J. Handmer, J. McAneney, A. Tibbits and L. Coates (2010). "Australian bushfire fatalities 1900–2008: Exploring trends in relation to the 'Prepare, stay and defend or leave early' policy." *Environmental Science & Policy* **13**(3): 185-194.

In many jurisdictions, including parts of the US, authorities often dictate mandatory evacuations of communities threatened by bushfire (wildfire). Prior to the 2009 'Black Saturday' fires in Victoria, Australian fire authorities in all States advised residents to decide whether they would prepare to stay and defend homes or leave early. The clear intent of that policy was to avoid late evacuations and the risks to life that this could entail. This study re-examines evidence underpinning this policy using analyses of a database of bushfire fatalities. The database

contains information on 552 civilian (non-fire fighter) fatalities obtained from print media archives at Risk Frontiers and forensic, witness and police statements contained within coronial inquest reports for all bushfire fatalities between 1901 and 2008. This data, compiled before the Black Saturday fires, clearly show the dangers of being caught outside during a bushfire and the gendered division of the circumstances of these deaths. While men have been most often killed outside while attempting to protect assets, most female and child fatalities occurred while sheltering in the house or attempting to flee. The database provides a benchmark against which the Black Saturday experience can be examined.

Hodgson, R. W. (2007). "Emotions and sense making in disturbance: Community adaptation to dangerous environments." *Human Ecology Review* **14**(2): 233-242.

When threatened with disaster, communities are faced with chaotic and threatening situations for which existing understandings provide no good explanations and established routines seem inadequate. A process is described here by which human understandings of dangerous environments and the risks of occupying them are socially reconstructed in the minds of the community following disaster or the credible threat of disaster. Those reconstructions may alter routines, changing how the community relates to its environment and, perhaps, change how well the community is adapted to the environment. Hypotheses are proposed predicting which of several competing reconstructions the community will adopt. Examples are described of how disaster managers might influence the reconstructions and, therefore, community adaptation to its environment.

Hughes, R. and D. Mercer (2009). "Planning to reduce risk: The Wildfire Management Overlay in Victoria, Australia." *Geographical Research* **47**(2): 124-141.

In a world where climate change is a 'given' the concepts of vulnerability, resilience and risk are now pivotal in public policy debates in many countries. Within this context, planning controls are designed to facilitate safe, sustainable and prosperous Communities. In line with March's (2007, 11) observation that 'one important "reason to plan" is the reduction of risk'. Victoria's Wildfire Management Overlay (WMO) was developed with the aim of mitigating wildfire risk through the identification of high risk areas and ensuring that minimum fire protection measures are implemented. The need for such an Overlay is becoming increasingly apparent as climate change contributes to the growing frequency and intensity of bushfires in Australia. Empirical research has found that, by following WMO prescriptions, the risk of a dwelling igniting from direct flame or radiant heat generated in a one in 50-year fire event can be greatly minimised. Yet not all local Councils in Victoria have built the WMO into their land use planning processes and schemes. Barriers to adoption include: lack of political will, a distrust of 'over-regulation', lack of training and mentoring of planning staff, and potential conflicts with vegetation conservation objectives.

Hull, R. B. and B. E. Goldstein (2006). Barriers to community-directed fire restoration. The Public and Wildland Fire Management: Social Science Findings for Managers; GTR-NRS-1. S. M. McCaffrey, Ed. Newtown Square, PA, USDA Forest Service, Northern Research Station: 77-85.

Key Findings: Results from a case study after the 2003 Cedar fire near San Diego suggest that managers can improve community relations and harness new collaborative potential that emerges during times of disaster by taking the following steps:

- Expect community groups to emerge following a disaster, get actively involved with their efforts, and be sensitive to their initial ignorance about established policies and procedures.

Barriers to Community-Directed Fire Restoration

- Appreciate that agency norms and procedures have benefits and costs. Agency practices and programs provide needed resources and structure in a time of chaos. However, adhered to too closely, agency norms also can suppress new ideas and solutions that typically emerge from communities mobilized during disasters.
- Recognize that the bureaucratic implementation of pre-disaster programs and priorities can help focus a community on critical tasks. However, these same programs can frustrate community members and create adversarial relations if these efforts are seen as suppressing alternative ideas, goals, and methods.
- Find ways to connect agency culture and practices with the culture and needs of the emergent group. In normal times, these connections are made through regular public participation channels, but during crises, emergent groups do not have the benefit of time.

Jacobson, S. K., M. C. Monroe and S. Marynowski (2001). "Fire at the wildland interface: The influence of experience and mass media on public knowledge, attitudes, and behavioral intentions." *Wildlife Society Bulletin* **29**(3): 929-937.

Prescribed fire is an important tool to manage some ecosystems, yet this message is a challenge to communicate to the public. The 2,282 wildfires that burned in Florida in 1998, causing \$800 million in lost timber and tourist revenues, underscore the impact of wildfire and the importance of using prescribed fire to ensure public safety. To understand public attitudes, knowledge, and behavioral intentions regarding wildland fire, we reviewed newspaper coverage of the 1998 wildfires and surveyed a random sample of 673 rural and suburban Florida residents living in counties experiencing high impacts or low impacts from the fires. The media and the survey respondents reported that the main benefit of prescribed burning was preventing more destructive fires. Media coverage and public opinion differed on the detrimental effects of prescribed burning. The media reported the spread of fire as a primary detriment, whereas the public reported harm to wild animals as the largest problem. Misconceptions about wildlife mortality suggest that simplistic messages of fire prevention campaigns need to be overcome. Proximity to the 1998 wildfires, based on county residence, did not change respondents' views of the benefits and constraints of prescribed burning, or their behavioral intentions toward reducing fire risks in their homes and landscapes. However, experience with prescribed burning and several sociodemographic factors were correlated with positive attitudes and increased knowledge levels.

Jakes, P., S. Burns, A. Cheng, E. Sacli, K. Brummel, N. Rachel, S. Grayzeck, V. Sturtevant and D. Williams (2007a). Critical elements in the development and implementation of Community Wildfire Protection Plans (CWPPs). *The Fire Environment: Innovations, Management, and Policy, Conference Proceedings, March 26-30, 2007, Destin, FL; RMRS-P-46CD*. B. W. Butler and W. Cook, Eds. Fort Collins, CO, USDA Forest Service, Rocky Mountain Research Station: 613-624.

Community wildfire protection plans (CWPPs) are being developed and implemented in communities across the United States. In a series of case studies, researchers found that the process of developing a CWPP can lead to benefits beyond those associated with fuels reduction, including enhancing social networks, developing learning communities, and building community capacity.

Jakes, P., L. Kelly and L. Langer (2010). "An exploration of a fire-affected community undergoing change in New Zealand." *Australian Journal of Emergency Management* **25**(3): 48-53.

In the first case study of a fire-affected community in New Zealand's rural-urban interface, researchers found evidence to support findings raised in other countries regarding evacuation,

blaming behaviour and perceptions of risk. Differences were evident based on ownership tenure, including less awareness of wildfire risk and preparedness among those with shorter residency. The study also provides new evidence of wildfire highlighting or intensifying existing divisions within an affected community.

Jakes, P., L. Kruger, M. Monroe, K. C. Nelson and V. Sturtevant (2007b). "Improving wildfire preparedness: Lessons from communities across the U.S." *Human Ecology Review* **14**(2): 188-197.

Communities across the U.S. have been taking action to adapt to the wildfire risk they face. In a series of case studies conducted in 15 communities, researchers identified and described four elements that form the foundation for community wildfire preparedness: landscape, government, citizens, and community.

Jakes, P. J., L. Kruger, M. Monroe, K. Nelson and V. Sturtevant (2004). Partners in wildland fire preparedness: Lessons from communities in the U.S. 3rd International Symposium on Human Behavior in Fire: Public Fire Safety - Professionals in Partnership, Sept 1-3, 2004, Belfast, NI, UK. London, UK, Interscience Communications: 139-150.

Description: By almost any measure, the past decade has been severe in terms of wildland fire in the United States (Table 1). The National Interagency Fire Center (NIFC) maintains a list of "Historically Significant Wildfires" in the US. - fires that are significant in terms of acres burned, value of the resources destroyed, or lives or property lost. Of the 34 significant fires listed by NIFC, half have occurred since 1990. Many of these fires burned in the wildland-urban interface - the area where homes and other structures or human development intermingle with undeveloped wildland or vegetative fuels. As many structural fire fighters can attest, fire protection no longer focuses exclusively on building materials and design, but must include vegetation near the structure and across the landscape. Similarly, wildland fire fighters are finding that they now spend a significant portion of their resources protecting homes rather than forests and other natural assets. As observed by a ranger on the Custer National Forest in the state of Montana, "We're not fighting fires in the woods anymore but saving houses."

Jakes, P. J., K. Nelson, S. Enzler, S. Burns, A. Cheng, V. Sturtevant, D. Williams, A. Bujak, R. Brummel, S. Grayzeck-Souter and E. Saeli (2011[†]). "Community wildfire protection planning: Is the Healthy Forests Restoration Act's vagueness genius?" *International Journal of Wildland Fire* **20**(3): 350-363.

The Healthy Forests Restoration Act of 2003 (HFRA) encourages communities to develop community wildfire protection plans (CWPPs) to reduce their wildland fire risk and promote healthier forested ecosystems. Communities who have developed CWPPs have done so using many different processes resulting in plans with varied form and content. We analyzed data from thirteen case study communities to illustrate how the characteristics of HFRA have encouraged communities to develop CWPPs that reflect their local social and ecological contexts. A framework for analyzing policy implementation suggests that some elements of HFRA could have made CWPP development and implementation problematic, but these potential shortcomings in the statute have provided communities the freedom to develop CWPPs that are relevant to their conditions and allowed for the development of capacities that communities are using to move forward in a number of areas.

Jakes, P. J. and K. C. Nelson (2007). Community interactions with large wildfire events: Critical initiatives prior to the fire. *People, Fire, and Forests: A Synthesis of Wildfire Social Science*. T. C. Daniel, M. S. Carroll, C. Moseley and C. Raish, Eds. Corvallis, OR, Oregon State University Press: 91-103.

Communities are more than places where people live, work, and raise their children. They are the relationships, partnerships, attitudes and values that bind people, businesses, organizations and agencies together and motivate them to achieve common goals. (Firewise Communities 2001, 4). Over the past decade, with the adoption of the National Fire Plan and development of other wildland fire initiatives such as the Western Governors' Association Ten-Year Comprehensive Strategy, there has been a major shift in philosophy regarding wildland fire, from a philosophy bent on suppression to one that seeks prevention (USDA Forest Service 2000, 2004; Western Governors' Association 2001). While federal, state, and county managers will undertake activities to prevent wildland fire on public land, the focus of many prevention efforts will be at the local or community level (Society of American Foresters 2004; USDA Forest Service 2004). Certain wildland fire preparedness actions – such as insuring adequate water systems, sufficiently wide streets, and clear and consistent street signage, and maintenance of perimeter green belts – can only be done at the community level (David 1990), yet it is the local community that may be least prepared to undertake many of the steps necessary to achieve preparedness (Cigler 1988).

Questions related to wildland fire management and communities are significant because the risks associated with the fire event are large; our knowledge of the potential or actual impacts of wildland fire on a community before, during, and after the event is incomplete; and the capacity of communities to deal with these impacts is limited. In this paper we focus on what the literature tells us about wildland fire preparedness—community level actions implemented before a wildland fire to minimize the potential impacts of the event. Our goal is to help communities act more effectively prior to the fire to reduce their wildland fire risk.

Jarrett, A., J. Gan, C. Johnson and I. A. Munn (2009). "Landowner awareness and adoption of wildfire programs in the southern United States." *Journal of Forestry* **107**(3): 113-118.

We surveyed nonindustrial private (family) forestland owners in five states in the southern United States to identify their perception, awareness, and adoption of wildfire prevention and mitigation programs. Wildfire is perceived as an imminent threat by the majority of the survey respondents, and over two-thirds of them have taken some preventive measure. Program awareness, wildfire experience and risk perception, information sources, wildfire preventive activities, and preferences for government interventions differ across racial groups; experience with wildfire, knowledge and activities of fire protection, information sources, and desire for government intervention and technical assistance are also significantly different between male and female landowners. Additionally, program awareness by landowners does not necessarily translate into action in preventing and mitigating wildfire, suggesting that additional assistance and stimuli would be needed to encourage private landowners to be more proactive against wildfire.

Jensen, S. E. (2006). "Policy tools for wildland fire management: Principles, incentives, and conflicts." *Natural Resources Journal* **46**(4): 959-1003.

Public perception of a fire "crisis" in the United States makes fire management a priority for both land managers and policy makers. Land managers focus on three major methods for resolving the current fuels build up problem: mechanical fuels treatment, the use of prescribed and naturally ignited fire, and fire suppression. Public policies create incentives for different fire management strategies, which encourage or discourage the use of these three management

objectives. This analysis finds conflicts in fire policy and management practices to be relatively few and minor. Conflicts generally result from the inherent complexity of fire-prone ecosystems, which requires some flexibility in policy implementation and interpretation. The absence of reliable data to either support or deny the claims that conflicting policies, excessive litigation, or burdensome procedures are thwarting federal attempts to bring the fuel/fire crisis under control suggests that sweeping policy changes would be ill advised at this time.

Johnson, J. F., D. N. Bengston and D. P. Fan (2009). "U.S. policy response to the wildfire fuels management problem: An analysis of the news media debate about the Healthy Forests Initiative and the Healthy Forests Restoration Act." *Journal of Environmental Policy & Planning* **11**(2): 129 - 142.

The Healthy Forests Initiative (HFI) and Healthy Forests Restoration Act (HFRA) represent major policy and legislative responses to the wildfire fuels management problem in the USA. This study examined the nature and evolution of the news media discussion and debate about these policy initiatives. Computer content analysis was used to analyse favourable and unfavourable beliefs about HFI/HFRA expressed in about 2800 news stories and editorials published from August 1, 2002 through December 31, 2004. The most frequently mentioned favourable beliefs that emerged included the view that HFI/HFRA will (1) reduce the risk of catastrophic wildfire, (2) protect people, communities, and property, and (3) cut red tape and speed up decision making processes. The most commonly expressed unfavourable beliefs included the view that HFI/HFRA (1) is an excuse to increase logging, (2) will weaken environmental protections, and (3) will reduce public input. Some evidence was found of a gradual shift in the media discussion to a more favourable view of HFI/HFRA over time. The Bush administration's framing of its HFI as essential for reducing dangerous levels of fuels in forests and lowering the risk of catastrophic wildfires slowly gained ground and became the dominant discourse, but mistrust was found to be an ongoing issue as the HFRA is implemented.

Kalabokidis, K., T. Iosifides, M. Henderson and B. Morehouse (2008). "Wildfire policy and use of science in the context of a socio-ecological system on the Aegean Archipelago." *Environmental Science & Policy* **11**(5): 408-421.

This paper summarizes the results of a primarily qualitative (with certain quantitative elements) socio-ecological study on three Greek islands of the Aegean Archipelago to characterize fire science and policy at regional and local levels, and perceptions of fire risk. Among the most important factors influencing dynamics of fire regimes on the islands are changing land use patterns and practices, and changes in climate and fuel conditions. While use of scientific information is not widespread, there are individuals in all three islands who regularly consult scientific sources. Although fire policy is largely controlled at the national and European Union levels, local activity also occurs, most notably through the volunteer fire fighting organizations, interactions with local officials, and public education efforts. However, though seen as important, significant lack of financial support and resources exist to support prevention and pre-suppression programs. Prevention of fires on the islands, including the use of prescribed burning, is relatively inadequate, and while an intense interest in preventing the loss of communities and ecosystems is frequently encountered, public participation in fire prevention remains limited. The findings suggest that relying on local knowledge, in combination with fire managers' decision-making abilities, could improve fire management options and reduce wildfire suppression costs and ecological disasters. (c) 2008 Elsevier Ltd. All rights reserved.

Kent, B., K. Gebert, S. McCaffrey, W. Martin, D. Calkin, E. Schuster, I. Martin, H. W. Bender, G. Alward, Y. Kumagai, P. J. Cohn, M. Carroll, D. Williams and C. Ekarius (2003). Social and economic issues of the Hayman Fire. Hayman Fire Case Study, GTR-RMRS-114. R. T. Graham, Ed. Odgen, UT, USDA Forest Service, Rocky Mountain Research Station: 315-395.

On June 26, 2002, U.S. Representative Mark Udall wrote the US Forest Service Chief, requesting that the Forest Service conduct an analysis of the Hayman Fire. In response to the Congressman's letter, five teams were established in August, 2002 to analyze various aspects of the Hayman Fire experience. This report describes the Hayman Fire analysis work conducted by the social/economic team and presents our findings.

Kneeshaw, K., J. J. Vaske, A. D. Bright and J. D. Absher (2004a). "Acceptability norms toward fire management in three national forests." *Environment and Behavior* **36**(4): 592-612.

Norm theory offers a paradigm for understanding why the public judges management actions acceptable or unacceptable. This study assesses normative beliefs about acceptable wildland fire management. The acceptability of three fire management actions for eight scenarios was examined. The scenarios varied by fire origin and fire impact on air quality, private property, forest recovery, and outdoor recreation. The data were obtained from a mail survey of visitors to three national forests: (a) Arapaho-Roosevelt, Colorado (n = 469), (b) Mt. Baker-Snoqualmie, Washington (n = 498), and (c) San Bernardino, California (n = 321). Results of a mixed design ANOVA indicated that the acceptability of wildland fire management actions varied according to the fire scenario evaluated, but substantive differences in normative beliefs were not noted among the three forests. Chi-square analyses identified differences in normative agreement for fire management actions across scenarios but did not reveal substantive differences in normative agreement between forests.

Kneeshaw, K., J. J. Vaske, A. D. Bright and J. D. Absher (2004b). "Situational influences of acceptable wildland fire management actions." *Society & Natural Resources* **17**(6): 477-489.

This article examines the effect of fire-specific situational factors on forest users' normative beliefs about wildland fire management. The acceptability of three fire management actions for eight scenarios was examined. The scenarios varied five factors: (1) fire origin, (2) air quality impact, (3) risk of private property damage, (4) forest recovery, and (5) outdoor recreation impact. Data were obtained from a mail survey of visitors to three national forests: (1) Arapaho-Roosevelt, Colorado (n = 469), (2) Mt. Baker-Snoqualmie, Washington (n = 498), and (3) San Bernardino, California (n = 321). Conjoint analyses indicated varying levels of the five factors (e.g., fire started by humans or lightning) differentially affected acceptability ratings of management actions. Similar percentages of importance were attributed to four of the factors for decisions regarding "put the fire out" and "contain the fire." There was more dispersion in the relative importance of factors for "letting the fire burn."

Knotek, K. and A. Watson (2006). Organizational characteristics that contribute to success in engaging the public to accomplish fuels management at the wilderness/non-wilderness interface. Fuels Management-How to Measure Success, March 28-30, 2006, Portland, OR; RMRS-P-41. P. L. Andrews and B. W. Butler, Eds. Fort Collins, CO, USDA Forest Service, Rocky Mountain Research Station: 703-713.

In the fall of 2003, the Rocky Mountain Ranger District of the Lewis and Clark National Forest initiated a multi-year, large-scale prescribed burn in the Scapegoat Wilderness. The objectives of this burn were to make the non-wilderness side of the wilderness boundary more defensible from wildfire and to establish conditions that will allow fire to play a more natural role within the wilderness in the future. Using this prescribed burn as a case study, qualitative research was

conducted in 2005 to understand the local ranger district's public outreach efforts and its subsequent influence on public attitudes towards the burn. A series of in-depth interviews with agency personnel involved in the burn, and representatives from local communities who were aware of and/or participated in public outreach efforts for the burn, were the primary sources of data for this research. A framework of mindfulness processes exhibited by high reliability organizations was used in analysis for identification and understanding of organizational characteristics that contribute to success in engaging the public in Forest Service efforts to treat hazardous fuels and manage risk from wildfire. As a case study, the methods and results provide a means of comparison to additional cases on other management units.

Knotek, K., A. Watson, W. T. Borrie, J. G. Whitmore and D. Turner (2008). "Recreation visitor attitudes towards management-ignited prescribed fires in the Bob Marshall Wilderness Complex, Montana." *Journal of Leisure Research*: 608-618.

Research at the Bob Marshall Wilderness Complex in Montana explored differences in recreation visitors' attitudes towards the use of management-ignited prescribed fires in the wilderness. A mail-back survey of visitors (n = 291) during the 2004 season revealed that over half of visitors would accept prescribed fires in wilderness. This support did not vary by ignition purpose: (a) to restore the natural role of fire or (b) to reduce hazardous fuels and potential for fire escaping to non-wilderness lands. Local visitors, however, were significantly more accepting of prescribed fires than non-local visitors across both ignition purposes. A smaller proportion of visitors than was expected considered the presence of natural fire undesirable.

Kolden, C. A. and T. J. Brown (2010). "Beyond wildfire: Perspectives of climate, managed fire and policy in the USA." *International Journal of Wildland Fire* 19(3): 364-373.

