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Support for regulatory and voluntary approaches to wildfire adaptation among unincorporated wildland-urban interface communities

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ABSTRACT

Regulation of building standards and residential development practices in the wildland-urban interface (WUI) is increasingly advocated as a possible avenue for wildfire risk reduction. However, many documented instances of successful wildfire adaptation occur in incorporated communities with local governments or formalized structures for channeling such efforts. Less research has explored whether regulatory approaches might be a viable option for adaptation in unincorporated communities without local governments, particularly from the perspective of community members and local professionals. The research presented here attempts to understand strategies, programs or incentives that local residents think would best advance fire adaptation in their communities given local social context, with a focus on both regulatory and voluntary approaches. Data presented come from focus groups of residents and professionals in Story, Wyoming, and Timber Lakes, Utah. Participants in both communities displayed low support for regulatory approaches due to distrust in local, state, or federal governments, preferring instead to conduct wildfire risk reduction activities on a voluntary basis. Each population was willing to consider regulatory approaches only if associated standards or policies were specifically tailored to their community, channeled through a trusted organizing body and organized by community leaders. Residents were interested in regulatory efforts that allowed community members the opportunity to act at the local level, govern efforts themselves, and produce tangible benefits for their community. We discuss implications for identifying appropriate voluntary and regulatory wildfire risk reduction approaches in unincorporated or rural communities and provide suggestions for encouraging collective action in similar local contexts.

1. Introduction

Formal requirements, local policies or ordinances are increasingly promoted as a plausible avenue for wildfire risk reduction among fire-prone populations. This includes calls to implement stricter land use planning and zoning restrictions in wildland-urban interface (WUI) areas (the area where dense human development lies adjacent to or intermixed with wildlands). Existing efforts to address wildfire risk include prohibiting building in fire-prone landscapes and providing incentives or levying fines that encourage vegetation mitigation or retrofitting of homes with fire-resistant materials (Syphard et al., 2013; Schoennagel et al., 2017). Discussions about regulatory approaches often center on increasing homeowner responsibility and accountability for wildfire risk reduction in the hope that small-scale efforts will contribute to community fire adaptation and changes in local culture surrounding wildfire mitigation (Calkin et al., 2014; Abrams et al., 2015a). The outgrowth of such efforts offers opportunities to implement more sustainable and enduring approaches that are intertwined with community values and needs. However, little existing research examines citizen opinions surrounding various regulatory approaches on private lands that are targeted at reducing wildfire risk. Also missing is a more comprehensive explanation for whether such regulatory approaches would be supported and effective in WUI communities. Understanding how specific communities might respond to increased oversight regarding property management and behavior in the WUI is essential to identify when an approach might actually be implemented, and whether it can adequately address localized issues and concerns surrounding wildfire risk (Paveglio et al., 2018).

Incorporated towns and cities typically have existing mechanisms and processes in place that allow for formal regulation, policies and ordinances that can help address wildfire management challenges. However, these formalized avenues for reducing risk are often not

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available or supported by unincorporated communities, who do not have their own local government or legislative structure to develop and implement regulatory approaches (Mockrin et al., 2018; Paveglio et al., 2018). Current arguments in support of regulatory approaches to wildfire on private lands often assume that success in more suburban, dense WUI communities will translate to more rural, dispersed, and sometimes unincorporated communities without critically considering the differing local contexts and impacts that regulatory approaches may have on local adaptation to wildfire (Syphard et al., 2013; Abrams et al., 2015b). The identity of many unincorporated communities in the U.S. West are closely tied to self-regulation and independence, meaning that the introduction of unwanted or ill-fitting regulation has the potential to change local dynamics and create repercussions for community-agency relationships, place attachment, and collective action (Jakes et al., 2011; Mockrin et al., 2016; Prior and Eriksen, 2013). There is scant evidence suggesting whether heightened regulation is attainable in many WUI communities, particularly in rural areas where existing regulatory structures are often absent. As such, this effort seeks to understand support or opposition towards regulatory approaches among unincorporated communities. Results from this research offer insights regarding the potential applicability and feasibility of regulatory approaches in other areas of the WUI.

