Chapter 2

Social Science Findings in the United States

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ABSTRACT
The rising number of acres burned annually and growing number of people living in or adjacent to fire-prone areas in the United States make wildfire management an increasingly complex and challenging problem. Given the prominence of social issues in shaping the current challenges and determining paths forward, it will be important to have an accurate understanding of social dynamics. After providing a brief contextual background of fire management in the United States, this chapter focuses on a review of the key findings from social science research related to how the public views fire management in the United States. Primary topics discussed are public acceptance of fuels treatments on public lands, homeowner mitigation activities, and social dynamics during and after a fire. The goal of the chapter is to (1) provide fire managers and other interested stakeholders with an accurate understanding of what shapes public response to fire management before, during, and after fires; (2) provide a context for future research; and (3) inform future efforts to foster fire-adapted communities where people are aware of the fire risk and have taken appropriate action to reduce that risk and increase resilience to wildfire.

2.1 INTRODUCTION

Wildland fire management in the United States is an increasingly complex and challenging problem. With a rising number of acres burned annually and a growing number of people living in or adjacent to fire-prone areas, much is at

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stake. Creating fire-adapted communities, where there is an awareness of the wildfire risk and actions have been taken to mitigate that risk and increase resilience, will require the active participation of residents, community leaders, and a range of governmental and nongovernmental organizations. Given the prominence of social issues in shaping the current challenges and in determining paths forward, it will be important to have an accurate understanding of social dynamics.

This chapter will first provide a brief contextual background of fire management in the United States. It will then provide a review of the key findings from the social science literature related to fire adapted communities, including acceptance of mitigation action on public lands, homeowner mitigation activities, and social dynamics during and after a fire. Our intent is to provide fire managers and other interested stakeholders with an accurate understanding of what shapes public response to fire management throughout the fire management cycle, inform efforts to foster fire adapted communities, and provide a context for future research.

2.1.1 Historical Context

Underlying the current fire management challenge in the United States is a fire policy that for most of the twentieth century has focused on fire control or full suppression. Prior to this focus, studies have shown that Native Americans were active resource managers, who used fire for a variety of reasons, including to stimulate production of desired plant species, decrease disease and pests, and facilitate game hunting (Huntsinger and McCaffrey, 1995; Lewis, 1993). Early-Euro-American settlers also extensively used fire to manage resources, but as permanent settlements were established, they also began to organize to suppress fires that threatened private resources (Pyne, 1997).

Fire suppression first took hold as a formal policy at the turn of the twentieth century, in congruence with the advent of the Progressive Era. Growing public concern over mismanagement and potential scarcity of natural resources led to calls for greater government oversight and management of the nation's natural resources to maximize present and future use. This movement led to the creation of the Forest Reserve Acts of 1891 and 1897, which withdrew large tracts of timber from settlement. In 1897, the Bureau of Forestry was created to manage the reserved areas, and, in 1905, the Bureau was transferred to the Department of Agriculture and became the United States Forest Service (Hays, 1959). From its inception, the agency was staffed by professional foresters whose training was based on methods imported from Europe where forests had been actively managed for centuries and fire suppression was an integral part of management practices (Behan, 1975; Pyne, 1997).

In 1910, a series of massive fires in the Northern Rockies consolidated the emphasis on fire suppression. Over subsequent decades, fire control efforts expanded with full fire suppression finally achieved with the arrival of

World War II. The war meant that forest products were increasingly valuable and also raised fears of Japanese incendiary bombs setting fire to the West Coast. Putting out all fires now became a patriotic duty (slogans of the time included "Careless Matches Aid the Axis" and "Another Enemy to Conquer, Forest Fires"), and advertising agencies were enlisted to develop fire prevention ad campaigns. This culminated in the creation of Smokey Bear in 1945 (Pyne, 1997).

Changes in wildfire policy began in the 1970s with the growing recognition of the technological limits to full suppression and of the important ecological role that fire plays in many forest ecosystems (Pyne, 1997; Davis, 2001). In many ecosystems, removing fire had affected the type, density, diversity, and pattern of vegetation, generally in a way that added to the fire hazard, particularly in terms of fuel load buildup. The policy shift was also due in part to an increase in the fire management responsibilities of federal agencies other than the Forest Service, which introduced other agency viewpoints into the mix. The Bureau of Land Management (BLM) entered into fire control in a significant manner in the 1950s when it began to try to control fires on its Alaska lands, which made up half of all federal lands (Pyne, 1997). The National Park Service (NPS) began experimenting with prescribed burning in the Everglades in the 1950s and in 1968 began to introduce let-burn and prescribed fire programs into its parks with the goal of restoring the ecological role of fire (USDI/USDA 1995).

In 1977, the Forest Service formally changed its fire policy from fire control to fire management and prescription fires, planned or natural, became a formal part of fire management policy (Pyne, 1997). In 1988, large fires in the Yellowstone National Park focused attention of the media, political officials, and the general public on wildfire-management strategies and prompted reviews of fire policies (Davis, 2006). A 1995 revision of existing federal fire policy recognized the role of fire in ecological systems and called for implementation of fuel reduction programs to reduce the likelihood of catastrophic fire events (Stephens and Ruth, 2005). A series of large wildfires in 2000 prompted additional policy revisions (Moseley, 2007).

