

Project Title: The Role of Adaptive Capacity in Creating Fire-Adapted Human Communities

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I. Abstract

In this research we sought answers to the question: What are the social characteristics and conditions of human communities that promote adaptive capacity for wildfire? The Quadrennial Fire Review (USDA and USDI 2009) promotes a goal of “achieving fire-adapted communities” in the wildland urban interface (WUI), and identifies metrics for determining whether a community is fire-adapted. While these metrics address some of the biophysical conditions necessary for fire-adapted human communities, they offer little insight into the social elements that promote or sustain adaptive capacity. Adaptive capacity refers to the individual and collective resources, capabilities, and actions that alleviate the risk or impacts of disturbances such as wildland fire, and support individual and community adaptive behaviors in response to changing conditions (Adger and Vincent 2005). More succinctly, adaptive capacity is a community’s ability to mobilize resources with a goal of adapting to change driven by events such as wildland fire (Nelson et al. 2007). In this project we improved our understanding of how the notion of adaptive capacity can be fruitfully applied to the problem of at-risk WUI communities. We sought advice from emergency managers, local stakeholders, and our colleagues working in the natural resources and hazards social sciences. We found that adaptive capacity is composed of a set of overt and latent characteristics that are mobilized by catalysts to adapt to disturbances, including wildland fire. We developed a model that begins to identify the social characteristics of adaptive capacity for wildfire. Finally, we suggest that more research is needed to (1) define social elements that are consistent across locales and disturbances, (2) understand how structure impedes or facilitates adaptive capacity, (3) integrate social characteristics of adaptive capacity into tools to assess the impacts of wildland fire, and (4) identify catalysts of adaptive capacity and the potential roles of different actors in adapting to living with wildland fire.

II. Background and purpose

The objective of achieving fire-adapted human communities in the WUI has been established as a national goal by the federal agencies involved in wildland firefighting (USDA and USDI

2009). Several entities have developed definitions of a fire-adapted human community (Appendix A), with the Wildland Fire Leadership Council (2011, p.33) defining a fire-adapted community as one that consists of “informed and prepared citizens collaboratively planning and taking action to safely co-exist with wildland fire.” The interagency Fire Adapted Community website (<http://fireadapted.org/>) simply states that a fire adapted community is one that is “prepared for the next wildfire.” Underlying each of these definitions is the idea that communities and individuals can take action or adapt in ways that will allow them to experience a wildland fire without it becoming a disaster.

We begin our investigation of adaptive capacity with the body of literature addressing vulnerability, which focuses on the inherent characteristics of a system that determine its potential for harm from disturbance (Wisner et al. 2004). In human communities, vulnerability is influenced not only by exposure and biophysical characteristics, but also by social characteristics (Cutter et al. 2008). Cutter and her colleagues (2008) suggest that resilience and vulnerability are separate but linked concepts, and that adaptive capacity is an important influence on both—potentially enhancing resilience and reducing vulnerability. Adaptive capacity has been adopted by a number of disciplines to help explain the resilience of human communities (Cutter et al. 2008, Norris et al. 2008). For example, studies from political ecology, environmental justice and global climate change conceive of adaptive capacity as an important facet of resilience to change (including hazards). Hazard literature, on the other hand, has more often used the term mitigation as a proxy of adaptive capacity, defining it as long term measures to reduce or eliminate risk (Cutter et al. 2008). But while resilience is considered to be a short-term response to a disturbance, adaptation is a longer-term response that requires the capacity to learn from the event and to develop significant corrections and adjustments (Brooks and Adger 2004). In many ways, adaptive capacity can be considered a form of community capacity that comes into play during and after a disturbance, with community capacity defined as “the interaction of human capital, organizational resources, and social capital existing within a given community that can be leveraged to solve collective problems and improve or maintain the well-being of a given community” (Chaskin 2001, p. 295).

Efforts to explicitly analyze or assess adaptive capacity in a given social system are still emerging (Adger et al. 2005). However, many of the efforts to assess vulnerability and/or resilience have not fully accounted for the community as an agent of change resulting in adaptation (what we are calling adaptive capacity). Recent research demonstrates that some classic indicators of vulnerability and resilience to hazards such as flooding and earthquakes (for example, wealth, structural density, race) do not apply in the same ways to populations at risk from wildland fire. For instance, although it is estimated that 13 million WUI residents “lack incomes sufficient to meet basic economic needs, much less the cost of adequate wildfire protection” (Lynn 2003, p. 10), a recent analysis of vulnerability to fire in the White Mountains of Arizona demonstrated that income only weakly correlates to vulnerability (Collins 2009). This analysis also found that residents who resided in the area full time, had lived in the community for a long time, and worked in forest-dependent jobs were less vulnerable to hazards, findings that contrast with the notions inherent in many vulnerability assessments. Other work near Vancouver, British Columbia found that those residents most at risk from wildfire were in the majority in terms of race and cultural background (non-minority) and were highly advantaged in terms of income and housing (Andrey and Jones 2008).

We reviewed the literature from natural hazards, political ecology, and global climate change to develop a model identifying the categories or types of social elements critical to adaptive capacity for wildland fire (Paveglio et al. 2009). In addition, we reviewed documents from communities involved in the Firewise Communities USA program, Fire Safe Councils, or community wildfire protection planning to ascertain conditions that contribute to a community being adapted to living with fire. We expanded and modified our model based on findings from focus groups composed of emergency managers and stakeholders in two WUI communities and of natural resource and hazards social scientists. Finally, we suggested areas for further research.

III. Study description and location

The study modified and expanded our initial model of adaptive capacity for wildland fire (Figure 1) by conducting case studies to identify specific characteristics that influence adaptive capacity

in two communities, then clarifying and further defining the new model with two groups of scholars—social scientists working in natural resources and those working in natural hazards.

The case studies were conducted in Flathead County, Montana and in Lee County, Florida. In Flathead County, three focus groups were held in the summer of 2010, with a total of 44 individuals participating in the discussions. Participants represented a wide range of interests from local community leaders and residents involved in fire management and protection, to private timber companies, to land and wildfire management agencies operating in Flathead County. In addition, 13 local leaders, residents, and emergency professionals who were unable to participate in the focus groups were interviewed. Focus groups were video recorded and interviews were audio recorded. Discussions revolved around two questions:

1. What are the social characteristics that promote effective wildfire management in Flathead County?
2. What are the social characteristics that cause some Flathead County stakeholders to initiate, adapt, and perform adaptive behaviors to reduce wildfire risk?

Analytical induction (Glaser and Strauss 1999, Charmaz 2006) and thematic analysis (Boyatzis 1998) were applied to the data collected in the videotapes and detailed focus group notes aided by Atlas Ti qualitative data analysis software, with social characteristics relevant to adaptive capacity at the individual and community levels emerging from the data. This analytical strategy provided a systematic way to identify relevant social characteristics based on their reoccurrence in the data (Boyatzis 1998, Silverman 2001). The initial model (Figure 1) was tested and used as a means to organize the emergent characteristics of the locality that influence adaptive capacity, and was expanded based on the data analysis (Figure 2).

In Lee County, data collection began with seven semi-structured interviews to build understanding of the unique social and environmental influences relevant to wildland fire management in the county, and to determine whether the Lee County conditions were sufficiently different from conditions found in Flathead County such that we might find new perspectives on adaptive capacity. After confirming Lee County as a study sight, the research team conducted two focus groups during the spring 2011, with a total of 20 individuals

participating in the discussions. Participants in the interviews and focus groups represented similar stakeholder groups as those represented by participants in Flathead County. Discussions revolved around three questions:

1. What are the characteristics that promote adaptation to wildfire in Lee County?
2. What are four Lee County localities that represent different levels of adaptive capacity to wildfire?
3. For each locality, what are the specific characteristics that contribute to that locality's adaptive capacity?

Data were collected on audio and video recordings, with analysis techniques similar to those used in Flathead County. A second general model emerged from the Lee County data that links adaptive capacity to fire-adapted human communities (Figure 3). The Lee County data analysis was concurrent with the scholar workshops, and benefited from the discussions at those workshops.

