

Contents lists available at ScienceDirect

Rangeland Ecology & Management

journal homepage: <http://www.elsevier.com/locate/rama>

Original Research

Wildfire Management Across Rangeland Ownerships: Factors Influencing Rangeland Fire Protection Association Establishment and Functioning

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ARTICLE INFO

Article history:

Received 25 October 2017

Received in revised form 31 January 2018

Accepted 14 May 2018

Key Words:

rangeland fire protection associations

fire adapted communities

wildfire

risk

cooperative management

fragmentation

ABSTRACT

Policymakers and managers are promoting Rangeland Fire Protection Associations (RFPAs) as one way to better incorporate private citizens as active participants who contribute to fire suppression efforts on public rangelands. While the RFPAs program is growing in popularity, little is known about the way that RFPAs establish and operate. This is especially true in mosaic management scenarios characterized by fragmented landownerships and a variety of land or fire management entities responsible for wildfire suppression. Our goal was to investigate how an RFPAs forms and functions in a management scenario characterized by: 1) proximity to exurban residential development; 2) agreements with multiple local, state, and federal wildfire suppression entities; and 3) a geographically disperse protection district. We conducted in-depth interviews with RFPAs members, land or fire management professionals, emergency managers, and local interest groups who interact with the Black Canyon RFPAs (BCRFPA) in southwestern Idaho. We found that the BCRFPA leveraged the insights, documents and support of existing RFPAs during their establishment, but ultimately had to adapt the RFPAs idea to specific elements of their local context. Members of nearby rural fire districts were initially apprehensive about the formation of the BCRFPA due to concerns about resource competition (e.g., funding and large equipment). RFPAs members with professional firefighting experience helped alleviate those tensions by explaining how the RFPAs would integrate into existing wildfire management networks. The BCRFPA provided local knowledge about road conditions, water resources, and fuel conditions and initial attack to fill in gaps in landscape-level wildfire protection. However, the proximity of residential areas to the BCRFPA protection district made decisions about fire suppression more complex by introducing trade-offs between residential and rangeland resource protections. Ultimately, our results indicate that RFPAs can help rangeland human populations better adapt to wildfire risk, but that social fragmentation may challenge RFPAs functioning.

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Introduction

The size and frequency of rangeland wildfires in the western United States are growing, posing a number of challenges for human communities, broader rangeland management strategies and the maintenance of wildlife habitat (Brooks et al., 2004; Abatzoglou and Kolden, 2011; United States Department of the Interior [USDI], 2015). The exacerbation of wildfire impacts to Western US rangeland and sagebrush systems can be attributed partially to the impacts of climate change, weed invasion (e.g., cheatgrass), changing fire regimes, and the legacy of past management strategies, such as post-fire restoration strategies. Some characterize sagebrush ecosystems as among the most imperiled ecosystems in the United States (Chambers et al., 2008; Rowland et al., 2010), and the conservation of sagebrush ecosystems and sagebrush-obligate species (e.g., greater sage-grouse) is a principal concern for

many rangeland stakeholders. In particular, increasing wildfire activity threatens many ranching operations that are intimately tied to rangeland landscapes for their livelihoods. Wildfire risks to ranching operations can include an immediate threat to cattle, leased forage resources, fencing, and structures. Impacts from wildfires also can compound economic risk to ranching operations, including loss of access to public grazing leases during multiseason or multiyear post-fire restoration activities (Brunson and Tanaka, 2011). The research presented here explores the development and functioning of rangeland fire protection associations (RFPAs), which may represent one strategy that ranching populations can utilize for collaborating with public land managers in adapting to changing fire regimes. Our efforts address a relative lack of research documenting efforts to reduce wildfire risk among human communities living in rangeland environments and the role of RFPAs in landscape-level wildfire management.

An RFPAs is a partnership between private citizens, state agencies and federal agencies that allows private citizens to engage in or contribute to wildland fire suppression efforts on public rangelands. They are non-profit organizations whose members work with land management

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agencies to keep wildfires smaller, protect values at risk from wildfire (e.g., forage, wildlife habitat, residential structures, citizen health), and reduce the need for extra-local assistance during wildfire suppression (Wildland Fire Executive Council, 2014; USDI, 2015). RFPAs have existed in Idaho since 2012 (Idaho Department of Lands [IDL], 2017), in Oregon since the 1960s (Oregon Department of Forestry, 2012), and in Nevada since 2015 (Nevada Division of Forestry, 2015). However, little research has focused explicitly on the functioning of RFPAs and the ways they operate as part of larger wildfire management initiatives. In particular, what little research has focused on RFPAs questions how well the program might function in more complicated “management mosaics” (Epanchin-Niell et al., 2010) characterized by the intersection or interspersed of public lands, pasture or agricultural lands, and residential or wildland-urban interface (WUI) development (Stasiewicz and Paveglio, 2017). The WUI encompasses areas where residential development is interspersed with or adjacent to wildland vegetation (Stewart et al., 2009). More complicated landownership patterns can necessitate additional coordination among organizations and agencies managing wildfires or associated natural resources and influence the utility of different wildfire management tactics by diversifying the range of values at risk from wildfire (Carroll et al., 2005; McCool et al., 2006; Black et al., 2008; Rideout et al., 2008; Schoennagel et al., 2017).

We conducted a case study of the Black Canyon RFPA (BCRFPA) in southwestern Idaho to examine how an RFPA establishes and operates in a landscape featuring public lands, ranching properties, and nearby residential development. An additional goal was to better understand how RFPA members interface with other agencies (i.e., Bureau of Land Management [BLM], Idaho Department of Lands [IDL]) or organizations that have responsibility for fire response (e.g., rural fire protection districts, city fire departments) in landscapes characterized by fragmented landownerships. There are a number of potential benefits from studying how RFPAs contribute to larger wildfire management initiatives, including: 1) examining the influence RFPAs have on citizen engagement in wildfire management; 2) determining how private organizations can interface with agencies to manage nearby public lands; 3) exploring influences on wildfire adaptations among human communities in rangeland ecosystems; and 4) assessing how ranchers can contribute to landscape-level wildfire management.