Under the suppression-centric approach, the wildfire-management authority rested almost exclusively with federal resource management agencies; however, more recent efforts have emphasized greater intergovernmental coordination in prefire preparations and during-fire management (Davis, 2001). As more nonfederal lands have been impacted by wildfires, state agencies and local fire departments have become more involved in wildfire-management issues. Although the Forest Service remains the largest wildland fire-fighting agency, today wildfire management in the United States must take into account a complicated mix of five federal agencies with fire management responsibilities (USFS, BLM, NPS, Fish and Wildlife Service, and the Bureau of Indian Affairs), state forestry agencies, and a vast network of independently operated local (county, municipal, and volunteer) fire departments.

Recent policies including the National Fire Plan (2000); the Western Governor's Association 10-Year Comprehensive Plan (2001); and the Healthy Forest Restoration Act (2003) reflect the shift away from a policy of complete fire suppression to one that includes a broader set of goals including restoration of fire-adapted ecosystems, reduction of wildland fuels, and providing economic assistance to rural communities (Gorte, 2003; Steelman et al., 2004). Federal and state agencies are involved in determining the resources available to mitigate risk at the local level; the federal government largely sets policy direction and provides financial resources, while state governments make organization and programmatic decisions about how to allocate those resources to mitigate fire risk (Steelman et al., 2004). Despite the development of this shift toward a broader set of policy goals than just suppression than evaluations of fire management practices suggest that, in practice, fire suppression and hazardous fuels reduction receive the most attention and resources, sometimes at the expense of restoration and community assistance (Gorte, 2003; Steelman et al., 2004; Jensen, 2006; Steelman and Burke, 2007).

More recently, the 2009 Federal Land Assistance Management and Enhancement Act mandated that federal agencies work with stakeholders to develop a national Cohesive Wildfire-Management Strategy. The Strategy uses a collaborative process to bring together stakeholders from all levels—local to national and governmental to individual homeowners—to develop local-, regional-, and national-level solutions to the fire management problem in three specific areas: (1) restore and maintain landscapes; (2) fire-adapted communities; and (3) response to fire. While the final phase of development has just recently been completed, the Strategy is expected to influence fire management and related objectives and allocation of resources on the ground.

2.2 REVIEW OF RELEVANT RESEARCH FINDINGS

In many places in the United States, the ecological changes created by fire suppression have contributed significantly to the growing severity of fires. Ongoing environmental change, including warmer spring and summer temperatures, increased drought, earlier spring snowmelt, and longer fire seasons have further contributed to changed fire activity (Westerling et al., 2006). These two elements, in and of themselves, would create a highly challenging wildfire-management problem. However, management is further complicated by the increasing impact of diverse social concerns particularly, the growing number of people moving into high fire-hazard areas, either on the fringe of urban areas or in more rural wildland areas—regions that are often referred to as the wildland urban interface (WUI). The presence of more people in fire-prone areas presents significant complications in fire fighting and in determining ways to mitigate the hazard. At the most basic level, more humans and more structures create more values at risk from a wildfire. Fragmented property ownership also creates challenges for consistent management among

diverse owners. Thus, effective fire management will require transcending numerous boundaries of land ownership and an understanding of the perspectives of diverse stakeholders. However, as a relatively new focus in fire management, there are many assumptions about how social elements influence current fire management dynamics. Understanding the accuracy of these assumptions will be important in developing policies that most effectively decrease future negative outcomes from wildfire.

The remainder of this chapter provides an overview of recent scientific findings in relation to understanding public perspectives of wildfire management. Although social scientists have conducted research on the human dimensions of wildland fire management for >40 years, the vast majority of this work has been conducted since 1998. The main focus of research to date has looked primarily at mitigation activities on either public or private land before a fire occurs. A smaller but growing body of work has begun to examine social dynamics during and after a wildfire. This chapter summarizes the findings in these areas from more extensive documents developed from a review of >200 research articles for a project that was funded by the Joint Fire Science Program to take stock of the key findings from social science research over the past decade. For ease of reading, we have provided minimal citations in this chapter; specific information about the range of studies being referenced can be found in the longer documents (Toman et al., 2013; McCaffrey and Olsen, 2012).

A consideration in interpreting findings is that, with only three exceptions, research participants in the studies lived in or owned homes in the WUI and thus may be more aware of wildland fire than perhaps the general public. However, findings across studies suggest that such geographic distinctions may not be that meaningful in understanding differences in response to wildfire. How much effect geographic and sociodemographic differences may have on public response is discussed more fully at the end of the chapter.

2.3 PREFIRE SOCIAL DYNAMICS

Overall, studies find that residents of fire-prone areas generally recognize the fire risk and often have a sophisticated understanding of the ecological role of fire. Many studies found that participants' comments indicated a good understanding of fire behavior and fire ecology and of the various factors that contribute to fire risk. For example, Vining and Merrick (2008) found that Minnesota study participants understood the complex nature and tradeoffs of different fire-management practices and understood "that fire-management techniques have just as many (or perhaps more) ecological benefits as negative ecological consequences." In qualitative studies, understanding of the role of fire in the environment is referenced primarily in relation to three related topics: (1) awareness of the risks of living in a natural landscape; (2) perceptions that the current forest is unhealthy from too many trees and/or a buildup of fuel; and (3) discussions of overall forest management and the need to reintroduce fire, whether via prescribed

fire or allowing some naturally ignited fires to burn. A number of studies have found that forest health is generally a parallel and sometimes more dominant consideration than reducing fire risk in shaping an individual's response to management actions.