The first scholar workshop was held on June 4, 2011 in Madison, Wisconsin (in association with the International Symposium on Society and Resource Management) with eight fire social researchers (Table 1). The focus of the first workshop was defining and clarifying the social characteristics included in the expanded model. Participants requested that the research team give examples of actions occurring before, during and after a wildland fire that illustrate the elements and characteristics of adaptive capacity illustrated in Figure 2. The research team drew on their previous research experience to produce the examples that appear in Table 2. A second scholar workshop was held on July 9, 2011 in Broomfield, Colorado (concurrent with the Annual Natural Hazards Research and Applications Workshop) with nine hazards social researchers (Table 1). The second workshop focused on gaps in our knowledge of adaptive capacity and ideas for potential future research. We discussed adaptive capacity as comprised of social characteristics that may be latent, and ideas from this discussion coupled with data analysis from Lee County, lead to Figure 3. Figure 3 suggests that adaptive capacity has latent elements that require a catalyst(s) to produce specific action that will help a community become more fire adapted. Transformation of adaptive capacity into action also produces a feed-back loop that strengthens or adds to adaptive capacity through experience and social learning.

As an outgrowth of this and other research being conducted by U.S. Forest Service researchers and their partners, Daniel Williams, Rocky Mountain Research Station, convened a workshop to discuss opportunities to bring together ongoing research on adaptive capacity. The goal was for social scientists to collaborate on adaptive capacity research, regardless of the drivers of change being studied (wildland fire, climate change, development). Outcomes of these collaborations could benefit multiple projects and produce more generalizable outcomes. At that meeting, the research team asked participants to take part in a Q-sort. Q-sort is a discourse analytical technique whereby individuals sort a set of Q-statements indicating their level of agreement or disagreement (Webler et al. 2009). Q-statements representing social characteristics of adaptive capacity emerged from the data collected during the Montana and Florida focus groups. We selected 56 statements that represented all four elements of the adaptive capacity model (Figure 2) and both states. Participants were asked to select 20 statements as least critical to adaptive capacity (element assigned a negative value between -1 and -5) and 20 as most critical to adaptive capacity (element assigned a positive value between 1 and 5) (Figure 4). Two statements were always selected as critical to adaptive capacity (received only positive votes): #27—Residents understand that their actions to create defensible space will make a difference if there is a wildfire and #31—Residents manage their land to improve forest health and thereby reduce wildfire risk. These two statements represent the tension illustrated in Figure 3 in that statement #27 represents a latent quality that can be mobilized for adaptive capacity while statement #31 represents an action that would be taken to improve adaptive capacity. One statement was always selected as an element not critical to adaptive capacity (received only negative votes): #45—There is a small population of renters in the community. Statement #45 also received the lowest average vote, -4.3. The highest average vote, 3.2, was obtained by statement #1—Local leadership emerges to organize and push collective action regarding wildfire management (Table 2). These ratings are based on a sample of 13 social scientists, and their perceptions of elements that are “not critical” are perhaps more useful than their perceptions of elements that are “critical” in that they suggest areas to focus on later in the research process. For example, this Q-sort suggests that social scientists not focus on demographic characteristics, but to advance understanding of other characteristics that make greater contributions to community adaptive capacity.

IV. Key findings

Local interaction is key to adaptive capacity (JFSP Finding 5217). The ability of members of a community to interact is critical to building adaptive capacity. Wilkinson (1991) described a community as an interactional field, and states that as long as people interact, the community will persist, develop a collective identity, and undertake civic action. Kulig et al. (2011, p.8) talked about resiliency as a process that is “dependent upon the presence of social cohesion and a sense of community.” Jakes and Langer (2012) suggested that civic action to build adaptive capacity occurs when individuals within communities interact and go through common experiences that result in shared perceptions and values. Local structure can constrain or facilitate interaction, and in our communities we found that local development patterns can amplify the importance of population, depopulation, and local social organizations that facilitate interactions. How local structure expedites or impedes local action, and how structure can be modified to facilitate action to build adaptive capacity are potential areas for future study.

Structuration theory helps explain how fire-adapted communities make use of and alter local rules and resources (social structure) to adapt and transform (community agency) in ways that reduce wildfire risk (JFSP Finding 5220). Structuration theory was developed by Giddens (1984) to link organizational structure and action, and suggests that rules and resources (structure) both enable and constrain the actions of individuals and organizations (agency). Members of the research team have used this theory to help explain the level of acceptance of alternatives to evacuation by firefighting organizations (Paveglio et al. 2010). In the Florida focus groups in particular, structural conditions were seen as predisposing the local social organization and interaction necessary to building and sustaining community adaptive capacity. One of the more obvious structural conditions that facilitates or constrains adaptive capacity for wildland fire in Lee County was land development patterns. Some forms of land development overcome barriers to adaptive capacity, fostering social interaction and organization that put residents in a position to adapt to living with wildland fire. In neighboring localities, development patterns may aggravate barriers to building adaptive capacity by discouraging social interaction. Social structure is not set in stone, but can be shaped by human action over

time. What structures are most effective for facilitating action to build adaptive capacity given a range of ecological, physical, and social conditions is an area for future study.

Some characteristics of adaptive capacity may be latent, and require a catalyst to become mobilized to support actions that contributed to a community becoming fire adapted (JFSP Finding 5221). As illustrated by examples from our Q-sort, some elements of adaptive capacity identified in our focus groups represent realized action (for example, residents manage their land to improve forest health and thereby reduce wildfire risk) while other elements more closely represent the potential for action, or are latent capacities (for example, residents understand that their actions to create defensible space will make a difference if there is a wildfire). Latent elements of adaptive capacity do not necessarily lead to community fire adaptation unless activated or mobilized. Latent elements of adaptive capacity can be mobilized by endogenous catalysts such as “...governance institutions that make it realizable” (Adger 2003, p.33) or by the interaction of local characteristics in the community such as the emergence of local leaders or an increased understanding of wildfire risk. Future research should explore potential catalysts—the motivational context, processes, and mechanisms through which latent elements of adaptive capacity for wildfire become engaged.

There is no one set of characteristics that determine adaptive capacity for wildfire; rather, interactions among various elements of ecological, physical, and social systems, and among people in a locality, influence local ability to act to manage wildland fire (JFSP Finding 5234). At a practical level, our research suggests that one size does not fit all in terms of what it takes to help communities become more fire adapted. In each locality, ecological conditions will demand different actions to reduce wildland fire risk, individuals will have different skills, education, values, and norms that will influence their willingness and ability to take action to reduce wildland fire risk, organizations will have different goals and operate under different rules that will influence their level of involvement and approach to wildland fire management. How specific factors contribute to specific actions and how factors interact to influence individual and collective actions to build adaptive capacity are areas for future study. This research would help identify universal or constant factors that are important across communities or across hazards (wildfire, hurricanes, floods, earthquakes, etc.).

V. Management implications

New Science Initiative projects are not required to demonstrate immediate relevance to managers; however, this research identified four management implications suggested by the research findings above.

One size does not fit all in terms of what it takes for a community to become more fire-adapted. Different pre-existing structural conditions may require different types of catalysts or community action. Experience gained working in one community may not be directly transferable to another community, even if they are neighboring communities. To help a community become more adapted to living with fire, managers need to understand the physical, ecological, and social characteristics that contribute to adaptation in that particular community. Models such as that displayed in Figures 2 and 3 can help a manager understand where to look for evidence of adaptive capacity, and identify the gaps that may need to be filled within a community.

Managers who understand what has made their communities successful in meeting past challenges are better prepared to help their communities respond and adapt to challenges in the future. Managers can look at what characteristics and conditions helped the community respond to past challenges in order to help the community prepare for future challenges. While frameworks such as the one illustrated in Figure 2 are useful in organizing findings and understanding how communities need to act to improve adaptive capacity, their detail can be overwhelming. Frameworks used by managers to organize and understand their findings must be useful to them and can be as simple as that illustrated in Figure 3. Identifying other models of adaptive capacity that may be more accessible to managers (such as those in Figures 5 and 6) can help. Because some characteristics of adaptive capacity are latent—they may not be visible or obvious until some event mobilizes that characteristic—studying past events will not reveal all elements available in the community, but it is a place to start.

Despite a manager’s best efforts to mobilize community adaptive capacity, “outside” help is not necessarily sufficient to build adaptive capacity. The local social interactions and organizations necessary for a fire-adapted human community must ultimately exist within the community. However, “outside” help, such as leadership from a public agency or non-governmental organization, can provide the initial spark that spurs a community to action, and can help facilitate community development as long as it is collaborative and respectful of local perspectives.

Managers can provide opportunities for local residents to gather and interact, which can result in consensus on community goals and actions. Social interaction is critical to building and mobilizing adaptive capacity for wildfire. Managers can provide forums, in the form of field trips, open houses, and discussion groups, that allow local residents to interact and build a sense of community.

VI. Relationship to other recent findings and ongoing work

“Community Wildfire Protection Plans: Enhancing Collaboration and Building Social Capacity.” JFSP Project Number 04-S-01. Findings from this earlier research highlight how the CWPP collaborative process contributes to community capacity, which, in turn, contributes to a community becoming fire adapted (Figure 5).