Climate-wildfire relationships have been widely addressed by the scientific community over the last two decades; however, the role of climate in managed fire in the US (i.e. prescribed fire and wildland fire use) has not yet been addressed. We hypothesised that if climate is an important component of managed fire, the fire community would already be aware of this and using climate information in order to mitigate risks associated with managed fires. We conducted 223 surveys with fire managers to ascertain how climate information is utilised in managed-fire decision-making. We found that wildland fire use managers consider climate to be an important aspect of managed fire and use various types of climate information, but prescribed-fire managers do not generally consider climate or use climate information in their planning activities. Survey responses also indicate a lack of agency training on climate information and decision-support tools. This is partly attributed to obstacles in US fire policy that inhibit widespread utilisation of climate information. We suggest these results are indicative of a broader conflict in US wildfire policy, which does not directly address climate despite two decades of scientific research showing climate plays a key role in wildfire regimes.

Kumagai, Y., J. C. Bliss, S. E. Daniels and M. S. Carroll (2004a). "Research on causal attribution of wildfire: An exploratory multiple-methods approach." *Society & Natural Resources* 17(2): 113-127.

Although studies show that actions by property owners, such as maintaining a defensible space, are generally the best means of protecting property from wildfire, victims often blame government agencies and others for property damage, injury, and death. This article describes a multiple-methods approach for investigating factors that influence how people who experience wildfire perceive the cause of wildfire damage. Phase I and II mail surveys and real-time field interviews were conducted in communities on the western slope of the Sierra Nevada. Generally speaking, people who had experienced wildfire attributed damage to other people's actions

more than people who had not. Whether residents incurred damage or not, having maintained a sense of control or interacting with firefighters also appears to have influenced attributions. We argue that multiple-methods approaches to such questions have the potential to reveal more about such phenomena than approaches based on any single method.

Kumagai, Y., M. S. Carroll and P. J. Cohn (2004b). "Coping with interface wildfire as a human event: Lessons from the disaster/hazards literature." *Journal of Forestry* **102**(6): 28-32.

The human community impacts of wildland fire is an understudied area. This article reviews the human disaster and hazards literature in an attempt to discover lessons applicable to understanding the social impacts of fire in the residential/wildland interface. It is argued that those literatures are potentially very useful in developing an understanding of wildland fire as a human event. A number of lessons are derived including why people tend to be unduly optimistic in the face of environmental hazards such as fire and why the characteristics of the affected community are at least as important as those of the fire in understanding social impacts.

Kumagai, Y., S. E. Daniels, M. S. Carroll, J. C. Bliss and J. A. Edwards (2004c). "Causal reasoning processes of people affected by wildfire: Implications for agency-community interactions and communication strategies." *Western Journal of Applied Forestry* **19**(3): 184-194.

Fire officials are dismayed when victims of wildfire blame fire fighters and others responsible for fire management for damage resulting from uncontrolled fires. This is in spite of the fact that wildfire damage is a consequence of dynamic interactions among natural factors (wind, temperature, location of wildfire, topography, etc.) and human factors (past land management, promptness of firefighting activities, extent of homeowners' defensible space, etc.). Fire and land managers do not typically understand why and how the victims arrive at such oversimplified, and in some cases inaccurate, conclusions about wildfire causation. Attribution theory in social psychology provides a framework for understanding the mechanisms of these blaming processes. In this study, both quantitative and qualitative approaches were used to explore how people who live in wildfire hazard zones and experienced wildfire, perceive the causes of wildfire damage. In the spring of 1999, a prefire survey was conducted in the western slope of the Sierra Nevada Mountains, an area where numerous wildfires are recorded nearly every year. This was followed by a postfire survey in two communities that actually experienced a fire that season. In addition, qualitative interviews were carried out in these two affected communities. Results suggest that people who experienced wildfire tended to attribute the cause of wildfire damage to factors associated with fire officials and nature and did not attribute fire damage to their own actions (or inactions). The implications of these attributions are discussed as are recommendations for future fire education and communication.

Kwon, J., C. Vogt, G. Winter and S. McCaffrey (2008). Forest fuels treatments for wildlife management: Do local recreation users agree? Proceedings of the 2007 Northeastern Recreation Research Symposium, April 15-17, 2007, Bolton Landing, NY; GTR-NRS-P-23. C. LeBlanc and C. Vogt, Eds. Newtown Square, PA, USDA Forest Service, Northern Research Station: 132-137.

In recent years, managers, policy makers and researchers, particularly in the social sciences, have worked to better understand the perspectives of homeowners, residents, tourists, and recreationists on wildfire and fuels management and how resource agencies can better involve these stakeholders in planning and implementation (Vogt et al., 2006). This research examined how one group of stakeholders, homeowners who participate in local outdoor recreation, viewed the relationships between fuel treatment approaches and improved wildlife conditions.

Specifically, we studied hunters, anglers, and wildlife viewers who were also wildland interface homeowners in a three-county area of Huron-Manistee National Forest (HMNF). Study participants generally viewed “prescribed burning” as more likely to improve wildlife conditions than mechanical fuel reduction or a defensible space ordinance. Moreover, the two largest recreation user groups in the population (hunters, anglers) were more likely than wildlife viewers to expect prescribed burning to have benefits for wildlife.

Kyle, G. T., G. L. Theodori, J. D. Absher and J. Jun (2010). "The influence of home and community attachment on Firewise behavior." *Society & Natural Resources* **23**(11): 1075-1092.

The purpose of this investigation was to examine the influence of residents' attachment to their homes and community on their willingness to adopt Firewise recommendations. Our sample was drawn from a population residing in the wildland-urban interface where the threat of wildfire is acute. The Firewise recommendations concerned 13 activities affecting home design, construction and maintenance, landscaping, and community engagement. Consistent with the tenets offered by the elaboration likelihood model of persuasion and empirical evidence stemming from the place and community attachment literatures, we hypothesized that those most attached to their homes and community would be most inclined to adopt Firewise recommendations to protect these settings. For the most part, our findings were consistent with this hypothesis. We observed that the dimensions of home attachment were most strongly predictive of activities centered on and around the home, whereas community attachment was more strongly predictive of community-based activities.

Laband, D. N., A. González-Cabán and A. Hussain (2006). "Factors that influence administrative appeals of proposed USDA Forest Service fuels reduction actions." *Forest Science* **52**(5): 477-488.

Using the database developed by the General Accounting Office on proposed fuels reduction actions on federal lands in 2001 and 2002, we conduct probit regression analysis to identify factors that significantly affect the likelihood of administrative appeal. The likelihood of appeal of a proposed fuels reduction action is significantly increased by (1) the size of area affected, (2) the number of proposed activities at the site, (3) when one of the stated purposes is commodity production (timber and sawlogs), (4) when one of the stated purposes is reduction of project-generated fuels, (5) implementation involves prescribed burning or mechanical thinning, and (6) the presence of at least one species of mammal at risk of extinction in the immediate vicinity of the site. Conversely, the likelihood of appeal is significantly reduced if (7) implementation is handled by Forest Service personnel or using a service contract, and (8) the proposed action is located in a Wildland-Urban Interface area. However, we also observe persistent regional effects, with fuels reduction proposals in Region 1 (3, 6, 8) characterized by a significantly higher (lower) likelihood of appeal than proposals in the other regions.

Lang, E. A., K. C. Nelson and P. Jakes (2006). Working with community leadership to promote wildfire preparedness. *The Public and Wildland Fire Management: Social Science Findings for Managers*; GTR-NRS-1. S. M. McCaffrey, Ed. Newtown Square, PA, USDA Forest Service, Northern Research Station: 137-149.

This study provides insights into the role of local leaders in wildfire preparedness, specifically, how leaders motivate residents to work together. We found that community leaders become involved in wildfire preparedness for a number of reasons and bring important skills with them from past experiences. The majority of leaders were involved in multiple leadership roles, from identifying key issues to developing a wildfire preparedness strategy to mobilizing needed resources. To get things started, managers may need to be more active in the critical stages of

identifying the issue and creating a vision, but community leaders will take over in later stages. Land managers also can assist leaders by helping identify key preparedness and mitigation issues, supplying information, providing training to improve leaders' skills, mobilizing resources, and rewarding commitment by sharing ownership or providing funding for future efforts.

Langley, A. K. and R. T. Jones (2005). "Coping efforts and efficacy, acculturation, and post-traumatic symptomatology in adolescents following wildfire." *Fire Technology* **41**: 125-143.

Recent studies of children and adolescents who have experienced a residential, industrial, or wild fire have suggested a causal link between fire disaster and PTSD related psychological distress. Not everyone, however, is equally affected by the stress of experiencing such an event, and the role of coping in this process may be an important mediating factor. Additionally, several studies have found that girls and African Americans report more distress following disasters than do boys and Caucasians. The current study sought to investigate the roles of exposure/loss, coping efficacy, and coping strategy in mediating psychological distress in adolescents after a disaster. The current study included a representative sample of 206 9th graders from a Central Florida High School affected by severe wildfires who were assessed via self-report measures 3- and 10- months after the fires, to assess the explanatory roles of exposure/loss, coping efficacy, and coping strategy on PTSD. Moreover, acculturation level and SES were included along with gender and ethnicity in testing for the moderating role of sociodemographics. Results indicated an important role for exposure/loss, coping efficacy, and coping strategy as they related to PTSD symptomatology in adolescents at both Time 1 and Time 2. Finally, although relationships between the proposed variables and PTSD did not interact with gender, acculturation, SES, or ethnicity, there was a significant interaction between acculturation and ethnicity signifying that for African American youth, high acculturation levels were predictive of less PTSD symptomatology.

Lewis, A., T. Hall and A. Black (2011[†]). "Career stages in wildland firefighting: Implications for voice in risky situations." *International Journal of Wildland Fire* **20**(1): 115-124.

Avoidance of injury and death on the fireline may depend on firefighters voicing their concerns, but often this does not occur. Reasons for employee reticence identified in the literature include a perception of various personal costs or a belief that raising concerns is futile. Additionally, the social context may play a significant role. In a qualitative study using in-depth interviews with 36 wildland firefighters in the US, we explored reasons firefighters do or do not voice concerns. Findings revealed two primary themes related to initiating voice (limits to environmental perception and social influence) that vary considerably depending on a firefighter's career stage. Additionally, the tactics that firefighters use similarly vary with career stage. Rookies often lack the ability to discern and interpret environmental cues, rely on others to ensure safety, fear being stigmatized if they voice worries, and may believe no one will listen to them. Veteran firefighters - both mid-career experienced firefighters and expert veterans in high-experience leadership roles - are better able than rookies to perceive and describe risky situations and feel more confident to raise concerns. However, experienced firefighters still face social pressures that may lead them to remain silent. Expert veterans face fewer social pressures, but their roles can put them in situations where they are either complacent or distracted. Implications of these findings for firefighter training and fire leadership are discussed.

Liljeblad, A. and W. T. Borrie (2006). "Trust in wildland fire and fuel management decisions." *International Journal of Wilderness* **12**(1): 39-43.

Public land managers are stewards of public lands and of the relationship between the public and these lands. Maintaining one aspect of this relationship, trust in the agency, can be challenging. Lack of trust can influence public response to management decisions, including about wildland fire use. By considering the factors that influence trust, managers can be more effective in accomplishing fire stewardship objectives.

Liljeblad, A., A. Watson and W. T. Borrie (2009). "Determinants of trust on public lands: Fire and fuels management on the Bitterroot National Forest." *Environmental Management* **43**(4): 571-584.

Management of public lands occurs today with high levels of scrutiny and controversy. To succeed, managers seek the support, involvement, and endorsement of the public. This study examines trust as an indicator of managerial success, and attempts to identify and measure the components that most influence it. A review of trust literature yielded 14 attributes that were hypothesized to contribute to trust, grouped into the three dimensions of Shared Norms and Values, Willingness to Endorse, and Perceived Efficacy. Operationalizing these attributes and dimensions, a telephone survey was developed and administered to a sample of Montana, USA residents living adjacent to the Bitterroot National Forest (N=1152). Structural equation modeling showed that all 14 attributes were found to be influential contributors to levels of trust. Results suggest that if managers are to maintain or increase levels of public trust, they need to consider trust's attributes as they make social, ecological, and economic resource decisions.

Lim, S. H., J. M. Bowker, C. Y. Johnson and H. K. Cordell (2009). "Perspectives on prescribed fire in the South: Does ethnicity matter?" *Southern Journal of Applied Forestry* **33**(1): 17-24.

Using a household survey and regression methods, we assessed preferences for prescribed fire in the southern United States. We found that the majority of the respondents favored the use of prescribed fire. However, we observed pronounced racial variation in opinions on prescribed fire and its side effects. African Americans and Hispanics were less supportive and were more concerned about the side effects of prescribed fire than whites. We also observed that females tended to be more concerned about the side effects of prescribed fire than males. In addition, education had no effect on preference for prescribed fire in general, but education was found to be negatively associated with concern levels in all three models pertaining to concerns over the side effects of prescribed fire. Concern over the side effects diminished as education increased.

Liou, G.-B., C. Vogt, G. Winter and S. McCaffrey (2008). Residents' values and fuels management approaches. Proceedings of the 2007 Northeastern Recreation Research Symposium, April 15-17, 2007, Bolton Landing, NY, GTR-NRS-P-23. C. LeBlanc and C. Vogt, Eds. Newtown Square, PA, USDA Forest Service, Northern Research Station: 77-83.

The research utilizes the Forest Value and Salient Value Similarity Scales to examine homeowners' value orientations and relate them to attitudes toward and support for fuels management approaches. Data were collected from homeowners living in the wildland-urban interface of the Huron-Manistee National Forest at two time periods, in 2002 and 2006. The panel data allowed for testing of whether residents' attitudes toward and support for fuel treatments changed within different value orientation and value similarity groupings over the 4-year period. Results show the Salient Value Similarity Scale provided strong predictive power in explaining attitudes toward and support for fuel treatments with the high value similarity group being more positive and supportive of the fuel management approaches over a 4-year period.

Loomis, J., A. González-Cabán and J. Englin (2001a). "Testing for differential effects of forest fires on hiking and mountain biking demand and benefits." *Journal of Agricultural and Resource Economics* **26**(2): 508-522.

Surveys of visitors to National Forests in Colorado were conducted to determine whether different fire ages and presence of crown fires have different effects on hiking and mountain biking recreation visits and benefits. Actual and intended behavior data were combined using a count-data travel cost model. The intended behavior trip questions asked about changes in number of trips due to the presence of a high-intensity crown fire, prescribed fire, and a 20-year-old high-intensity fire at the area respondents were visiting. Using the estimated recreation demand function, years since a non-crown fire had a statistically significant positive effect on the trip demand of hikers. In contrast, presence of crown fires had no statistically significant effect on the quantity of hiker trips, but had a significant and negative effect on mountain biking trips. Crown fires also had a large effect on the value per trip, with crown fires increasing the value per hiking trip but lowering the value per mountain biking trip.

Loomis, J. B., L. S. Bair and A. González-Cabán (2001b). "Prescribed fire and public support: Knowledge gained, attitudes changed in Florida." *Journal of Forestry* **99**(11): 18-22.

Florida residents' knowledge of and attitudes toward wild and prescribed fire were elicited before and after receiving educational information. The results indicate that Florida residents exhibit knowledge and tolerance of prescribed fire similar to respondents of past surveys. Florida residents are less tolerant of wildfire than residents in past surveys but hold similar knowledge scores concerning wildfire. Respondents became more knowledgeable and tolerant of prescribed fire after the introduction of educational information.

MacGregor, D. G., M. Finucane and A. González-Cabán (2008). The effects of risk perceptions and adaptation on health and safety interventions. *Wildfire Risk: Human Perceptions and Management Implications*. W. E. Martin, C. Raish and B. Kent, Eds. Washington, DC, Resources for the Future: 142-155.

Human habitation has made significant intrusions into forested lands, particularly in the western United States, but in other parts of the world as well. At the interface of the natural and built environments, known as the wildland-urban interface (WUI), communities and property owners are exposed to the potential ravages of wildland fire. Efforts to manage these threats have led to outreach programs in which communities and homeowners can participate to protect themselves and their property from loss. Likewise, in the United States, a national fuel management effort has sought to reduce the burden of volatile fuels on national forests and has as one of its motivations the reduction of fire-related risk in the WUI. Both outreach programs and the national fuel program can be viewed as offering the public options for self-protection, and members of the public living in the WUI engage in self-protection when they abide by the behavioral recommendations of outreach programs and provide support to fuel management efforts.

Even casual observation reveals, however, that people who are exposed to the risks of wildland fire do not always abide by the recommendations and guidelines offered by fire management authorities to protect their homes and property by undertaking voluntary self-protective actions, such as providing a defensible space around dwellings and removing flammable materials from near buildings. Likewise, the public at large (including those exposed to the risks of wildland fire) is not consistently and uniformly supportive of hazardous fuel management programs that have as a prime objective the reduction of wildland fire risk. How

can human behavior with respect to wildland fire risk be understood? What factors influence how those exposed to this risk translate that exposure into voluntary self-protective behaviors? From an agency perspective, these questions are central to determining the potential success or failure of interventions intended to yield a public response that is consistent with the risks as analyzed by the agency. From a public perspective, they provide opportunities for insights into the factors that motivate voluntary self-protection in general and shed light on how risk-reducing interventions influence the people they are intended to benefit.

Martin, I. M., H. Bender and C. Raish (2007). "What motivates individuals to protect themselves from risks: The case of wildland fires." *Risk Analysis* 27(4): 887-900.

This research investigates the cognitive perceptual process that homeowners go through when faced with the decision to protect themselves from the risk of wildfires. This decision can be examined by looking at the interaction between the integrated protection motivation theory-transtheoretical model and different levels of homeowners' subjective knowledge related to wildfire risks. We investigated the role of motivation, decision stages of risk readiness, and subjective knowledge on the number of risk-mitigating actions undertaken by homeowners living in high-risk communities. The results indicate that homeowners who are in an early or precontemplative stage (both low and high subjective knowledge) as well as low knowledge contemplatives are motivated by their perceived degree of vulnerability to mitigate the risk. In contrast, high knowledge contemplatives' potential behavioral changes are more likely to be motivated by increasing their perceptions of the severity of the risk. Risk-mitigating behaviors undertaken by high knowledge action homeowners are influenced by their perceptions of risk severity, self-efficacy, and response efficacy. In contrast, the low knowledge action homeowners engage in risk reduction behaviors without the influence of any of the PMT variables; demonstrating their motivation to emulate others in their community. These results have implications for the type of information that should be used to effectively communicate risks in an effort to influence the diverse homeowner segments to engage in risk-reduction behaviors.

Martin, I. M., H. W. Bender and C. Raish (2008). Making the decision to mitigate risk. *Wildfire Risk: Human Perceptions and Management Implications*. W. E. Martin, C. Raish and B. Kent, Eds. Washington, DC, Resources for the Future: 117-141.

Why individuals choose to mitigate, downplay, or ignore risk has been a topic of much research over the past 25 years for natural- and human- created risks, such as earthquakes, flooding, smoking, contraceptive use, and alcohol consumption. Wildfire has been a relatively recent focus in the natural hazard literature, perhaps a result of several years of catastrophic fires in the western United States. The desire of many to live in areas that provide wildland amenities has led to significant population migration into rural, forested areas of the West, exacerbating the risks of large-scale, catastrophic wildfires. This migration has resulted in more people living in the wildland-urban interface (WUI), which has created many unique problems for homeowners as well as land managers. To mitigate or reduce the risks of wildfires to communities and homeowners in the WUI requires action across the landscape, which includes treating both public and private lands. Significant research has demonstrated that on private property, a home's exterior materials and its immediate surroundings principally determine the home's ignition potential during extreme wildfire events; additionally, the area that determines the home ignition zone during extreme wildfires occurs largely on private lands (Cohen 2004). Yet many homeowners do not undertake mitigating actions to protect their homes and potentially their lives from the risks of wildfire.

This chapter investigates the cognitive perceptual process that homeowners experience when faced with the decision of whether to protect themselves from the risk of wildfires. This decision can be explained through two complementary theories: protection motivation theory (PMT) and stage theories such as the transtheoretical model (TTM). PMT states that some form of risk information can provide the impetus for individuals to determine the degree of risk severity, their vulnerability, and their ability to reduce that risk. Stage theories categorize the decision making stages that individuals go through when exposed to risk information—whether through actual experience with the risk or through indirect experience, such as from brochures or videos. We integrated these two theories to investigate when homeowners are more or less likely to reduce their risk of being impacted by wildfire (Block and Keller 1998; Weinstein and Sandman 1992).

To further enhance our understanding of human response to wildfire risk and effective risk communication, we explore how PMT and TTM can be combined to explain homeowners' behavior. A discussion of these two theories in conjunction with other related theories provides the foundation for a set of hypotheses. A description of the methodology used to test the hypotheses follows, along with the data analyses and results. After a discussion of the results as they relate to our theoretical conceptualization, we present a set of unanswered questions to provide a basis for a research agenda. Finally, we discuss the managerial implications of our work.

Martin, W. E., I. M. Martin and B. Kent (2009). "The role of risk perceptions in the risk mitigation process: The case of wildfire in high risk communities." *Journal of Environmental Management* **91**(2): 489-498.