2.3.1 Fuel Management on Public Lands

A significant number of studies have examined public acceptance of fuel management practices on public lands, primarily in relation to prescribed fire and mechanized thinning practices. Studies in a variety of locations have found high levels of acceptance (>80 percent in many at-risk communities) for some use of prescribed fire and/or of mechanized thinning treatments. A series of studies (Shindler and Toman, 2003; Brunson and Shindler, 2004; Shindler et al., 2009, 2011) that found overall acceptance levels of >80 percent distinguished between unqualified acceptance (legitimate tool, use anywhere) and qualified acceptance (use in carefully selected areas). For prescribed fire, roughly equal proportions of respondents chose unqualified and qualified acceptance, while for thinning, a greater proportion chose unqualified acceptance (50 percent vs 30 percent).

Although the majority of studies found high acceptance levels for both treatments, a few studies have found more measured levels of support; some have found lower acceptance levels for prescribed burning and others for thinning. For instance, a nationwide survey of the general public asked whether participants agreed or disagreed with manager use of prescribed fire and mechanical vegetation removal as part of a wildfire-management program. Nearly all participants agreed with the use of prescribed fire (91 percent), while fewer, though still a majority (58 percent), agreed with the use of mechanical vegetation removal (Bowker et al., 2008). Conversely, Toman et al. (2011) found high levels of support for thinning (83 percent) and lower levels of support for prescribed fire (66 percent).

Substantially fewer studies consider public acceptability of other fuel reduction methods. The largest body of findings indicates that taking "no action" is consistently the least preferred choice and that acceptance levels for herbicide use are fairly low, with large proportions of respondents finding herbicide use unacceptable. Only a few studies included livestock grazing as a treatment. These found that it is a generally acceptable practice with roughly 80 percent indicating partial or full acceptance. For both grazing and herbicides, rural respondents tended to be more supportive of the practice than respondents from urban areas.

Limited research has examined public acceptance of managing unplanned ignitions to achieve resource benefits. One-third to one-half of visitors to three National Forests in California, Colorado, and Washington agreed with allowing naturally ignited fires to burn when the fire was expected to result in minimal impacts to human communities or the forested ecosystems (Kneeshaw et al.,

2004). Similarly, a survey of California residents found that 60 percent agreed with allowing some fires to burn as long as residences were protected (Winter, 2002). Research focused on fire managers has also identified a number of factors that may limit adoption of this practice including psychological factors (e.g., attitudes of fire managers favor suppression, risk of personal liability) and other policy-related factors (e.g., extensive planning requirements, need for specialized personnel, inability to qualify for emergency stabilization funds should something go wrong, air quality regulations).

While not universal across all studies, some findings suggest that treatment acceptance can differ depending on the specific location of treatment implementation. The few studies that examined acceptability of letting naturally ignited fires burn have found higher levels of acceptance for the practice in remote areas removed from private lands. Similarly, a number of studies have found a preference for the use of mechanical thinning in more urbanized areas and for use of prescribed fire in less populated areas. However, one study found similar levels of acceptance for use of prescribed fire both in remote areas and around neighborhoods (Toman et al., 2011). One study also found that land ownership or designation can play a role in acceptance with respondents indicating a preference for the use of prescribed fire on NPS lands versus a slight preference for the use of mechanical harvest (preferably in conjunction with prescribed fire) on Forest Service and private lands (McCaffrey et al., 2008).

2.3.1.1 Concerns with Potential Treatment Impacts

Although acceptance levels are generally fairly high, studies have also identified various concerns with treatment use. Concerns with treatments include the potential for an escaped prescribed burn (generally the greatest concern for use of prescribed fire), increased prevalence of smoke, increased erosion, reduced water quality, impacts to wildlife or esthetics, and concern that mechanized thinning treatments may be used to promote commercial harvesting. It should be noted that concerns were not universal across studies, and treatments were considered as often for their potential positive impacts as negative impacts. For instance, in a survey of Northern Michigan residents, Kwon et al. (2008) found that participants believed that prescribed fires would improve wildlife habitat. Similarly, Vining and Merrick (2008) found that some respondents thought prescribed fires posed safety risks while others thought that they would reduce the safety risk.

Findings from a Utah study (Brunson and Evans, 2005) that resurveyed respondents who had been directly impacted by an escaped prescribed burn illustrate the complexity of treatment acceptance. While a high percentage of participants indicated that the escaped burn had negatively influenced their views about the use of prescribed fire, actual acceptance ratings remained constant across the study period (with ~80 percent indicating acceptance of

some amount of prescribed fire use). However, other important changes emerged—participants expressed less confidence in forest managers to use prescribed fire effectively, were more concerned about fire use within 10 miles of their home, and also indicated more concern about the potential impacts of smoke on public health. Despite these increased concerns with smoke impacts, few participants (13 percent) indicated that prescribed fire should no longer be used due to the increased prevalence of smoke.

Findings from a number of studies suggest that, for a majority of the population, smoke is not a significant barrier to the use of prescribed fire and that a desire to improve forest health and/or reduce future fire risk tends to outweigh smoke concerns. However, findings also suggest that for a sizeable portion of the population—roughly a third of households—smoke is a major issue due to health concerns. For this segment of the population, smoke is likely a more dominant concern because of its implications for the health and well-being of family members. For individuals who are potentially affected, understanding how smoke issues are addressed in fire and fuel management efforts will be a highly salient issue.