The research presented here explores community members' perspectives surrounding the effectiveness and acceptability of regulatory approaches for wildfire management on and in close proximity to private lands. We investigate the specific elements of local social context that influence stakeholders' perceptions of regulatory approaches to wildfire management through a series of focus groups in two unincorporated communities. Discussion about support or opposition regarding various wildfire management approaches focused on identifying the effectiveness of voluntary and mandatory approaches for risk reduction, and local acceptance associated with each approach. We also sought to identify approaches that community members felt were suitable alternatives for promoting collective action in instances where regulatory actions were not supported. Our effort contributes to a broader body of literature that seeks to better understand how communities can be matched with a suite of wildfire risk management approaches that reflect local contexts in order to aid in the development of fire adapted communities (Paveglio et al., 2018). We also seek to encourage discussion about the place of unincorporated community approaches to wildfire risk reduction, and the role of community in decision making about wildfire regulation.

2. Literature review

2.1. Collective action and wildfire

Identifying whether collective action is appropriate or possible remains a central goal for understanding and improving community adaptation to wildfire. However, approaches to community adaptation are likely to vary across the western U.S. as a result of differential ties between people and place (Paveglio et al., 2009; Meldrum et al., 2018). Numerous studies have sought to understand social diversity in the WUI as it applies to wildfire response and risk reduction, identifying a need for more nuanced approaches to efforts such as policy development and implementation, management approaches, risk communication, and public involvement that can accommodate this heterogeneity (Varela et al., 2014; Paton and Buegelt, 2012; Spies et al., 2014). Additionally, there is increasing interest in facilitating improved collective action among residents in fire-prone communities as a central approach to reducing wildfire risk in an effective manner (Gan et al., 2015; Canadas et al., 2016). However, motivating and sustaining collective action at the community level has proven challenging, particularly when the fabric of that community continues to evolve as new residents move in or long-term residents move away (McCaffrey et al., 2011; Paveglio et al., 2015a). The research presented here focuses on identifying ties between community support or opposition to regulatory or voluntary approaches and their relationships with collective action by considering three overarching considerations synthesized from existing wildfire social science research by Paveglio et al. (2018): (1) ways to promote property-level residential adaptation (Newman et al., 2014; Champ and Brenkert-Smith, 2016); (2) governance model/structure of collaborative processes (i.e. the different ways that stakeholders may come together to address wildfire risk in an area) (Jakes et al., 2011; Fischer and Jasny, 2017); and (3) adaptation leadership and relationships (Olsen and Shindler, 2010; Canadas et al., 2016). It is important to note that successful approaches in one community may not transfer to another as a result of varying place-specific social conditions, but there are some broader trends that can help characterize different community responses (Paveglio et al., 2009, 2012, 2015a). We briefly outline key elements underlying each of these three considerations as they relate to voluntary and regulatory approaches and their implications for wildfire adaptation in the section below.

One important component of efforts to encourage property-level adaptation entails consideration of whether voluntary actions and incentives or formalized regulatory approaches will be most effective and supported within a community (Reams et al., 2005; Berry et al., 2016). Recent high rates of WUI expansion across the West have driven many states and counties to focus on regulatory efforts to address wildfire through land use planning and development in an attempt to preemptively limit the amount of risk new developments may face (Gude et al., 2008; Syphard et al., 2013). Likewise, an increasing number of researchers, policymakers and fire managers are exploring the possibility of mandatory wildfire mitigations on private properties (e.g. vegetation management or fire-resistant building materials) (Mockrin et al., 2018; Syphard et al., 2013). Despite these efforts, other evidence suggests that regulatory approaches are unlikely to be adopted or may be actively opposed by some populations (Jakes et al., 2010; Abrams et al., 2015a; Steelman and Burke, 2007). Existing research indicates that requirements surrounding wildfire mitigations are more successful in more suburban communities where similar regulatory approaches already exist (Paveglio et al., 2018; Abrams et al., 2015a). Voluntary approaches to wildfire mitigation actions have been particularly successful among communities that already have some mechanism or group that promotes cohesion, such as Homeowners' Associations (HOAs) or social clubs (Winter et al., 2009). Educational programs often are less effective in more rural or dispersed communities, particularly those with residents that may have firefighting, forestry, and emergency management experience, or among those who have acquired the skills and resources needed to manage their property independently (e.g. heavy equipment operators, chainsaw use, residential sprinklers) (Monroe et al., 2013; Paveglio et al., 2015b). The success of more informal collective efforts for wildfire mitigation are more likely to depend on longitudinal support and commitment to independent actions that address wildfire (Brenkert-Smith, 2010; Stidham et al., 2014). Exploring what incentivizes collective action in these varying social contexts and identifying whether these approaches may be transferrable may offer an alternative to legally enforced regulation.