“Trial by Fire—Does Community Wildfire Protection Planning Make a Difference for Wildfire Response and Recovery?” National Fire Plan Project (Northern Research Station). Building from the earlier JFSP CWPP research discussed above, Jakes and Victoria Sturtevant (Southern Oregon University) asked how CWPPs help wildland fire response and recovery. The scientists were able to demonstrate that CWPPs contribute to all elements of wildland fire management and thereby help build fire-adapted human communities (Figure 5).

“Adaptive Capacity of Fire-Adapted Human Communities.” National Fire Plan Project (Northern Research Station). Jakes and Mae Davenport, University of Minnesota, are investigating the adaptive capacity of Midwestern communities to climate change, building on

findings from this JFSP research project and other research by Davenport on adaptive capacity for watershed management (Figure 7). One of the unique aspects of this research is the inclusion of interactive workshops in each community that enable local actors to reflect on the study findings (i.e., their community's vulnerabilities and capacities) and to develop action plans for building adaptive capacity. The social scientists have completed a case study in Walker, Minnesota, and are initiating a case study on the Leech Lake Reservation.

“Forest Community Vulnerability and Adaptive Capacity in the Context of Climate Change.” Forest Service Climate Change Initiative and National Fire Plan Project (Rocky Mountain Research Station). Jakes, Carroll, and Paveglio have been involved in this effort, led by Daniel Williams (RMRS) and his partners, to link studies of adaptive capacity and vulnerability across locales and disasters including climate change and wildland fire. Research conducted as part of the adaptive capacity JSFP project is informing other studies in this network.

“Assessing and Adaptively Managing Wildfire Risk in the Wildland-Urban Interface for Future Climate and Land Use Changes.” NSF Project No. 0903562. (University of Montana, University of Missouri). Paveglio is part of an ongoing interdisciplinary research project simulating future wildfire risk in Flathead County, MT under various assumptions about climate change, economic growth, patterns of human development, resident mitigations, and forest management. Focus group data collected for the adaptive capacity JFSP project was used to inform and design models for simulating future human response to wildfire risk. Insights from the Montana focus groups also were used to help design and implement a survey of Flathead County populations that can help determine which elements of adaptive capacity identified in Figure 2 are most important to future community adaptation.

“Understanding the Roles of Socioeconomic Vulnerability, Adaptive Capacity, and Mitigation in Determining Economic Impacts of Wildfire.” NSF Project No. 238391A. (University of Oregon, Washington State University). In this recently funded, ongoing research project, Paveglio and Carroll are applying what has been learned in this project to the

development of more comprehensive indicator approaches to assessing community resilience to wildfire.

“Quantifying the Characteristics and Investigating the Biogeoscientific and Societal Impacts of Extreme Wildland Fires in the United States Northern Rockies Region.” NASA Project No. GNK013SB001. (University of Idaho). In this recently funded, ongoing research project, Carroll and Paveglio are carrying forward what has been learned in this project to help develop and apply social science metrics to understand how human actions to mitigate and/or recover from the impacts of past extreme wildland fire events have succeeded or failed, including the role that adaptive capacity and stakeholder knowledge play in effectively responding to fires.

VII. Future work needed

Because this was a JFSP new initiatives study, we developed four suggestions for future research:

Identify the social constants in adaptive capacity for wildland fire. In this and other projects, the research team has stressed the importance of local context in assessing or working to build a community’s capacity to live with fire (Paveglio et al. 2009, Jakes et al. 2012, Jakes and Langer 2012). Just as there are many, many sets of numbers that when added together equal 100, there are different sets of social characteristics that when added together will result in a community being better adapted to wildland fire. The question is, are their adaptive capacity constants that are found in every community where managers and local stakeholders can begin their efforts to help a community build adaptive capacity? Cutter et al. (2003, 2008) and others have suggested sets of demographic and structural characteristics that influence a community’s vulnerability and resilience, and others have pointed out the need to expand consideration to the process (agency) elements (Pfefferbaum et al. 2005, Perkins and Long 2002, Nelson et al. 2007) such as communication networks, relationships among people, and place attachment. Although there has been a plethora of case study research focusing on community efforts to improve preparedness and minimize the negative local impacts of wildfire events (Daniel et al. 2007, Martin et al.

2008, Carroll et al. 2011, Jakes and Langer 2012, Jakes et al. 2012), it is difficult to conduct cross-case analyses to identify adaptive capacity constants due to methodological differences. We have begun the process of identifying critical social characteristics of adaptive capacity for wildland fire with our two case studies, but what is needed to move forward is additional systematic, coordinated case study research which will result in sufficient comparative data to allow social scientists to conduct cross-community analyses identifying the social constants that contribute to adaptive capacity. The search for social constants on adaptive capacity for wildland fire could also be facilitated by conducting cross-hazard analyses of the social elements of adaptive capacity for any hazard.

Identify how structure can impede or facilitate adaptive capacity. Structuration theory and the interactional field theory of community suggest that decisions made by community planners, managers, and individual property owners regarding the structure of local communities, including rules and resources that facilitate interaction within the community, can impede or facilitate the development of adaptive capacity for wildfire. Because local structure can be changed, we need to understand how components of structure impact adaptive capacity, identify ways in which communities have acted to reduce structural barriers to adaptive capacity, and suggest actions that communities can take, given local ecological, physical, and social conditions, to employ structure in building adaptive capacity.

Integrate social elements critical to adaptive capacity into tools to assess impacts of wildland fire. Although early theoretical models developed to predict the short- or long-term impacts of hazards on communities and associated ecosystems often lacked consideration of social systems, in the last decade models have explicitly focused on social elements (Turner et al. 2003, Wisner et al. 2004, Cutter et al. 2003). These models have attempted to develop quantitative functions linking ecological, biophysical, and economic elements to possible hazard impacts (estimated damage to property, job losses, etc.) (Eakin and Luers 2006). More recently, efforts have been made to create metrics that acknowledge social vulnerability, including characteristics of the population at risk (e.g. socioeconomic status, race, class, diversity of employment, density of built environment) and how they are linked to possible hazard impacts (Schmidtlein et al. 2008, Calkin et al. 2010, Thompson et al. 2011). What these emerging

metrics still lack is the integration of local social characteristics (e.g. local leadership, community identity, strength of communication networks or organization, etc.) that influence or can be catalysts for adaptive capacity. Tools like the U.S. Forest Service's Climate Change Performance Scorecard point to the demand for an assessment framework that local forest managers can use to assess progress to reduce community vulnerability and improve adaptive capacity for a number of drivers of ecological change. Likewise, emerging frameworks for simulating impacts to social systems from wildfire (e.g. Calkin et al. 2010, Thompson et al. 2011) could be expanded to include agent-based models that simulate individuals' or organizations' decision making processes and aggregate them to understand the predict patterns at larger scales (Paveglio and Prato 2012). Agent-based models or the integration of disparate models that account for diversity in social and biophysical elements of wildfire risk, including development patterns, resident motivations, place attachment, or potential economic losses could also be used to expand research capacity to understand wildfire impacts and adaptation. Research is needed to expand existing tools to assess ecological vulnerability or forecast hazard impacts—including wildland fire—or to create new tools to model potential impacts of wildland fire that integrate social and ecological characteristics of adaptive capacity. To increase the relevance of such tools to land managers' and other stakeholders' efforts to build local adaptive capacity, social characteristics included in the models should focus on elements of adaptive capacity that managers and other stakeholders can influence or change at the local level.

Understand catalysts of adaptive capacity and the role of different actors in adaptation for living with wildland fire. Many of the skills and resources (capacities) that define adaptive capacity are latent, and must be mobilized within a community before they interact to enable adaptations for living with wildland fire. Catalysts are “components of a community that facilitate the mobilization of resources.” A wildland fire may be a catalyst for adaptations that build adaptive capacity, and so is a national forest district ranger who initiates a community wildfire protection planning process. We need to identify the different catalysts for community adaptive capacity, how they function to combine latent elements of adaptive capacity, and begin to define the roles that various actors—including policy makers, planners, emergency managers, and individual landowners— can play to facilitate adaptation to wildland fire.