An important policy question receiving considerable attention concerns the risk perception-risk mitigation process that guides how individuals choose to address natural hazard risks. This question is considered in the context of wildfire. We analyze the factors that influence risk reduction behaviors by homeowners living in the wildland-urban interface. The factors considered are direct experience, knowledge of wildfire risk, locus of responsibility, fulltime/seasonal status, and self-efficacy. Survey data from three homeowner associations in the western U.S. are used to estimate the direct and indirect effects of this relationship. Our results indicate that the effects of knowledge and locus of responsibility are mediated by homeowners' risk perceptions. We also find that beliefs of self-efficacy and fulltime/seasonal status have a direct influence on risk reduction behaviors. Finally, we find, surprisingly, that direct experience with wildfire does not directly influence the risk perception-risk mitigation process.

Mayer, J. (2002). Learning across borders: Community-based fire management – Kalimantan to California. *Communities in flames: Proceedings of an international conference on community involvement in fire management*. P. Moore, D. Ganz, L. C. Tan, T. Enters and P. B. Durst, Eds. Bangkok, Thailand, Food and Agriculture Organization of the United Nations Regional Office for Asia and the Pacific: 16-26.

Communities in very different places are initiating participatory fire management planning processes. This paper raises questions about the effectiveness of transferring experiences from one place to another, based on recent examples from northern California, USA, and West Kalimantan, Indonesia. Reforming approaches to fire management is both politically and technically challenging. Vastly different political and administrative systems, and unequal technological capabilities make many apparently sensible approaches unworkable in the foreseeable future. Transferring some practices and assumptions may actually endanger

ecosystems and people, demanding that planners “first, do no harm”. Despite demands for caution, in Kalimantan and California there is a growing consensus that participatory and collaborative initiatives offer the most promising approaches to effective fire management.

McCaffrey, S. (2004a). "Fighting fire with education: What is the best way to reach out to homeowners?" *Journal of Forestry* **102**(5): 12-19.

Better understanding is needed of what makes educational efforts most effective in increasing public support for wildfire management and mitigation efforts. Results of a mail survey of homeowners in Incline Village, Nevada, indicate that personalized contact is key in the educational process and that which type of contact—government or personal—is more influential depends on the type of practice involved. Notably, prescribed burning appears to have more in common with defensible space than with thinning in terms of how homeowners respond to educational efforts.

McCaffrey, S. (2004b). "Thinking of wildfire as a natural hazard." *Society & Natural Resources* **17**(6): 509-516.

Natural hazards theory with its emphasis on understanding the human–hazard interaction has much to offer in better understanding how individuals respond to the wildfire hazard. Ironically, very few natural hazards studies have actually looked at wildfires, despite the insights the field might offer. This report is structured around four interrelated questions that are often heard from individuals involved with wildfire management. Examining these four items through the natural hazards lens can demonstrate just a few of the ways the field can help us think more clearly about individual response to risk and how to increase participation in fire mitigation and support for fire management practices.

McCaffrey, S. (2006). Prescribed fire: What influences public approval? Fire in Eastern Oak Forests: Delivering Science to Land Managers, Proceedings of a Conference, November 15-17, 2005, Columbus, OH; GTR-NRS-P-1. M. B. Dickinson, Ed. Newtown Square, PA, USDA Forest Service, Northern Research Station: 192-198.

Except in remote areas, most prescribed fires will have some effect on members of the public. It is therefore important for land managers to work with the public before, during, and after a prescribed burn. To do this effectively, managers need to have an accurate idea of what people do and do not think about prescribed fire and they need to understand what shapes those opinions. This paper summarizes findings from recent research studies on the social acceptability of prescribed burns and identifies the key factors that people consider in forming their opinions of prescribed fire. Results indicate that there is a fairly high level of public acceptance for use of prescribed fire and that smoke, concerns about escape, and trust are key issues shaping that support. In addition, there is a clear link between understanding of the purpose and intended benefits of prescribed fire and approval of its use. The lesson for managers who wish to introduce prescribed fire in their communities is that they are most likely to gain public support if they: 1) increase familiarity with the practice; and 2) work to build trust between officials from the implementing agency and the public.

McCaffrey, S. (2008a). The homeowner view of thinning methods for fire hazard reduction: More positive than many think. Proceedings of the 2002 Fire Conference: Managing fire and fuels in the remaining wildlands and open spaces of the Southwestern United States. PSW-GTR-189. M. G. Narog, Ed. Albany, CA, USDA Forest Service, Pacific Southwest Research Station: 15-22.

With the focus of the National Fire Plan on decreasing fire risk in the wildland-urban interface, fire managers are increasingly tasked with reducing the fuel load in areas where mixed public and private ownership and a growing number of homes can make most fuel reduction methods problematic at best. In many of these intermix areas, use of prescribed burning will be difficult, and it is likely that thinning will be the dominant method for fuel load reduction. Yet little research has been done on acceptability of different thinning methods, and the current understanding is based primarily on accepted conventional wisdom. A limited number of surveys found that two-thirds of respondents thought thinning in general an acceptable fire management tool, but they did not examine differences in acceptability of specific practices. However, understanding what homeowners think about particular methods, and what is associated with more supportive views, can provide critical assistance to managers as they develop fuel hazard reduction plans. A survey of homeowners in Incline Village, Nevada found that support for most thinning methods, except herbicide use, was quite high, but varied across respondents. Factors associated with acceptability of specific methods include perception of fire risk, previous direct and indirect wildfire experience, perception of the role of various agencies in fire planning, and age. Individual responses also appeared to be influenced by the local character of the environment around Incline Village, particularly the desire to protect the water clarity of Lake Tahoe.

McCaffrey, S. (2008b). Understanding public perspectives of wildfire risk. *Wildfire Risk: Human Perceptions and Management Implications*. W. E. Martin, C. Raish and B. Kent, Eds. Washington, DC, Resources for the Future: 11-22.

In recent years, heightened attention to the social dimensions of wildfire has led to increased of wildfire risk. One focus has been on the need to enhance the wildfire risk perception among homeowners living in high fire hazard areas. The underlying supposition is that once they understand risk, homeowners will then take action to reduce their exposure. This is based on two assumptions: that definitions of wildfire risk will be consistent across groups and that increased risk perception will necessarily lead to taking action. These assumptions are problematic, however, as research on other natural hazards has not found consistent evidence supporting either of these views (McCaffrey 2004a).

Research has shown that risk perception is not simply a scientific concept, but also a cultural one shaped by individual and societal values. As Slovic (1999a) states, "Risk is a subtle concept with many possible meanings. It is sometimes used as a synonym for a hazardous activity, sometimes used to mean probability, sometimes used to mean a consequence, and sometimes used to mean threat." Perceived risk of a natural hazard is generally defined as how serious the threat is deemed to be coupled with the "subjective probability of experiencing a damaging environmental extreme" (Mileti 1994). Thus perceived risk has much room for variation, as different groups may consider a threat to be more or less serious and probability can be a highly subjective calculation...

...This chapter focuses on the first of the two problematic assumptions set forth above by reviewing various approaches to understanding risk and how different groups define the term, then examining the results from a series of 2004 focus groups to learn how members of the public define wildfire risk and what shapes their reactions to it. I was part of a team of researchers at the North Central Research Station of the USDA Forest Service that worked with a

professional facilitator to conduct the focus groups, which took place in the western United States and included discussions related to public conceptions of wildland fire risk.

McCaffrey, S. and R. Graham (2007). "Science information for informing forest fuel management in the dry forests of the western United States." *Journal of Forestry* **105**(2): 73-76.

Land managers need timely and straightforward access to the best scientific information available for informing decisions on how to treat forest fuels in the dry forests of the western United States. However, although there is a tremendous amount of information available for informing fuels management decisions, often, it is in a form that is difficult to use or of limited applicability. To improve access, interpretability, and use of the full body of research, a pilot project was initiated by the USDA Forest Service to synthesize relevant scientific information and develop publications and decisions support tools that managers can use to inform fuels treatment plans. This article provides an overview of the project and briefly discusses key lessons learned as an introduction to a series of articles, to be published in future *Journal of Forestry* issues, on different topic areas addressed by the project.

McCaffrey, S. and Y. Kumagai (2007). No need to reinvent the wheel: Applying existing social science theories to wildfire. *People, Fire, and Forests: A Synthesis of Wildfire Social Science*. T. C. Daniel, M. S. Carroll, C. Moseley and C. Raish, Eds. Corvallis, OR, Oregon State University Press: 12-36.

Social science research on fire has only recently begun to gain critical mass under the sponsorship of the National Fire Plan. Previous to that, there were only a handful of studies on the topic in the 1980s and the 1990s. However, there is no need to completely reinvent the scientific wheel to begin to understand social wildfire dynamics. There is much that can be learned from existing disciplines. Natural hazards research can provide insight into the dynamics of mitigation and key variables that may influence mitigation decisions and responses to an actual event such as risk perception, past experience, and post-fire blaming tendencies. The field of Diffusion of Innovations in turn suggests reasons why wildfire mitigation efforts, particularly the creation of defensible space as a preventive practice, might be adopted only slowly, while also suggesting the usefulness of trigger events, change agents, and interpersonal networks in overcoming the inherent difficulties. Taken together, these two fields can provide context and a starting framework in which to place current wildfire issues and offer insight into ways to increase wildfire mitigation.

This chapter will examine the general theories that have developed to understand human responses to natural hazards and to the adoption of mitigation measures and new technologies. Information on these topics is also presented in chapters by Shindler and Daniel in this volume. The first section will focus on the natural hazards research field and how it informs understanding of human response to wildfires. The second section will discuss components of the Diffusion of Innovations field that shed light on factors that foster or inhibit adoption of mitigation measures. The final section discusses how these two seemingly distinct areas are actually quite connected.

McCaffrey, 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**(2): 224-233.

The present paper discusses results from a survey about the acceptance of and preferences for fuels treatments of participants following a field tour of the University of California Blodgett Forest Fire and Fire Surrogate Study Site. Although original expectations were that tours would be composed of general members of the public, individual tour groups ultimately were much

more specialized, with tours made up of individuals from five distinct groups including foresters, environmentalists, entomologists, the Natural Resource Conservation Service, teachers, and high school or undergraduate students. This proved fortuitous as most studies of 'public' perceptions to date have been of general members of the public and little work has been done assessing the views of groups who may have more specific knowledge or interest in fuels treatments. Such assessment is perhaps long overdue given the importance of understanding characteristics of different audience segments in developing effective outreach programs. Analysis showed that group membership was in fact the key element in differences in survey responses with significant differences found between groups on overall acceptability of treatments, treatment preferences based on different land ownership and management types, and which variables were most important in determining treatment preferences.

McCaffrey, S. M. and A. Rhodes (2009). "Public response to wildfire: Is the Australian stay and defend or leave early approach an option for wildfire management in the United States?" *Journal of Forestry* **107**(1): 9-15.

In the United States, the increasing costs and negative impacts of wildfires are causing fire managers and policymakers to reexamine traditional approaches to fire management including whether mass evacuation of populations threatened by wildfire is always the most appropriate option. This article examines the Australian "stay and defend or leave early" (SDLE) approach (which is not inherently the same as shelter in place) and the contextual factors that may make it more or less appropriate in the United States. We first discuss what SDLE actually entails and then examine four contextual areas that could influence how appropriate the approach might be in the United States: nature of fire risk, agency roles and responsibilities, education and shared responsibility, and human dimensions and decisionmaking. Although some contextual differences may mean that there are US locations where the approach would be inappropriate, they are not systematic enough to mean that the approach would not be viable in many localities. However, significant groundwork would need to be laid to ensure success.

McCool, S. F., J. Burchfield, D. R. Williams, M. S. Carroll, P. Cohn, Y. Kumagai and T. Ubben (2007). Social science to improve fuels management: A synthesis of research on the impacts of wildland fires on communities. GTR-NC-269. Newton Square, PA, USDA Forest Service, North Central Research Station: 36 p.

...Much of this newly settled WUI falls in the dry, low elevation forests of the West—forests that have been most susceptible to the consequences of the fire exclusion policies of the 20th century. In the past, low intensity fires frequently burned through these forests, and the species that made up these forests, such as ponderosa pine, were not damaged. But our efforts to exclude wildland fires have led to longterm vegetation changes, including the development of hazardous fuels. These fuels, coupled with a prolonged drought in the West, have resulted in fires that exhibit a dramatic shift in behavior. Low intensity fires have been replaced by massive stand-replacement fires that burn with such intensity they cannot be effectively attacked with traditional fire suppression strategies (Graham et al. 2004).

The effects of such fires on people and communities have increasingly become the focus of policy debates among members of neighborhood associations, county land commissioners, and extending all the way to the White House (see, for example, U.S. Department of Agriculture and U.S. Department of the Interior 2000). In this synthesis we step back from these debates and look at what science can tell us about the impacts of wildland fires on communities. We start with an overview of wildland fire and communities, followed by an event-based model of

wildland fire and decisionmaking related to fire management. Finally, we present what social science tells us about the impacts of wildland fire on people and their communities.

McCool, S. F., J. A. Burchfield, D. R. Williams and M. S. Carroll (2006). "An event-based approach for examining the effects of wildland fire decisions on communities." *Environmental Management* **37**(4): 437-450.

Public concern over the consequences of forest fire to wildland interface communities has led to increased resources devoted to fire suppression, fuel treatment, and management of fire events. The social consequences of the decisions involved in these and other fire-related actions are largely unknown, except in an anecdotal sense, but do occur at a variety of temporal and social organizational scales. These consequences are not limited to the fire event itself. Preparation for the possibility of a fire, actions that suppression agencies take during a fire, and postfire decisions all have consequences, if unknown currently. This article presents an "event-based" approach that can be useful for constructing and systematizing discussion about the consequences of wildland fire to human communities. For each of the three major periods within this approach, agencies, communities, and individuals make decisions and take actions that have consequences. The article presents an integrated, temporally based process for examining these consequences, which is similar to others developed in the natural hazards and disaster management literature.

McDaniel, J., D. Kennard and A. Fuentes (2005). "Smokey the Tapir: Traditional fire knowledge and fire prevention campaigns in lowland Bolivia." *Society & Natural Resources* **18**(10): 921-931.

Severe wildfires devastated the southeastern Bolivian lowlands during 1999-2001. In response, the Bolivian government instituted an education campaign to reduce rural burning. Working with Chiquitano Indians in the southeastern lowlands, we were interested in finding out (1) the level of knowledge of fire behavior and the ecological role of fire in shaping forest and savannah ecosystems, and (2) current attitudes in Lomerio toward fire as a land management tool. We conducted key informant interviews in the Chiquitano territory of Lomerio to document Chiquitano knowledge of and attitudes toward fire practices. Informants expressed knowledge of fire behavior and effects, recognizing the effects of wind, relative humidity and fuel moisture on fire intensity, and the effects of fire intensity on soil fertility. Informants revealed a complex understanding of the role of fire in maintaining the structure and composition of savannahs and how fire interacts with changing cattle production, climatic, and demographic conditions.

McFarlane, B. L. (2006). Human dimensions of fire management in the Wildland-Urban Interface: A literature review. *Canadian Wildland Fire Strategy: Background Syntheses, Analyses, and Perspectives*. K. G. Hirsch and P. Fuglem, Eds. Edmonton, Alberta, Canadian Council of Forest Ministers: 27-36.

The forested landscape in Canada is changing as human communities expand further into the wildland-urban interface (WUI) and more crown land is designated for industrial forest management and other resource use. In recent years Canada has experienced some severe fire seasons, which have affected timber supply and put human communities at risk. For example, in 2003, about 3 300 Alberta residents were evacuated from their homes because of the threat of wildfire, and in British Columbia more than 45 000 residents were evacuated and about 330 homes and businesses were destroyed by wildfire (Filmon 2004). Scenarios of fire danger under conditions of climate change suggest that in the future a "normal" fire season may be more like the extreme fire seasons experienced today (Weber and Flannigan 1997).

As part of a comprehensive fire management strategy, fire management agencies in Canada are considering proactive approaches specific to the WUI to reduce the threat to private

property and human life. Agencies' response to wildfire in the WUI has traditionally followed a common paradigm for reducing risk from natural hazards, stressing engineering solutions (e.g., creation of defensible space, use of fire-resistant building materials) based on technological judgments (e.g., fire behaviour models) (McDaniels et al. 1997). What is lacking in these engineering solutions is consideration of the psychological, social, cultural, and political factors that influence people's willingness to support and engage in risk reduction. The success of proactive management in the WUI depends, largely, on individual homeowners' and communities' willingness to support and engage in fire mitigation and preparedness measures. Although considerable research on the human dimensions of wildfire risk mitigation and preparedness has been conducted in the United States and Australia, it is unclear how property owners and communities in Canada perceive the threat of wildfire; similarly, their preferences for mitigation and preparedness measures and their willingness to use such measures are unknown. There is also little understanding of the individual and sociocultural factors that influence such responses or the role of municipal governments and other relevant agencies in influencing responses at the individual and community levels. This document reviews the human dimensions of managing wildfire risk and offers suggestions for research topics relevant to the Canadian situation.

McGee, T. K. (2005). "Completion of recommended WUI fire mitigation measures within urban households in Edmonton, Canada." *Environmental Hazards* 6(3): 147-157.

The purpose of this study was to examine completion of recommended wildland–urban interface (WUI) fire mitigation measures by residents adjacent to the heavily vegetated North Saskatchewan river valley and ravine system in the City of Edmonton, Alberta. A mail survey was distributed to a random sample of households adjacent to this natural area. Almost all homeowners were found to be completing some recommended mitigation measures and in many cases were willing to complete most but not all of the measures that they had not yet completed, despite mixed motivations to act. Perceived responsibility for reducing risks, social bonds, beliefs that emergency services would protect homeowners' property in the event of a fire, and perceptions of the effectiveness of recommended mitigation measures, were not significantly related to completion of a higher average number of recommended mitigation measures. Importantly, most mitigation measures were completed for reasons other than WUI fire mitigation. The implications of these results and recommendations for emergency managers and communicators are discussed.

McGee, T. K. (2007). "Urban residents' approval of management measures to mitigate wildland-urban interface fire risks in Edmonton, Canada." *Landscape and Urban Planning* 82(4): 247-256.

This paper is based on a survey of homeowners living adjacent to the extensive and heavily vegetated North Saskatchewan River Valley and Ravine System in Edmonton, Alberta. Residents in a random sample of 436 households adjacent to this urban natural area completed a mail questionnaire that sought insights into interface fire risk perceptions, completion of related household-level mitigation measures and approval of potential management measures. This paper presents respondents' approval of five interface fire management measures. Education was most popular, and both thinning of vegetation within the river valley and restricting where people can build their homes received considerable support. Over half of respondents supported a requirement for residents to remove flammable vegetation close to their homes. Prescribed burning was the least popular measure. Edmonton survey respondents were more supportive of zoning and mandatory vegetation removal than has been found in previous studies in the US. Those measures that impacted residents the least were more likely to be

supported. Factors influencing support for management measures, including risk perceptions, experiences, tenure and formal education, are discussed. Recommendations are made for natural area managers and land use planners. (c) 2007 Elsevier B.V. All rights reserved.

McGee, T. K., B. L. McFarlane and J. Varghese (2009). "An examination of the influence of hazard experience on wildfire risk perceptions and adoption of mitigation measures." *Society & Natural Resources* **22**(4): 308 - 323.

Previous experience with a hazard has been identified as influencing risk perception and adoption of adjustments. However, this relationship is not clear and may depend on the differences in experiences that may occur within a community. This article describes residents' wildfire experiences and explores how these experiences may influence risk perceptions and implementation of mitigation measures 1 year after the 2003 Lost Creek and McLure wildfires in western Canada. Interviews were conducted with 40 residents with different wildfire experiences, including losing their home, being evacuated, self-evacuating early, staying in their house during a wildfire, and being away from the area. Results suggest that differences in hazard experiences can impact post-event risk perceptions and adoption of mitigation measures. Management implications are discussed.

McGee, T. K. and S. Russell (2003). "'It's just a natural way of life...'" an investigation of wildfire preparedness in rural Australia." *Global Environmental Change Part B: Environmental Hazards* **5**(1–2): 1-12.

This study explores the preparedness of residents living in a rural community in Victoria, Australia, for wildfires, and the factors influencing their preparedness. Overall, participants were well aware of wildfire risks and appeared well prepared for the event of a fire. However, residents involved in agriculture and with a long-standing association with the area appeared better prepared than were those on small properties and newcomers. Their social networks, previous experiences with wildfires and grassfires, and involvement with the local fire brigade influenced preparedness of long-term residents. Characteristics of agricultural communities, including a culture of self-reliance, experience with fires as part of farming, and social cohesion, appeared to contribute to wildfire preparedness within this community. Included are recommendations encouraging preparedness for wildfires.

Miller, C. and P. Landres (2004). Exploring informational needs for wildland fire and fuels management, RMRS-GTR-127. Fort Collins, CO, USDA Forest Service, Rocky Mountain Research Station: 36.

We report the results of a questionnaire and workshop that sought to gain a better and deeper understanding of the contemporary information needs of wildland fire and fuels managers. Results from the questionnaire indicated that the decision to suppress a wildland fire was most often influenced by factors related to safety and that the decision to allow a fire to burn was influenced by a variety of factors that varied according to land management objectives. We also found that managers anticipated an increase in the use of wildland fire, but that these increases will be moderate due to a variety of constraints that will continue to limit the use of wildland fire. From the workshop, we learned that managers will need to become increasingly strategic with their fire and fuels management planning, and that the information used to support tactical fire operations may prove to be insufficient. Furthermore, the managers participating in the workshop indicated the functional linkage between land management and fire management planning is lacking. We suggest that effective fire management planning requires information on the benefits and risks to a wide variety of values at landscape scales, integration with land management objectives, and a long-term perspective.