2.3.1.2 Factors Influencing Treatment Approval

The two variables most frequently associated with fuel treatment acceptance are knowledge of a practice and trust in managers to implement it. The most common predictor of treatment acceptance across studies is the knowledge of, or familiarity with the practice. Some studies have also examined the influence of public outreach and education programs on treatment acceptance. Findings suggest that outreach programs can have a positive influence on knowledge and, in some cases, on attitudes toward treatments. Not all outreach programs are equally effective; results indicate that the success of outreach activities is influenced by both the quality of the content provided and the method by which it is communicated. Overall, interactive formats tend to be more highly rated.

Some studies have also found that higher knowledge levels about a treatment are associated with decreased concerns, particularly for prescribed fire. In Massachusetts, participants who self-reported having "some" or "a great deal" of knowledge were less concerned about effects of prescribed fire on esthetics and impacts to wildlife and their habitat (Blanchard and Ryan, 2007). The same study found that respondents on Long Island, who were more familiar with prescribed fire, were more willing to allow its use on private lands (Ryan and Wamsley, 2008). In Nevada, McCaffrey (2004) found that those who had read prescribed burning educational materials were more likely to think the practice improved wildlife habitat and diversity and less likely to agree that they did not like the appearance afterward or that smoke caused problems for a member of their household.

Studies have also found that citizen trust in management agencies significantly influences treatment acceptance. Across this research, trust has

been conceptualized in different ways; common definitions describe trust as perceived competency of agency managers to implement treatments, perceptions of shared values between public participants and agency managers, or a combination of these two approaches. For example, Toman et al. (2011) found confidence in agency managers to effectively implement specific treatments (perceived competency) had the strongest influence on treatment acceptance, even when accounting for other variables (e.g., residency status, ratings of agency management, and general trust in agency managers).

2.3.2 Mitigation on Private Land

The second main focus of social science research to date is in relation to dynamics around homeowner mitigation on private property. This work has found that residents in fire-prone communities are generally aware of their fire risk, and most report taking some action to reduce that risk. These findings are consistent across studies and locations in the South, Northeast, Lake States, Rocky Mountains, Southern California, and the Pacific Northwest of the United States. Private landowners have implemented a range of practices, often recommended through FireWise and other programs, to mitigate their fire risk, including modifying vegetation, reducing flammability of structures, and developing an evacuation plan. However, not all activities are uniformly adopted; not surprisingly, activities with lower initial cost (either financial or in required time/effort) are more likely to be adopted. Although few studies have examined whether these actions are being maintained over time, what data there is suggests that property owners see their risk-reduction behaviors as a multiyear process, often discussing ideas about additional activities to complete in the future, and that many activities—such as raking needles, mowing vegetation adjacent to their homes, and clearing needles and leaves from their roofs—are seen as part of normal outdoor chores.

2.3.2.1 Factors Influencing Adoption of Mitigation Measures

Wildfire studies, as well as research on other natural hazards, demonstrate that while having an awareness of fire risk is important, it does not automatically lead to adoption of risk-reduction behaviors. Studies have found that adoption of wildfire mitigation measures is influenced by both personal/psychological factors and situational characteristics such as conditions of adjacent properties and residency status. While both types of factors have been found to influence decisions, there is evidence that the former are more influential. Personal/psychological factors that influence adoption of mitigation measures include perceived effectiveness of risk-reduction activities, self-efficacy (belief in their ability to complete treatments), and, for some WUI residents, perceived norms (e.g., beliefs about the attitudes of others toward treatments).

Several situational characteristics may influence adoption of risk reduction measures. Local ecological conditions are a consideration for many residents who have indicated a greater likelihood of adopting treatments they view as appropriate to the local ecological context. Residents also recognize that their risk is influenced by conditions on adjacent lands. In some cases, studies found that this provides motivation to reduce fuels on their properties to be a good neighbor and to do their part to contribute to shared protection. However, in other locations, residents have indicated they are unlikely to adopt risk-reduction behaviors on their properties because they believe that they would be ineffective given the poor condition of neighboring properties, including adjacent public lands. This recognition of shared risks has prompted some communities to adopt cooperative, communitywide risk-reduction efforts. While such efforts were effective at influencing behavior in those locations, community-organized programs were not needed elsewhere as homeowners worked individually or directly with adjacent neighbors to take action on their properties and across property boundaries.

Residency status (whether residents were part-time or full-time residents) is a final situational factor that may influence treatment adoption. While some studies found few differences between seasonal and permanent residents, others found that full-time residents had more positive attitudes toward, or were more likely to adopt risk-reduction behaviors, particularly the more involved treatments such as tree removal. Findings suggest that the time required to undertake mitigation measures can be was particularly important to part-time residents, who have indicated that they did not want to spend their limited time at their properties engaged in such activities. Conforming with neighborhood norms may be a more important factor for permanent residents. Absentee landowners who never or rarely visited their properties were more likely to be disconnected from the local situation and take few fire preparedness actions.