VIII. The deliverables cross walk table

Proposed	Delivered	Status
Review of fire management planning documents for insight into fire-adapted human communities (Final report supplement)	Sturtevant V and Jakes P. 2012. <i>What is a fire-adapted human community? Similar answers from different sources.</i> JFSP Deliverable 9996	Complete
Review of scientific literature	Will appear in publications listed below.	
Convene state workshops	Conducted as focus groups: Flathead County, Montana, summer 2010, and Lee County, Florida, spring 2011.	
Convene scholar workshops	1.Natural resource social scientists' workshop to refine dimensions of community adaptive capacity. JFSP Deliverable 9917	Complete
	2.U.S. hazards social scientists' workshop to refine dimensions of community adaptive capacity.	Complete
Presentations	<p>1.Carroll M et al. 2010 <i>Incorporating adaptive capacity into existing concepts of hazard vulnerability and resilience: what social characteristics lead to fire-adapted human communities.</i> Second Human Dimensions of Wildland Fire. April 27-29, 2010. JFSP Deliverable 9919</p> <p>2.Newman S et al. 2011. <i>Identifying fire-adapted communities: a framework of adaptive capacity.</i> 17th International Symposium on Society and Resource Management. June 4-8, 2011. JFSP Deliverable 9915</p> <p>3.Paveglio, TB, Carroll MS, and Prato T. 2011. <i>Exploring the social characteristics of adaptive capacity to wildfire: insights from Flathead County, Montana.</i> 17th International Symposium on Society and Resource Management. June 4-8, 2011. JFSP Deliverable 9998</p>	<p>Complete</p> <p>Complete</p> <p>Complete</p>

	<p>4. Newman S et al. 2012. <i>Adaptive capacity for wildfire: local level case studies in Florida and Montana</i>. Third Human Dimensions of Wildland Fire Conference. April 17-19, 2012.</p> <p>JFSP Deliverable 9918</p>	Complete
Publications	<p>1. Pavaglio TB et al. <i>Exploring the Social Characteristics of Adaptive Capacity for Wildfire: Insights from Key Informants and Professionals in Flathead County, Montana</i>. Human Ecology Review.</p> <p>JFSP Deliverable 9920</p> <p>2. Newman S et al. <i>Land development patterns and adaptive capacity for wildfire: three examples from Florida</i> JFSP Deliverable 9921</p> <p>3. Pavaglio TB et al. <i>Understanding and assessing social vulnerability to disturbance—considerations for managers</i>.</p>	<p>Accepted for publication—posted when printed</p> <p>Submitted to Journal of Forestry</p> <p>Submitted to Journal of Forestry</p>
Dissertation	<p>Newman, SN JFSP Deliverable 9916</p>	Scheduled for defense spring 2013—posted when printed

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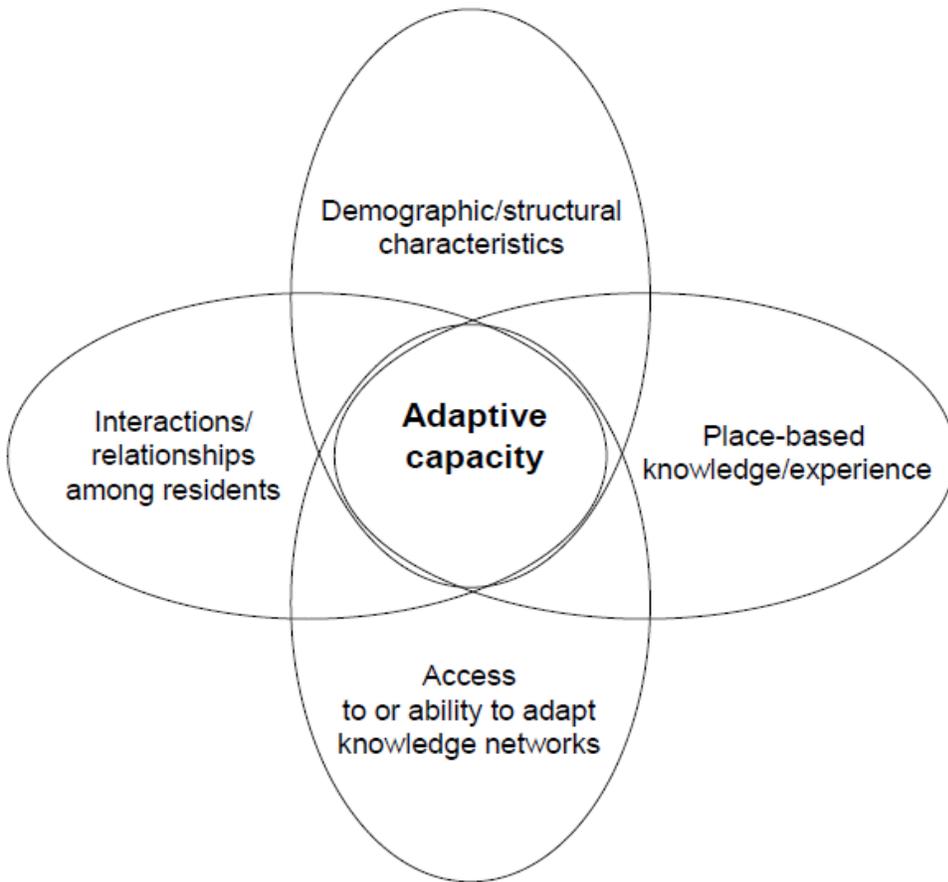


Figure 2.—Characteristics influencing each of the four elements of adaptive capacity for populations in Flathead County, Montana (revised model)

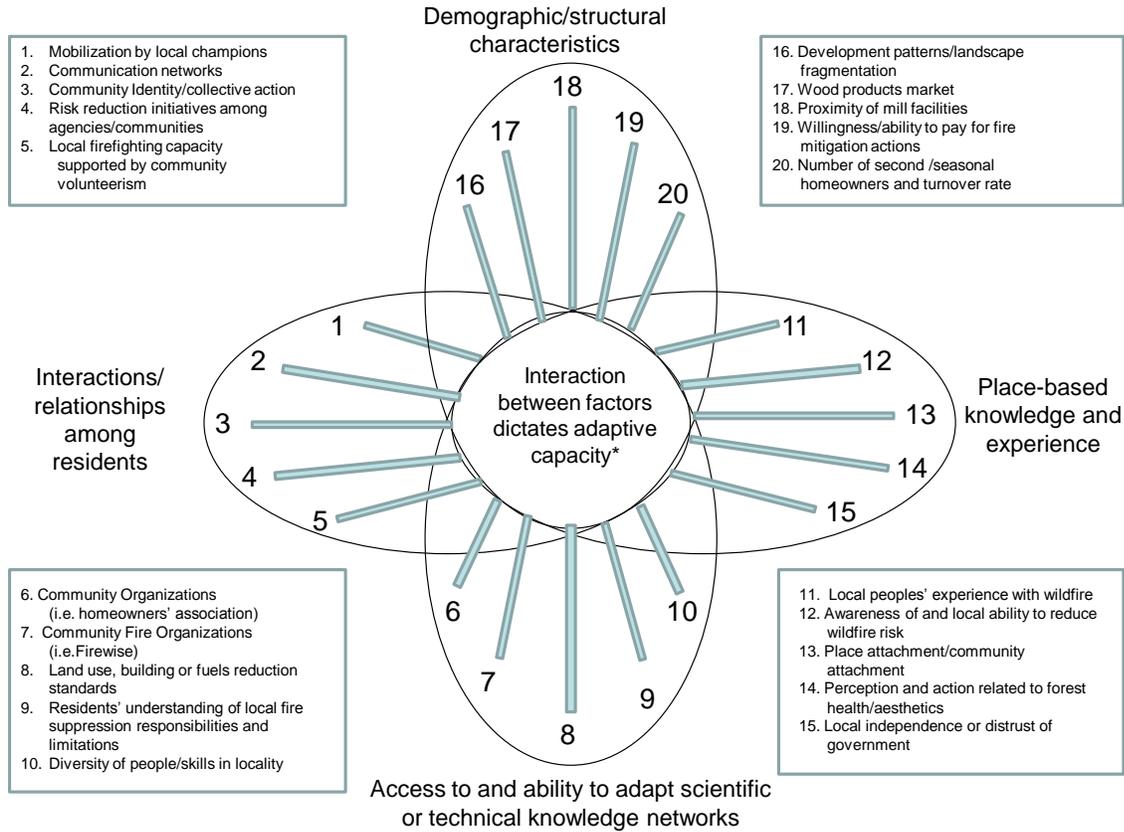


Figure 3.—Adaptive capacity as a latent concept that requires a catalyst for mobilization

