Policy tools to encourage community-level defensible space in the United States: A tale of six communities

Melanie Stidham [a,*], Sarah McCaffrey [b], Eric Toman [a], Bruce Shindler [c]

[a] School of Environment and Natural Resources, The Ohio State University, 210 Kottman Hall, 2021 Coffey Road, Columbus, OH 43210, USA
[b] USDA Forest Service, Northern Research Station, 1033 University Place, #360, Evanston, IL 60201, USA
[c] Department of Forest Ecosystems and Society, Oregon State University, 321 Richardson Hall, Corvallis, OR 97239, USA

ABSTRACT

Within the wildland–urban interface (WUI), wildfire risk contains both individual and collective components. The likelihood that a particular home will be threatened by wildfire in any given year is low, but at a broader scale the likelihood that a home somewhere in the WUI will be threatened is substantially higher. From a risk mitigation perspective, individuals may take a number of actions to reduce risk exposure, but their risk is lowered even further when neighboring properties also take mitigation measures. Collectively, risk mitigation on individual properties lowers both individual and community-level risk. Multiple factors contribute to whether or not an individual will take action to reduce their risk; when an individual opts to not implement risk mitigation measures that would be beneficial from a community standpoint, community leaders can use a variety of policy tools to encourage the individual to adopt an action or change their behavior. As proposed by Schneider and Ingram in 1990, these include passing rules or regulations, building capacity, providing incentives, and establishing community norms. As part of a larger longitudinal study on WUI communities in the western United States, we reviewed approaches used by six communities in Idaho, Oregon and Utah to mitigate interdependent wildfire risk at two points in time. Each community's approach was different, being well suited to meet the community's specific needs. The most consistent policy tool utilized across communities was capacity-building, primarily through raising awareness of fire hazards and potential mitigation behaviors and leveraging external resources. Another commonality was the involvement of a central group or individual that provided leadership by initiating and championing the mitigation effort and serving as a link to external resources. There are a number of other communities in the WUI that are also at risk for wildfire; these findings can be useful to community members and agency personnel who are seeking to engage residents to reduce individual and collective risk. Within our communities, several different approaches have been effective at encouraging homeowners to adopt and maintain mitigation activities ranging from collective efforts organized locally to others developed externally to provide incentives or potential punishments for not adopting treatments. Understanding the diversity of approaches and activities that have fostered mitigation can help managers identify what will work best for their specific communities.

1. Introduction

As more homes and communities have been impacted by wildfires, increased attention has been paid to pre-fire actions that could be taken to mitigate fire risk, particularly within the wildland–urban interface (WUI). Radeloff et al. (2005) define the WUI as the "area where houses meet or intermingle with undeveloped wildland vegetation" (pg. 799). One of the best ways to prevent house loss is through structural and vegetation measures in the area immediately adjacent to the home (Cohen, 2000). Although this focuses attention at the parcel level, wildfire risk within the WUI consists of both individual and collective components, as a home's risk of ignition can also be influenced by the flammability of nearby structures and vegetation which can carry the fire or act as

* Corresponding author.
   E-mail addresses: stidham.39@osu.edu (M. Stidham), smccaffrey@fs.fed.us (S. McCaffrey), toman.10@osu.edu (E. Toman), bruce.shindler@oregonstate.edu (B. Shindler).

an ember source (Cohen, 2000; Spyratos et al., 2007). Thus, the risk of property damage can be shared among neighboring properties (including public and private lands). In addition, while the probability is low that an individual property will be threatened by wildfire in a given year (Daniel, 2007), there is a much higher probability that fire will occur somewhere in the WUI, making the collective risk for an area higher than individual risk (Steelman, 2008). From a shared risk perspective, an individual can take actions to reduce their individual wildfire risk, but, particularly for communities with smaller lots, their risk is lowered even further when their neighbors also take action.

In recent years, multiple pre-fire efforts have been undertaken to reduce hazardous fuels and provide assistance to communities to reduce their exposure to wildfire risk (defined as a function of the likelihood of a fire occurring and the severity of consequences if it does occur). To address the interdependent nature of wildfire risk, communities can utilize a number of policy tools to encourage residents to implement mitigation measures on their own properties. These can range from direct approaches that regulate resident behavior to indirect approaches that enhance individual capability to enable residents to take action. Given the diversity of communities within the WUI, such approaches will likely vary depending on local physical characteristics (e.g., location, topography, landscape ownership patterns) and social conditions (e.g., beliefs, attitudes, and norms of local residents; relationships between community members; community resources; governance structures) (Paveglio et al., 2009). However, some factors may prove consistent across locations and provide an important starting point for other communities wishing to reduce their risk. In addition, the value and utility of approaches may change over time, depending on both external (e.g., availability of grant funding) and internal (e.g., stages of mitigation efforts) circumstances. In this paper we explore programs designed to encourage the adoption of risk mitigation efforts in six communities in the western US. The purpose of this study was to identify different approaches communities are taking to mitigate wildfire risk, investigate utilization and effectiveness of policy tools in encouraging certain behaviors, and understand resident perceptions of the approaches used in their community over time.