Support and opposition to regulatory or voluntary approaches associated with wildfire management actions often are influenced by past interactions or collaborations among residents. They also may be influenced by past interaction between communities and outside organizations (e.g. community support for a fuel break implemented by an agency may depend on previous resident interactions with that agency and resultant perceptions of trust stemming from that experience) (Brenkert–Smith et al., 2006; Carroll and Paveglio, 2016). The presence or absence of rules or agreements that structure such collaborative efforts serve as a form of fire management governance and can influence local involvement in different forms of adaptation efforts (Abrams et al., 2015a; Steelman, 2016). Existing studies indicate that communities featuring a high proportion of part-time populations, or whose members feel that responsibility for fire risk management primarily lies

with fire professionals, will be less likely to support voluntary mitigation actions (McCaffrey et al., 2011; Winter and Fried, 2000). Additionally, regulation of fire mitigation behavior often is more challenging in rural, independent communities where a lack of government oversight may encourage grass-roots action, and where some research suggests that trust in firefighting agencies is lower (Paveglio et al., 2015b; Absher and Vaske, 2011). Collaborative actions in these rural communities are more likely to originate at the local level and in more informal capacities, such as the establishment of social norms that are enforced through peer pressure to comply. Creating avenues for community-led regulation offers opportunities to increase local responsibility for wildfire risk and foster partnerships for management between communities and fire professionals (Williams et al., 2012; Lachapelle and McCool, 2012).

Adoption of voluntary or formally regulated approaches may hinge around organization or oversight by leaders who are trusted by residents and can achieve collaboration among diverse interests (see also Absher and Vaske, 2011). These findings also align with lessons from broader natural resource management, which emphasize the importance of gaining the early support of community leaders as a means to build broader resident support for new management approaches, particularly in rural areas (McLean and Jensen, 2004; Abrams et al., 2015b). One approach for introducing new risk reduction actions may be to channel them through existing individuals or groups that are trusted in the community, but the success of that strategy must also respond to local social conditions, such as the level of risk awareness and understandings of responsibility for mitigating wildfire among residents (Koebele et al., 2015; Fischer and Jasny, 2017). For example, the presence of a local champion or a HOA that is already serving residents in other capacities may be the preferred outlet because it is localized and familiar, or that existing formal regulation through that organization has been successful (Stidham et al., 2014; Paveglio et al., 2016). Mismatches or disagreement about approaches to wildfire management can lead to loss of trust and strained citizen-agency relationships. This can occur when regulations such as burn bans are not implemented consistently by a governing agency, or there is confusion about the same regulation at different scales such as at the county and HOA levels (Hann and Burnell, 2001).

There is limited research that examines the factors influencing cross-community variation in support or adoption of voluntary or regulatory approaches, and the degree to which those outcomes are influenced by local social context that dictates the form or function of adaptation, governance and leadership. Heterogeneity in community context and resultant implications for risk reduction also has been observed in literature on other hazards (e.g. Newman et al., 2014; Bird et al., 2011; Flint and Luloff, 2005). Understandings of the factors that can influence these differences in support or opposition towards fire adaptation efforts also is valuable for better pairing communities with appropriate policies and management approaches. Furthermore, there is a need to understand how and if elements of local social context interact with each other to influence collective action at the community level. The following section reviews existing research on characteristics that help explain community ability to adapt to wildfire and discusses how these efforts reflect community diversity in the WUI. It also outlines current understandings of community diversity and support or opposition regarding different types of regulatory approaches.

2.2. Local contexts and regulatory approaches to wildfire

There are growing concerns that existing regulatory or management approaches for addressing wildfire in the United States are not designed to reflect the social diversity across the WUI, and that they may lack the flexibility needed to address the increasing complexities of wildfire management (Jakes et al., 2011; Stidham et al., 2014). Recent efforts have sought to accommodate social diversity when considering whether to implement voluntary or regulatory management approaches. Those efforts look for ways to minimize barriers to community wildfire adaptation by matching local social conditions with risk reduction strategies most likely to be carried out by community members.

One such approach is provided by Paveglio et al. (2018), who use lessons from the breadth of wildfire social science to outline adaptive capacity 'pathways' that may help streamline policy design and management approaches for four different characterizations of WUI communities. Broader recognition of disparate approaches to wildfire management within the same geographic area also highlight the need to consider the influence that diverse WUI populations have on the implementation of fire adaptation strategies, particularly when carrying out larger-scale efforts that address both environmental conditions and risk reduction (Brenkert–Smith et al., 2012; Paveglio et al., 2018; Meldrum et al., 2018). Exploring the social diversity of rural community support for voluntary and regulatory approaches to wildfire management can help clarify unincorporated community needs for wildfire adaptation and how they might differ from incorporated communities.