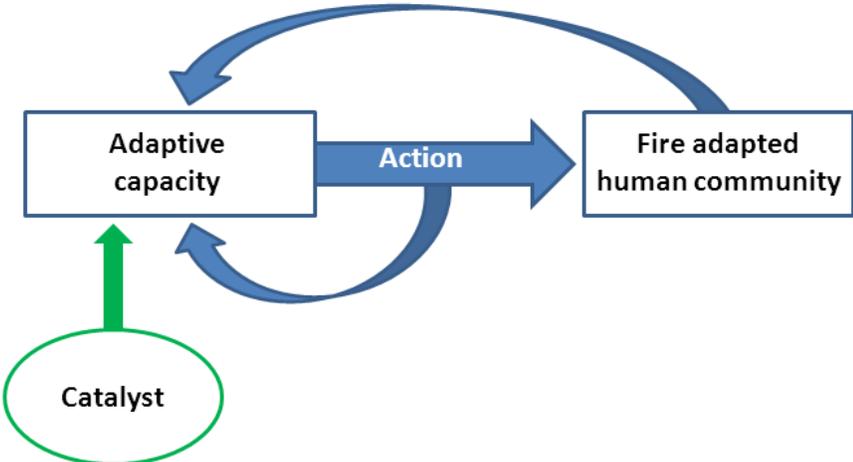


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LEAST CRITICAL TO HAVE					MOST CRITICAL TO HAVE					
-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
LEAST CRITICAL TO HAVE					MOST CRITICAL TO HAVE					

Figure 5.—Community wildfire protection planning (CWPP) requirements that a collaborative process be used to prioritize areas for fuels mitigation and to recommend measures to reduce structural ignitability, produce outcomes that contribute to wildfire management and a community being adapted for wildfire. Research supporting the relationships indicated by the shaded boxes is found in Jakes et al. (2007, 2011)

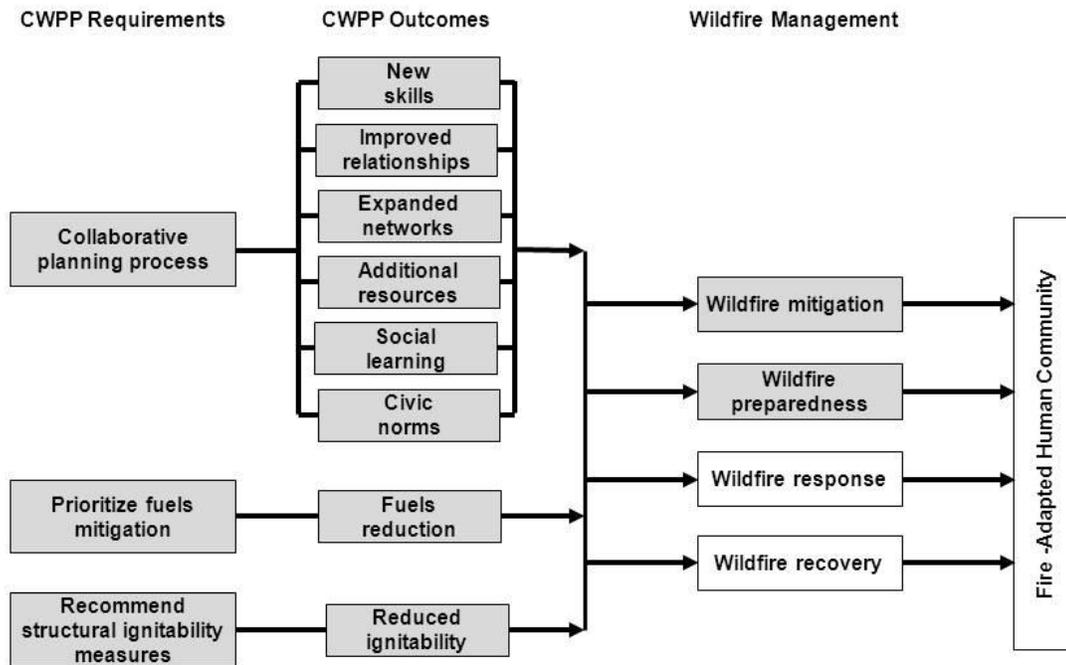


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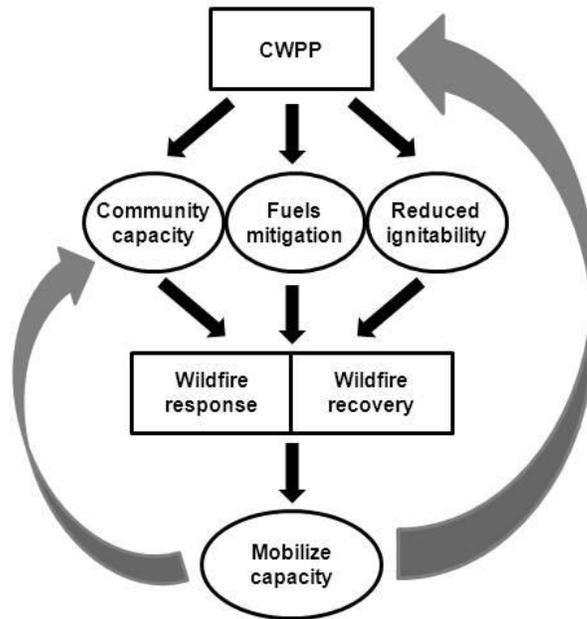


Figure 7.—Community capacity levels and indicators for collaborative watershed management, currently being tested as indicators of adaptive capacity for climate change in northeastern Minnesota.

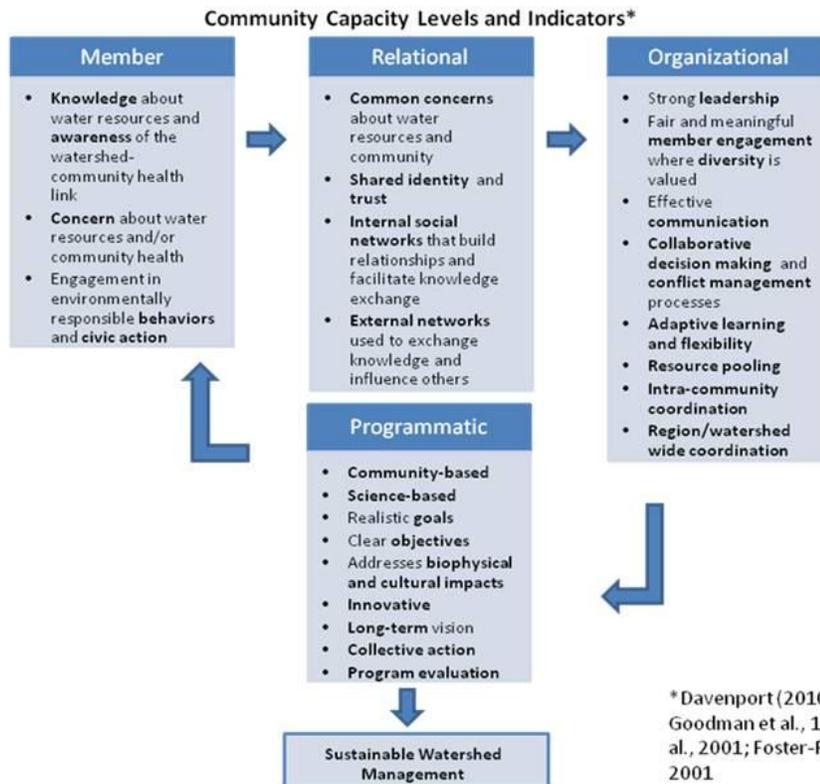


Table 1.—Dates, locations, and attendees at adaptive capacity scholar workshops, Joint Fire Science Program “The role of adaptive capacity in creating fire-adapted human communities”¹

Date	Location	Attendee	Affiliation
June 5, 2011	Madison, Wisconsin	<ol style="list-style-type: none"> 1. Dennis Becker 2. Thomas Beckley 3. David Cleaves 4. Mae Davenport 5. John Parkins 6. Toddi Steelman 7. Susan Stewart 8. Victoria Sturtevant 9. Hannah Brenkert-Smith 	<ol style="list-style-type: none"> 1. University of Minnesota 2. University of New Brunswick, Canada 3. USDA Forest Service, Washington Office Global Climate Change 4. University of Minnesota 5. University of Alberta, Canada 6. North Carolina State University 7. USDA Forest Service, Northern Research Station and NWCG WUI Mitigation Committee 8. Southern Oregon University 9. University of Colorado
July 9, 2011	Broomfield, Colorado	<ol style="list-style-type: none"> 1. Tim Collins 2. Thomas Cova 3. Susan Cutter 4. John Handmer 5. Branda Nowell 6. Katherine Tierney 7. William Travis 8. Daniel Williams 	<ol style="list-style-type: none"> 1. University of Texas, El Paso 2. University of Utah 3. University of South Carolina 4. Royal Melbourne Institute of Technology, Australia 5. North Carolina State University 6. University of Colorado 7. University of Colorado 8. USDA Forest Service, Rocky Mountain Research Station

¹ JFSP research team attending both workshops: Pamela Jakes, USDA Forest Service, Northern Research Station; Matt Carroll, Washington State University; Soren Newman, Washington State University; Travis Paveglio, University of Montana

Table 2.—Elements of adaptive capacity, preconditions to adaptive capacity, and examples of actions taken before, during and after a wildfire that contribute to adaptive capacity (page 1 of 4).