Background and Literature Review

Rangeland Fire Protection Associations

RFPAs in Idaho are nonprofit associations comprised of private citizens who enter into an agreement with the state or an agency of Idaho “...for the detection, prevention or suppression of forest and range fires” (Idaho Forestry Act, 2013). Minor changes to existing Idaho State code surrounding fire protective associations on timbered lands provide the legal basis for RFPAs in Idaho. The first Idaho RFPA was established in 2012 by ranchers, the IDL and the BLM in Mountain Home, Idaho. There were nine RFPAs in Idaho as of 2017 (IDL, 2017). Ranchers, the IDL, and the BLM established the RFPA program in Idaho to address several emerging management challenges: 1) the alignment of local, state, and federal concerns about more frequent and larger-scale wildfire events on rangelands; 2) conservation of sagebrush ecosystems and sage grouse habitat threatened by wildfire; and 3) the repeated loss of forage and access to public grazing allotments due to wildfire (USDI, 2015; IDL, 2017). The aforementioned concerns, when combined with increasing wildfire suppression costs and the lack of suppression resources in remote rangelands (e.g., equipment, personnel), garnered a shared interest in incorporating civilian resources and knowledge into wildland fire suppression efforts (Stasiewicz and Paveglio, 2017).

Citizens interested in forming an RFPA must acquire nonprofit status, liability insurance, and establish a governing structure for the association (i.e., board of directors) (Idaho Forestry Act, 2013). The cost of RFPA liability insurance is commonly funded by annual membership

fees. Each RFPA independently determines how to distribute costs across its membership (e.g., a uniform membership fee or by acre). The proposed RFPA must either demonstrate the ability to cover its start-up costs or the state legislature must have adequate funding to help pay for the necessary personal protective equipment (PPE) (e.g., nylon pants, hard hat, fire shelters) and radios so that RFPA members can communicate with other responders (Idaho Forestry Act, 2013; BLM, 2016).

RFPA members must complete an initial 40-hour wildland firefighter training (BLM, 2016; McCormick and Wuerzer, 2016) and attend annual recertification meetings in order to engage in suppression efforts on public lands. These minimum training and equipment standards were designed to address concerns about professional firefighter liability associated with civilian volunteer firefighter injuries or fatalities during a wildfire event. RFPA training and radio requirements also address concerns about a lack of coordination between private citizens and firefighters, which could endanger civilian and firefighter lives.

RFPA members negotiate with local fire management entities to establish a “mutual aid area” (BLM, 2014a, 2014b) that serves as the RFPA’s protection district. The RFPA protection district often is composed of “no man’s land”—areas where professional agencies have little wildfire suppression capacity or protection responsibility (IDL, 2016). RFPAs commonly utilize memorandums of understanding (MOUs) to create partnerships with adjacent jurisdictional authorities (e.g., city or rural fire districts [RFDs]) and form mutual aid agreements (MAAs) with other emergency management entities (e.g., United States Forest Service [USFS], BLM, IDL). MOUs and MAAs enable parties in the agreement to lend assistance across jurisdictional boundaries and provide guidelines about the responsibilities of each entity during a wildfire event.

RFPAs can enhance local wildfire suppression capacity by integrating privately owned equipment (e.g., dozers, discs, water tanks), local knowledge, and/or human resources into suppression efforts (IDL, 2017). RFPAs integrate into the Incident Command System and cede decision-making authority to agency fire managers when they arrive (BLM, 2016). They also may act as the Incident Commander (IC) and the only responders to a wildfire if agency fire professionals are unable to respond (BLM 2014; Stasiewicz and Paveglio, 2017).

Some recent policies promote the establishment or enhancement of existing RFPAs and RFDs to better mitigate rangeland wildfire impacts (USDI, 2015). This indicates a need to better understand the establishment of fire suppression entities, how they respond to fire events in different contexts, and what those trends mean for landscape-level wildfire management. Exploring how RFPAs fit into landscape-level wildfire management means first drawing from the established body of social science focusing on the ways that human populations organize or respond to wildfire risk in their locality. We turn to this topic in the next section.

Facilitating Cooperative Fire Management in Rangeland Contexts

A growing body of wildfire social science research examines how to promote the adaptation of human populations to changing wildfire circumstances across diverse landscapes. Scholars and policymakers now refer to fire adapted communities (FACs) when describing groups of people who effectively mobilize to enhance local ability to prepare for, deal with, and recover from wildfire events (Fire Adapted Communities Coalition, 2017). Lessons from existing literature suggest that communities may employ a diverse array of strategies for adapting to wildfire based on their specific local context (e.g., fuel type, local culture, rules and regulations, financial resources) (Jakes et al., 2007, 2011; Jakes and Sturtevant, 2013; Stidham et al., 2014), and that not every community will adapt in the same way (Paveglio et al., 2012, 2015a; Paveglio and Edgeley, 2017). Thus, there is a documented need to understand how wildfire adaptation strategies emerge from specific contexts.

Wildfire social science and larger policy design and implementation literature both suggest that the social characteristics of specific populations influence program or policy effectiveness (Berke, 1998; Cohn et al., 2008; Jakes et al., 2007, 2011; Howlett, 2011; Stidham et al., 2014; Paveglio et al., 2015a). Mitigating wildfire impacts to rangeland social systems may require different policy innovations that better address the needs of these distinct populations (see Paveglio et al., 2018). The RFPA program represents this type of policy innovation by allowing ranchers to become active participants in fire management on lands that are critical to their continued livelihood (Abrams et al., 2017; Stasiewicz and Paveglio, 2017).

RFPAs are often associated with landscapes and communities characterized by ranching or farming (IDL, 2017), what some authors refer to as “working landscape communities” (Field and Burch, 1988; Paveglio et al., 2015a, 2015b). Rural rangeland populations commonly feature strong familial and informal relationships between residents, high-levels of independence, and experience addressing natural resource issues collectively (Ellickson, 1991; Huntsinger et al., 2010; Paveglio et al., 2015a, 2015b). They also tend to have intergenerational ties to the land that may promote a high level of knowledge or familiarity about ecosystem dynamics (Eriksen and Prior, 2011), including climate patterns (Nyong et al., 2007; Mackinson, 2001) and weather behavior (Lefale, 2010; Stasiewicz and Paveglio, 2017). Finally, working landscape residents’ long history and familiarity with the land often means they have developed informal practices for dealing with disturbance events such as wildfire, including assisting agency professionals with fire suppression efforts. It also includes collective mobilization among neighbors to help suppress wildfires on public leases and/or private lands (Pyne, 1982; Stasiewicz and Paveglio, 2017).