Overall, studies have shown that residents attempt to balance risk-reduction behaviors with other values they hold for their properties, such as privacy, perceived naturalness, shading, wildlife habitat, and potential esthetic impacts (although esthetic improvements were also often cited as rationale for adopting risk reduction measures WUI residents weigh the expected risk-reduction benefits of a mitigation measure with the potential impacts on these other values and, in some cases, make decisions such as leaving shrubs to provide screening from neighboring properties or leaving trees to provide views from windows even though they understand this may increase their fire risk. In addition to the perceived tradeoffs between risk-reduction behaviors and other values people hold for their properties, residents across locations most frequently cited financial cost and time constraints as barriers to implementation. In some locations, residents also noted the challenging nature of the work and indicated an inability to complete the work as a significant barrier. This perception was driven by physical limitations, a lack of

knowledge about what specifically should be done at the property level, or a lack of necessary equipment.

2.3.2.2 Mitigation Responsibility

When asked about who is responsible for undertaking risk reduction measures, most residents view mitigating fire risk on their property as their responsibility. However, in recognition that their risk is influenced by the condition of adjacent lands, residents see the responsibility for mitigation as shared; each landowner, whether private or public, is responsible for mitigation of the fire risk for their property. Although residents did not see the government as having a mitigation responsibility on private land, they did support the idea that government agencies had some responsibility for providing educational materials and, in some cases, technical assistance to help homeowners understand local fire conditions and specific methods to mitigate their fire risk. While multiple methods can be used to provide such information, several studies indicate that interactive methods are particularly effective.

2.3.3 Working with Communities

Only a few studies have examined the dynamics of collaboration in the context of wildfire. In 15 case studies of wildfire planning and preparedness conducted throughout the country, Sturtevant and Jakes (2008) found that collaboration was integral to successful wildfire risk planning at the community level. Another study examined the Fire Learning Network, which is designed to link local level collaborative groups into larger regional and national networks interested in restoring fire adapted landscapes (Goldstein and Butler, 2010). Leaders of the local collaborative groups meet periodically with regional partners to share successes and mistakes, receive peer reviews of their restoration plans, and build expertise. A review has found that the network has successfully contributed to the development of local expertise while supporting local collaborative efforts (Goldstein and Butler, 2010). Early studies on the effectiveness of developing Community Wildfire Protection Plans (CWPP) in reducing wildfire risk find mixed results. One project found a lack of innovation in fire management approaches in examined CWPPs (Brummell et al., 2010). Another study reviewed the development and implementation of two CWPPs in Oregon. At the time of the study, the Forest Service had elected not to implement the fuel reduction plans in either one, but for different reasons. In one case, the Forest Service had not participated in the development of the CWPP and did not choose the CWPP prescription in their planning process, and in the other case, insufficient funds in the USFS budget was attributed to nonimplementation (Fleeger and Becker, 2010). However, a different study that surveyed state-level wildfire program managers in 11 states found that CWPPs were rated as one of the more effective elements for

the overall success of programs designed to mitigate risk on private land (Renner et al., 2010).

2.4 DURING AND POSTFIRE SOCIAL DYNAMICS

Although most social science research in the United States to date has focused on prefire concerns, there has been growing research interest in social dynamics during and after fires. Although more limited, this body of work provides a sense of key variables to consider for future management efforts, as well as for future research.

2.4.1 During-Fire Considerations

2.4.1.1 Evacuation

Fires that directly threaten a community can lead to substantial psychological, physical, and financial impacts. While designed to limit loss of life, evacuations themselves can result in significant stress and social disruption to residents. Evacuated residents indicate substantial anxiety over the status of their home and property and a lack of control of ongoing events. Limited research suggests that homeowner decisions to evacuate are influenced by the nature of the evacuation order (e.g., mandatory vs voluntary), the fire readiness of their home and property, previous evacuation experiences, and complicating factors such as ownership of pets and livestock, age, and health of family members, etc.

Although evacuation is seen as the surest way to ensure human safety and is the most common response in the United States, the evacuation process is not without risks. For this and other reasons, managers and researchers have begun to consider alternatives to the evacuation of residents during wildland fire events. The "Shelter in Place" (SIP) model has been used during other disasters in the United States, whereas the "Stay and Defend or Leave Early" approach is commonly used in Australia. The limited available research suggests that successful adoption of either alternative in the United States will require a substantial shift in the paradigm of fire management for both residents and fire management personnel. For example, in one of the few US locations where alternative plans have been developed (communities developed to SIP in Southern California), the local fire community disagreed on the definition of SIP and whether it should be used as a primary response or a last-ditch effort only if evacuation was not possible. At the same time, most residents in the designated communities did not know what to do should a fire occur (Paveglio et al., 2010a). However, research in a rural Idaho community suggested that alternatives to evacuation could be viable in certain circumstances and with appropriate preparation (Paveglio et al., 2010b), indicating the issue warrants further exploration.

2.4.1.2 Communication

During a fire, residents seek real-time information to help them decide on appropriate behaviors. In the initial stages, residents seek information about the fire location, when and how an evacuation order will be issued, and details about available services (e.g., location of shelters, availability of support to transport and board pets/livestock, where additional information can be obtained). Once evacuated, residents want to know how the fire has affected their homes and places they care about. When the fire no longer is seen as posing a significant threat to the community, resident information needs shift to learning when they will be allowed to return home, remaining health and safety risks, and the availability of services to help them in their recovery efforts (e.g., grief counseling, insurance, disposal of burned material, and rebuilding assistance).

Throughout a fire, residents are likely to draw on multiple information sources to address their information needs. Mass media sources are generally seen cited as being overly sensational and providing inaccurate information. A recent study found an expanding use of informal sources and social media including local web sites, blogs, internet-based forums, and mobile phones (Sutton et al., 2008). In some locations, studies have identified a tension between the information needs of residents, who may seek near continuous, specific information during a fire, and agency practices that may delay information to ensure quality control or emphasize delivery of tactical information (e.g., size of fire and resources dedicated to fire protection).