Elements of Adaptive Capacity Framework	Preconditions (characteristic or process leading to adaptive action)	Examples of adaptive action taken at different time frames in relation to a wildfire		
		Before	During	After
Physical Infrastructure and Demographics (Vulnerability Context)	Land use, building or vegetation regulations			
	Local forest products market that includes contractors for product removal and transportation, and processing capacity			
	Number of permanent residents			
	Ability to pay for (or otherwise accomplish) risk mitigation actions			

Table 2.—continued (page 2 of 4)

Elements of Adaptive Capacity Framework	Preconditions (characteristic or process leading to adaptive action)	Examples of adaptive action taken at different time frames in relation to a wildfire		
		Before	During	After
Local Residents' Knowledge and Experience	Locals have knowledge relevant to being a fire-adapted community	In Waldo, FL, a local pine plantation owner conducts prescribe burns in the spring to reduce fire risk because that's when his father burned and he feels that those burns have allowed the plantation to survive several wildfires.	In Wilderness Ranch, ID, community members have designated "safe houses" that residents can collectively defend or shelter in when fires prevent evacuation.	Residents of "Shelter In Place" communities in Rancho Santa Fe, California observed the effectiveness of home construction and vegetation standards when no structures in these communities burned despite nearby destruction from the 2007 Witch Fire.
	Locals communicate and can access relevant knowledge	In Auburn Lake Trails, CA, local residents who participate in the Volunteers in Prevention program visit with neighbors about what they can do to reduce wildfire risk around their homes.	During the Columbia Complex Fire near Dayton, WA, some locals with firefighting knowledge banded together to help build fire lines with their own equipment.	Volunteer firefighters and other locals in Bigfork, MT researched/established a Firewise chapter and applied for fuel reduction grants in reaction to nearby fire impacts
	Locals have skills through which they apply and adapt knowledge	In Whitefish, MT, the local Fire Safe Council disseminates a list of local forest contractors who have and can work with NGOs to obtain funding for fuels reduction.	In Mt. Somers, NZ, a local agricultural contractor rode with a firefighting team during a fire so he could identify the location of water sources and gates into fields.	In the North Fork community of Montana, retired emergency services officials and those with professional writing experience have teamed up to obtain fuel reduction grants following multiple fire impacts.

Table 2.—continued (page 3 of 4)

Elements of Adaptive Capacity Framework	Preconditions (characteristic or process leading to adaptive action)	Examples of adaptive action taken at different time frames in relation to a wildfire		
		Before	During	After
Access to Scientific/Technical Knowledge	Scientific/technical knowledge exists that is relevant to local conditions	Canadian engineers developed an external sprinkler system to deploy around a community when a wildfire approaches, creating a safe green zone.	Along the Gunflint Trail, MN, locals turned on their external sprinkler systems as they evacuated to protect their homes and so that firefighters had safe zones.	Following a wildfire that destroyed structures along the Gunflint Trail, MN, a study was conducted to evaluate the effectiveness of external sprinkler systems in protecting homes from a wildfire.
	Relevant scientific/technical knowledge accessible and communicated throughout the locality (vertical communication networks)	Canadian engineers demonstrated the usefulness of the Canadian sprinkler system to homeowners along Gunflint Trail, MN.	In Mt. Somers, NZ, the CIMS commander met with local residents to explain firefighting strategies.	Scientists and resource professionals presented the findings of the study on the effectiveness of external sprinkler systems at a local Gunflint Trail community meeting.
	Scientific/technical knowledge can be adapted and applied in locality	A Gunflint Trail retired engineer adapted the Canadian sprinkler system making use of water sources along the Trail and creating a more dependable fuel system.	The Local Fire Department in Whitefish, MT can use their "red zone maps" to quickly pull up geo-referenced GIS information about the fuel loading, building types and water sources associated with structures near the fire they are responding to.	A study of the effectiveness of external sprinkler systems in protecting homes along the Gunflint Trail, MN from fire was used by local residents to apply for a FEMA grant to obtain funding for additional sprinklers.

Table 2.—continued (page 3 of 4)

Elements of Adaptive Capacity Framework	Preconditions (characteristic or process leading to adaptive action)	Examples of adaptive action taken at different time frames in relation to a wildfire		
		Before	During	After
Interactions/relationships among residents	Involvement and/or development of local champions/community leaders	In the North Fork, Montana, a local resident persuaded the HOA to create a fire committee as a permanent committee of the HOA to work towards Firewise Communities/USA recognition.	A local grocery store manager in Show Low, AZ stayed behind during an evacuation and provided groceries to firefighters/community members who also stayed behind.	A local resident in the Timberland Acres subdivision near Show Low, AZ wrote grants for and organized removal of burned trees on private property following the Rodeo-Chediski fire.
	Horizontal communication networks (formal and informal)	In Taylor, FL, messages about creating defensible space around homes was included in the church bulletin.	In Wilderness Ranch, ID, a community member established a web-based information system that can provide real-time updates about nearby fires	In Mt. Somers, NZ, Federated Farmers provided counseling to farmers who had experienced losses due to the fire.
	Emergence of shared norms, values, and commitment to local action	In Em Kayan, MT, a recognized Firewise Community/USA, their Firewise sign and a Firewise bulletin board are located at the entrance to the development to demonstrate the community's commitment to taking responsibility for reducing fire risk.	In Mt. Somers, NZ, local women baked and cooked food that they delivered to the community hall to feed firefighters because "that's what we do" in emergencies.	Following the Rodeo-Chediski fire in Arizona, local environmentalists revised some of their positions on forest management and supported stewardship contracting to reduce fuels on the national forest.
	Place and community attachment (i.e., Strong bonds with physical landscape and people in locality)	In Libby, MT, the high school's mascot is the Libby Logger, demonstrating the community's attachment to the local forests and the importance of the logging economy.	In Painted Rocks, MT, residents plan to stay and defend their properties from wildfire by making appropriate preparations based, in part, on their local ecological knowledge.	In Ashland, Ore., residents participated in and helped organize locally based restoration projects on locally held land impacted by the Biscuit Fire.
	Community organizations (e.g., Local homeowners associations; Land preservation or conservation groups)	In Virginia, the state forester decided to only support CWPPs in communities that have a HOA, so the Front Royal community rejuvenated its HOA so they could obtain state support to create a CWPP.	In Mt. Somers, NZ, the local Red Cross representative worked with the sheriff to map where people lived who would need help evacuating during the fire.	In the immediate aftermath of the Hayman fire in CO, a local organization formed to help distribute needed resources to impacted community residents who 'fell through the cracks" of pre-existing social service programs.

Table 3.—Statements representing social elements of adaptive capacity for wildland fire and median score for each statement.

Statements emerged from focus groups conducted in Montana and Florida. Natural resource social scientists used these statements in a Q Sort to determine the most critical elements for adaptive capacity for wildland fire. Elements were rated on a scale from -5 (least critical) to 5 (most critical).² Page 1 of 4

Q statement	Median score ³
Local leadership emerges to organize and push collective action regarding wildfire management	3.2
Property owners create defensible space on their properties and/or in the home ignition zone	2.5
Firefighting authorities and property owners work together to plan for what happens during a wildfire	2.3
Rural property owners organize to manage wildfire risk across the landscape.	2.3
Residents manage their land to improve forest health and thereby reduce wildfire risk.	2.2
There are local organizations such as homeowners' associations and civic groups that promote and/or bring people together for collective wildfire management	2.0
Wildfire managers recognize differences among communities/localities and work with populations to develop locally appropriate actions to reduce wildfire risk.	1.9
Residents understand that their actions to create defensible space will make a difference if there is a wildfire	1.9

² An example of a rating sheet used by participants is displayed in Figure 4.

³ Median score was calculated based on 13 participants. Participants were tasked with selecting the 20 most critical elements and 20 least critical elements, with 15 elements receiving no score from a participant. If a statement was not scored by a participant, it was assigned a 0 score for that case.