Working landscape communities in the western United States often depend on public lands (i.e., USFS, BLM, IDL) to sustain their livelihoods through the opportunity for grazing leases, timber contracts, or water resources (Field and Burch, 1988). This means that local populations could be heavily impacted by fire mitigation actions on those lands. More recently, efforts to decentralize natural resource management include the co-design of resource management strategies by a broad range of agency and private stakeholders—what some call “co-management.” RFPAs may represent one important step toward co-management of rangeland resources and disturbances surrounding fire.

The sharing of fire suppression responsibility among agencies and private citizens is a relatively new concept in the United States. The dominant preference in US fire management is for citizens to evacuate during wildfire events (e.g., Ready, Set, Go!), which reflects agency concerns about public safety, fear of scrutiny, and agency liability (McLennan and Eburn, 2015). Studies investigating cooperative fire management among private property owners predominantly focus on prescribed fire management (e.g., Toledo et al., 2014; Weir et al., 2015, 2016) or Australian examples of bushfire brigades and “stay and defend” programs (e.g., Whittaker and Handmer, 2010). The integration of citizen volunteers into US suppression efforts can occur when RFDs have wildland fire suppression responsibilities, although this interaction is also understudied (McCaffrey et al., 2013).

The body of literature investigating RFPAs is nascent (e.g., McCormick and Wuerzer, 2016; Stasiewicz and Paveglio, 2017). Stasiewicz and Paveglio (2017) examined how the Three Creek RFPA established and functioned in a landscape dominated by public lands, and with little exurban development, structures or civilian lives at risk during wildfire events. They found that RFPAs capitalize on a long history of reciprocity among neighbors, and that shared training allowed RFPAs to serve important roles in the early detection and suppression of wildfires. Likewise, improved familiarity with firefighting practices or ranchers’ values for the landscape opened up opportunities for RFPA members and the BLM to collectively address increasing wildfire risk on public lands. Abrams et al. (2017) also found that RFPAs provided an avenue for the integration of local resources and knowledge into formal state and federal networks. The authors discuss how institutional and

historical differences between RFPAs in Idaho and Oregon influenced the role of RFPAs in each state.

Despite early support for RFPAs in the literature, they may not be appropriate for mitigating wildfire risk in *all* rangeland contexts. Many western rangelands are experiencing increases in exurban and suburban residential development (Soullard, 2006). Residential development can increase social diversity by introducing new populations to the landscape who might possess different views about land management, experiences with wildfire, and expectations for wildfire management entities (Shindler et al., 2002; Brunson and Shindler, 2004; Paveglio et al., 2015a). That diversity of perspectives often makes it difficult to manage natural resource issues (e.g., wildfire risk) across landownership boundaries because stakeholders’ goals for resource or fire management may not align (Epanchin-Niell et al., 2010). Biophysical conditions such as terrain, fuel-type, presence of invasive species, or endangered species habitat may also influence whether RFPA establishment is a suitable course of action for mitigating fire risk in a given rangeland system (Stasiewicz and Paveglio, 2017). For instance, the concurrent identification of endangered species habitat and critical suppression areas in a resource management plan (e.g., BLM, 2015) may incentivize RFPA formation. RFPA formation would augment agency capacity to protect species habitat, but concerns about habitat disturbance may also put limitations on the suppression tactics RFPA members can use.

Residential development in rangeland systems also can diversify values at risk (e.g., homes, forage, civilian health, fences) and increase the number of entities contributing to suppression efforts (i.e., city or rural fire districts) (Moynihan, 2009). Suppression organizations may prioritize protection of different values at risk (e.g., structures, resources) during suppression due to differing mandates and missions. Research on wildfire co-management notes that the loss of common suppression priorities during fire events can be one important source of conflict and frustration among collaborators (Fleming et al., 2015; Paveglio et al., 2015b). It also can lead to breakdowns in trust, communication, and partnerships between firefighting entities, which can have immediate consequences for the safety and efficacy of wildfire management activities and influence future interactions between communities, local organizations, or extra-local organizations (Carroll et al., 2005). In summary, mosaic landownership or fire protection patterns created by residential development in rangeland systems may complicate the establishment and functioning of citizen-based volunteer suppression organizations such as RFPAs. This paper addresses the lack of research on that topic by exploring how one RFPA operates in a more complex management environment. Accordingly, we utilize the following research questions to further explore the role of RFPAs in changing rangeland landscapes:

- 1) What influences RFPA establishment and function?
- 2) How does a “management mosaic” influence RFPA functioning?

Methods

We used a qualitative and inductive case study approach to study influences on RFPA establishment and functioning. Qualitative case studies are often employed during the exploratory stages of research because they allow for in-depth investigation into the factors that influence a little-known phenomenon (Bryman, 2012). Case study selection began by considering the institutional and land management characteristics of existing RFPA response areas. More specifically, we were looking for an Idaho RFPA with a response area that featured the following conditions: 1) adjacent exurban or WUI development; 2) MOUs or MAAs with multiple local, state, and federal entities involved in wildfire suppression; and 3) a geographically fragmented RFPA jurisdiction. We chose the above selection criteria in order to ensure a study area where an RFPA would have to interact with multiple state, federal, and local cooperators who may approach fire management differently. Proximity to the WUI also may introduce added complexity regarding fire

suppression, including how resources are allocated to protect lives and private property (Steelman and McCaffrey, 2011; Wilson et al., 2011; O'Donnell et al., 2014).

The BCRFPA protection district emerged as the best-suited case study site because it is comprised of private, state, and federal lands with little-to-no wildland fire protection. It shares response boundaries with 11 different RFDs and its response area is spread widely across the landscape (Fig. 1A and B). Nine of the 11 RFDs in close proximity to the BCRFPA have signed MMAs with the organization (Fig. 1B). RFD jurisdictions adjacent to the BCRFPA feature exurban residential development where the dominant land-use is not related to farming or ranching. The BCRFPA is in relatively close proximity to the National Interagency Fire Center in Boise, Idaho, which hosts and coordinates wild-fire management across the United States and houses a significant number of fire suppression resources (e.g., equipment, personnel). The BCRFPA was established in 2014 and participated in that wildfire season. Nineteen BCRFPA members helped protect 189,000 acres of private, state, and federal land during the 2016 wildfire season (IDL, 2017).