Monroe, M. (2005). Tools to reach, educate, and involve citizens. *Forests at the Wildland-Urban Interface*. S. W. Vince, M. L. Duryea, E. A. Macie and A. Hermansen, Eds. New York, NY, CRC Press: 123-138.

Wildland-urban interface issues, by proximity and definition, always involve people. The people may be nearby rural residents, activists in a wise-use or environmental organization, planners and developers, townspeople, or urban visitors. Whether these people are knowledgeable, helpful, disinterested, or antagonistic is often a function of the outreach activities that communicate, educate, and involve citizens in natural resource management.

Natural resource agencies and organizations are not newcomers to education and communication activities. They typically use a host of opportunities to conduct outreach with different audiences, from schoolchildren and teachers to garden club members and hunters. Many of these techniques are appropriate for managing interface issues as well, with one small caveat: in the interface, communication, education, and public involvement are more critical because the interface is close enough to some people to be part of "their territory." Nearby residents may feel responsible for it, even if they know they do not own all the land they enjoy. Planners may wish to control it, so they can better manage the developed regions. Those who drive by it may believe their view of landscape should never change. This chapter will explore some techniques and strategies for engaging citizens in the interface in natural resource management issues and describe several examples of successful projects.

Monroe, M. C., A. J. Long and S. Marynowski (2003). "Wildland fire in the Southeast: Negotiating guidelines for defensible space." *Journal of Forestry* **101**: 14-19.

Wildland fire is becoming a concern for residents in many eastern states as fuel loads, weather patterns, and population growth increase risk at the wildland-urban interface. Some messages about reducing risk, however, are based on western wildfire information and are seen as inappropriate by wildland fire communicators in Florida. This case study describes the process of reaching agreement on landscape modifications that reduce the risk of wildland fire for interface residents in the Southeast. The melding of various perspectives through a negotiated process helped create a product that meets a need in this fire-prone state.

Monroe, M. C. and K. C. Nelson (2004). "The value of assessing public perceptions: Wildland fire and defensible space." *Applied Environmental Education and Communication* **3**(2): 109-117.

Fire is a challenge in the wildland-urban interface. Although resource managers encourage residents to create defensible space, many do not. This study illustrates the value of using a needs assessment to better understand perceptions of an audience in order to develop meaningful messages and materials. In this case, our audience is residents of forested areas of Florida and Minnesota at risk of wildland fire. By using in-depth interviews, we explore their perceptions of their landscape, their perception of risk, and their willingness to reduce that risk. Their perceptions can be used to evaluate current wildfire communication tools and suggest ways to modify them to inform and change the behavior of residents. Printed materials emphasize the threat of fire and what to do. Interview data suggest that emphasizing relevant values: privacy, wildlife, and recreation opportunities, as well as acknowledging neighborhood norms, could be helpful to motivate residents when the threat of fire is not sufficient.

Monroe, M. C., L. Pennisi, S. McCaffrey and D. Mileti (2006). Social science to improve fuels management: A synthesis of research relevant to communicating with homeowners about fuels management; GTR-NC-257. St Paul, MN, USDA Forest Service, North Central Research Station: 52 p.

The large fires in southern California during the fall of 2003 highlighted the significant fire hazard many wildland-urban interface communities and homes currently face. Despite this risk, people continue to leave metropolitan areas for the beauty and tranquility of the wildland-urban interface. The peaceful natural views instill a treasured sense of place and privacy among residents, which can make it challenging to manage the environment and reduce fuels (Lee and Tribe 1987, Lee et al. 1987, Shands 1988, Sullivan 1994, Weise and Martin 1994). Firefighting and land management agencies as well as cooperative extension are leading the movement to encourage private landowners to become more active in reducing their risk from wildland fire. Many agencies and communities provide information to encourage more active involvement of property owners in fuels management. Homeowners' actions have put many of them at risk of wildfire, and resource managers want to encourage them to do something different. In some low risk cases, existing practices may just need minor modifications. But in other cases, managing fuels on private property may mean dramatically changing the look, the feel, and the view that attracted homeowners to the wildland-urban interface in the first place...

...The purpose of this paper is to summarize what is known about the techniques of effective persuasive communication programs and to provide fire managers with an outline of the characteristics of such programs. Although most managers will be unlikely to have the resources to be able to use all the possible tools discussed, reviewing key elements to consider in developing an effective program to change behavior should help managers identify the most appropriate options/tools for their specific situation. Information is drawn from the fields of environmental communication and social marketing, as well as the natural hazards and risk communication literature. Although they are important, examining the various regulatory tools, such as vegetation management ordinances, or other types of sanctions or disincentives that can be part of an overall program is beyond the scope of this document. This document is broken into the three main elements of an effective educational effort: understanding the audience, creating effective messages, and delivering those messages. Part 2 reviews why the audience needs to be considered. Part 3 reviews issues to consider in developing the message content. Part 4 reviews the variety of communication techniques and tools that can be used to encourage behavior change.

Morehouse, B. J., S. O'Brien, G. Christopherson and P. Johnson (2010). "Integrating values and risk perceptions into a decision support system." *International Journal of Wildland Fire* **19**(1): 123-136.

One of the thorniest challenges to effective wildland fire management is integration of public perceptions and values into science-based adaptive management. One promising alternative is incorporation of public values into place-based decision support technologies that are accessible to lay citizens as well as to fire-management experts. A survey of individuals, including residents, fire and fuels managers, volunteer firefighters, and others living in or near four mountain areas of the US Southwest, identified a set of personal values and perceptions about wildland fire risk that could be spatially represented in a geographic information science-based decision support system designed for wildland fire strategic planning efforts. We define values, in this context, as phenomena that are not necessarily quantifiable but that strongly attract and connect individuals for whatever reasons to particular areas. Inclusion of this type of information into interactive decision tools for fire management may contribute to improved understanding and finer-scale spatial visualisation of public perceptions of fire risk. The integration of such factors

in decision support tools offers opportunities for improving interactions between managers and the public involved in strategic planning processes for fire management.

Morehouse, B. J. and J. Sonnett (2010). "Narratives of wildfire: Coverage in four U.S. newspapers, 1999-2003." *Organization Environment* **23**(4): 379-397.

The years 1999 through 2003 were marked by intense episodes of wildland fire in the United States and an increased interest in covering fire policy and practice in the media. Analysis of articles published in four newspapers over this time period reveals important differences in reporting emphases, as reflected in the narrative story lines that defined coverage.

Identification of how these narratives came to be similarly and differentially constituted as story lines may be useful for fostering better decisions and strengthening public awareness of serious risks as well as willingness to address those risks.

Moseley, C. (2007). Class, ethnicity, rural communities, and the socioeconomic impacts of fire policy. *People, Fire, and Forests: A Synthesis of Wildfire Social Science*. T. C. Daniel, M. S. Carroll, C. Moseley and C. Raish, Eds. Corvallis, OR, Oregon State University Press: 171-186.

Federal fire policies, like all federal land management policies, have the potential to greatly impact public lands communities—those communities located in or near public lands. The federal impact on public-lands communities can be large because, as major landowners, the federal government controls most of the physical resources of a particular area and makes the key decisions about how those resources will be used ... This chapter reviews the limited literature available about the social and economic costs and opportunities over time of fire suppression, prescribed fire, and hazard reduction for rural communities and other minority groups in the United States.

This review reveals that federal wildland-fire policy has shifted several times over the past one hundred years; however, suppression has long been and continues to be a central component. Over time, the ecological and socioeconomic costs of long-term fire suppression are growing. These costs (as well as the benefits) are not spread evenly across the landscape or across demographic groups. Some ecological regions have suffered more change than others; some areas are experiencing increasing numbers of large fires, while others are not. Similarly, some demographic groups are less able than others to prepare for and recover from fire. In particular, poor rural people are particularly vulnerable to fire and yet are likely to be the least able to recover due to a lack of financial resources. Fire suppression and fire hazard reduction have benefits as well, and these are also not distributed evenly. Government workers and contractors, and contract firefighters all benefit economically from wildfire suppression and from efforts to reduce fire hazard. However, these contract workers – particularly the growing number of Hispanic workers – appear to have poorer working conditions, earn less money, have less training, and be more vulnerable to exploitation than government workers.

Moseley, C., M. Balaev and A. Lake (2003). Long term trends in contracting and the impact of the National Fire Plan in northern California; EWP Working Paper Number 7. Eugene, OR, Ecosystem Workforce Program, Institute for a Sustainable Environment, University of Oregon.

This report (1) documents changes in Forest Service procurement contracting between the early 1990s and the early 2000s and (2) evaluates whether the authority to consider local benefit when awarding the National Fire Plan (NFP) funded contracts has impacted contracting opportunities in Northern California. In sum, the Forest Service's forest management contracting and the number of contractors working on national forests in Northern California declined over the last decade. Contractors are located closer to national forests than they once

were, but this has not translated to more opportunities for rural communities. Instead, contractors from rural communities have seen their share of the contracting dollars decline, while contractors from Redding and mid-size towns have seen their share of the contracting increase. Despite the decrease in money being spent on forest management contracting, the average contract size increased. The increase in average contract size may partially explain the decline in rural contract capture because we might expect rural contractors to be smaller than those based in mid-sized towns or urban areas. The decline in labor-intensive work may be reducing the demand for mobile crews from California's Central Valley and Oregon's Willamette Valley. In sum, the National Fire Plan authority does appear to have created opportunities for businesses closer to national forests than was the case for regularly funded contracts, and that this translated to additional opportunities for nearby rural communities as well. However, because of the small number of contracts involved, this analysis is not conclusive. Regardless, National Fire Plan funding has not come close to replacing the amount of money that was being spent on forest management contracting in the early 1990s.

Moseley, C. and N. A. Toth (2004). "Fire hazard reduction and economic opportunity: How are the benefits of the National Fire Plan distributed?" *Society & Natural Resources* **17**(8): 701-716.

Fire suppression and hazard reduction were first linked to efforts to create economic opportunity during the 1930s. In funding the National Fire Plan in 2000, Congress gave the Forest Service and Department of the Interior the authority to consider local benefit to rural communities when awarding service contracts funded with Fire Plan money. This article examines whether this local benefit criteria has created economic opportunities for businesses and people in rural communities by evaluating Forest Service procurement of ecosystem management services across Oregon and Washington and through two case studies of isolated rural communities. Results show that while there was some overall benefit from this directive, some isolated rural communities did not benefit.

Mozumder, P., N. Raheem, J. Talberth and R. P. Berrens (2008). "Investigating intended evacuation from wildfires in the wildland-urban interface: Application of a bivariate probit model." *Forest Policy and Economics* **10**(6): 415-423.

With evidence of increasing wildfire risks in wildland-urban interface zones in the U.S. West and elsewhere, understanding intended evacuation behavior is a growing issue for community planners. This research investigates intended evacuation behavior due to wildfire risks, using mail survey data collected from over 1000 households in the East Mountain area outside Albuquerque, New Mexico (USA). Respondents were asked whether they would evacuate under both voluntary and mandatory evacuation orders. Bivariate probit probability models are used to jointly investigate the subjective belief structure of whether or not the respondent is concerned about wildfire risk, and the intended probability of evacuating as a function of risk perception, and a variety of socioeconomic and demographic variables (e.g. gender, political affiliation, length of residence, owning animals and amenity ratings).

Muleady-Mecham, N. E., M. E. Lee and B. D. Burch (2004). "A public opinion survey on wildland fire in Grand Canyon National Park." *The George Wright Forum* **21**(4): 12-21.

In 1933 George Wright challenged National Park managers to recognize naturally occurring fires as a natural part of park ecosystems (Davis and Halvorson 1996). After decades of research by scientists and overcoming resistance by land managers, fire has returned to most national park ecosystems through a wildland fire program resulting in ecological restoration (Covington et al. 1997, 2000; Davis and Halvorson 1996; Fulé 1995). However, the public has not been as

supportive of these programs as have biologists (Manfredo 1990). While scientists are privy to the intimate details of the biological reasons behind the role and need for fire as a disturbance in natural ecosystems, the public may not be as aware...

...We conducted a survey to obtain data from visitors to Grand Canyon National Park about their knowledge and opinion of fire. The survey consisted of a demographic section, a questions section, and an open comments section. Comparing visitors' opinions with selected demographic variables related to these opinions enabled us to better understand the visitors' opinions about the role of fire in the national park ecosystem. Results of statistical analysis of the answered questions will help managers and educators target populations and groups of people who do not appear to have a grasp of fire's role in national parks. The open comment section of the survey provided additional insight as to the intent of the respondents to perform a given behavior, i.e., support or not support natural and/or prescribed fires, through the TRA [Theory of Reasoned Action] (Fishbein and Ajzen 1975).

Nelson, 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 & Natural Resources* **18**(4): 321-336.

Many forest and fire agencies seek to influence homeowners to manage vegetation near their home to reduce wildfire risk. To be successful managers need to understand the range of existing landscape typologies based on a defensible space evaluation, homeowners' activities for wildfire preparedness, and what they value in landscape attributes. Interviews and visits with 80 homeowners at risk of wildfire in the wildland-urban interface of northern Minnesota and central Florida reveal that respondents managed for "naturalness," valuing their privacy, wildlife, aesthetics, and recreation. Five landscape typologies in Minnesota and four in Florida ranged from wide-open spaces to homes nestled in the deep woods. The valuing of naturalness was most closely linked to the tendency for a deep woods landscape. Respondents noted that how they manage for what they value as well as the ecosystem they live in partially explained their behavior in creating defensible space around their homes.

Nelson, K. C., M. C. Monroe, J. F. Johnson and A. Bowers (2004). "Living with fire: Homeowner assessment of landscape values and defensible space in Minnesota and Florida, USA." *International Journal of Wildland Fire* **13**(4): 413-425.

Homeowners' preferences for vegetation and defensible space near their homes were documented for wildfire-prone areas in Florida and Minnesota (USA) through 80 in-depth interviews and home site visits. The dominant preference for 'natural' landscapes was articulated as valuing vegetated views, wildlife, recreation, quiet, solitude, and privacy. Homeowners recognized wildfire risk but varied in their perceptions of effective wildfire prevention measures and willingness to take actions to reduce their risk. Most supported prescribed burns, especially if fire experts who understand the local ecology and fire behavior conduct the burns.

O'Laughlin, J. (2005). "Policy issues relevant to risk assessments, balancing risks, and the National Fire Plan: Needs and opportunities." *Forest Ecology and Management* **211**(1-2): 3-14.

The needs and opportunities for assessing and managing risks posed by wildfire are identified through synthesis of natural resources agency and conservation group perspectives. Risk assessment is needed primarily to compare environmental effects of management alternatives, including effects on habitat for threatened and endangered species. This need for comparative risk assessment (CRA) is driven by policies requiring federal agencies to consider risks and other

adverse effects, as well as benefits, when planning and implementing land and resource management projects. An active, adaptive approach to wildfire risk management is highly desirable. Clear objectives are needed, consistent with a long-term vision of what the land should look like. Effective risk communications can help organizations build trust with stakeholders. Several improvements in existing laws and policies could encourage comparisons of active management risks and risk-reduction benefits with risks of no action when fuel loads may result in uncharacteristically severe wildfire effects on resource values, including fish and wildlife habitat. Despite some weaknesses, CRA asks important questions and encourages more transparent decision-making processes.

Ojerio, R., C. Moseley, N. Bania and K. Lynn (2011[†]). "The limited involvement of socially vulnerable populations in federal programs to mitigate wildfire risk in Arizona." *Natural Hazards Review* **12**(1): 28-36.

Currently, biophysical risk factors figure prominently in federal resource allocation to communities threatened by wildfire. Yet, disaster research demonstrates that socioeconomic characteristics impact disaster risk and resilience. Consequently, this study evaluates whether federal wildfire program resources are reaching socially vulnerable populations. Biophysical and social vulnerability indicators were included in a series of regressions to identify predictors of participation in three wildfire mitigation programs in Arizona. Findings indicate that mitigation activities are closely correlated with biophysical risk to wildfire, but socially vulnerable communities are less likely to participate even when exposed to high wildfire risk. This finding suggests a need for a more strategic and equitable distribution of federal resources to mitigate wildfire risk.

Olsen, C. S. and B. Shindler (2010). "Trust, acceptance, and citizen-agency interactions after large fires: Influences on planning processes." *International Journal of Wildland Fire* **19**(1): 137-147.

Wildfires have increased in number and size in recent years, making post-fire forest management an increasingly important topic. Citizen–agency interactions, citizen trust, and citizen acceptance of management strategies are central to successful planning and decision-making in these settings. In this study, citizen opinions from the attentive public are evaluated in two locations near recent fires in Oregon: the 2003 Bear and Booth Complex Fires and the 2002 Biscuit Fire. Results suggest an agency’s commitment to long-term interactions with citizens influences citizen trust in the agencies and acceptance of post-fire management strategies. There is broad acceptance for several post-fire management strategies (i.e. erosion control, replanting, reseeding). However, acceptance is highly dependent on trustworthy relations. Further, results suggest it is not enough to simply offer opportunities for public engagement; citizens need to feel that these activities were meaningful opportunities to participate. Although results differed between locations, overall the majority of respondents did not agree with how the local Forest Service and Bureau of Land Management handled forest planning after recent fires. Findings from this research indicate that positive citizen–agency relations need to be long-term and developed well before a fire occurs if post-fire actions are to be supported by communities.

Olsen, C. S. and B. A. Shindler (2007). Citizen-agency interactions in planning and decisionmaking after large fires; GTR-PNW-715. Portland, OR, USDA Forest Service, Pacific Northwest Research Station: 37.

This report reviews the growing literature on the concept of agency-citizen interactions after large wildfires. Because large wildfires have historically occurred at irregular intervals, research from related fields has been reviewed where appropriate. This issue is particularly salient in the

West where excess fuel conditions indicate that the large wildfires occurring in many states are expected to continue to be a major problem for forest managers in the coming years. This review focuses on five major themes that emerge from prior research: contextual considerations, barriers and obstacles, uncertainty and perceptions of risk, communication and outreach, and bringing communities together. It offers ideas on how forest managers can interact with stakeholders for planning and restoration activities after a large wildfire. Management implications are included.

Ostergren, D. M., K. A. Lowe, J. B. Abrams and E. J. Ruther (2006). "Public perceptions of forest management in north central Arizona: The paradox of demanding more involvement but allowing limits to legal action." *Journal of Forestry* **104**(7): 375-382.

National-level forest policy is changing in response to social pressure to "improve forest health." A particularly fierce public debate surrounds the forest health impacts of administrative appeals, lawsuits, public involvement, and federal agency ability to balance managerial efficiency, ecological health, and social expectations. A self-administered mail survey was conducted in 2003 to assess public opinion on litigation and forest restoration in north central Arizonan communities in the ponderosa pine ecosystem. Although results indicate some support for limits to the, right to file suit, appeal, and review environmental decisions, an overwhelming number of respondents indicate a strong desire to be more informed and involved in forest management decisions.

Parkinson, T. M., J. E. Force and J. K. Smith (2003). "Hands-on learning: Its effectiveness in teaching the public about wildland fire." *Journal of Forestry* **101**(7): 21-26.

This study evaluated workshops for the adult public featuring experiential learning about wildland fire. Participants used hands-on activities to investigate fire behavior and ecology and to assess hazards in the wildland-urban interface. Effectiveness was examined using a pretest, a posttest following the program, and another posttest 30 days later. Participants' knowledge increased following the program, and their attitudes and beliefs became more supportive of fire management. These changes were still evident a month later. Hands-on activities can help adults become better informed about wildland fire and more positive about fire management.

Paveglio, T., M. S. Carroll, J. D. Absher and T. Norton (2009a). "Just blowing smoke? Residents' social construction of communication about wildfire." *Environmental Communication: A Journal of Nature and Culture* **3**(1): 76-94.

This study uses social constructionism as a basis for understanding the effectiveness of communication about wildfire risk between agency officials and wildland-urban interface (WUI) residents. Risk communication literature demonstrates a well-documented difference in the way land managers and stakeholders conceptualize risk. This is especially true of fire because management of these hazards have changed so drastically in past decades; fire managers have typically struggled to clearly articulate the current management policy to the public or integrate their specific knowledge in the risk management process. This study contributes to an understanding of how WUI residents construct communication about wildland fire and agency effectiveness in communicating the new era of fire inclusion. Specifically, we explore the personal and professional sources of information residents' use to understand their fire risk and the subjects they would like more information about. We also explore the continued viability of Smokey Bear, the most enduring symbol of fire management.

Paveglio, T., M. S. Carroll and P. J. Jakes (2008). "Alternatives to Evacuation: Protecting Public Safety During Wildland Fire." *Journal of Forestry* **106**(2): 65-70.

Remaining inside fire-safe structures or at designated safety zones in order to actively defend against wildland fire events is an underrepresented area of scholarship. Though research on chemical spills and tornadoes has long advocated a similar practice of shelter-in-place during certain types of emergency situations, its applicability to the field of wildland fire management appears only infrequently in conferences and necessitates a more active view of participants in ensuring their safety. This paper suggests that the Australian model of fire response, "prepare, stay and defend, or leave early," may emerge as a viable alternative to evacuation in some, but not all, wildland-urban interface (WUI) fire situations. Several communities in the West have begun to explore opportunities for alternatives to evacuation during wildland fire. Because of the lack of U.S. experience with these types of response during fire events we attempt to draw lessons from disaster and risk communication literature related to other types of hazards. An overview of associated fire literature will provide background and situate these concerns in a larger social context. We maintain that this literature provides insight into the considerations, precautions, and initial steps needed for testing the applicability of the Australian model of "prepare, stay and defend, or leave early" during wildland fire events threatening WUI populations.