2. Individual and community risk mitigation

In recent years there has been a shift in disaster management from a response-centered approach to a more comprehensive strategy that emphasizes preparedness and mitigation. The United Nations defines a disaster as: "a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources," (United Nations International Strategy for Disaster Reduction, 2009, pg. 9). As this definition indicates, disasters have two components: disruption and response. Communities and individuals are more or less vulnerable to disasters depending on their exposure to the potential hazard and their ability to cope with and recover from the event if it happens (Keim, 2008). An event (e.g., earthquake, hurricane, wildfire) could be a disaster in a community that has done little to reduce its exposure to the hazard and has few resources to respond, whereas the same event could be a relatively minor disruption in a community that reduced its risk exposure and has the ability to effectively respond. Clearly an event that results in a "disaster" is much more costly (both in economic and social terms) than one that constitutes a minor disruption. As such, disaster response agencies, both in the US and internationally, have begun to shift their disaster management strategies from response-only to include preparatory actions

that could help to reduce the likelihood that a natural event will become a disaster (Pearce, 2003). Likewise, policies directing wildfire management for US land management agencies have broadened their focus from suppressing fires after they start to also include pre-fire actions that would lessen the exposure of risk for WUI communities (Steelman and Burke, 2007).

Reducing community-level wildfire risk poses an interesting challenge for community leaders and wildfire managers. Many of the necessary mitigation actions need to be undertaken at the individual parcel level by individuals who may or may not choose to implement them on their own (Steelman, 2008). In this context, communities are defined in terms of physical proximity and shared infrastructure rather than broader conceptualizations of community (Hillery, 1955). A number of factors may provide a disincentive for individuals to mitigate their risk: the likelihood of experiencing property damage is fairly low, mitigation actions require resources and may detract from other values owners have for their properties, and risk mitigation does not offer absolute assurance that negative consequences will not occur (Daniel, 2007). Indeed, early research indicated that homeowners were not willing to undertake mitigation actions on their properties (Gardner et al., 1987; Winter and Fried, 2000). However, recent studies show that many communities have begun to take advantage of available assistance to educate residents, facilitate individual mitigation efforts, reduce fuels in common areas, and bolster emergency planning (see e.g., Everett and Fuller, 2011; Jakes and Nelson, 2007; Paveglio et al., 2009; Shiralipour et al., 2006; Steelman, 2008). Moreover, numerous studies have found that a large proportion of study participants in high risk areas have taken action to reduce their risk (see, e.g., Toman et al., 2013).

An individual's willingness to implement fire mitigation activities has been found to be influenced by a number of factors including, but not limited to, awareness of risk, perceived vulnerability to potential negative consequences, trade-offs with other values they hold for the property, knowledge of and ability to implement mitigation actions, and belief that the mitigation actions will be effective (see e.g., Kent et al., 2003; Martin et al., 2009; McCaffrey et al., 2011; Nelson et al., 2005). Of note is that beliefs regarding treatment effectiveness are not always related to actions on an individual parcel alone: residents in two Colorado communities reported misgivings about taking action on their own properties if their neighbors did not also take action (Brenkert-Smith, 2011). These factors play out on a spectrum, potentially leading to substantial differentiation of when people will choose to adopt mitigation behaviors and how much external encouragement is needed.

The theory of Diffusion of Innovations (the process by which a new idea or technology gets established within a population) suggests that certain individuals within a community are more likely to quickly and independently apply a new approach to solve a problem (e.g., creating defensible space to mitigate fire risk) (Rogers, 2003). Termed innovators and early adopters, these individuals have the resources and ability to try new things while there is still much uncertainty as to how beneficial the innovation might actually be. However, these individuals tend to not compose the majority of the population. Other people in the population may need external encouragement in the form of incentives, information, or even rules to adopt the practice, at least while it is still new. Individuals that can provide a link between the general population and experts (termed change agents) have been found to be an important factor in diffusion of an innovation throughout a community. They can introduce the concept and provide information to friends, family, neighbors, and colleagues in a manner that is understandable and relevant, encouraging adoption. As more and more people adopt the innovation it becomes more familiar,