We used a combination of theoretical and snowball sampling to identify interviewees for this study (Charmaz, 2000; Bryman, 2012). Theoretical sampling is an inductive approach where interview participants are selected due to their expertise or familiarity with a particular field or topic of interest (Lindlof and Taylor, 2002). Snowball sampling

identifies new study participants based on referrals from initial study participants (Biernacki and Waldorf, 1981).

Initial contacts for the research included the BCRFPA chairperson, other members of its board of directors, and RFPAs liaisons from the BLM and IDL. One of the researchers attended the BCRFPA annual recertification meeting in May of 2016 to gauge RFPAs member and cooperator interest in the study. They acquired a list of all BCRFPA members and cooperators during the recertification meeting, which helped initiate a snowball sampling effort and ensure a representative sample of interviewees who might influence or be affected by RFPAs participation in wildfire management. More specifically, we identified and interviewed at least one representative from every operation (i.e., ranch, outfit, farm, property owner) participating in the BCRFPA, fire professionals from the BLM and the IDL, local fire department members (e.g., fire chiefs, volunteers, and career firefighters), local emergency management organizations, and local interest groups involved in rangeland management.

We conducted 25 interviews with 29 individuals during the spring and summer of 2016. All but one of the interviews was conducted by both authors as a team. Interviews were conducted face-to-face and lasted between 20 minutes and 2.5 hours. We used a semistructured interview protocol to guide the interviews. A semistructured interview protocol provides the opportunity for in-depth discussions about research questions or topics and enabled researchers to ask additional questions

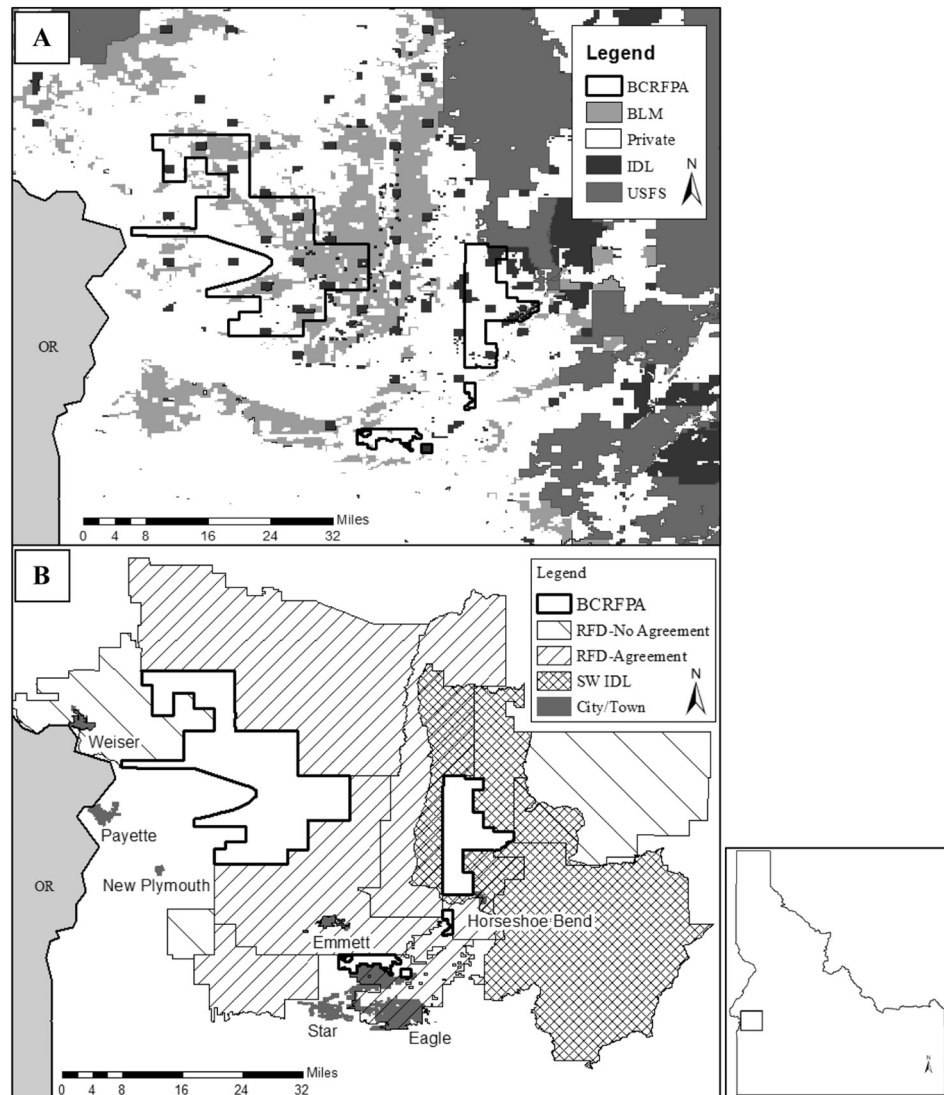


Figure 1. A, Land ownership and B, fire protection responsibility that constitute the management mosaic in the BCRFPA study area. Data source: IDL ownership as of 2017.

based on interviewee expertise or experience. The semistructured protocol also allowed researchers to add follow-up questions in response to emergent lessons from earlier interviews (Bryman, 2012). Topics covered in the protocol included: 1) influences on personal and collective decisions to form or join the RFPA; 2) factors influencing decision-making during a wildfire event; 3) interactions between fire suppression organizations; and 4) how local context (e.g., social or jurisdictional fragmentation) influenced any of the aforementioned dynamics.

We discussed emergent patterns following each interview and at the conclusion of each field day. These discussions informed any modification to the interview protocol (i.e., adding or editing questions) and allowed us to investigate any new themes that emerged from the interviews (Bryman, 2012). Discussions about emergent themes also helped identify missing perspectives or additional stakeholders who needed to be interviewed. We conducted interviews until both authors agreed on the achievement of theoretical saturation. Theoretical saturation is commonly considered the point where collecting additional data consistently reinforces identified patterns and no new information is forthcoming from interviews with new stakeholders (Morse, 1995).

Analysis

All interviews were audio-recorded and transcribed word-for-word. We used processes of analytic induction and thematic analysis to systematically analyze our qualitative data. Analytic induction outlines a process for systematically comparing participants' experiences to uncover common factors (e.g., conditions) influencing a phenomenon of interest (Ryan and Bernard, 2000). Thematic analysis provides a complementary set of coding phases that help structure analytic comparisons between influences and arrive at common explanations for the outcomes observed during the research (Strauss and Corbin, 1990). More specifically, we conducted three rounds of increasingly restrictive coding to arrive at the final themes presented in the results section (Boyatzis, 1998; Saladaña, 2013).