Table 3 page 2 of 4

Q statement	Median score⁴
Wildfire risk reducing activities on public land compliment activities on private property	1.8
Local residents understand their roles and responsibilities in wildfire management	1.8
Development is carefully planned to produce housing patterns that facilitate wildfire mitigations	1.8
Technical support is available to help local residents with wildfire management on their property.	1.8
Residents with diverse values are able to agree on and implement a plan to reduce wildfire risk.	1.7
Local agency representatives collaborate to address wildfire risk in the area	1.6
Partnerships form among stakeholders to reduce risk across the landscape.	1.5
Local residents share their knowledge about managing wildfire risk	1.4
Local residents support community-wide action to reduce wildfire risk	1.4
There is local support for planning and zoning regulations that support wildfire mitigation	1.4
Local residents are concerned about the potential impacts of wildland fire	1.0
Development codes, covenants, and regulations require vegetation management on empty lots.	0.6
There are local codes, covenants and regulations that require property owner action to reduce wildfire risk (i.e. defensible space ordinances, building material codes).	0.5
Residents have a shared understanding of local wildfire risk	0.5
There are financial incentives for property owners to reduce their wildfire risk.	0.5

⁴ Median score was calculated based on 13 participants. Participants were tasked with selecting the 20 most critical elements and 20 least critical elements, with 15 elements receiving no score from a participant. If a statement was not scored by a participant, it was assigned a 0 score for that case.

Table 3 page 3 of 4

Q statement	Median score ⁵
New housing developments enact wildfire mitigations measures	0.4
Vegetation regulations do not impede efforts to reduce wildfire risk	0.4
Local residents accept the limitations imposed by local regulations to reduce wildfire risk	0.3
Locals residents create community fire organizations, such as FireSafe or Firewise Communities USA	0.0
Residents support agency initiatives to improve forest health and thereby reduce wildfire risk	0.0
There are local facilities to dispose of or gain revenue from materials (e.g. biomass; sawmills) resulting from residential fuel reduction projects.	0.0
Residents are capable of reducing wildfire risk on their properties without intervention or support from land management agencies or local firefighters	-0.1
Concern and affinity for the local area and/or its people promote action to reduce wildfire risk	-0.2
Property owners who lack resources are willing to take advantage of financial incentives for wildfire management.	-0.2
Local contractors are available to bid on and conduct wildfire mitigation projects	-0.5
Rural property owners recognize that land use and fragmentation affects wildfire risk	-0.7
Local populations include a number of land management and fire management retirees who want to remain active in wildfire management.	-0.7

⁵ Median score was calculated based on 13 participants. Participants were tasked with selecting the 20 most critical elements and 20 least critical elements, with 15 elements receiving no score from a participant. If a statement was not scored by a participant, it was assigned a 0 score for that case.

Table 3 page 4 of 4

Q statement	Median score ⁶
Residents draw on their local or long-term knowledge of their environment to reduce wildfire risk	-0.8
Locals encourage and support the development of industries that use material removed during fuel reduction projects.	-0.8
Local residents feel like they are members of a community	-1.0
Local firefighters are active members of the community.	-1.5
The local population has recently experienced a nearby wildfire or wildfire losses (i.e. property damage, injuries).	-1.5
Land managers reduce fuels on public land without delays from litigation	-1.5
There is a market for material removed during fuels reduction projects	-1.5
Property owners have personal or secondary (i.e. friends or relatives) experience with the impacts of wildfire	-1.8
Local residents understand fire ecology	-2.1
Local populations include a preponderance of residents who have the time and resources to reduce wildfire risk	-2.3
A significant portion of the local population has lived in the area for a long time	-2.4
A significant portion of the community's population lives there year-round	-2.7
Local residents are proud of the area they live in	-3.0
Alternatives to evacuation, such as safety zones and/or shelter-in-place, have been developed for the community.	-3.1
There is a low turnover in property ownership	-3.2
There is a small population of renters in the community.	-3.6

⁶ Median score was calculated based on 13 participants. Participants were tasked with selecting the 20 most critical elements and 20 least critical elements, with 15 elements receiving no score from a participant. If a statement was not scored by a participant, it was assigned a 0 score for that case.

Appendix A

What is a Fire Adapted Human Community?

Similar Answers from Different Sources

Compiled by Victoria Sturtevant & Pamela Jakes
Southern Oregon University & U.S. Forest Service

Until recently, when the phrase “fire adapted community” was entered into a computer search engine, thousands of articles about ecological adaptation would appear. This has changed. Now, a number of resources are available on the Web for identifying and creating fire adapted human communities (there is even a Wikipedia entry), and the concept is becoming an area of research not only in the ecological sciences but also in the social sciences. Below are examples of how these sources answer the question: What is a fire adapted human community?

Quadrennial Fire Review (http://www.iafc.org/files/wild_QFR2009Report.pdf)

We probably have the Quadrennial Fire Review to thank for advancing the concept fire adapted human communities (National Wildfire Coordinating Group 2009). The Quadrennial Fire Review is produced by fire experts every four years to advance a unified fire management strategy for the U.S. Departments of Agriculture and Interior. The 2009 Review promotes four mission strategies: (1) moving to strategic management response within asymmetric fire, (2) reshaping emergency response within fire leadership, (3) building a new national intergovernmental wildfire policy framework, and (4) achieving fire adapted communities. Although the Review promoted fire adapted communities, it does not define fire adapted community rather it suggests several elements of such a community:

1. Has community defensible space and fuel reduction zones for the wildland urban interface (WUI)
2. Enables, where appropriate, leave-early-or-stay-and-defend policies for property owners
3. Recalibrates public expectations for fire adapted communities

The Review identifies components of a checklist that might be used to identify a fire adapted community that includes:

1. Defensible space
2. Fuels treatment programs
3. Ingress/egress and infrastructure standards
4. Local wildfire response capacity
5. Building codes/ordinances and spacing/density requirements for new and established structures

WUI Mitigation Committee of NWCG

<http://www.nwcg.gov/branches/ppm/wuimc/index.htm>

The National Wildfire Coordinating Group (NWCG) is an interagency organization that provides leadership to the wildland fire community regarding training, standards, and other functions. The NWCG's work is conducted by committees, including the Wildland Urban Interface (WUI) Mitigation Committee that provides leadership, input, and recommendations for achieving fire adapted human communities in the WUI. Committee members Jane Arteaga and Kate Dargen identified 5 types of adaptations that are necessary to developing fire adapted communities, and elements that would contribute to each type of adaptation:

1. Social adaptations
 - a. Community values
 - b. Grass-roots/community organizations
 - c. Citizen involvement
 - d. Business community stability
2. Political adaptations
 - a. Political institutions
 - b. Policy-making input
 - c. Regulatory policy/philosophy
 - d. Governmental/agency
3. Ecological adaptations
 - a. Fire regimes/conditions
 - b. Watershed stability/health

- c. Fire fuels characteristics
- d. Biodiversity values
- 4. Emergency management adaptations
 - a. Preparedness
 - b. Mitigation
 - c. Response
 - d. Recovery
- 5. Community hardening/development adaptations
 - a. Codes/ordinances/zoning
 - b. Community design
 - c. Infrastructure (roads, water...)
 - d. Evacuation corridors/areas
 - e. Community information systems

Firewise Communities (<http://www.firewise.org/Communities.aspx>)

The National Fire Protection Association's (NFPA) Firewise Communities Program focuses on "saving lives and property from wildfire." The program is a project of the NWCG's WUI Mitigation Committee, and is funded by the U.S. Departments of Agriculture and Interior. The heart of the program is the Firewise Communities/USA Recognition Program that encourages communities in all parts of the country to achieve a high level of protection against WUI fire and contribute to sustainable ecosystems by offering courses and training and opportunities for WUI community members to network with each other. Steps required to become a Firewise Community contribute to that community becoming adapted to living with wildfire. A Firewise community has:

1. Assessed the community' fire risk
2. Formed a board or committee to accept the community assessment and take action to do something about it
3. Developed an action plan and monitoring plan
4. Involved local residents in a community activity day
5. Invested in mitigation activities

Fire Adapted Community Web Site (<http://www.fireadapted.org/>)

The NFPA, U.S. Forest Service, and a coalition of wildland fire management agencies have collaborated on a new Fire Adapted Community Web site. The Web site defines a fire adapted community as a community that takes responsibility for its wildfire risk. It suggests that the more actions community members take to protect community assets and reduce wildland fire risk the more fire adapted it becomes. The Web site characterizes the process of becoming fire adapted, and offers residents and homeowners, fire and emergency responders, fire and land managers, and civic and community leaders information and specific actions they can take to reduce wildfire risk.