2.4.2 Postfire Considerations

2.4.2.1 Impacts

Wildland fires are a social as well as an ecological disturbance and have the potential to have far reaching impacts on the surrounding communities. Some impacts are tangible, such as damaged homes and infrastructure, and potential flooding issues, while many other impacts may be less obvious, but no less significant, ranging from the stress of evacuation to grief over changes to the surrounding landscape. Similar to what has been found with other natural hazards, experiencing a fire can lead to a variety of long-term responses. For some individuals, the experience will increase motivation to take proactive risk-reduction measures, while others may be less likely to engage in risk-reduction behaviors due to a sense of fatalism (e.g., seeing risk reduction efforts as ineffective after witnessing loss of homes that had implemented mitigation activities) or a belief that such behaviors are unnecessary because they believe local conditions have changed enough that fire is less of a threat.

In addition to individual level impacts, wildfires can also result in changes at the community level. In some locations, residents have reported an increased

sense of community as residents, local businesses, and agency personnel worked together during and immediately after the fire event to help each other and to protect their homes and valued natural resources. However, in other cases, disputes about how the fire was managed, particularly underutilization of local firefighting resources, or over appropriate land management prior to the fire, may negatively affect agency–community relationships after the fire.

The postfire landscape presents new management challenges. Research indicates that there are high levels of support for many postfire management activities. Immediate postfire stabilization activities, such as erosion control, and removal of hazard trees, particularly along trails and in other public areas, have been found to have high levels of support. Broader forest management decisions, such as salvage logging and restoration actions, tend to have a greater range of opinions. Support for either can be high under appropriate conditions. The level of support can depend on location, values placed on the trees (economic or ecological), and the perceived risk to the forest with intervention or nonintervention. Most studies have reported finding preference for a balanced approach; take some burned trees in order to not waste them and recoup some economic value, and also leave some standing dead trees for wildlife and shade for seedlings. Support for harvesting has also been found to be correlated with levels of trust that citizens have in the implementing agency, with how the fire was managed, and handling of postfire decision making.

2.4.2.2 Communication and Outreach

Research has begun to identify a number of factors that contribute to successful postfire outreach. Research has shown several areas of interest to the public after a fire event including cause of the fire, how it could have been prevented, goals and reasons for postfire management actions, and outcome of restoration efforts. How messages are communicated is also important, particularly the need for two-way communication, including having agency personnel ask for and utilize forest-users knowledge and experience in the local area. Field tours have been shown to be an effective means of increasing the understanding of forest and fire ecology, what happened during the fire, and options for postfire management. Where field tours are not possible, visual presentations at public meetings with photographs of burned sites have aided in the understanding of the complexities of postfire management.

Fire events may inspire local citizens to participate in fire recovery efforts, through planning or on-the-ground restoration activities. When agencies are willing to engage citizens and offer opportunities for them to participate in restoration efforts, citizens have reported improved relationships with agency personnel. Perhaps more importantly, many citizens have reported that participating in on-the-ground restoration activities after a fire helped them to reconnect with the forest and to heal from the fire. These efforts have been

most successful when projects are located in locally important areas such as popular recreation spots or view sheds.

2.5 GEOGRAPHIC AND SOCIODEMOGRAPHIC DIFFERENCES

It is commonly believed that individuals living in different regions of the country or with different sociodemographic characteristics will respond differently to fire management issues. However, analysis of social science research findings from 2000–2010 indicates that geographic and sociodemographic differences are rarely key explanatory factors where fire management knowledge, attitudes, or actions are concerned.

Studies have been conducted at sites throughout the United States, and many have explicitly included geographic variation as part of their design. Notably, the most consistent finding across these studies is that they detected much less variation than expected. Where geographic variation has been found, it either has generally been too small to be meaningful or was seen to reflect specific local contextual factors, such as ecological conditions, regulations, building styles, agency–community interaction, or specific historical events. This is not to discount such differences when they exist; such differences can be highly influential highlighting why managers need to understand their local communities and tailor programs to the context.

When discussing sociodemographic factors, studies address two general categories—standard demographic measures (age, income, education level, and gender) and residential characteristics, such as length of residence and type of residency (permanent or seasonal). The most apparent dynamic for both these measures is how often these variables are found to have no significant relationship with key variables, particularly support or approval of a treatment. Of the few studies that report significant relationships between a socio-demographic variable fire-related attitudes and behavior, relationships are not consistent among studies, and no meaningful pattern can be identified for all but two sociodemographic variables: type of residency and gender. As noted earlier, some studies have found that part-time residents are less likely to undertake mitigation activities, particularly more time-consuming actions. Gender differences have most commonly been found in relation to risk response finding that women have a higher risk perception and concern levels and lower support for more controversial practices such as prescribed fire and herbicides. For both residency and gender, however, it is important to note that the majority of studies either do not report on the variables or find no significant relationship with fire related attitudes and behaviors. One reason why sociodemographic variables may have such a limited influence is suggested by Absher and Vaske (2006) who found that psychological variables (familiarity, effectiveness, and esthetics) explained substantially more

variance in approval of fuel treatments and the likelihood of taking mitigation measures on one's property than demographic variables.