A first round of "descriptive" or "concept" coding identified broad ideas represented in the interview data (Strauss and Corbin, 1990; Charmaz, 2000). Concept coding was organized in a codebook containing names, descriptions, and examples from the transcripts. A second round of what some authors call "topic" or "category" coding sought to eliminate topics the authors' felt were not directly relevant to the research questions (e.g., discussions about grazing plans or reseeding) or that could be merged together under a common categorical description in the codebook (Strauss and Corbin, 1990; Gibbs, 2007). A final stage of "analytic coding" explored instances of each topic code to identify underlying meanings and to note any connections between codes to collapse ideas identified during previous rounds (Gibbs, 2007). Analytic coding included the iterative evaluation of emerging meanings identified during the coding process against each new instance of text under that topic (sometimes referred to as the "constant comparative method") (Glaser and Strauss, 1999). Each finalized analytic code represents a "theme" that succinctly represents and describes the perspectives of participants surrounding each topic and describes its relationship to the overall research questions (Saladaña, 2013). Both researchers examined a randomly selected segment of the transcripts during each stage of coding to confirm agreement on codes. They refined descriptions of codes and code parameters where there was disagreement to ensure the reliability of the codebooks (Saladaña, 2013). Finally, the authors selected quotes from transcript data that best represented the final themes identified during the coding process (Boyatzis, 1998).

Results

Factors Influencing BCRFPA Establishment and Functioning

Study area ranchers became interested in forming an RFPA to address reoccurring conflicts between fire managers and locals during fire suppression activities. They described difficulties accessing private

or leased property (e.g., forage, cattle, farmland) during a wildfire event as one challenge that RFPA establishment might alleviate. Ranchers knew that they had the legal right to stay and defend their private land. However, some interviewees recounted conflicts between ranchers and firefighters about the boundaries of private and public lands during fire events. This confusion created a scenario where managers and landowners argued about evacuation dynamics rather than taking collective action on fires. BCRFPA members also reported encountering roadblocks when returning to defend their ranchlands during wildfire events and considered these roadblocks unacceptable. As one interviewee described:

...my nephew, was a classic deal. We had a couple of fires over here on the highway and they wouldn't let him get down to his own place because he didn't have the certification. The sheriff got the orders from somebody to close the highway and so he closed it, and he should have been able to defend his own land.

BCRFPA members described livestock safety and evacuation as a primary fire management priority. Establishment of the BCRFPA allowed ranchers additional opportunities to protect their livestock and forage either by expanded access to public and private lands during fire events or avenues to engage in fire suppression activities. A secondary concern was saving forage that might be consumed by fire. As one rancher explained: "My biggest concern would be going to get the cows out. By the time I asked any of my neighbors to come up there and help me, I would want them bringing horse trailers, not firefighting equipment."

The BCRFPA also provided a useful conduit for sharing local residents' knowledge about roads, water resources, fuel types and conditions, and terrain during fire events. This informant role was particularly valued by older BCRFPA members (60+) who wanted to move cattle safely, open gates, and provide tactical information about fire spread, but who could not necessarily engage in strenuous suppression activities (e.g., digging line). As one BCRFPA member summarized:

I spent the whole fire on a four-wheeler. Moved my cows, got them in the black, got them safe, came back around the bottom of the fire, went back up, helped them on the Alpha flank up this side and said, 'Okay, if that thing gets away from you, right there is where you can stop it, not on your map.'

Community leaders in the study area were introduced to the RFPA concept by ranchers in other parts of Idaho, the Cattlemen's Association, and through interactions with state-level political offices (e.g., the Governor's Office). These contacts provided examples of how RFPA training and agreements might help local ranchers play a more active role in wildfire risk management. Leaders of other Idaho RFPAs provided study participants with what they described as invaluable guidance and advice on how to navigate initial relationships with agencies. Existing RFPAs also provided interviewees with template agreements (i.e., MOUs and MAAs) or documentation (i.e., by-laws and constitutions) that helped streamline BCRFPA establishment. As one rancher described: "We basically took their [other RFPAs'] template and ran it by the fire districts and came up with something that would meet what they needed too."

Some ranchers in the study area had considered joining an RFD in order to gain the credentials for responding to wildfires on their private and public lands. Study participants indicated that RFPAs ultimately were a more attractive option for the ranching population because RFDs require too large a time commitment and focused too much on structure protection. BCRFPA and RFD leaders described initial tensions between the organizations due to RFD concerns about competition for volunteer firefighter funding. RFD members were worried that funding resources and equipment would go toward RFPAs rather than sustaining long-term investments in RFDs. As one firefighter described:

The new RFPA comes in and all of a sudden IDL is giving them, here's some money. Here's lots of money. Here is the RFDs that are still running

off 1960 engines and trucks that don't have radios themselves...the RFDs have been here longer and still do the same job as a professional bills.

Addressing RFD concerns about potential resource competition was an important step in establishing the BCRFPA. Interviewees outlined how BCRFPA leaders with professional firefighting experience were important to this process because they were able to share a vision of how the BCRFPA would integrate into local fire management and address RFD concerns. For example, BCRFPA liaisons clarified how the organization would use their private equipment to engage in suppression and would not compete with RFDs for heavy equipment from federal reserves. They also stressed that the BCRFPA was a nonprofit entity that would collect membership dues to help fund their activities. Volunteer RFD members and fire chiefs interviewed for this study ultimately indicated that the BCRFPA was welcome help.

Both fire professionals and RFD members valued the BCRFPA as a complimentary fire suppression entity because agency fire professionals could not always respond effectively to various segments of no man's land that became the BCRFPA jurisdiction. The BCRFPA could also be useful when agency resources were scarce due to higher priority fires in other parts of the state or region. RFD members appreciated the initial attack and fire look-out roles the BCRFPA could provide since BCRFPA members were out on the landscape for work and commonly near equipment that could be useful in suppression. As one RFD volunteer described: "I can't imagine any fire district refusing help. I'm a volunteer. I go to work every day. I've got my own job, and the more people are there to help, the less I miss my own work."

As mentioned earlier, most BCRFPA members expressed disinterest in acquiring additional equipment (e.g., discs, dozers) from agency partners to use in wildfire response. As one BCRFPA member explained:

The problem with that [accepting equipment] is then, once you do that, it becomes firefighting only. I can't put my pesticides in it, I can't spray my stuff that I need to. So then is it really that valuable to me to have it just for fighting fire and maintaining it?