Existing research indicates that residents' support and action surrounding wildfire mitigation or adaptation efforts can be understood as a product of evolving local context. The evolution of that action stems from changing relationships among residents or between communities and professionals, social change, the experience of past fires, and changes in landscape processes (e.g. buildup of fuels or climate change) (Flint et al., 2010; Meldrum et al., 2018). Paveglio et al. (2009) identify four broad conceptual elements of WUI community adaptive capacity: (1) demographic/structural characteristics; (2) place-based knowledge/experience; (3) informal interactions/relationships among residents; and (4) access to scientific/technical knowledge networks. Nested within each of these four categories are 21 distinct characteristics (shown in Fig. 1) that combine to help to explain how communities differ in their approaches to and actions in response to wildfire risk. The combination of characteristics present in each community help explain why or how community members might respond to various wildfire adaptation strategies, including voluntary or regulatory approaches to adaptive action. Paveglio et al.'s (2009, 2012, 2015) approach implies that WUI communities are continually evolving and interacting with other local or extra-local processes to influence the capacities that people mobilize in response to stressors such as wildfire.

Existing efforts to study social diversity in the WUI have typically focused on the range of different actions that communities might take to address risk (i.e., voluntary actions), rather than actions being imposed on them by regulatory bodies (i.e., regulatory actions) (Brenkert-Smith, 2011; Jakes et al., 2011). Uncovering the influences behind local preferences related with regulatory wildfire mitigation or adaptation strategies offers one opportunity to streamline risk reduction efforts and foster shared management of risk among citizens and agencies (Berkes, 2009; Toman et al., 2013). Improving shared management of wildfire and promoting policy flexibility to accommodate for these different contexts may play a key role in producing sustainable approaches to 'living with fire' (Paveglio et al., 2018). This study aims to address the needs outlined above by exploring how existing local conditions in two socially distinct WUI communities influence support or opposition for voluntary and regulatory approaches. We also seek to identify which alternatives residents would support alongside or the place of regulation, and what characterizes observed patterns in support. The following research question drives our effort: *What factors influence support or opposition for formal wildfire regulation in unincorporated communities?*

3. Methods

3.1. Study site selection

We sought to identify two distinct communities in different regions with potential variability in local social context that might influence wildfire. Researchers began the site selection process by compiling a list of WUI communities in Western states that are not often represented in

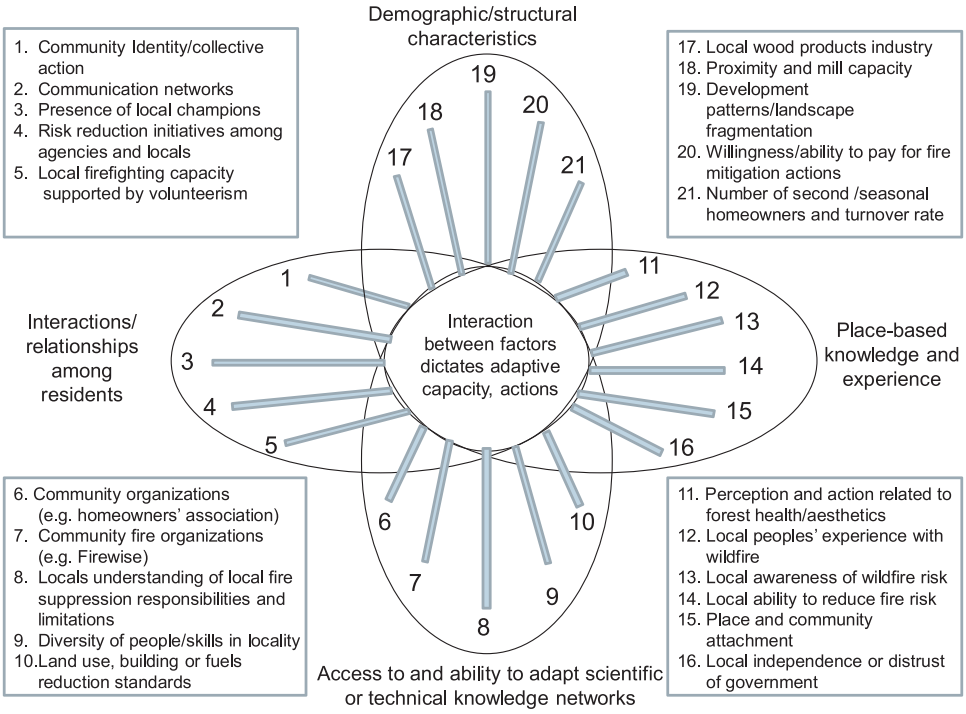

Fig. 1. Characteristics influencing adaptive capacity to wildfire in WUI communities (replicated from Paveglio et al. (2012)).