Paveglio, T., P. Jakes, M. Carroll and D. Williams (2009b). "Understanding social complexity within the wildland-urban interface: A new species of human habitation?" *Environmental Management* **43**(6): 1085-1095.

The lack of knowledge regarding social diversity in the Wildland Urban Interface (WUI) or an in-depth understanding of the ways people living there interact to address common problems is concerning, perhaps even dangerous, given that community action is necessary for successful wildland fire preparedness and natural resource management activities. In this article, we lay out the knowledge and preliminary case study evidence needed to begin systematically documenting the differing levels and types of adaptive capacity WUI communities have for addressing collective problems such as wildland fire hazard. In order to achieve this end, we draw from two theoretical perspectives encompassing humans' interactions with their environment, including (1) Kenneth Wilkinson's interactional approach to community, (2) and certain elements of place literature. We also present case study research on wildfire protection planning in two drastically different California communities to illustrate how social diversity influences adaptive capacity to deal with hazards such as wildland fire. These perspectives promote an image of the WUI not as a monolithic entity but a complex mosaic of communities with different needs and existing capacities for wildland fire and natural resource management.

Paveglio, T. B., M. S. Carroll and P. J. Jakes (2010a). "Adoption and perceptions of shelter-in-place in California's Rancho Santa Fe Fire Protection District." *International Journal of Wildland Fire* **19**(6): 677-688.

The increasing impact of wildland fire on human settlements in the USA, and a growing recognition that evacuation might not always be the safest option for those in the path of the flames, continue to spur consideration of alternatives to evacuation among the American public and its fire professionals. Alternatives to evacuation typically include the option for residents to remain in fire-hardened structures while the flames pass; however, it appears there is no clear consensus on whether existing Australian alternatives or new variations should be used in American communities, and if any option will reduce risks to residents and firefighters. This study uses structuration theory to analyse adoption of the shelter-in-place policy created by the

Rancho Santa Fe Fire Protection District in southern California. We interviewed professionals working in and around the District and the public affected by the policy. Results suggest that professional support and implementation of shelter-in-place are influenced by the breadth of their personal firefighting experience, their agencies' flexibility and constraints on innovation, and perceived potential liability for damage from adoption of alternatives. Resident knowledge and understanding of shelter-in-place are also lacking. We conclude with recommendations for continued development of alternatives to evacuation.

Paveglio, T. B., M. S. Carroll and P. J. Jakes (2010b). "Alternatives to evacuation during wildland fire: Exploring adaptive capacity in one Idaho community." *Environmental Hazards* 9(4): 379-394.

The use of alternatives to evacuation during wildfire events continues to be an intensely debated strategy in the professional and policy circles of numerous fire-prone countries. The most recent chapter comes in response to the Black Saturday Fires in Australia, which has led to policy changes concerning alternatives to evacuation in both Australia and USA. This study explores the local context that influenced the development of alternatives to evacuation in one Idaho community through in-depth interviews with local residents and officials. It acknowledges alternatives as one 'fire-adaptive behaviour' of the local community, a key characteristic that US fire professionals identify as a means to better manage wildfire. We apply and extend a recently created adaptive capacity framework for wildfire to uncover specific community characteristics that both led to and reinforce the development of alternatives to evacuation that are tailored to the local population. Identification of these characteristics serves as one important step towards better local assessment of adaptive capacity for a broad classification of 'fire-adaptive' behaviours. We conclude that no one combination of local resources can guarantee the development of alternatives to evacuation. Rather, diverse local context will result in different approaches and applicability of the practice.

Radeloff, 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.

The wildland-urban interface (WUI) is the area where houses meet or intermingle with undeveloped wildland vegetation. The WUI is thus a focal area for human-environment conflicts, such as the destruction of homes by wildfires, habitat fragmentation, introduction of exotic species, and biodiversity decline. Our goal was to conduct a spatially detailed assessment of the WUI across the United States to provide a framework for scientific inquiries into housing growth effects on the environment and to inform both national policymakers and local land managers about the WUI and associated issues. The WUI in the conterminous United States covers 719 156 km² (9% of land area) and contains 44.8 million housing units (39% of all houses). WUI areas are particularly widespread in the eastern United States, reaching a maximum of 72% of land area in Connecticut. California has the highest number of WUI housing units (5.1 million). The extent of the WUI highlights the need for ecological principles in land-use planning as well as sprawl-limiting policies to adequately address both wildfire threats and conservation problems.

Raish, C., A. González-Cabán and C. J. Condie (2005). "The importance of traditional fire use and management practices for contemporary land managers in the American Southwest." *Environmental Hazards* 6(2): 115-122.

Indigenous and traditional peoples worldwide have used fire to manipulate their environment for thousands of years. These longstanding practices still continue and have considerable relevance for today's land managers. This discussion explores the value of documenting and

understanding historic and contemporary fire use attitudes and practices of the varied cultural/ethnic groups that interact with land managers concerning fire and fuels management in the American Southwest. Current research with historic records and present-day communities is reviewed.

Raish, C., A. González-Cabán, W. Martin, I. M. Martin and H. Bender (2007). Cultural variations in public perceptions concerning fire use and management. *People, Fire, and Forests: A Synthesis of Wildfire Social Science*. T. C. Daniel, M. S. Carroll, C. Moseley and C. Raish, Eds. Corvallis, OR, Oregon State University Press: 70-88.

Much fire research in the social sciences has used the questionable assumption that diverse cultural groups have homogeneous perceptions and practices concerning fire use and management. Review of the available literature indicates that both variation and similarity exist with regard to fire and fire-related issues among cultural groups as well as among subgroups within larger designations, such as Native Americans. There is more information on these topics for some groups than for others, with considerable research on historic fire use among certain Native American groups and among rural Southern farmers and forest users, for example. There is considerably less information on fire use practices among Asian Americans. The information on Native American fire management practices seems to show greater preference for burning as a management tool among groups with active past and present burning traditions. Groups with less-active burning programs are less supportive and more concerned about possible negative effects of prescribed burning. . .

. . . Topics of interest include attitudes on fuel reduction and vegetation management techniques such as prescribed burning and mechanical thinning. Perceptions concerning wildfire risk and risk-mitigation measures are included. This review presents information on both contemporary and historic fire-use patterns, traditions, and perceptions. For enhanced understanding, contemporary attitudes toward fire use and management should be set within the framework of the historical background of fire use among the groups of concern. In many cases, historical uses include the recent past and form an important body of ongoing traditions that potentially shape the way people view the role of fire and its management. For example, Native Americans such as the Methow of Washington and the Dene Tha of Alberta, who have active traditions of annual burning to clear vegetation (Boyd 1999; Lewis 1982), tend to be supportive of burning as a management tool. Groups with less-active burning programs and/or more experience with wildfire damage, such as some of the Southwestern Puebloan groups, may express greater concerns about the possible escape of prescribed fire and the potential damage to both resources and sacred sites caused by wildfires. This type of information is important for the management of public lands with their increasingly wide diversity of user groups and growing recommendations for greater stakeholder involvement and/or co-management.

Rasmussen, K., M. Hibbard and K. Lynn (2007). "Wildland fire management as conservation-based development: An opportunity for reservation communities?" *Society & Natural Resources* **20**(6): 497-510.

This article explores the economic and cultural development potential of wildland fire management for American Indian communities. Wildland fire management provides opportunities to engage in "conservation-based development" - helping communities to strengthen their connections with the land, improve ecosystem health, stimulate small-business development, and reduce their risk from fire. Indian communities - many of which are rural and dependent on natural resources for their cultural, spiritual, and economic livelihood - are an

important example of the potential of wildland fire management for conservation-based development. To examine this potential we asked the question: What are the opportunities and issues for fire-management activities to augment tribal economies, providing jobs and small-business development opportunities while restoring the ecosystem and providing opportunities for cultural development? To answer the question we interviewed representatives of all federally recognized tribes in the Pacific Northwest.

Reams, M. A., T. K. Haines, C. R. Renner, M. W. Wascom and H. Kingre (2005). "Goals, obstacles and effective strategies of wildfire mitigation programs in the wildland-urban interface." *Forest Policy and Economics* **7**(5): 818-826.

The dramatic expansion into the Wildland–Urban Interface (WUI) places property, natural assets, and human life at risk from wildfire destruction. The U.S. National Fire Plan encourages communities to implement laws and outreach programs for pre-fire planning to mitigate the risk to area residents. Starting in 2003, we surveyed the administrators of regulatory and voluntary wildfire risk reduction programs in 25 U.S. states. These state and local programs are listed on the United States Department of Agriculture (USDA) Forest Service’s National Wildfire Programs Database website, www.wildfireprograms.usda.gov, and are concerned with vegetation management on private lands. Analyses of the administrators’ responses suggest several new insights about these risk mitigation efforts, including 1) how they are organized, 2) what they are trying to accomplish, 3) what are the obstacles, and 4) how well they may be working. In our study we describe the goals and objectives of these programs as well as the obstacles confronting managers. Further, we explore trends in these programs including participation in collaborative planning and use of program evaluation to measure progress toward goals. Additionally, we explore the program managers’ perceptions of what are their most effective programs for creating defensible space.

Renner, C. R., T. K. Haines and M. A. Reams (2010). "Building better blocks." *Wildfire* **19**(2): 10-16.

As researchers for the National Database of State and Local Wildfire Mitigation Programs, we began cataloging programs to reduce wildfire risk on private land in 2001. Over the years, more than 250 programs in 35 states were described at www.wildfireprograms.usda.gov, and we wondered about their relative success. Was there one type of program that wildfire managers would agree was the most effective? Did different programs work for different people in different states?

Rodriguez-Mendez, S., M. S. Carroll, K. A. Blatner, A. J. Findley, G. B. Walker and S. E. Daniels (2003). "Smoke on the hill: A comparative study of wildfire and two communities." *Western Journal of Applied Forestry* **18**(1): 60-70.

Wildfire represents a serious challenge to communities in the rural West. After decades of fire suppression, land managers now perceive a greater role for wildfire in the ecosystem. In the meantime, migration patterns from urban to rural settings have increased the number of people living in forested areas throughout the West, therefore; wildfires are a threat to more homes than ever in the region. This study focuses on two communities' response to wildfires during the intense fire season of 1994. Through qualitative research methods, the study analyzes these diverse responses in the context of local social history. Residents of the two communities in north central Washington differed markedly in their perceptions of the wildfires and the followup recovery efforts. We argue that these differences are in large part due to differences in the communities' historical development patterns, geographical location, and the resulting differences in social composition and world views of members. The historical trajectory and

everyday life in each of the two communities serve to frame differing attitudes and positions regarding forest and fire management, which can be explained further by using three distinct perspectives on community. Lessons are drawn for forest/fire managers that center on the critical role of trust in successful/fire management.

Rohrman, B. (2003). "The utility of the World-Wide-Web for fire preparedness of residents." *The Australian Journal of Emergency Management* **18**(3): 20-28.

The "World-Wide-Web" (WWW) is the newest – yet also least researched – tool for informing residents about environmental hazards such as cyclones, fires, volcanic eruptions or floods and for enhancing their preparedness for emergencies and disasters. In this research, a set of six websites by fire authorities (four Australian and two international) were systematically assessed by a group of fire experts, disaster researchers, cognitive psychologists, website experts and residents (N=16). Evaluation criteria included: comprehensibility, completeness of information, relevance for residents, visual appeal, layout, navigability, and suitability for relevant target groups. The results indicate that the websites are well accepted and mostly rated as useful, yet there is considerable potential for improvement. Pertinent suggestions are outlined and further research needs discussed.

Ryan, R. L. (2005). Social science to improve fuels management: A synthesis of research on aesthetics and fuels management. GTR-NC-261. St. Paul, MN, USDA Forest Service, North Central Research Station: 58 p.

Fuels management, like many other aspects of forest management on public land, can be highly controversial. The public's concern that forest thinning projects will significantly impact the scenic beauty of the forests in which it recreates and resides is often a root cause of this controversy. Given that the public's acceptance of forest management practices, including fuels reduction, is heavily based upon the visual appearance of the forest (Ribe 2002), fuels managers can improve their chance of success by incorporating aesthetic considerations into management decisions. In fact, a visually preferred landscape can be the natural outcome of fuels treatments if managers understand the important characteristics that shape the public's landscape preferences. Fortunately for forest planners and managers, a large body of research has explored the impact of forest management, particularly timber harvests, on forest aesthetics. This report summarizes the existing body of research on aesthetics and forest management, and suggests strategies for managers and planners to use in applying this research information to fuels management. The goal of this report is to help managers reduce fuels hazards in a manner that respects, or even improves, the scenic beauty of the forest.

Ryan, R. L. (2010). "Local residents' preferences and attitudes toward creating defensible space against wildfire in the Northeast Pine Barrens." *Landscape Journal* **29**(2): 199-214.

Creating more defensible neighborhoods in the wildland-urban interface requires better understanding of local preferences for residential landscaping meant to reduce wildland fire risk and of the motivation of residents to undertake action at home. A survey of local residents within two areas of fire-prone pitch pine ecosystem in the northeastern United States used a photo questionnaire depicting scenes of different residential landscaping, as well as written items about residents' plans for creating more defensible space. The results indicate a low to mid-level perception of wildfire risk to homes and property, despite the participants' experience with wildfires in the area. Participants showed higher preference for scenes showing a balance of native plants and ornamental lawns than for those with lawn only or entirely native forest plantings. Despite their perceptions, residents engaged in defensible space strategies. In

particular, those with a higher degree of natural areas knowledge were more likely to thin trees or vegetation than were other residents. The desire to retain mature trees around residential homes is a challenge to creating more defensible space. The connection between landscape preference and willingness to engage in residential landscaping may both benefit local ecosystems and contribute to their resistance to fire.

Ryan, R. L. and E. Hamin (2008). "Wildfires, communities, and agencies: Stakeholders' perceptions of postfire forest restoration and rehabilitation." *Journal of Forestry* **106**(7): 370-379.

After wildfire, land managers are often called on to undertake complex restoration activities while also managing relations with wildfire-devastated communities. This research investigates the community-US Forest Service agency relations in the postwildfire period in three western US communities. In each community, we interviewed key informant representatives from government, business, environmental organizations, and recreation groups and conducted focus groups to gather input from residents located near burn areas. The goal was to understand how forest restoration and rehabilitation efforts and agency outreach were perceived by stakeholders who were recently affected by wildfire and how these perceptions were related to underlying community and fire conditions. Our findings suggest that four vectors interact to determine the level of expectations and need for agency-community engagement in the postfire period: (1) the extent and characteristics of the fire; (2) community economic, recreational, and emotional connection to the forest; (3) the history of agency-community relations; and (4) the level of volunteerism in the community. We provide a schematic of different types of collaboration relevant to the postfire period in which, generally, residents preferred action-oriented collaboration, while other agency personnel were more amenable to collaborative planning. On-the-ground volunteer restoration activities helped restore community spirit and improve agency-community relations, and increased education and outreach were desirable. The model developed in this research argues for agency responses that consider both the social and the ecological communities when planning postfire restoration projects.

Ryan, R. L. and E. Hamin (2009). "Wildland-urban interface communities response to post-fire salvage logging." *Western Journal of Applied Forestry* **24**(1): 36-41.

Salvage logging, the removal for profit of standing trees that have been damaged by extensive wildfires, has been quite controversial and subject to lawsuits that can delay the logging past the time in which the lumber is still useful. It has not been clear, however, whether the public that has been most affected by wildfires—those that live near burned areas—support or oppose postfire logging. In this research we use focus groups and stakeholder interviews in urban interface communities that have experienced significant wildfires to examine in some detail the perspectives these members of the public have regarding salvage logging. Public support for salvage logging in communities that have recently experienced wildfires was much stronger than hypothesized at the beginning of this study from our review of the number of unsuccessful salvage logging proposals or even popular press reports. Key reasons for supporting salvage logging were that letting useful timber rot was wasteful, that it improves the postfire aesthetics and safety of the forest, and that it can provide some income for local postfire restoration activities. Caveats include assuring that any environmental impacts, such as new roads, are mitigated postlogging, and assuring that appropriate snags are left to provide wildlife habitat.

Ryan, R. L. and E. M. Hamin (2006). Engaging communities in post-fire restoration: Forest treatments and community-agency relations after the Cerro Grande Fire. *The Public and Wildland Fire Management: Social Science Findings for Managers*; GTR-NRS-1. S. M. McCaffrey, Ed. Newtown Square, PA, USDA Forest Service, Northern Research Station: 87-96.

Our research provides advice to managers in their work in post-fire forest rehabilitation based on focus groups and interviews in the Los Alamos, New Mexico, community after the Cerro Grande fire of 2000. We address two key issues: how different restoration efforts compare to natural revegetation from the public's perspective, and how to effectively communicate with and engage the public in the rehabilitation process. Overall, resident perceptions of the USDA Forest Service were reported to be better after the fire than before, and acceptance of hazard mitigation measures had also increased significantly. Not surprisingly the key aspect to residents' perceptions of the Forest Service was the amount and quality of communication, and the availability of a clear person to go to with questions. A second important aspect was supporting volunteers in rehabilitation efforts, which both aids the forest and helps the community heal from the trauma of the fire. Such fires create an opportunity to increase networks of collaboration and cooperation, both with residents and with other agencies. The study found strong support for rehabilitation techniques that stabilized soils and minimized flood damage near developed areas. One point of near consensus was the need to remove hazard trees from trails and to re-open trails and other popular recreation areas as quickly as possible. However, residents' perceptions varied about how many dead and dying trees should have been removed after the fire as well as how much area should be seeded.

Ryan, R. L. and M. B. Wamsley (2008). "Public perceptions of wildfire risk and forest management in the Central Pine Barrens of Long Island (USA)." *The Australasian Journal of Disaster and Trauma Studies* **2008-2**.

Wildfire risk is increasing as more people move into wildland-urban inner-face areas, such as the pitch pine barrens of the Northeastern United States. However, little is known about local residents' perceptions of wildfire risk or their reaction to management efforts such as prescribed fire to reduce the danger of catastrophic wildfires. This study in the Central Pine Barrens of Long Island, New York (USA) looked at the relationships between previous experience with wildland fire, level of knowledge about forest management to reduce fire danger and attitudes toward implementing these strategies in local forests. The results of a mail-out survey of 135 residents living in at-risk neighborhoods found that over half of the respondents had experienced a wildfire yet still perceived only a mid-level of risk to their own property. Public perceptions of risk were positively influenced by residents' previous experience with wildfire as well as their understanding of their homes' specific landscape setting (i.e., proximity to large forested areas and surrounding density of vegetation). Unlike other natural disasters, wildfire was perceived to be a human-caused hazard that can be managed and controlled by local fire officials. The more familiarity and knowledge local resident had about such hazard reduction strategies as prescribed fire, the more supportive and less concerned they were about such issues like smoke. While the study found a strong level of trust in local fire officials to suppress wildfires, local residents wanted more public involvement and participation in fire hazard reduction planning. The study points to the need to engage local residents in wildfire planning and to increase outreach about wildland fire risk and management options.

Ryan, R. L., M. B. Wamsley and B. P. Blanchard (2006). Perceptions of wildfire threat and mitigation measures by residents of fire-prone communities in the Northeast: Survey results and wildland fire management implications. *The Public and Wildland Fire Management: Social Science Findings for Managers*; GTR-NRS-1. S. M. McCaffrey, Ed. Newtown Square, PA, USDA Forest Service, Northern Research Station: 11-17.

We surveyed residents of fire-prone areas of the Central Pine Barrens of Long Island, New York, and the Plymouth Pine Barrens in Massachusetts to learn how they perceived wildland fire risk and management techniques for reducing fire hazard. We found that residents considered the fire threat to their own property to be relatively low in spite of first-hand experience with wildfires; support for fuel breaks and mechanical treatments was higher than support for prescribed fire; support for mitigation treatments increased with increased knowledge about those treatments; and residents showed a strong desire to be involved in forest planning to manage wildfire danger. Key points from the study for managing wildland-urban interface areas include the following: (1) Public education and outreach efforts about fuel-hazard reduction planning need to be increased well in advance of changing forest management. (2) Wildland-urban interface communities differ from each other; implementation strategies should be tailored to the particular area. (3) Voluntary defensible space programs will be easier to implement than mandatory ones. (4) The public needs to be involved early in fuel-hazard planning.

Schroeder, S. L. and I. E. Schneider (2010). "Wildland fire and the wilderness visitor experience." *International Journal of Wilderness* **16**(1): 20-25.

The purpose of this study was to understand wilderness visitors' perceptions of wildland fire and describe visitors' wilderness recreational experience following wildland fire in the Boundary Waters Canoe Area Wilderness (BWCAW). Qualitative interviews revealed visitors' perceptions of burned areas as well as if and how activities and behaviors were influenced by wildland fire occurrence. Results indicated that BWCAW visitors predominately perceived burned areas as interesting landscape features worthy of exploration. Route choices did not change due to burned areas but site selection and camping behaviors did. Wilderness planning and management implications include adjusting for spatial displacement and developing education material.