2.6 CONCLUDING REMARKS

The current wildfire challenge in the United States is, in part, a product of ecological changes created by decades of fire suppression and climate change. It is greatly complicated by the increasing social complexity created by the growing number and diversity of organizations and people impacted by wildfires. This has created a situation where the traditional fire management approach no longer effectively mitigates the fire risk, and new approaches are needed. Given the increased social complexity, a key component of identifying new approaches will be in understanding how diverse social dynamics are affected by, and in turn can influence, wildfire outcomes. Ultimately reducing fire risk is not about eliminating fire; fire will occur on the landscape. However, communities and individuals can reduce the risk of negative consequences when wildfires do occur. In the face of a changing environment and as more people move into natural areas, the current body of knowledge described here, along with future research findings, will be increasingly relevant to development of fire adapted communities.

This chapter has provided an overview of key findings from the past decade of fire social science research. Results indicate that many oft-heard descriptions of the public as not understanding the fire risk, not taking responsibility for mitigating that risk on their land, or not supporting fuels treatments on public lands are not accurate. Instead, on the whole, WUI residents understand their fire environment, support fuels treatments on public lands, and are undertaking mitigation actions on their property. Most residents in fire-prone areas not only understand the fire risk but also the ecological role of fire. The vast majority of the public support some amount of prescribed fire and mechanized thinning with knowledge of a practice and trust in those implementing it key in shaping acceptance. These findings, combined with findings that "no action" is consistently the least preferred alternative, suggest that there is greater public support for active rather than passive management in achieving fire risk reduction goals. Further, WUI residents believe that it is their responsibility to reduce fire risk on their property. Many are taking action, but the decision process to act is complex; property owners balance their fire risk with other values they hold for their properties, considerations of potential efficacy of the action, and their ability to implement it. Property owners are more likely to adopt those behaviors they perceive as compatible with their other values as well as those they believe will provide enough benefits to outweigh costs.

While there is less research on social dynamics during and after fires, the work points to several important considerations, for managers and for future research. Experiencing a fire is a stressful process, particularly evacuation.

Timely and accurate communication during this period is particularly important to minimizing the uncertainty caused by a fire. However, there is a need for better understanding how best to improve outcomes, whether in terms of communication and the evacuation process or in terms of when evacuation is or is not the most appropriate response. Experiencing a wildfire can have diverse long-term impacts on a community whether in terms of loss of homes, loss of a valued landscape, or agency–community relationships. Findings suggest there are high levels of support for many postfire management activities, including salvage logging under appropriate conditions. Open communication and, when possible, including citizens in on-the-ground postfire recovery effort provide ways to see and understand the effects of the fire, share perspectives with agency personnel, and can provide a tangible way to participate in the forest's recovery, which in turn can help with their own recovery.

A thread running through the findings is that effective communication and outreach are important throughout the fire management process—before, during, and after an event—and that interactivity is a key component of effective communication. Outreach programs and citizen–agency interactions before an event can help residents both to understand management efforts on public lands and to also help them identify and implement mitigation measures on private property. During and after a fire, residents have an ongoing need for information on the fire and its impacts on their home and property and on places they care about; this information helps reduce the stress and anxiety associated with the uncertainty of experiencing such a disruption to normal lives. Communities that reported being well informed by fire agencies during and after a wildfire event have tended to experience less negative emotion during the fire and less postfire stress.

A second thread running through the findings is that actions taken at one stage can have a lasting effect, positively or negatively, on public response and citizen–agency interactions at another stage. Understanding and trust that are built at one point can facilitate ease of exchange and support at another stage. Perceptions of how forest management decisions were made and implemented before a fire can influence views both of how a fire was managed and on acceptable postfire management actions. Trust in agency personnel has been found to be correlated with acceptance of prefire treatments such as prescribed fire and with postfire treatments such as salvage logging. Agency efforts to connect with local groups during a fire event can lead to the development of partnerships with local governments and local citizens to address postfire recovery, landscape restoration, and to prepare for future fire events. Perceptions that a fire was well managed can lead to increased community cohesion and strengthened agency ties following a fire event. However, the opposite can also be true; when residents perceive that a fire or immediate postfire phase is poorly managed, this can lead to reduced confidence in agency managers or acceptance of management activities. Where

communities and agencies have sufficiently prepared, recovery from a wildfire event is likely to proceed more smoothly than in places where little or no prefire planning has taken place.

Collectively, this body of research demonstrates that individuals, communities, policy makers, and fire management agencies are working to create fire adapted communities. However, there is still much work to be done, in both the research arena and on-the-ground activities. Ultimately, citizens' attitudes, confidence in agency managers, and acceptance of agency activities are linked across the different phases of a fire event. Recognizing these linkages can help managers take into consideration how actions taken at one point in time may affect outcomes and relationships down the road. Although before, during, and after a fire provides a convenient structure for discussing fire management, it will be important to more explicitly recognize and work across these stages.

REFERENCES

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

Behan, R.W., May 1975. Forestry and the end of innocence. Am. For. 16–19, 38–49.

Blanchard, B., Ryan, R.L., 2007. Managing the wildland–urban interface in the northeast: perceptions of fire risk and hazard reduction strategies. North. J. Appl. For. 24 (3), 203–208.

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

Brummel, R.F., Nelson, K.C., Souter, S.G., Jakes, P.J., Williams, D.R., 2010. Social learning in a policy-mandated collaboration: community wildfire protection planning in the eastern United States. J. Environ. Plann. Manage. 53 (6), 681–699.