However, some BCRFPA members were interested in acquiring water tenders and implementing water improvement projects that could help them suppress fires in their water-scarce jurisdiction. They considered such equipment or water improvements as useful to suppression efforts in the jurisdiction, especially in areas with rough or rocky terrain where large equipment could not be used (i.e., discs and dozers).

RFPA Functioning in a Management Mosaic

Both agency professionals and ranchers acknowledged how past conflict leading to BCRFPA formation could be at least partially attributed to the "checkboard" or "patchwork" of landownership in the region. Wildfires in the area often posed risk to multiple landownerships, including private parcels intermixed with public lands. One interviewee described how the management mosaic influenced private landowners when multiple federal, state, and local entities responded to a fire event: "We would kind of be out of the loop on our private ground, or on our range ground, and we wouldn't be able to get to the fire. So, it was becoming a problem."

Proximity to or dependence on nearby public lands emerged as an important influence on interest in BCRFPA membership. For instance, interviewees pointed out how ranchers who were not interested in joining the BCRFPA often were not as dependent on public land to sustain their operations. However, not all ranchers agreed with that logic. As one BCRFPA member described: "The shortsightedness of that to me is that he may or may not get the RFPA's help... We'd go help, but it's not as organized... It's not like he can communicate. He doesn't know everybody."

The mosaic of fire protection jurisdictions and landownership that served as the backdrop for BCRFPA formation also influenced its

functioning in a number of related ways. To begin, the complexity of land management and fire jurisdictions in the area required the BCRFPA to find its role within a fire management system that already featured numerous cooperators (e.g., private landowner, BLM, IDL, USFS, city and rural RFDs). This potentially meant understanding divergent strategies or priorities for wildfire suppression and negotiating how the BCRFPA could augment or interface with existing efforts. As one participant articulated:

...several different entities all respond from 360 degrees, all in a very chaotic emergency situation where houses are getting ready to burn down, fire is blowing across the road, there's people out in front of it, there's cattle out in front of it, there's traffic just not knowing where to go. All of that's happening at once and you have to find those people [your cooperators] get them all on the same page, and get that plan going.

Many BCRFPA members noted that the number of cooperators they could interact with on a fire—a consequence of the heterogeneity of the mosaic landscape—was something that set them apart from other RFPAs in Idaho. They noted how BLM and IDL fire professionals were somewhat used to working with larger, contiguous RFPAs in the remote, southern portions of the state. In contrast, the number of cooperators in the study area meant that the BCRFPA largely would not be relied on as the sole wildfire responder. As one BCRFPA member described:

I say I usually just stay clear away if we can just let the BLM do their job. As long as they got the resources, but when they don't, like if they've got eight fires in one day and they're all gone, that's when we've got to do our job.

The majority of BCRFPA members perceived themselves as partners—and not necessarily leaders—in wildfire suppression. They committed to participation during initial attack, but expressed a desire to hand suppression efforts off to agency professionals unless needed because they had other responsibilities (e.g., ranch management, farming). Accordingly, BCRFPA members wanted to manage professional firefighter expectations regarding the limited response the BCRFPA would provide and the support role it would play in suppression. As one BCRFPA member described:

First of all, we're just starting out so for you to lean on us very hard, particularly at the outset would be foolish. I said, I don't even anticipate down the road ... We're so scattered as a ... It's not like we're a fire department at the ready. We're all scattered. We're working.

The focus on "no man's land" as a criterion for delineating the BCRFPA jurisdiction illustrates another influence that the management mosaic has on the collective functioning of the organization. Interviewees stressed how the focus on "no man's land" served as a common recognition that the new organization would fill gaps in fire protection and not duplicate efforts. However, establishment of BCRFPA jurisdiction based on "no man's land" also resulted in a noncontiguous fire response area. That is, the private land or public grazing leases that the BCRFPA has primary responsibility for constituted irregularly shaped combinations of private and public land interspersed among lands where other cooperators may respond. The fragmented nature of the resultant BCRFPA jurisdiction could make it less likely that a large number of BCRFPA members respond to each fire burning across pieces of the jurisdiction. Additionally, the proximity or intermixing of BCRFPA jurisdiction with residential areas or public infrastructure adds significant complexity to the prioritization of values at risk that other fire entities would consider threatening rancher property during fire events. This, in turn, meant that BCRFPA members would need to negotiate whether and how those larger prioritizations (e.g., putting resources toward protecting residences vs. grazing land) would influence their experience during fires. As one rancher summarized by comparing the BCRFPA

to another RFFA: “(Name) and those guys, they’ve got trucks and they’ve got pre-positioned stuff. Like I said, they have no towns to worry about. They have no houses. It’s just a different ball game.”

Despite the common wildfire suppression goal of keeping rangeland fires smaller, BCRFPA members and fire professionals indicated that they did not always agree about how to best manage a wildfire event. Disagreements over wildfire management tended to arise when fires encroached on the WUI and professionals with structure protection responsibilities perceived that structures and civilian lives might become threatened. Some BCRFPA members recalled instances where partners with structure protection responsibilities redirected suppression efforts and resources to protect WUI assets, which left it up to the BCRFPA to safely suppress the fire in the wildlands to protect the rangeland resources they cared about. Most BCRFPA members understood their cooperators’ reasoning, but were frustrated with the outcomes. As one BCRFPA member explained:

Their biggest deal, the local firefighters, is structure. That becomes the BLM’s biggest deal, when it starts to go toward structures. That’s part of where we lose with the RFFA. They will pull things off and say, “Hey, we got to go over and protect this house.” If you put that fire out, you wouldn’t have to protect that house. They’re erring on the side of caution saying, “We need something up there in case this thing blows up and gets away. We have to save that house.”

Underlying tensions surrounding wildfires that might threaten residential areas are fundamental differences in how the BCRFPA is perceived by interviewees from different fire management entities. For example, federal and state fire professionals (e.g., IDL, BLM) described the BCRFPA as a partner and additional resource in rangeland fire response, while RFDs tended to consider the BCRFPA a complimentary entity that took care of range fires and enabled the RFD to focus primarily on protecting structures. As one RFD member described:

We know where the structures are at and what we have to protect in the area that we have those structures and stuff. They [the BCRFPA] definitely know the ground, and the fences, and the gates, and all the important stuff. It really makes a good fit with us for what we do... we’re glad that if they are going to be out there, at least to have wildland equipment.