Schulte, S. and K. A. Miller (2010). "Wildfire risk and climate change: The influence on homeowner mitigation behavior in the wildland-urban interface." *Society & Natural Resources* **23**(5): 417-435.

This project examines the sensitivity of behavior and attitudes regarding wildfire risk to perceptions of drought and climate change impacts, and documents the current state of homeowner risk mitigation effort in Clear Creek County, Colorado. Survey results demonstrate that homeowners have a fairly accurate understanding of the impact of climate change and other environmental risk factors, and that the majority have undertaken the most obvious risk mitigation investments, such as pruning vegetation around the home. Perception of climate and weather as risk factors has a significant impact on risk perception and concern about wildfire but is not a determinant of advanced mitigation effort. Further mitigation effort primarily relates to the value homeowners place on amenities associated with their house and their perception of the impact of neighboring lands mitigation.

Shindler, B. (2002). Citizens in the fuel-reduction equation: Problems and prospects for public forest managers. *Fire in Oregon's Forests: Risks, Effects, and Treatment Options*. S. A. Fitzgerald, Ed. Corvallis, OR, Oregon State University Press: 139-147.

Today's fire management professionals operate in a world of high expectations. Unfortunately, many often have a low level of understanding about citizen concerns, possess inadequate communication skills, and frequently work in a climate of diminishing public trust (Blahna and Yonts-Shepard 1989). But if managers fail to pay attention to public concerns, they are condemned to responding to negative reactions. Thus, the purpose for this analysis is to focus on the characteristics of agency-citizen interactions and to encourage thoughtful consideration of factors that both constrain and facilitate acceptance of fuel reduction programs. (1) Public acceptance of fuel treatments depends on the process of how and why decisions are made as much as the decision itself. (2) It makes little difference how good a fuels plan may be; nothing will be supported unless the people involved trust one another. (3) Technical, science-based planning for fuel management does not adequately incorporate public concerns. (4) Achieving natural, healthy forest systems is complicated by a range of perceptions of what "natural" forests might be. (5) The initial basis for judgments of forest landscapes is visual; we need to aim for a more comprehensive understanding of conditions. (6) It is a misconception that information alone will lead to increased understanding. People learn and change their behavior based on relevant personal experience.

Shindler, B. (2007). Public acceptance of wildland fire conditions and fuel reduction practices: Challenges for federal forest managers. *People, Fire, and Forests: A Synthesis of Wildfire Social Science*. T. C. Daniel, M. S. Carroll, C. Moseley and C. Raish, Eds. Corvallis, OR, Oregon State University Press: 37-54.

Federal forest managers today are faced with unprecedented, complex challenges. Risks to our national forests, affected by years of fire suppression, drought, increased stand density, insect outbreaks, and human population growth at the wildland-urban interface present a technical challenge perhaps greater than any other confronted by our natural resource agencies (Grote 2000). Furthermore, the last two decades of forest management have been fraught with legal challenges and public protests, reflecting serious problems with public acceptance, a critical element to successful implementation of any action on the ground. Most recently, major wildfire events have attracted national media coverage, which can raise public awareness but also tend to exaggerate risks and distort information. Fire professionals in the western U.S., are experiencing this dilemma as they attempt to determine appropriate levels of salvage operations and rehabilitation in the aftermath of large fires in 2002, 2003, and 2005. Throughout all this, resource professionals are increasingly called on to manage forest ecosystems in ways that simultaneously sustain biophysical, economic, and social aspects of those systems (Clark 1999; Dombeck 1996).

Public acceptance has always been a major factor in the ability of federal agencies to effectively manage forests (Shindler et al. 2002), and is especially important now that the National Fire Plan (NFP) and the Healthy Forest Restoration Act (HFRA) have directed personnel to improve forest conditions through fuel-reduction activities. However, the stated goal of improving forest conditions is often debated and of some controversy. In the current sociopolitical climate the scrutiny of bureaucratic actions runs high and questions of trust and credibility are the subject of each decision. Over the last two decades (but particularly since Joint Fire Science Program and NFP initiatives), a substantial amount of research has been conducted to advance our understanding of public concerns, knowledge, and attitudes about fire-management activities. Raish et al. (this volume) provide the review of research on variations among cultural/ethnic/racial groups concerning these topics. Drawing from research

on public concerns, knowledge, and attitudes, this chapter outlines the social acceptability concept and describes a set of common but specific challenges to agency fuel-reduction efforts. The analysis aims to contribute to more durable decisions by helping structure management's response for gaining public acceptance and support.

Shindler, B. A. and R. Gordon (2005). A practical guide to citizen-agency partnerships: Public outreach strategies for fire and fuel management. Corvallis, OR, Oregon State University.

This Practical Guide is a companion to the video program Communication Strategies for Fire Management: Creating Effective Citizen-Agency Partnerships. The video is designed to assist land management personnel in working collaboratively with citizens for community fire and fuel reduction strategies. The DVD uses real world examples from successful agency communication programs to highlight effective approaches. It examines essential attributes for developing partnerships and offers a set of organizing principles to initiate an outreach strategy or to improve an existing one. This guide goes further by outlining important steps for implementation.

Shindler, B. A. and E. Toman (2003). "Fuel reduction strategies in forest communities." *Journal of Forestry* **101**(6): 8-15.

This study uses panel data from a mail survey administered to the same individuals in 1996 and 2000 to measure change in public attitudes toward fire management programs on federal lands in eastern Oregon and Washington. Findings were generally similar between 1996 and 2000, but three noteworthy changes occurred over the four-year interval. First, the number of citizens who view smoke as a problem has risen. Second, citizens gave Forest Service information programs lower ratings and considered other sources of information more reliable. And finally, the relationship between the Forest Service and residents in the region appears to have eroded. Nevertheless, respondents continued to support prescribed fire and mechanized thinning for fuel reduction purposes in local forests.

Shindler, B. A., E. Toman and S. M. McCaffrey (2009). "Public perspectives of fire, fuels, and the Forest Service in the Great Lakes Region: A survey of citizens in Minnesota, Wisconsin, and Michigan." *International Journal of Wildland Fire* **18**(2): 157-164.

Relative to the western United States, where fire and fuel management programs have received greater emphasis, few community-based studies have focused on the Great Lakes region. The present paper describes public opinion research from counties surrounding National Forests in Wisconsin, Minnesota and Michigan. Survey data address citizen perspectives on (1) fuel reduction practices and related risks, (2) confidence in the US Forest Service to effectively implement treatments, and (3) interactions between the agency and forest communities. Substantial support for prescribed fire and thinning treatments is evident, with few participants believing these practices should not be considered or are unnecessary. However, ratings of agency actions were weak at all three study sites; in particular, there is some skepticism that managers can safely implement prescribed fire programs. Overall, Minnesota residents had fewer concerns whereas Michigan respondents were more cautious. These results are discussed and compared with findings from the western US.

Shiralipour, H. J., M. C. Monroe, K. C. Nelson and M. Payton (2006). Working with neighborhood organizations to promote wildfire preparedness. *The Public and Wildland Fire Management: Social Science Findings for Managers*; GTR-NRS-1. S. M. McCaffrey, Ed. Newtown Square, PA, USDA Forest Service, Northern Research Station: 151-162.

Several government agencies and other natural resource managers have instituted outreach programs to promote wildfire preparedness in wildland-urban interface (WUI) neighborhoods that complement community-wide efforts. To help these programs become more effective, research was undertaken to gain a better understanding of the role that neighbors and neighborhood organizations play in assisting people to reduce their wildfire risk. Research was conducted in six U.S. communities where State forestry agencies or fire departments had engaged in wildfire education and outreach in a number of local neighborhoods, although the amount of wildfire prevention education received varied from none to considerable. Results show that neighborhood organizations are a readymade physical, social, and political entity capable of playing an important role in helping people reduce their wildfire risk. A series of recommendations geared to resource managers who want to work with neighborhood organizations was developed from research findings.

Steelman, T. and M. DuMond (2009). "Serving the common interest in U.S. forest policy: A case study of the Healthy Forests Restoration Act." *Environmental Management* **43**(3): 396-410.

In the United States, the common interest often is conceived as a by-product of the pluralist, interest-group-driven democratic process. Special interests dominate in many political arenas. Consequently, we have lost the language, vocabulary, and ability to talk about the common interest. The way to reverse this trend is to develop and practice with new tools that allow us to articulate what we mean by the common interest in specific contexts. In this article, we leveraged the literature on procedural, substantive, and pragmatic decision making to illustrate how they work together to demonstrate whether and how the common interest was served in three case studies of Healthy Forests Restoration Act implementation on the Apache-Sitgreaves National Forest in Arizona. In two of the cases we found that the common interest was mostly served, while in the third case it was not. Our results raise questions about the ability of procedural criteria or substantive criteria alone to determine effectiveness in decision making. When evaluated together they provide a more complete understanding of how the common interest is or is not served.

Steelman, T. A. (2008a). Addressing the mitigation paradox at the community level. *Wildfire Risk: Human Perceptions and Management Implications*. W. Martin, C. Raish and B. Kent, Eds. Washington, DC, Resources for the Future: 64-80.

Continued population growth in the intermountain West coupled with decades of fire suppression policy places entire communities and their associated infrastructure at continued risk of wildland fire (Beebe and Omi 1993; GAO 1999). As a consequence, more people, property, and infrastructure are exposed to the risk of wildfire than at any time in recent history. Since 1970, more than 30,000 structures, including 10,000 homes, have been destroyed by wildfires throughout the United States (Firewise 2004). From 1988 to 1998, wildfires consumed over 20,000 square miles, destroyed some 6,500 structures, caused losses estimated in excess of \$2.5 billion, and resulted in more than 40 deaths (Deyle et al. 1998).

In spite of these trends, mitigating the risk from wildfire is not high on the list of concerns of individual property owners. The perceived risk of wildfire destroying anyone individual's home is very low, while the cumulative risk to the entire community of wildfire can be much higher. This creates a greater incentive for a community to mitigate the risk from wildfire than for any

individual property owner. This problem is termed the wildfire mitigation paradox. This paradox is the result of a complex interaction of factors associated with an individual's willingness to accept, support, and comply with mitigation activity or risk reduction programs (Gregory 2002; Rohrmann 1998; Slovic 2000b), with a key factor being a trade-off between the perceived risks of wildfire and benefits of taking action. Once individuals have identified the full range of mitigation actions available to them, they engage in two types of evaluation: cost-benefit and their estimated return over time (Kates 1971). In general, relatively high levels of resources, such as money, expertise, and time, are needed for mitigation programs (Tierney 1993). Averting wildfire risk and insuring against wildfire losses are costly, and households will undertake such actions only when subjective benefits exceed the costs of resources used (McKee et al. 2004)...

...The conventional framing of mitigation action along risk-benefit lines suggests that individuals are unlikely to undertake mitigation activity (Daniel 2007). Yet in some places, individuals and communities are taking action to mitigate their threat of wildfire risk. In these situations, the communities are providing incentives or other programs to reduce the cost of mitigation activity for individual landowners. This chapter investigates two case studies to illustrate how the mitigation paradox has been addressed to facilitate mitigation measures. The purpose is to provide practitioners and scholars alike with examples of community mitigation measures and how they alter the risk-benefit calculus.

Steelman, T. A. (2008b). Communities and wildfire policy. *Forest Community Connections: Implications for Research, Management, and Governance*. E. M. Donoghue and V. Sturtevant, Eds. Washington, DC, Resources for the Future: 109-126.

In 2000, federal wildfire policy shifted from a reactive approach dominated by wildfire suppression to a more proactive approach that aimed to reduce the long-term wildfire risk to communities and the environment (USDA and USDI 2000; WGA 2001). Since the 1990s, more people have settled in what is called the wildland urban interface (WUI)—the place where humans and forests meet. This expanding patchwork pattern of residential development has resulted in humans residing closer to the areas where wildfire occurs, so that human communities are a central concern in this new approach to wildfire management.

Every community in the WUI faces different challenges and possesses unique attributes to address their wildfire risk. A sustainable approach to mitigating the long-term wildfire risk at the community level would allow communities to craft their own distinctive responses to the risks they face. Initially, the new federal wildfire approach specified four broad goals that could be adopted and integrated by communities to achieve their desired wildfire response: 1) improving fire prevention and suppression; 2) reducing trees, shrubs, and other vegetative growth (known as “hazardous fuels”) near communities; 3) restoring fire-adapted ecosystems; and 4) promoting economic opportunity and social capacity-building through community assistance. However, more recent policy directives and subsequent allocation of resources have narrowed the federal approach to focus on fire suppression and hazardous fuel reduction to the exclusion of the other goals. These changes call into question the long-term feasibility of a sustainable, community-based wildfire policy.

This chapter explores wildfire policy from the perspective of communities. It begins by examining important trends related to the changing nature of the wildfire problem, including shifting settlement patterns and past and current policy approaches that shape community responses to wildfire threats. The chapter then summarizes the limited empirical research about community response to wildfire threats. The chapter concludes with policy implications and

suggestions for future work on communities and wildfire policy that could contribute to a more sustainable wildfire policy that reduces the long-term risk to communities.

Steelman, T. A. and C. A. Burke (2007). "Is wildfire policy in the United States sustainable?" *Journal of Forestry* **105**(2): 67-72.

Beginning in 2000, wildfire policy in the United States shifted from focusing almost exclusively on suppression to embracing multiple goals, including hazardous fuels reduction, ecosystem restoration, and community assistance. Mutually reinforcing, these policy goals have the potential to result in an ecologically, socially, and economically sustainable wildfire policy that can mitigate the long-term risk of wildfires for human and ecological communities alike. Six years into this new policy, we evaluate the evidence to determine how well the multiple goals are being served. We conclude that suppression and hazardous fuels reduction receive greater attention and resources relative to ecosystem restoration and community assistance. This provides an incomplete solution to mitigating the long-term risk of wildfire, thereby running the risk of perpetuating it.

Steelman, T. A., G. Kunkel and D. Bell (2004). "Federal and state influence on community responses to wildfire threats: Arizona, Colorado, and New Mexico." *Journal of Forestry* **102**(6): 21-27.

Federal policy has placed a priority on community-based approaches to address the wildfire risks facing communities and the environment. Federal and state governments impact considerably the resources that are available to local communities. This research identifies how federal and state agencies influence community response. Federal agencies impact communities dominantly through policy direction and the provision of financial resources. State agencies impact communities through organizational arrangements, access to funding, and programmatic decisions.

Steelman, T. A. and G. F. Kunkel (2004). "Effective community responses to wildfire threats: Lessons from New Mexico." *Society & Natural Resources* **17**(8): 679-699.

National policies to address the wildfire threat in the United States place emphasis on community responsiveness, but great uncertainty surrounds the scope and success of community response to wildfire threats and why some communities foster effective responses while others fail to do so. Two case studies of community responses to wildfire threats in New Mexico are explored. A decision process framework illustrates how an effective response can be defined. Findings indicate that an effective community response to wildfire means that a community works through all stages of the decision process with appropriate social and structural responses to its specific threat.

Stephens, S. L., M. A. Adams, J. Handmer, F. R. Kearns, B. Leicester, J. Leonard and M. A. Moritz (2009). "Urban-wildland fires: How California and other regions of the US can learn from Australia." *Environmental Research Letters* **4**(1): 014010.

Most urban-wildland interface (UWI) fires in California and the other regions of the US are managed in a similar fashion: fire agencies anticipate the spread of fire, mandatory evacuations are ordered, and professional fire services move in and attempt to suppress the fires. This approach has not reduced building losses in California. Conversely, losses and the associated suite of environmental impacts, including reduced air quality, have dramatically increased over the last three decades. In contrast to California, Australia has developed a more effective 'Prepare, stay and defend, or leave early' policy. Using this approach, trained residents decide whether they will stay and actively defend their well-prepared property or leave early before a

fire threatens them. Australian strategies have the distinct advantage of engaging and preparing those most affected by such fires: homeowners. Investing more in fire suppression alone, the common response after large UWI fires in California, will not reduce losses. US society has attempted to accommodate many of the natural hazards inherent to the landscapes that we inhabit; by examining the Australian model, we may approach a more sustainable coexistence with fire as well. However, it should be noted that some California communities are so vulnerable that a 'Prepare and leave early' strategy may be the only option.

Stephens, S. L. and L. W. Ruth (2005). "Federal forest-fire policy in the United States." *Ecological Applications* **15**(2): 532-542.

Forest-fire policy of U.S. federal agencies has evolved from the use of small patrols in newly created National Parks to diverse policy initiatives and institutional arrangements that affect millions of hectares of forests. Even with large expenditures and substantial infrastructure dedicated to fire suppression, the annual area burned by wildfire has increased over the last decade. Given the current and future challenges of fire management, and based on analytical research and review of existing policies and their implications, we believe several changes and re-emphases in existing policy are warranted. Most importantly, the actual goal of fuels-management projects should be the reduction of potential fire behavior and effects, not the simple reduction of fuels. To improve safety and economic efficiency, fire-suppression policies should recognize differences in the characteristics of wildfires, and strategies should be tailored to better respond to the unique demands of each fire. Where forest fires are burning large areas, as in the western United States, reducing the trend of increased amounts of burned area may require a diversity of treatments, including prescribed burning, mechanical fuels treatment, and increased use of the Wildland Fire Use Policy. Assessment of how fire is affecting forests would be enhanced if land-management agencies reported the area burned by low-, mixed-, and high-severity fire and what proportion is outside the desired trend or range of conditions for each forest type. Congress should provide an improved budgetary process for fire and fuels management, with a larger annual federal fire-suppression budget. Additionally, reducing annual area burned will require long-term coordinated efforts by federal and state governments, with robust partnerships between land-management agencies and the public in collaborative planning and stewardship. Research and adaptive management are essential in allowing fire-hazard-reduction projects to move forward where proposed projects are met with uncertainty and mistrust. While legislative reform may be desirable, a strategy that is not entirely dependent on new legislation is needed. Building on existing programs that are consistent with a science-based strategy will enable land-management agencies to better utilize information in pursuit of the overall objective of reducing uncharacteristically severe wildfires.

Stewart, S. I., V. C. Radeloff, R. B. Hammer and T. J. Hawbaker (2007). "Defining the wildland-urban interface." *Journal of Forestry* **105**(4): 201-207.

Federal wildland fire policy in the United States has been substantially revised over the past 10 years and new emphasis has been given to the wildland-urban interface (WUI), which creates a need for information about the WUI's location and extent. We operationalized a policy definition published in the Federal Register (US Department of the Interior [USDI] and US Department of Agriculture [USDA]), 2001, Urban wildland interface communities within vicinity of federal lands that are at high risk from wildfire. Fed. Regist. 66(3):751-777) to create national maps and statistics of the WUI to guide strategic planning. Using geographic information system analysis, we evaluate the national WUI by altering the definition's parameters to assess the influence of individual parameters (i.e., housing density, vegetation type and density, and

interface buffer distance) and stability of outcomes. The most sensitive parameter was the housing density threshold. Changes in outputs (WUI homes and area) were much smaller than parameter variations suggesting the WUI definition generates stable results on most landscapes. Overall, modifying the WUI definition resulted in a similar amount of WUI area and number of homes and affected the precise location of the WUI.

Sturtevant, V. and P. Jakes (2008). Collaborative planning to reduce risk. *Wildfire Risk: Human Perceptions and Management Implications*. W. E. Martin, C. Raish and B. Kent, Eds. Washington, DC, Resources for the Future: 44-63.

Wildland fire knows no political boundaries, nor should efforts to address its risk. Collaboration is not a new idea; many examples of natural resource managers and community groups working together can be found in forest management planning, watershed restoration, and wildland fire suppression (Sturtevant et al. 2005). Direction from a number of sources has urged collaboration as a means to achieve wildland fire management objectives. In 2001, Congress called for "close collaboration among citizens and governments at all levels" for the management of wildland fire, hazardous fuels, and ecosystem restoration (P.L. 106-291, cited in WGA 2001). The Western Governors' Association also outlined a collaborative approach for reducing wildland fire risks. Federal and state authorities provide incentives for collaboration, coordination, and cooperation, including recent initiatives such as the National Fire Plan (NFP) and Healthy Forests Restoration Act 2003 (HFRA) (USDA/USDI 2000; USFS 2004). Programs such as Firewise, FireFree, and Firewise Communities USA provide collaborative forums for homeowners to collectively address their risk.

Findings from case studies of community fire-planning processes across the country support the notion that collaboration enhances community preparedness for wildland fire and implementation of fuel-reduction projects across ownership boundaries. We found that successful collaborations reflect their ecological and social contexts and are affected by their ecological and social scale. For example, collaboration for fuel reduction by a small group of property owners is less complicated socially but less significant ecologically than collaboration on a larger scale, such as a watershed. This ecologically appropriate scale includes a variety of ownerships, however, including small woodland, industrial, and public forest, as well as diverse social values, presenting challenges for collaboration. Successful collaborations work at a scale appropriate to the community, a scale that evokes shared values, collective action, and sense of place – often neighborhoods or subwatersheds within a larger watershed. Local, small-scale projects may work better than larger ones, but planning needs to be broad enough both to gain endorsement from appropriate political jurisdictions and to cover the ecosystem (Pipkin and Doerksen 2000).