Ready, Set, Go! (<http://www.wildlandfirersg.org/learn/index.cfm?navItemNumber=500>)

Firefighters are among the most respected and trusted members of their communities. The Ready, Set, Go! (RSG) Program brings together firefighters, through the International Association of Fire Chiefs (IAFC), the U.S. Forest Service, Bureau of Land Management and other stakeholders in wildland fire management, in an effort to encourage residents to take personal responsibility for preparing for wildfire and become involved in community efforts to address the problem. It does this by “amplifying” the preparedness messages put forth by Firewise and other existing wildland fire public education efforts. One of the goals of the RSG! Program is to provide the guidance and implementation tools for fire departments to help their communities become fire adapted. The program defines a fire adapted community as one that “can withstand the devastating effects of a wildland fire.” For further information on becoming fire adapted, the RSG! Program sends visitors to its Web site to the Fire Adapted Community Web Site (above).

Community Wildfire Protection Planning (CWPP)

The Healthy Forests Restoration Act of 2003 (HFRA) encourages communities to develop CWPPs to reduce their wildland fire risk and promote healthier forested ecosystems. To be a CWPP as defined in HFRA, a plan must:

1. Be developed collaboratively by multiple stakeholders and “agreed to” by representatives of the applicable local government (for example, homeowner association, city or county

government), local fire departments, and the state agency responsible for forest management, in consultation with federal land management agencies

2. Identify and prioritize land requiring hazardous fuels reduction, and recommend the type and method of treatment
3. Recommend ways to reduce structural ignitability

Jakes and Sturtevant (in review) suggest that developing a CWPP moves a community towards being fire adapted, and offer a model to describe the process:

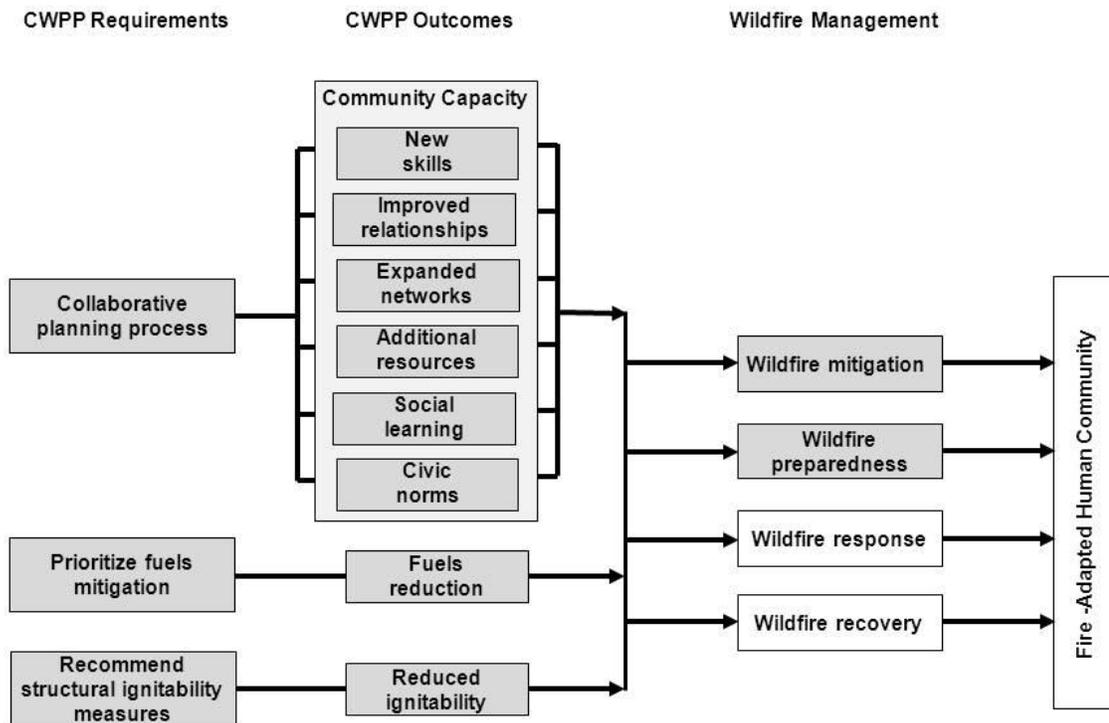


Figure 1.—Community wildfire protection planning (CWPP) requirements, that a collaborative process be used to prioritize areas for fuels mitigation and to recommend measures to reduce structural ignitability, produce outcomes that contribute to wildfire management and a community being adapted for wildfire. Research supporting the relationships indicated by the shaded boxes is found in Jakes et al. (2007, 2011)

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Appendix B
Adaptive Capacity Discussion Among Scholars
Discussion Notes

Joint Fire Science Project: Fire Adapted Human Communities

June 4, 2011, Madison, WI

July 9, 2011, Broomfield, Colorado

Key discussion points regarding adaptive capacity:

- Difference between adaptive capacity and adaptation
 - Adaptive capacity
 - Looks at potential to take action
 - Adaptive capacity is mobilized by an external catalyst
 - You need to identify capacity for what... Evacuation? Mitigation? To maximize safety? To minimize damage?
 - Capacity different before, during and after an event
 - Capacity different for mitigation, response and recovery
 - Adaptive capacity is a more generalized concept than adaptation or readiness
 - At the household level is infinitely variable
 - At the community level is a generalized concept to handle anything
 - Adaptation
 - Is the action that is taken
 - Is the mitigation that occurs
 - Is about change
 - Readiness is a type of adaptation
 - Readiness is risk/threat specific
 - Readiness has a stronger/more direct tie to performance to mitigating risk than adaptive capacity
 - A catalyst causes adaptive capacity to be mobilized that results in adaptation/action that leads to readiness

- CWPPs are an example of readiness
- An example: the presence of local leaders is adaptive capacity, if those leaders take action to reduce wildfire risk that is adaptation that results in increased readiness
- Agencies understand how to be catalysts
 - Agencies don't have to start with building adaptive capacity but they can bring about adaptations that increase readiness by acting as a catalyst for change
 - This project needs to help agencies understand how to be catalysts for change
- Difference between adapting to a hazard vs. adapting to an event—adapting to a hazard relates to the ability to deal with risk
- Whatever is done to increase adaptive capacity, adaptation or readiness needs to consider if the benefits are worth the costs
- Regarding metrics for adaptive capacity (generally)
 - You may need different metrics at different scales (scale from household to landscape)
 - The metrics you pick depend on how much you want to spend on monitoring/collecting the data
 - What resources do you have to measure/evaluate?
 - Are the benefits of collecting the data worth the costs of collecting the data?
 - The elements you are trying to measure change every day and the relevance of any one element may change every day—you're only going to get a snapshot, but it can be a mistake to rely on a snapshot
 - Importance of using metrics to establish a baseline
 - Baseline can be used to measure change
 - Have lots of ecological baseline data but no social baseline data
- Regarding indicators (metrics) of model's elements of adaptive capacity (specifically)
 - Indicator of a shared norm around wildfire is if government has taken action to enforce CCRs around mitigation—local community has given them permission to take that action
 - Indicator of commitment to mitigation is number of inspectors or enforcers of CCRs
 - Attachment to place
 - Is it a positive or negative indicator of adaptive capacity or adaptation?
 - Migration is a potential indicator of attachment to place—if people are attached they are less likely to move away or more likely to move in

- Scientific information—existence of information different from trust in that information
- Local knowledge
 - Length of residence one indicator
 - Where people came from another indicator
- Indicator of willingness to take action
 - Percent of full-time residents
 - Amenity migrants may be more willing to take action around forest health than wildfire
- General considerations for model or tool being developed:
 - Be clear about the dependent and independent variables
 - Is dependent variable action to reduce wildfire risk?
 - Are independent variables the elements of adaptive capacity that lead to action to reduce wildfire risk?
 - Is the question: What causes people to do things?
 - Whatever is developed needs to be well-founded conceptually—be clear about what’s the basis for the model
 - Decide whether we’re developing main affects model or a diagnostic model
 - Tool for evaluating adaptive capacity or adaptation should be mixed-methods approach
 - If develop a tool will also need to develop a training program for using the tool
 - Potential valuable outcome would be a taxonomy of communities based on adaptive capacity or readiness
 - Use qualitative factor analysis or a type of Q-sort with workshop participants to verify the model
 - Sort on similar contributions to adaptive capacity
 - Sort on ease of measuring/quantifying/monitoring
 - Sort on the ability/ease of federal agency to influence
 - Bring together social science fire research and social science hazards research
- Other potential research questions:
 - What are different mental models people have about fire, risk, and fire in the ecosystem?
 - Where/in what cases does more information increase danger?
 - Where are property values high and fire risk high? Why is this the case?

- Research on near misses