Interviewees described effective communication and familiarity between cooperators as important for promoting a safe wildfire response that maximized entities’ collective efforts to protect their values at risk. This capacity was often built prefire season and off the fire line. BCRFPA members typically interfaced with fire professionals (i.e., ICs) from the BLM or IDL. The BLM hosted the BCRFPA training and annual recertifications, which participants described as helping to facilitate better cooperation and efficiency during fire events (e.g., frequencies, trainings, updates, or resource distribution). RFD and BCRFPA members noted that their relationships with each other were often less developed than those relationships with the IDL or the BLM. Some attributed this to the newness of the BCRFPA and the fact that local suppression entities tended to complete trainings with IDL or BLM professionals rather than each other. Investing effort in developing relationships between BCRFPA members and RFDs was perceived as an area of future growth for strengthening cooperative suppression efforts, though this relationship did not necessarily have to be built from scratch. Some RFDs had historically allowed ranchers (now members of the BCRFPA) to engage in suppression efforts in parts of the RFD jurisdiction. As one professional described:

Most of the time, the fire chiefs are supposed to keep ranchers off of fires because we don’t want to be responsible for liability. Here we’re a lot

more conservative than that. I don’t want to tell them what to do and they don’t want to tell me what to do. If you guys are going to go out with your tractor with a disc and fight fire, great. Love the help.

Discussion

The research presented here investigated what factors influence RFFA establishment and functioning. We were particularly interested in how a management mosaic influences RFFA implementation and how RFPAs help populations adapt to changing wildfire risk. We found that ongoing conflicts or confusion surrounding wildfire management among residents, land managers, and firefighters in our study area provided an opportunity for the RFFA. The BCRFPA initially leveraged the insights, materials, and support of existing RFFA institutions, but eventually had to adapt the RFFA idea to the specific circumstances of its local context. The BCRFPA faced initial challenges related to finding their role in a management mosaic. These challenges included alleviating perceived competition with RFDs, assuming a suppression support or informant role to complement cooperative wildfire management efforts, and negotiating differential priorities for values at risk when working with other fire entities. We expand on each of these points in the following sections by comparing our results to existing wildfire social science literature. We also explore how our findings relate to goals of creating fire adapted communities (FACs).

Adaptation, Context, and Wildfire in Rangeland Systems

Our results suggest that the local context and external connections of BCRFPA members combined to influence the establishment and functioning of the organization. This finding matches existing literature demonstrating a need to adapt broad policies or wildfire mitigation programs at finer or local scales where programs may be variably implemented (Jakes et al., 2007, 2011; Stidham et al., 2014). For instance, we found that the BCRFPA was more comfortable serving a support role during cooperative wildfire suppression efforts, including a greater motivation to protect their private property (i.e., cattle) or leased forage resources during wildfire events rather than serve as point-people for fire suppression efforts.

The roles the BCRFPA negotiated for itself were a response to a number of local characteristics, including: 1) the fragmented nature of BCRFPA members’ lands (and therefore the BCRFPA fire protection area), 2) an aging population less comfortable with engaging directly in fire suppression activities, 3) the RFFA’s proximity to other firefighting entities, and 4) the ruggedness of the terrain. However, these same elements of local context also produced challenges for the BCRFPA in the form of relationship building among entities and an emerging understanding that RFFA members and other firefighters might not prioritize protecting the same resources. Overcoming these barriers to RFFA implementation and functioning first necessitated the establishment of RFFA legitimacy among existing fire entities. In our case, the BCRFPA represented one of the first RFPAs integrating into a landscape with multiple RFDs. This meant there was little RFD experience with RFPAs in the region, and RFDs proximate to the BCRFPA had little information to draw on when reacting to the RFFA creation. The BCRFPA also had to explore negotiation with RFDs, demonstrate it could aid in fire suppression response, and alleviate RFD concerns about RFFA establishment. These findings mirror trends in larger public administration literature where perceived legitimacy is considered a salient influence on the development and implementation of public land management partnerships (O’Leary and Vij, 2012).

BCRFPA members’ and firefighters’ understandings that they might not prioritize the same resources/values at risk also constitute a marked difference from existing research regarding the ways that RFPAs function. For instance, Stasiewicz and Paveglio (2017) found that the Three Creek RFFA formed and functioned in a remote, BLM-dominated landscape where ranching was the predominate land use. Consequently,

the Three Creek RFPAs and agency partners had few civilian life or structure concerns, and cooperative fire management was characterized by partners' common prioritization of rangeland resource protection and a focus on keeping rangeland wildfires small. These elements of local context promoted the development of the Three Creek RFPAs as a relatively autonomous wildland fire suppression entity that amassed and staged large-equipment across its remote, 1.8-million-acre jurisdiction (Stasiewicz and Paveglio, 2017). It served a useful purpose as initial attack because ranchers were in close proximity to the resource and professionals often needed significant time to respond. Comparatively, the BCRFPAs operate in gaps between fire protection districts (i.e., RFDs) and in proximity to the WUI where civilian lives and structures are at risk. This meant that entities sometimes had differential prioritizations of values at risk (i.e., structure vs. rangeland resources) and some confusion as to whether the BCRFPAs served as a wildland suppression entity that would buffer WUI values or as a wildland suppression-focused entity that could bring back-up equipment to a fire when other resources were scarce. In sum, the local context of the BCRFPAs meant its members were not as interested in evolving the RFPAs into an autonomous suppression entity, and its importance for initial attack on remote public lands was not as central as other cases (e.g., Abrams et al., 2017; Stasiewicz and Paveglio, 2017).

The increasing risk that wildfire poses to ranchers' livelihoods may have been an impetus for the RFPAs, but it was their linkages to outside associations, agencies, or other ranching populations that gave the BCRFPAs the foundation it needed to establish and adapt. These connections allowed the BCRFPAs to set up quickly and start operating in a new environment. The importance of this finding is a recognition that programs such as RFPAs may be somewhat generalizable to other resource-based settings and populations. Our results also suggest that RFPAs can generate interest among other populations if the conditions are right, including perceived risks to resource-based livelihoods, a historic culture of "neighbors helping neighbors" to solve collective problems, and ties to larger networks (e.g., political savvy or connections) or professional associations (such as a cattlemen's association or a timber collaborative) (Didier and Brunson, 2004; Lubell and Fulton, 2007; Lubell et al., 2013; Stasiewicz and Paveglio, 2017). Of critical importance is that the suggestions about RFPAs establishment come with support from other ranchers who have made RFPAs work. This reflects existing literature about the importance of horizontal capacities (e.g., local trust networks and relationships) for motivating collaborative behavior and program proliferation, such as community wildfire mitigation collaboratives and Firewise communities (Cheng and Sturtevant, 2012).