existing social research on fire. Wyoming and Utah emerged as good candidates for underrepresentation. Researchers collected preliminary information about site selection from multiple sources to help identify each potential area, including Google Maps, city and county web pages, land use data and local news articles. Indicators of social context likely to shape each of the potential site locations included the presence of local businesses or operations such as timber mills, access to amenities and recreation opportunities, and presence of absence of ongoing efforts to address fire risk. Researchers then conducted semi-structured telephone interviews with key informants from a shortlisted set of potential case study communities, including local officials, emergency management professionals, and community leaders. Initial questions during this screening process included description of interactions among residents and agencies and description of local peoples' attitudes and approaches to wildfire risk management.

Two communities emerged as potential study areas for this research: Story, Wyoming, and Timber Lakes, Utah. Story is situated in the Bighorn Mountains and surrounded by the Bighorn National Forest. Approximately 828 people live in the Story area year-round (U.S. Census Bureau, 2010). A project to construct a fuel break around the community has been ongoing since 2004 (Sheridan County, 2014). Story is currently a Firewise Community. Forested areas surrounding Story are predominantly characterized by ponderosa pine, intermixed with other coniferous species like lodgepole pine. The Story area has limited ingress and egress and is supported by a small local volunteer fire department.

Timber Lakes is a gated community of around 607 full-time residents overlooking the Wasatch Mountains, consisting of approximately 800 developed and 200 undeveloped lots (U.S. Census Bureau, 2010). The community has direct access to state recreational lands and is in close proximity to the Uinta-Wasatch-Cache National Forest. The Timber Lakes community features an assortment of common areas that include lakes and trailheads for snowmobiling trails. The northern end of the community is populated by scrub oak, while the southern end is characterized by aspen. The Timber Lakes Property Owners' Association (POA) collects annual fees to maintain roads and fund security measures in the area, serving a similar purpose to a HOA. Both Story and Timber Lakes are unincorporated, meaning that they are not overseen by a formal city government. Neither community has been directly impacted by a wildfire in recent years, but other communities in close proximity have reported property losses during recent fires.

3.2. Focus groups

Researchers conducted a total of eight focus groups (four in each location) with residents and professionals in both communities: Three focus groups comprised of residents and one focus group comprised of professionals. They collected data in Story during August 2017 and in Timber Lakes during January 2018. Residents and professionals participated in separate focus groups in order to allow both groups to speak openly about one another and to avoid potential conflicts among stakeholders. A total of 44 residents and professionals participated in the Timber Lakes focus groups and 45 residents and professionals participated in Story. Focus groups each lasted between 1 h and 40 min and 2 h and 15 min. Focus groups were part of a larger study of five communities; for a comparison across all locations see Paveglio et al. (2019).

Professionals and local community members contacted to take part in the focus groups were identified using theoretical sampling, which seeks individuals with specific knowledge about the topic of interest in each community (Charmaz, 2000). Professionals recruited to participate in the focus groups included land management agency employees, fuel and fire mitigation experts, government officials, and local emergency management (including the County Sheriff's Office and local fire department). Participants selected to participate in the focus groups were chosen for their potential insight on current efforts to address wildfire risk and how community residents have interacted with professionals to inform management decisions.

Community members recruited for the focus groups were identified through local social organizations and Internet searches to identify relevant local news stories that featured residents. These individuals were then asked to recommend other residents who have similar or contrasting opinions about fire management in a process known as snowball sampling (Biernacki and Waldorf, 1981). Researchers also recruited resident participants in person by intercepting residents in popular community areas and by knocking door-to door at households

throughout each community. This systematic recruiting approach ensured that focus group participants were representative of residents living in each community, including local values, attitudes and preferences about wildfire management.