Brunson, M.W., Evans, J., 2005. Badly burned? Effects of an escaped prescribed burn on social acceptability of wildland fuels treatments. J. For. 103 (3), 134–138.

Brunson, M.W., Shindler, B.A., 2004. Geographic variation in social acceptability of wildland fuels management in the western United States. Soc. Nat. Res. 17 (8), 661–678.

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

Davis, C., 2006. Western wildfires: a policy change perspective. Rev. Policy Res. 23 (1), 115–127.

Fleeger, W.E., Becker, M.L., 2010. Decision processes for multi-jurisdictional planning and management: community wildfire protection planning in Oregon. Soc. Nat. Res. 23 (4), 351–365.

Goldstein, B.E., Butler, W.H., 2010. Expanding the scope and impact of collaborative planning. J. Am. Plann. Assoc. 76 (2), 238–249.

Gorte, R.W., 2003. Policy response. In: Cortner, H.J., Field, D.R.J., Pamela, J., Buthman, J.D. (Eds.), Humans, Fires, and Forests: Social Science Applied to Fire Management. Workshop summary Ecological Restoration Institute, Flagstaff, AZ, pp. 59–63.

Huntsinger, L., McCaffrey, S., 1995. A forest for the trees: forest management and the Yurok environment, 1850–1994. Am. Indian Cult. Res. J. 19 (4), 155–192.

Hays, S.P., 1959. Conservation and the Gospel of Efficiency: The Progressive Conservation Movement. Atheneum, New York, 1890–1920.

Jensen, S.E., 2006. Policy tools for wildland fire management: principles, incentives, and conflicts. Nat. Res. J. 46 (4), 959–1003.

Kneeshaw, K., Vaske, J.J., Bright, A.D., Absher, J.D., 2004. Acceptability norms toward fire management in three national forests. Environ. Behav. 36 (4), 592–612.

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

Lewis, D.R., 1993. Still native: the significance of native Americans in the history of the twentieth-century American west. The West. Hist. Q. 24, 203–227.

McCaffrey, S., 2004. Fighting fire with education: what is the best way to reach out to home-owners? J. For. 102 (5), 12–19.

McCaffrey, S., Moghaddas, J.J., Stephens, S.L., 2008. Different interest group views of fuels treatments: survey results from fire and fire surrogate treatments in a Sierran mixed conifer forest, California, USA. Int. J. Wildland Fire 17 (2), 224–233.

McCaffrey, S., Olsen, C., 2012. Research Perspectives on the Public and Fire Management: A Synthesis of Current Social Science on 8 Essential Questions. Gen. Tech. Rep. NRS-104. Dept of Agriculture, Forest Service, Northern Research Station, Newtown Square, PA, U.S., 40 pp.

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

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

Paveglio, T.B., Carroll, M.S., Jakes, P.J., 2010b. Alternatives to evacuation during wildland fire: exploring adaptive capacity in one Idaho community. Environ. Hazards 9 (4), 379–394.

Pyne, S., 1997. Fire in America: A Cultural History of Wildland and Rural Fire. University of Washington Press, Seattle.

Renner, C.R., Haines, T.K., Reams, M.A., 2010. Building better blocks. Wildfire 19 (2), 10–16.

Ryan, R.L., Wamsley, M.B., 2008. Public perceptions of wildfire risk and forest management in the Central Pine Barrens of Long Island (USA). Australas. J. Disaster Trauma Stud. 2008 (2).

Shindler, B.A., Toman, E., 2003. Fuel reduction strategies in forest communities. J. For. 101 (6), 8–15.

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

Shindler, B.A., Gordon, R., Brunson, M.W., Olsen, C., 2011. Public perspectives of sagebrush ecosystem management in the Great Basin. Rangeland Ecol. Manage. 64 (4), 335–343.

Steelman, T.A., Burke, C.A., 2007. Is wildfire policy in the United States sustainable? J. For. 105 (2), 67–72.

Steelman, T.A., Kunkel, G., Bell, D., 2004. Federal and state influence on community responses to wildfire threats: Arizona, Colorado, and New Mexico. J. For. 102 (6), 21–27.

Stephens, S.L., Ruth, L.W., 2005. Federal forest-fire policy in the United States. Ecol. Appl. 15 (2), 532–542.

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

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

Toman, E., Stidham, M., Shindler, B., McCaffrey, S., 2011. Reducing fuels in the wildland urban interface: community perceptions of agency fuels treatments. Int. J. Wildland Fire 20 (3), 340–349.

Toman, E., Stidham, M., McCaffrey, S., Shindler, B., 2013. Social Science at the Wildland Urban Interface: A Compendium of Research Results to Create Fire Adapted Communities. Gen. Tech. Rep. NRS-111. U.S. Department of Agriculture, Forest Service, Northern Research Station, Newtown Square, PA, 75 pp.

Vining, J., Merrick, M.S., 2008. The influence of proximity to a National Forest on emotions and fire-management decisions. Environ. Manage. 41 (2), 155–167.

Winter, P.L., 2002. Californians' opinions on wildland and wilderness fire management. In: Jakes, P.J. (Ed.), 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, pp. 84–92. St. Paul, MN.

Westerling, A.L., Hidalgo, H.G., Cayan, D.R., Swetnam, T.W., 2006. Warming and earlier Spring increase western U.S. Forest wildfire activity. Science 313, 940–943.