One potential challenge for the continued growth of the RFPAs program may be informing new chapters that RFPAs are not a "cookie cutter" solution, but rather a starting point from which to expand or adapt. Each RFPAs will not look the same, and very different RFPAs may evolve to address the nuances of their particular wildfire circumstances. Each RFPAs is likely to encounter important decisions about the level of agency the organization will assume, how it sets up its land base, and the relationships it establishes with other entities. Our study found that these elements all made a large difference in the ongoing operation of the BCRFPAs. Additional research focusing on RFPAs implementation and functioning should focus on the influence of increasingly fragmented landownerships or fire protection jurisdictions, especially considering the proliferation of suburban and exurban development into western US rangelands (Soulard, 2006). Further investigation also could focus on how RFPAs continue to operate in contexts with multiple and divergent values at risk, including new complexities like endangered or invasive species management priorities or the protection of historic or cultural sites.

Facilitating FACs on the Range

The FAC concept stresses the development of programs and approaches that allow local populations to be partners in fire management at a landscape level. Existing research also stresses how the particulars

surrounding how a FAC functions, including the programs that help achieve adaptation, must respond to local conditions. Both our work and other research indicate that RFPAs serve as an important program for promoting FACs in resource-based rangeland communities characterized by ranching (Abrams et al., 2017; Stasiewicz and Paveglio, 2017). RFPAs respond to ranchers' predominant values at risk, which are often very different from other at-risk populations (Paveglio et al., 2015a, 2015b).

Strong familial ties, a "neighbors helping neighbors" mentality, and often long-term or intimate understandings of the landscape makes ranching populations ideally suited to be more active partners in managing wildfire. Through RFPAs, ranching populations can help take personal responsibility for reducing wildfire risk to their private property and values at risk, which has long been heralded as the goal of wildfire social science surrounding development of FACs (Paveglio et al., 2015a). Likewise, ranching populations' strong ties to public lands allow them to promote the "all hands, all lands" ideas about managing cross-boundary risks that are a current focus of federal agency fire management (USDI, 2014; Charnley et al., 2017). There is likely a need to expand beyond an exclusive focus on public land grazing leasees and ranches if RFPAs are to really serve as a conduit for realizing cross-boundary wildfire suppression and communications. For instance, RFPAs members in our case recognized barriers to effective neighbor communication during wildfire suppression as a potential threat to effective and safe cross-boundary wildfire response. Other studies also stress the importance of continuous abilities to communicate and address wildfire risk effectively across a landscape (Brenkert-Smith et al., 2013; Ager et al., 2014; Haas et al., 2015). Abrams et al. (2017) also found that establishing reliable radio communication was a concern for RFPAs operating in remote rangelands.

Existing research and thought about FACs indicates that they may become more difficult to realize where a significant amount of social diversity is present across a landscape (Busby et al., 2012; Ferranto et al., 2013; Fischer and Charnley, 2012). That is, social fragmentation may also fragment efforts to manage fire across landscapes. The results of our case study demonstrate how this is the case, but they also provide insight on the issues that would need to be addressed in allowing RFPAs to be a part of a larger suite of adaptive actions in a rangeland context. RFPAs are a useful way of addressing ranchers' concerns, but simple management situations such as those described for the Three Creek RFPAs (Stasiewicz and Paveglio, 2017) are bound to become scarcer as residential populations continue to expand into rangelands. Fragmentation or infilling of large rangeland areas once used for ranching or farming might mean less "no-man's land" that was so important for BCRFPAs formation. It may be necessary to assess whether this criterion should always guide RFPAs establishment, particularly if the intent is to facilitate growth in a locality's capacity to deal with wildfire events with little to no extra-local assistance.

Management Implications

The proximity of the WUI and the fragmented nature of BCRFPAs protection areas meant that cooperators were sometimes frustrated by tactic changes that prioritized residential structures or populated areas over rangeland resources. It suggests that RFPAs implemented in management mosaics may need to adapt to a variety of cooperator concerns as they negotiate their role in wildfire management, including the negotiation of different roles in different portions of their jurisdiction. For example, an RFPAs might anticipate staging resources and taking sole responsibility for wildland protection in areas adjacent to RFDs that have no wildland suppression obligations or capabilities. Similarly, they may also be implemented to focus on remote portions of a fragmented RFPAs jurisdiction that agency managers struggle to respond to.

Ultimately, many RFPAs will need to negotiate the difference between articulating their efforts as a complementary service for fire

management in diversifying landscapes and setting reasonable expectations about what they can achieve. RFPAs may be able to serve different roles in different settings, but those roles need to evolve through dialogue with other local entities (e.g., RFDs, agencies, municipalities) and be supported by those actors in different ways (e.g., trainings, equipment, access). Future research on RFPAs may investigate opportunities for members to access hands-on fire training (sometimes called experiential fire learning, see *Scasta et al., 2015*). Examples of hands-on training might be exercises coordinating with fire management partners, utilizing radios, and practicing fire suppression tactics or strategies. Hands-on training activities may be particularly useful for RFPAs in fragmented social landscapes in that they could provide an opportunity to build and maintain trusting relationships among cooperators who may not meet on a fire line frequently. Prevailing trends of decentralizing decision-making power and providing private/local actors with more agency in natural resource management are often heralded as an encouraging and empowering step for rural communities. However, it can be argued that the pendulum can swing too far. RFPAs (i.e., ranching populations) could run the risk of being overutilized or depended upon to provide wildfire protection on public lands or to act as a buffer for WUI protection without much professional support. It will be important for both agencies and RFPAs to agree on standards for monitoring these dynamics and revisit their respective responsibilities at regular intervals.

Acknowledgments

We thank all the interviewees for their participation in this study. Funding for this work was provided in part by the National Science Foundation (Hazards SEES 1520873), the Rocky Mountain Research Station of the USDA Forest Service (15-JV-11221636-121) and the National Institute of Food and Agriculture (IDAZ-MS-0107).

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