In this chapter, we introduce a model of collaboration that highlights the importance of context, describe stages of collaborative processes, and suggest potential desired outcomes (Figure 3-1). We then illustrate the model with case study findings regarding community efforts to address wildfire risk.

Sturtevant, V. and S. M. McCaffrey (2006). Encouraging wildland fire preparedness: Lessons learned from three wildfire education programs. *The Public and Wildland Fire Management: Social Science Findings for Managers*; GTR-NRS-1. S. M. McCaffrey, Ed. Newtown Square, PA, USDA Forest Service, Northern Research Station: 125-136.

Several key lessons/findings from this analysis can help guide managers who are working with homeowners to create defensible space and reduce hazardous fuels across ownership boundaries:

- People need to know that fire mitigation practices are compatible with their lives and values. Programs that tailor their efforts to address local values and interests are more likely to be adopted.
- People are more apt to adopt practices that complement or enhance social values. Programs that increase contact between neighbors can help develop a sense of community as people work together to reduce hazardous fuels across ownership boundaries. Working together increases the social advantage of adopting defensible space as such work becomes the “norm” rather than the exception.
- People prefer to try new practices in stages. Being able to adopt segments of a new practice allows people to adopt at a comfortable pace. Checklists can provide homeowners with a way to incrementally assess and test each stage of an innovation.
- People who have opportunities to observe a practice and its benefits are more likely to adopt the practice. Concrete examples allow residents to see the results, reassess their previous notions of what “defensible space” or fuel reduction might look like, and choose the actions they find acceptable. Demonstration sites and neighborhood events provide opportunities for sharing the aesthetics of fuels reduction.
- People will compare the cost of implementing defensible space with the potential benefit. Because people don’t really expect to lose a house to wildfire, highlighting the social benefits of adoption may be more effective in encouraging adoption than highlighting economic advantages.

Sturtevant, V., M. A. Moote, P. Jakes and A. S. Cheng (2005). Social science to improve fuels management: A synthesis of research on collaboration; GTR-NC-257. St. Paul, MN, USDA Forest Service, North Central Research Station: 84 p.

A series of syntheses were commissioned by the USDA Forest Service to aid in fuels mitigation project planning. This synthesis focuses on collaboration research, and offers knowledge and tools to improve collaboration in the planning and implementation of wildland fire and fuels management projects. It covers a variety of topics including benefits of collaboration, stages of collaboration, challenges to collaboration, and keys to successful collaboration.

Sutton, J., L. Palen and I. Shklovski (2008). Backchannels on the front lines: Emergent uses of social media in the 2007 Southern California wildfires. In: Fiedrich, F., Van de Walle, B. (Editors), 5th International Conference on Information Systems for Crisis Response and Management ISCRAM2008, May 5 - 7, 2008, Washington, DC, USA, pp. 624-631.

Opportunities for participation by members of the public are expanding the information arena of disaster. Social media supports “backchannel” communications, allowing for wide-scale interaction that can be collectively resourceful, self-policing, and generative of information that is otherwise hard to obtain. Results from our study of information practices by members of the public during the October 2007 Southern California wildfires suggest that community information resources and other backchannel communications activity enabled by social media are gaining prominence in the disaster arena, despite concern by officials about the legitimacy of information shared through such means. We argue that these emergent uses of social media are pre-cursors of broader future changes to the institutional and organizational arrangements of disaster response.

Taylor, J. G., S. C. Gillette, R. W. Hodgson, J. L. Downing, M. R. Burns, D. J. Chavez and J. T. Hogan (2007). "Informing the network: Improving communication with interface communities during wildland fire." *Human Ecology Review* **14**(2): 198-211.

An interagency research team studied fire communications that took place during different stages of two wildfires in southern California: one small fire of short duration and one large fire of long duration. This "quick-response" research showed that pre-fire communication planning was particularly effective for smaller fire events and parts of that planning proved invaluable for the large fire event as well. Information seeking by the affected public relied on locally convenient sources during the small fire. During the large fire, widespread evacuations disrupted many of the local informal communication networks. Residents' needs were for "real-time," place-specific information: precise location, severity, size, and direction of spread of the fires. Fire management agencies must contribute real-time, place-specific fire information when it is most needed by the affected public, as they try to make sense out of the chaos of a wildland fire. Disseminating fire information as broadly as possible through multiple pathways will maximize the probability of the public finding the information they need.

Taylor, J. G., S. C. Gillette, R. W. Hodgson, J. L. Downing, D. J. Chavez, J. T. Hogan and M. R. Burns (2008). Quick-response research of communication between agencies and interface communities during wildland fire. *Fire Social Science Research From the Pacific Southwest Research Station: Studies Supported by National Fire Plan Funds. PSW-GTR-209*. D. J. Chavez, J. D. Absher and P. L. Winter, Eds. Albany, CA, USDA Forest Service, Pacific Southwest Research Station: 119-134.

An interagency research team studied fire communications during different stages of two wildfires, one relatively small fire of short duration and one large fire of long duration. This "quick-response" research showed that prefire communication planning was particularly effective for smaller fire events and parts of such planning proved invaluable for the large fire event as well. Information seeking by the affected public relied on locally convenient sources during the small fire. The information being sought included the precise location and severity, size, and direction of spread of the fire. During the large fire, with widespread evacuations, many of the local informal networks were disrupted. Local residents' needs were for real-time, place-specific information. With changes in communication technology, the public has multiple pathways to explore to discover the information they need. To increase the likelihood that the public will discover real, accurate, and timely information, it is critical to disseminate the kinds of information people need at the appropriate times and through multiple information pathways.

Thapa, B., S. M. Holland and J. D. Absher (2004). The relationship between wildfires and tourist behaviors in Florida: An exploratory study. *Proceedings of the 4th Social Aspects and Recreation Research Symposium, February 4-6, 2004, San Francisco, CA*. P. T. Tierney and D. J. Chavez, Eds. San Francisco, CA, San Francisco State University: 154-161.

Introduction: Florida is a popular national and international tourist destination with 74.3 million visitors in 2000, and slightly more than half of these visited natural and protected areas (Visit Florida, 2001). However, in recent years, notably in 1998 and 2001, drought conditions have led to wildfires that affected large parts of the state, led to smoke closure of interstate highways and air quality alerts (Albright, 1998; Davis, 1998; Dillon, 1998; Drummond, 1998; Farrington, 2001; Woodman, 1998a, 1998b). These conditions have become an increasing issue for recreational and leisure travelers as well as destination promoters and managers. In 1998, Florida's tourism industry was severely affected as approximately 500,000 forest acres burned predominantly in 18 northeastern counties, resulting in forced evacuations from many tourist

destinations, notably the Daytona Beach area (Hays, 1998). Butry and associates (2001) estimated that the 1998 fires resulted in a gross loss of \$61 million to the lodging industry and \$77.2 million gross loss in other business sectors, especially in Orange, Volusia, St. John's and Brevard counties (these are the Orlando and Central Florida east coast areas). Since 1998, the number of fires in the subsequent years has increased and are of concern to the tourism industry, as sustained negative economic impact does not bode well for the tourism-dependent economy of Florida.

Toman, E. and B. Shindler (2006a). Communicating the wildland fire message: Influences on knowledge and attitude change in two case studies. *Fuels Management- How to Measure Success*, Conference Proceedings, March 28-30, 2006, Portland, OR; RMRS-P-41. P. L. Andrews and B. W. Butler, Eds. Fort Collins, CO, USDA Forest Service, Rocky Mountain Research Station: 715-728.

Current wildland fire policy calls for citizen involvement in planning and management. To be effective in their efforts to engage outside stakeholders, resource professionals need to understand citizens' understanding and attitudes toward current practices as well as how to best communicate about proposed actions. A variety of outreach methods have been used to communicate the rationale behind fuel reduction techniques. Limited evaluation of these efforts has occurred resulting in a lack of information available to guide the outreach decisions of agency personnel. This paper evaluates the effects of two basic communication strategies—unidirectional information exchange and interactive approaches—on participant understanding and attitudes. Data was collected in two phases; first, citizens completed a survey on-site prior to outreach participation, then, a follow-up questionnaire was mailed to each participant two weeks following initial contact. Resulting data enable assessment of the influence of outreach activities on participant understanding and attitudes and evaluation of factors that contributed to program success. Findings suggest interactive outreach methods may be more effective at influencing knowledge. However, unidirectional and interactive approaches influenced participants with low initial understanding of fire management or less supportive attitudes toward fuel practices. Results also showed a strong association between knowledge and attitude change suggesting fire professionals have a real opportunity to help shape public perceptions about appropriate management actions.

Toman, E. and B. Shindler (2006b). Wildland fire and fuel management: Principles for effective communication. *The Public and Wildland Fire Management: Social Science Findings for Managers*; GTR-NRS-1. S. M. McCaffrey, Ed. Newtown Square, PA, USDA Forest Service, Northern Research Station: 111-123.

Key Principles: Four principles of effective communication have emerged from recent studies designed to measure citizen responses to fire outreach (research described in the Research Context section). These principles are further supported by findings from related projects, several of which are discussed in this volume. These organizing principles are:

- Effective communication is a product of effective planning.
- Both unidirectional (one-way) and interactive approaches to communication have a role in public outreach. The strengths of each should be used to build a program.
- Communication activities that focus on local conditions and concerns can decrease the uncertainty that citizens associate with fire management and build their capacity to participate in solutions.
- A comprehensive communication strategy will emphasize meaningful interaction among participants and build trust along the way.

Toman, E., B. Shindler, J. Absher and S. McCaffrey (2008a). "Post-fire communications: The influence of site visits on local support." *Journal of Forestry* **106**(1): 25-30.

The prevalence of large wildfires has increased in recent years. In many cases, agency personnel have little prior experience to draw from to organize their postfire response to uncharacteristically large events. However, local residents look to resource managers to provide the necessary leadership to work through these difficult decisions. In particular, methods to create meaningful discussion of management priorities with local citizens are essential. This article reports results from a telephone survey of participants in a US Forest Service–led tour after the Booth and Bear Butte Complex Fires in central Oregon. Findings indicate that the tour provided local residents with useful information and contributed to improved understanding of potential actions. Participants also expressed a high level of support for active management to restore forest conditions. The most striking outcome was the substantial goodwill generated by the tour among participants. Responses showed a high level of appreciation for and improved confidence in local US Forest Service personnel.

Toman, E., B. Shindler and M. Brunson (2006). "Fire and fuel management communication strategies: Citizen evaluations of agency outreach activities." *Society & Natural Resources* **19**(4): 321-336.

Wildfire impacts have increased in recent years. In response, public agencies have undertaken measures to reduce forest fuels and improve forest health conditions. To be successful these programs require a supportive local constituency. Research has identified a relationship between public understanding of, and support for, fuel and fire management activities. Correspondingly, in many areas federal agencies have focused their communication strategies on fuel management programs. This article draws on research in adult learning to develop a framework to evaluate citizen reactions to 11 different outreach programs at study locations in Arizona, Colorado, Oregon, and Utah. Few differences in citizen reactions were found among study locations, but results suggest interactive formats were more effective than unidirectional methods and are also more consistent with principles of adult learning. However, people were less likely to have participated in interactive activities. Contributions of learning theory principles and the efficacy of individual formats are discussed.

Toman, E., B. Shindler and C. S. Olsen (2008b). Communication strategies for post-fire planning: Lessons learned from forest communities. Fire Social Science Research From the Pacific Southwest Research Station: Studies Supported by National Fire Plan Funds. PSW-GTR-209. D. J. Chavez, J. D. Absher and P. L. Winter, Eds. Albany, CA, USDA Forest Service. Pacific Southwest Research Station: 165-179.

Agency communication activities following a wildland fire event are an important part of the postfire actions. Results from 78 semistructured interviews conducted with agency personnel and community members at five national forests were analyzed. Each community had been previously affected by large wildfires. Important issues included credibility, trust, addressing uncertainty, and attention to special places. This study concludes with five key ways to contribute to successful communication in postfire environments.

Toman, E., B. Shindler and M. Reed (2004). "Prescribed fire: The influence of site visits on citizen attitudes." *Journal of Environmental Education* **35**(3): 13-17.

This research employed a panel design to measure the effect of site visits on public perceptions of prescribed fire. On-site survey questions were devised to compare answers to a mail questionnaire previously completed by the same respondents. Questions were designed to examine how site visits influence public opinion and affect acceptance of forest practices. Open-ended questions were also used to capture initial reactions to the treated sites and allow

individuals to identify site factors of greatest concern to them. Although site visits did not increase treatment acceptability ratings, responses indicate that remaining fuel levels and evidence of treatments are important factors influencing treatment support. Additional benefits of site visits are described. This research employed a panel design to measure the effect of site visits on public perceptions of prescribed fire. On-site survey questions were devised to compare answers to a mail questionnaire previously completed by the same respondents. Questions were designed to examine how site visits influence public opinion and affect acceptance of forest practices. Open-ended questions were also used to capture initial reactions to the treated sites and allow individuals to identify site factors of greatest concern to them. Although site visits did not increase treatment acceptability ratings, responses indicate that remaining fuel levels and evidence of treatments are important factors influencing treatment support. Additional benefits of site visits are described.

Toman, E., M. Stidham, B. Shindler and S. McCaffrey (2011[†]). "Reducing fuels in the Wildland Urban Interface: Community perceptions of agency fuels treatments." *International Journal of Wildland Fire* **20**(3): 340-349.

Wildland fires and resulting impacts have increased in recent years. Efforts are underway nationwide to proactively manage vegetative conditions to reduce the threat of wildland fires. Public acceptance is critical to the successful implementation of fuels reduction programs, particularly at the Wildland Urban Interface (WUI). This study examines public acceptance of fuels treatments and influencing factors in five neighborhoods in Oregon and Utah located adjacent to public lands. Support for treatment use was high across locations. Findings suggest citizen trust in agency managers to successfully implement treatment activities is particularly influential on treatment acceptance. Thus, building and maintaining trust with local citizens is an essential element to the successful implementation of fuel management programs.

Trainor, S. F., M. Calef, D. Natcher, F. S. Chapin III, A. D. McGuire, O. Huntington, P. Duffy, T. S. Rupp, L. O. DeWilde, M. Kwart, N. Fresco and A. L. Lovecraft (2009). "Vulnerability and adaptation to climate-related fire impacts in rural and urban interior Alaska." *Polar Research* **28**(1): 100-118.

This paper explores whether fundamental differences exist between urban and rural vulnerability to climate-induced changes in the fire regime of interior Alaska. We further examine how communities and fire managers have responded to these changes and what additional adaptations could be put in place. We engage a variety of social science methods, including demographic analysis, semi-structured interviews, surveys, workshops and observations of public meetings. This work is part of an interdisciplinary study of feedback and interactions between climate, vegetation, fire and human components of the Boreal forest social-ecological system of interior Alaska. We have learned that although urban and rural communities in interior Alaska face similar increased exposure to wildfire as a result of climate change, important differences exist in their sensitivity to these biophysical, climate-induced changes. In particular, reliance on wild foods, delayed suppression response, financial resources and institutional connections vary between urban and rural communities. These differences depend largely on social, economic and institutional factors, and are not necessarily related to biophysical climate impacts per se. Fire management and suppression action motivated by political, economic or other pressures can serve as unintentional or indirect adaptation to climate change. However, this indirect response alone may not sufficiently reduce vulnerability to a changing fire regime. More deliberate and strategic responses may be required, given the magnitude of the expected climate change and the likelihood of an intensification of the fire regime in interior Alaska.

Vaske, J. J., J. D. Absher and A. D. Bright (2007). "Salient value similarity, social trust and attitudes toward wildland fire management strategies." *Human Ecology Review* **14**(2): 223-232.

We predicted that social trust in the USDA Forest Service would mediate the relationship between shared value similarity (SVS) and attitudes toward prescribed burning and mechanical thinning. Data were obtained from a mail survey (n = 532) of rural Colorado residents living in the wildland urban interface (WUI). A structural equation analysis was used to assess the mediation role of social trust. Results indicated that respondents shared the same values as USDA Forest Service managers, and trusted the agency to use prescribed burning and mechanical thinning effectively. As hypothesized, social trust fully mediated the relationship between salient value similarity and attitudes toward prescribed burning and mechanical thinning. As salient value similarity increased, social trust in the agency increased. As social trust increased, approval of prescribed burning and mechanical thinning increased. These findings reinforce the role of social trust in gaining public support for wildfire management and support prior SVS research suggesting that trust mediates the relationship between value similarity and attitudes.

Vining, J. and M. S. Merrick (2008). "The influence of proximity to a National Forest on emotions and fire-management decisions." *Environmental Management* **41**(2): 155-167.

Because American national forests are managed for all citizens, it is important that researchers explore the differences and similarities between citizens living both near and far from publicly managed land. We surveyed residents living at various distances from nationally managed land to collect resident perceptions of different forest fire-management techniques, to determine public preferences for these techniques, and to examine the motivations behind these preferences. Participants both close to and far away from national forests tended to favor a multipronged approach to fire management by preferring the use of a combination of two or more fire-management techniques. There were no significant differences by proximity in participants' self-rated emotions, types of fire-management techniques preferred, or the reasons and rationales for their preferred fire-management technique(s), indicating that the proximity variable may not be as significant as previously thought.

Vogt, C., G. Winter and J. S. Fried (2005). "Predicting homeowners' approval of fuel management at the wildland-urban interface using the theory of reasoned action." *Society & Natural Resources* **18**(4): 337-354.

Social science models are increasingly needed as a framework for explaining and predicting how members of the public respond to the natural environment and their communities. The theory of reasoned action is widely used in human dimensions research on natural resource problems and work is ongoing to increase the predictive power of models based on this theory. This study examined beliefs, attitudes, and intention to support the implementation of three fuel management approaches (FMA)—prescribed burning, mechanical fuel reduction, and defensible space ordinances—in three wildland-urban interface (WUI) areas in the United States. Besides factors prescribed by the theory, the influence of three additional explanatory variables was assessed: past experience, personal importance, and trust. Personal importance of a FMA was a consistently significant predictor of attitude toward that approach, and trust in an agency's implementation of that approach was also a predictor of intention to approve the use of that approach.

Vogt, C., G. Winter and S. McCaffrey (2007). Community views of fuels management: Are national forest local recreation users more supportive? Proceedings of the 2006 Northeast Recreation Research Symposium; GTR-NRS-P-14. R. Burns and K. Robinson, Eds. Newtown Square, PA, USDA Forest Service, Northern Research Station: 546-550.

Significant advances in social science-based wildfire research have occurred in the past five years. Managers, policy makers, and researchers have worked to better understand the perspectives of homeowners, residents, tourists, and recreationists on fire and fuels management and how to better involve them in the planning process. This research examines how the recreational usage of residents living near the Mark Twain National Forest influences levels of support for fuels management. Findings suggest cognitive factors that influence fuels support are different across recreation users and nonusers, but support itself was similar.

Vogt, C. A. (2003). Seasonal and permanent home owners' past experiences and approval of fuels reduction. Homeowners, Communities, and Wildfire: Science Findings from the National Fire Plan; Proceedings of the Ninth International symposium on society and management: June 2-5. Bloomington, Indiana. Gen. Tech. Rep. NC-231. P. Jakes, Ed. St. Paul, MN, USDA Forest Service, North Central Research Station: 63-73.

This paper reports a study of seasonal and permanent homeowners in three wildland-urban interfaces in the United States: San Bernardino County in California, southwestern Colorado, and the panhandle of Florida. Past experiences with fuel reduction techniques, wildland fire, and fire education, as well as attitude toward and approval of prescribed burning, mechanical fuel reduction, and defensible space were evaluated. While many similarities were found, distinct differences between seasonal and permanent homeowners were identified. Geographic differences between states and homeowner types point to the importance of tailoring fire education efforts to the audience.

Vogt, C. A. (2008). Living at the wildland-urban interface: Views about wildland fire and defensible space practices. Fire Social Science Research From the Pacific Southwest Research Station: Studies Supported by National Fire Plan Funds. PSW-GTR-209. D. J. Chavez, J. D. Absher and P. L. Winter, Eds. Albany, CA, USDA Forest Service, Pacific Southwest Research Station: 193-206.

Over 1,000 homeowners or Forest Service special use cabin permittees in three national forest areas were surveyed about their views on wildland fire and defensible space. Questions addressed their home-buying process, residency length, recreation usage, consideration for defensible space features for structure and lot, and attitude toward and support for defensible space implementation in their local area. Results suggest most homeowners in the three study areas (California, Colorado, and Florida) learn about wildland fire after they move to the area. California homeowners showed high levels of compliance to defensible space efforts. In Colorado and Florida where it was less likely to be required, 20 to 30 percent of homeowners were practicing defensible space. Special use cabin permittees were studied in California and Colorado and showed high levels of support for adopting wildland-urban interface wildland fire mitigation efforts.

Watson, A., R. Matt, T. Waters, K. Gunderson, S. Carver and B. Davis (2009). Mapping tradeoffs in values at risk at the interface between wilderness and non-wilderness lands. Proceedings of the third international symposium on fire economics, planning, and policy: common problems and approaches. GTR-PSW-227. A. González-Cabán, Ed. Albany, CA, USDA Forest Service, Pacific Southwest Research Station: 375-387.

On the Flathead Indian Reservation in Montana, U.S., the Mission Mountains Tribal Wilderness is bordered by a buffer zone. To successfully improve forest health within that buffer zone and restore fire in the wilderness, the managing agency and the public need to work together to find solutions to increasingly threatening fuel buildups. A combination of qualitative, culturally sensitive research and a web-based mapping exercise have been used to develop understanding of the tradeoffs Reservation residents describe in relation to potential buffer zone actions. The primary meanings Tribal members associate with the Buffer Zone are protection of the wilderness, wildlife and water quality, access and functional attachments, recreation and scenic values, and personal and cultural meanings. To build trust among both tribal and non-tribal residents, fire planners must understand how proposed actions interact with values at risk assigned by the local community and describe a prioritization process that addresses publicly perceived threats.

Weible, C., P. Sabatier and M. Nechodom (2005). "No sparks fly: Policy participants agree on thinning trees in the Lake Tahoe Basin." *Journal of Forestry* **103**(1): 5-9.

This article reports an analysis of mail-in questionnaires of policy participants in the Lake Tahoe Basin. The results show all stakeholder affiliations are concerned about the severity of fire risk relative to other important issue areas in the Basin, support thinning trees to reduce fire risk, and are skeptical that thinning trees will have adverse effects on scenic resources in the Basin. Support for thinning trees is strong among stakeholders with pro-development beliefs and with advanced degrees but is minimally influenced by owning property in the Basin.

Weisshaupt, B. R., M. S. Carroll, K. A. Blatner and P. J. Jakes (2006). Using focus groups to involve citizens in resource management- Investigating perceptions of smoke as a barrier to prescribed forest burning. The Public and Wildland Fire Management: Social Science Findings for Managers; GTR-NRS-1. S. M. McCaffrey, Ed. Newtown Square, PA, USDA Forest Service, Northern Research Station: 177-186.

Participants in a series of focus groups discussed how their tolerance for smoke varied by the source of the smoke and found their opinions changing as they talked with other participants. Even those opposed to smoke from agricultural burning eventually found smoke from prescribed forest burning would be acceptable under appropriate circumstances. Observations of the development of smoke acceptance among participants suggest the focus group process itself could be a useful tool for managers wishing to engage communities in collaborative efforts to plan and implement fuels management projects in the wildland-urban interface.

Weisshaupt, B. R., M. S. Carroll, K. A. Blatner, W. D. Robinson and P. J. Jakes (2005). "Acceptability of smoke from prescribed forest burning in the northern inland west: A focus group approach." *Journal of Forestry* **103**(4): 189-193.

Focus groups were used to gauge tolerance of smoke from broadcast prescribed forest burning in the wildland-urban interface of the northern Inland West. Focus group participants worked through issues surrounding prescribed burning as a management tool to determine if the origin of smoke made a difference in the acceptance of that smoke. Participant responses across five different population sectors suggest that prescribed forest burning could be applied as a forest

management tool with a well-informed public and that establishing and maintaining a dialogue with the public may be the most important part of any fire prescription.

Weisshaupt, B. R., P. J. Jakes, M. S. Carroll and K. A. Blatner (2007). "Northern inland west land/homeowner perceptions of fire risk and responsibility in the wildland-urban interface." *Human Ecology Review* **14**(2): 177-187.

The issue of sorting through who should bear responsibility for mitigating wildfire risk in the wildland-urban interface of the northern Inland West was approached using focus groups. The groups were selected to reflect a variety of stakeholders in the study area population for whom interface issues are relevant. Most participants believed that current forest fuel conditions exist due to human alteration and that changes in forests and the interface are needed to mitigate wildfire risk. Overall the focus group members believed that the government has responsibility for managing forests under its control, but does not "owe" safety to the people who choose to live in the wildland-urban interface; most felt that homeowners must take greater responsibility for having defensible property in order to protect those responsible for wildland and wildfire management.

Williamson, M. A. (2007). "Factors in United States Forest Service district rangers' decision to manage a fire for resource benefit." *International Journal of Wildland Fire* **16**(6): 755-762.

United States wildland fire policy and program reviews in 1995 and 2000 required both the reduction of hazardous fuel and recognition of fire as a natural process. Despite the fact that existing policy permits managing natural ignitions to meet resource benefits, or Wildland Fire Use (WFU), most fuel reduction projects rely on mechanical treatments and prescribed fire. Budget constraints suggest that successful fuel and ecosystem management hinges on expanding WFU. The decision to authorize WFU in the US Department of Agriculture Forest Service (USFS) rests with line officers, and the so-called 'go/no go' decision constitutes a time-critical risk assessment. Factors influencing this decision clearly impact the viability of WFU. The present study examined influences on line officers' go/no go decision. A telephone survey was conducted of all USFS district rangers with WFU authority in the Northern, Intermountain, and Southwestern Regions. The census was completed during February 2005 and obtained an 85% response rate. Data were analyzed using Classification and Regression Tree analysis. Personal commitment to WFU provided the primary classifier for 91% of the district rangers who authorized WFU. External factors, negative public perception, resource availability, and a perceived lack of support from the USFS were the main disincentives to authorizing WFU.

Winter, G. and J. S. Fried (2000). "Homeowner perspectives on fire hazard, responsibility, and management strategies at the wildland-urban interface." *Society & Natural Resources* **13**(1): 33-49.

Following a survey of forest homeowners in rural Michigan to assess the value of reducing the risk of damage from wildfires at the wildland-urban interface, focus-group discussions were conducted with a subset of survey participants to learn about their perceptions concerning specific components of fire hazard (e.g., how fires start, fire control, fire damage), their understanding of how fire protection responsibility is allocated between government and individuals, and their understanding of and preferences for alternative fire management strategies. Focus-group data were analyzed using a framework based on behavioral economics and psychometric models of risk. Attributes associated with the fire risk help explain the relative popularity of different fire protection strategies. Because participants consider forest fires inherently uncontrollable, and the resulting damage essentially random, they are only weakly supportive of investments in firefighting infrastructure, unlikely to take all possible steps to

safeguard their own properties, and resolute in their emphasis on solutions that reduce the number of fire ignitions. Their universally negative perceptions of prescribed fire may ultimately preclude its use as a risk management tool in Michigan's wildland-urban interface forests.

Winter, G., S. M. McCaffrey and C. A. Vogt (2009). "The role of community policies in defensible space compliance." *Forest Policy and Economics* **11**(8): 570-578.

Recently enacted federal and state policies provide incentives, including financial assistance, for local jurisdictions to manage risks associated with wildland fire. This has led to an array of local-level policies designed to encourage homeowners to create fire-safe landscapes. This qualitative study collected data from focus group interviews with homeowners in three diverse communities and used the theory of reasoned action to interpret dimensions of local-level wildland fire policies that are associated with homeowner acceptance of or compliance with defensible space guidelines or regulations. Common factors emerged in two policy evaluation categories: acceptance and compliance. WUI homeowners are more accepting of policies that are seen as fair and part of a more comprehensive risk reduction strategy. Topics that shaped acceptance of voluntary versus mandatory approaches included perceived risk severity, views about the proper roles of government, and beliefs about alternatives to regulatory approaches (e.g. private insurance, education, ignition source reduction). Program characteristics that were found to be related to beliefs about defensible space and acceptance included provision of one-on-one expert consultation, direct mail communication modes, needs-based financial assistance, and enhanced yard waste disposal options. Homeowner compliance is related to the feasibility in terms of household costs and yard waste disposal options, neighborhood norms, competing land use objectives, insurance considerations, and whether or not the policy is mandatory. These findings led to a proposed conceptual model of vegetation management policy acceptance and compliance that local governments can use to develop or amend defensible space vegetation management policies to increase policy acceptance and compliance.

Winter, G., C. Vogt and S. McCaffrey (2006). Residents warming up to fuels management: Homeowners' acceptance of wildfire and fuels management in the WUI. *The Public and Wildland Fire Management: Social Science Findings for Managers; GTR-NRS-1*. S. M. McCaffrey, Ed. Newtown Square, PA, USDA Forest Service, Northern Research Station: 19-32.

Understanding how wildland-urban interface (WUI) residents perceive fire and specific fuels management approaches is essential to land managers' success in coordinating mutually acceptable fire management plans (Lichtman 1998, Manfredo et al. 1990). Successful implementation of fuels management necessarily involves two types of behavior change among WUI residents. Land managers want residents to invest in fire-safe landscaping and building practices and other Firewise activities. Land managers also seek support for fuels management efforts on public lands from those who may not currently be supporters. In these respects, our study suggests that wildland fire managers have reason to be optimistic.

Winter, G., C. A. Vogt and S. McCaffrey (2004). "Examining social trust in fuels management strategies." *Journal of Forestry* **102**(6): 8-15.

Surveys of homeowners in three different ecosystems with varying fuels management approaches reveal that homeowners' trust in natural resource agencies is significantly associated with perceived risks and benefits and with perceived agency competence. A weaker association between forest value orientation and agency trust is evident. Focus group interviews provide further contextual support that the characteristics of competence, care, and credibility

associated with an agency are influential in shaping trust. The correlation between trust and acceptance of each fuels management strategy at each of the study sites suggests that trust-building and trust maintenance should be key goals of agency-citizen interactions.

Winter, G. J., C. Vogt and J. S. Fried (2002). "Fuel treatments at the wildland-urban interface: Common concerns in diverse regions." *Journal of Forestry* **100**(1): 15-21.

Forest fuels reduction has the best chance of success if managers understand the factors that influence public acceptance of fuel management. This article reports an analysis of focus group interviews with wildland-urban interface residents at sites selected to provide variation in fire regime, fire history, land-use and ownership patterns, and socioeconomic profile. Analyzed within a framework developed from the human dimensions and social psychology literature, the focus group data reveal four common factors that affect the acceptance of three fuel management strategies (prescribed fire, mechanical treatment, and defensible space requirements): beliefs about the outcomes of fuel management, personal importance of fuel management, situational specificity, and agency trust.

Winter, P. L. (2003). Californians' opinions on wildland and wilderness fire management. Homeowners, Communities, and Wildfire: Science Findings from the National Fire Plan. Proceedings from the Ninth International Symposium on Society and Resource Management, June 2-5, 2002, Bloomington, Indiana. GTR-NC-231. P. J. Jakes, Ed. St. Paul, MN: 84-92.

To assess public attitudes and values regarding fires and fire management, a telephone survey was conducted of California residents. Most respondents were concerned about wildland and wilderness fires. The greatest percentage agreed that "we probably have to let some fires burn, but must protect residences." Fire management techniques were rated for expected effectiveness and approval. The trust measure, based on the shared values similarity model, was the most significant predictor in these ratings. Knowledge about fires, concern, and gender were also helpful predictors. The results are useful in understanding public perceptions of and reactions to fire management.

Winter, P. L., J. D. Absher and A. Watson (2007). Assess and enhance public trust. Fire Social Science Research- Selected Highlights; GTR-PNW-736. A. González-Cabán, R. W. Haynes, S. McCaffrey, E. Mercer and A. Watson, Eds. Portland, OR, USDA Forest Service, Pacific Northwest Research Station: 5-9.

Trust is a form of social capital, facilitating effective land management, communication and collaboration. Although trust in the Forest Service is at least moderately high for most publics, evidence of a lack of trust and outright distrust has been found in some communities. However, the amount, types, and conditions of trust necessary for effective management to occur remain poorly understood.

Researchers initiated studies to assess the degree of trust or distrust various publics hold in the Forest Service's ability to manage fire and fire risk. Studies have focused on describing the level of trust the public has in agency decisionmaking, understanding the constituent elements and contributors to trust, and developing tools to monitor and enhance trust while accomplishing resource management objectives. These studies range from the community level to multistate level, and involve rural, wildland-urban interface (WUI), and urban residents. Combining quantitative and qualitative approaches have been a hallmark of this work.

Winter, P. L. and G. T. Cvetkovich (2008a). Diversity in southwesterners' view of Forest Service fire management. *Wildfire Risk: Human Perceptions and Management Implications*. W. E. Martin, C. Raish and B. Kent, Eds. Washington, DC, Resources for the Future: 156-170.

The risk of wildland fires is of significant concern in the southwestern United States. Although the Southwest has a long history as a fire-prone ecosystem, years of drought and insect infestation have increased fire risk. Paired with these ecological forces is the increased risk caused by the concentration of populations in the wildland-urban interface (WUI), compounded as urban encroachment spills over into wildland areas (Cleaves 2001; Daniel 2003; Fulton 2003; Murphy 2000; Platt 2001). As a consequence of this encroachment, the WUI has been growing (Cleaves 2001; Hamner et al. 2004; Platt 2001). These land-use changes and aggressive fire suppression have altered vegetative composition and structure and increased the risk of larger and more severe wildland fires (Cleaves 2001).

As the area defined as WUI and its population base increase, so does the importance of an effective approach to fire management, including prevention and suppression, with tools that integrate public communication, collaboration, and cooperation. Whether the approach is effectual rests in part on public acceptance and compliance with measures that impact individuals and communities (Daniel 2003). Public attitudes and actions pave the way for more effective management, such as through compliance with seasonal fire closures of natural resource areas. Individual and community support can lead to improved compliance with specific measures that can decrease fire risk to personal property. An understanding of the human aspects of support and compliance is essential to effective fire management (Cleaves 2001).

Winter, P. L. and G. T. Cvetkovich (2008b). The role of trust, knowledge, concern, and gender in the prediction of Californians' reactions to fire management. *Fire Social Science Research From the Pacific Southwest Research Station: Studies Supported by National Fire Plan Funds*. PSW-GTR-209. D. J. Chavez, J. D. Absher and P. L. Winter, Eds. Albany, CA, USDA Forest Service, Pacific Southwest Research Station: 209-219.

Findings from a statewide survey of California residents were used to predict approval and effectiveness ratings for potential wilderness and wildland fire management techniques that might be used by the Forest Service. The data suggest that self-reported knowledge, concern, and trust in the Forest Service (defined by the Salient Values Similarity model) are helpful in predicting how people perceive controlled burns, closures of partial sites or whole areas, mechanical techniques such as chipping, restrictions on use, and signage in recreation settings. Patterns of trust and distrust derived from a series of studies focused on natural resource management and the literature on risk perception and communications serve as the basis for recommended education and information strategies.

Winter, P. L. and G. T. Cvetkovich (2010). Shared values and trust: The experience of community residents in a fire-prone ecosystem. *Advances in Threat Assessment and Their Application to Forest and Rangeland Management*, PNW-GTR-802. J. M. Pye, M. Rauscher, Y. Sands, D. C. Lee and J. S. Beatty, Eds. Portland, Oregon, USDA Forest Service, Pacific Northwest Research Station: 409-418.

The risk and impact of fires have been significant on the San Bernardino National Forest. It is important to understand how residents of areas surrounded by the forest perceive the impact of fires. If fire management agencies understand these perceptions, fire management agencies will be better equipped to communicate with publics about risk-reduction efforts that agencies, community residents, and property owners need to take. Issues of interest include residents' responses to fire risk, beliefs about personal and agency responsibility for addressing risk, personal experiences with fire, and stressors associated with living in a fire-prone area. These issues are examined in light of values perceived as being shared with the Forest Service and other community residents, as well as trust.

A series of studies of natural resource management issues surrounding risk to habitat, nonhuman species, and humans has informed our understanding of the role of perceived similar salient values and trust. Trust continues to be highlighted as an essential element of fire management and communication, and risk management and communication in general. However, the functions of salient values similarity and trust have not been explored in the context of the experience of residing in a community in a fire-prone area.

The authors arranged for residents of fire-prone communities surrounding an urban national forest to participate in focus-group discussions and complete self-administered surveys. It was found that most study participants had multiple fire-related experiences, and that many regarded the risk of fire as part of living in the mountains. Although participants considered the Forest Service and the California Department of Forestry to be primarily responsible for reduction of fire risk, they also rated personal and community responsibility highly. When participants saw their own values and those of the Forest Service as similar with respect to fire management, they seemed to consider the consistency of agency actions with those values an important basis for making judgments to trust the agency. Public meetings with the Forest Service were supported, although some participants stipulated that the meetings needed to involve dialogue. Other means of communication were also supported. Implications for communication and collaboration, education, and management actions are discussed in light of the role of salient values similarity and trust in a risk environment.

Wise, C. and A. J. Yoder (2007). Policy and institutional arrangements in federal wildland fire mitigation. *People, Fire, and Forests: A Synthesis of Wildfire Social Science*. T. C. Daniel, M. S. Carroll, C. Moseley and C. Raish, Eds. Corvallis, OR, Oregon State University Press: 187-206.

This chapter uses an adaptive management framework to assess the evolution of policy and institutional arrangements for wildland-fire management in the United States. This chapter finds that: (1) Federal natural-resource management agencies, which have historically operated separately and hierarchically, have begun to show recognition of adaptive management. (2) Although federal agencies have been slow to implement several of the requirements of the 1995 National Fire Policy and the National Fire Plan (NFP), they have begun to jointly develop systems that provide for more comprehensive, data-driven ways to prioritize wildland-fire hazards for management. (3) Historically, natural-resource management agencies have not evaluated fire-management programs systematically or jointly. Federal policy has been modified to require systematic evaluation, but more informative evaluation awaits completion of comprehensive data systems such as LANDFIRE. (4) Horizontal coordination of fire-management programs among federal agencies has historically been spotty. Federal agencies have established a headquarters framework for working together but now need to translate this national framework into effective action at the regional and district levels. (5) Some steps toward greater integration of federal with state and local fire-management efforts have been taken, but collaborative processes must be developed in detail and managed on a sustained basis. (6) Federal assistance to states and communities to build their capacities to partner with federal agencies in fire management has been limited and scattered.

Wise, C. R. and C. M. Freitag (2002). "Balancing accountability and risk in program implementation: The case of national fire policy." *Journal of Public Administration Research and Theory* **12**(4): 493-523.

For most of the twentieth century, public land managers in the United States suppressed virtually all wildland fires. This suppression philosophy contributed to unhealthy ecosystems and allowed a dangerous buildup of burnable vegetation. As a result of generations of fire suppression, recent years have seen an increased incidence of catastrophic fires in American

wildlands. Following some of the worst fire seasons in American history, representatives from several federal agencies promulgated the 1995 National Fire Policy, updated in 2001. The National Fire Policy, and the subsequent National Fire Plan passed by Congress, acknowledged the importance of fire in natural systems, replacing the suppression philosophy with directions that wildland fire should be used as a tool by forest managers to restore and maintain ecosystem health. Fueled by high profile incidents such as the prescribed burn gone awry at Cerro Grande in 2000, critics have pointed to the lack of appropriate accountability mechanisms for agencies in charge of implementing the National Fire Policy and Plan. Fixing blame for catastrophic events should not be the only goal of accountability systems, however. Accountability systems interact with other important variables in the management context, including risk. Risk perception and risk management issues significantly influence managerial decision making. Moreover, organizational incentives and disincentives for risk taking can heavily influence managerial risk propensity, which can have important consequences for program implementation. Accountability systems may affect managerial perception of risks and thus managerial risk propensity. This article examines the relationship between accountability systems and risk management in the context of the National Fire Policy, arguing that accountability and risk should be treated as systemic and related matters within public programs.

Wolcott, L., J. J. O'Brien and K. Mordecai (2007). "A survey of land managers on wildland hazardous fuels issues in Florida: A technical note." *Southern Journal of Applied Forestry* **31**(3): 148-150.

Due to a rapidly expanding human population in Florida, fire management has become hampered by urban encroachment, smoke management issues, and forest fragmentation. For these and other reasons, fire has been excluded from many stands, resulting in the buildup of dangerous fuel loads. These fuel loads have begun to result in recurrent destructive wildfires. Already, different communities are responding to these dangerous fuel loads in various ways. As part of a larger project to synthesize best management practices for hazardous fuel management in pine flatwoods and pine rocklands in Florida, a survey was distributed to a variety of land managers in Florida to investigate fuel management practices already in place. This note summarizes responses to this survey.

Zaksek, M. and J. L. 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.

The management of natural- and human-induced wildland fires is an intricate process that must balance two considerations: that of fire as a necessary natural disturbance and that of the risks that fire poses. Reconciling tradeoffs between these risks and benefits is contingent upon informed, directed, and two-way communication between wildland fire managers and stakeholders. In an effort to aid with the design of such a communication effort, this study used mental models research to determine the unique wildland fire information and decisions-making needs of stakeholders living at the wildland-urban interface of a fire-prone area. While the analysis revealed many similarities in how stakeholders conceptualized the risks and benefits of wildland fire, many misconceptions and important gaps in understanding on the part of both expert and nonexpert respondents were identified.

Zimmerman, G. T. and D. L. Bunnell (2000). The federal wildland fire policy: Opportunities for wilderness fire management. *Wilderness science in a time of change conference— Volume 5: Wilderness ecosystems, threats, and management*; 1999 May 23– 27; Missoula, MT. Proceedings RMRS-P-15-VOL-5. D. N. Cole, S. F. McCool, W. T. Borrie and J. O'Laughlin, Eds. Ogden, UT, USDA Forest Service, Rocky Mountain Research Station: 288-297.

The Federal Wildland Fire Management Policy and Program Review represents the latest stage in the evolution of wildland fire management. This policy directs changes that consolidate past fire management practices into a single direction to achieve multidimensional objectives and creates increased opportunities for wilderness fire management. Objectives previously accomplished through prescribed natural fire are now achieved through application of an appropriate management response to wildland fires. The 1998 fire season provided both a test of the policy and a clear indication of future wildland fire management and benefits to wilderness management.