Researchers designed a mixed-method protocol that included semi-structured questions and discussion prompted by interactive ratings of potential wildfire adaptation strategies designed to elicit conversation among research subjects. Participants were first asked to characterize the community in their own words before identifying where residents in that community live on a map of the broader area. Participants next answered several sets of five-point Likert-scale questions assessing a range of different management scenarios, approaches or policies for their community based on two concomitant criteria: (1) effectiveness for risk reduction; and (2) whether the proposed management would be supported or implemented by residents and professionals in the area. Each potential management scenario, approach or policy included in the focus groups fell under several broad categories represented in existing literature, including: (1) regulations and incentives (e.g., Jakes et al., 2011); (2) responsibility for risk management (e.g., Olsen and Shindler, 2010); and (3) mitigation efforts at the household and community level (e.g., Paveglio and Kelly, 2018). Examples of these scenarios included: requiring mandatory evacuation of all residents during fire events, certifying residents so they can aid in suppression activities on lands near their property, requirement of vegetation mitigations on properties that are enforced with fines or penalties, and increasing voluntary mitigations performed by residents on their properties. The scenarios provided were purposefully broad, allowing focus group participants to describe or define what they felt would be most appropriate for their community. For example, one scenario asked how effective additional local taxes to support wildfire management would be for reducing wildfire risk in their area. Participants then discussed who would tax them, and what they would like to see that money spent on.

Participants each used a personal electronic response card or 'clicker'– electronic remotes that allow the holder to record ratings of support for each approach presented. Researchers then used automatically generated graphs depicting rating results to invite discussion about reasons for support or opposition to each approach given the specific context of the community. Facilitators used graphs to guide discussion on reasons why certain approaches might be more successful locally in comparison to others. We focus solely on the qualitative data here in order to explore participants' justifications and perspectives in depth.

3.3. Analysis

Each focus group was recorded with the permission of participants and later transcribed verbatim. Researchers discussed emergent themes after every focus group, which were used to guide the first step of the coding process. All subsequent qualitative analysis was conducted in QSR NVivo. Two iterative rounds of coding characterized the analysis process. First, transcripts were coded based on any indication of the 21 adaptive capacity characteristics outlined in Paveglio et al. (2012, 2015a, 2018) (Fig. 1). This allowed the researchers to identify which elements of local context were most influential in community support or opposition for different wildfire management approaches. A second round of coding used results from the first phase to identify explanations or justifications for participant support or opposition to each management approach, regulation, or policy introduced in discussions guided by the Likert-scale questions. This second phase utilized a combination of analytic induction and thematic analysis to develop descriptive codes (Ryan and Bernard, 2003; Gibbs, 2007). Combining the two coding phases enabled the identification and characterization of final themes. Researchers each coded a subset of randomly selected transcripts to ensure intercoder reliability (Saldaña, 2016). Finally, representative quotations were identified and agreed upon by researchers (Boyatzis, 1998).

4. Results

4.1. Drivers of community opposition to regulation

Both Story and Timber Lakes residents described themselves as vehemently against regulation in their communities as a result of previous experiences with regulation or government entities. However, the specific reasons behind that lack of support reflected specific and divergent local context in both areas. Story residents described themselves as a "lawless group" that shared one commonality: their desire to escape government overreach. Many shared their experiences living elsewhere in the U.S. with higher levels of regulation and identified the absence of private property regulations as a dominant factor in their decision to move to Story. Residents in Story often did not distinguish between federal, state, or local governments, but rather saw them as one united "government" entity that restricted resident behavior. As one Story resident summarized:

> *By adding more government to try to solve the problem [with fire risk] that this community has, I just don't have faith that government is gonna actually be a plus. We'll pay for things, like they'll be people getting salaries and so on. But will they actually accomplish good ends? I'm very skeptical.*

Several focus group participants voiced concerns that the introduction of any government-enforced regulation would change their way of life and lessen residents' interest in continuing to live in the area. While Story featured an absence of formal rules or entities that would regulate wildfire mitigation or adaptation actions, participants did describe underlying social norms that encouraged certain risk reduction behaviors. Residents discussed acting as informal regulators by talking with their neighbors and new residents about efforts to reduce risk on their property, explaining how adherence to those actions was common sense and tied to their community identity as self-sufficient. Encouraging mitigation actions on private property was described as a necessary alternative that could stave off formalized collective action in a community that values independence. As one resident explained:

> *I kind of understand Story more as an identity than a community. We don't get together in large groups and enjoy each other very much, but we're very proud to say we're from Story. So how do you appeal to that identity issue?... A good Story person doesn't burn in the summer. A good Story person cleans up your block. A good Story person, you know? …I don't think you're gonna get people together here, we're just too contrary and we're too independent. If you're here, it's the kind of person you are.*

Residents in Timber Lakes described opposition to regulatory approaches as explicitly tied to historic interactions community members have had with their local county government. Residents felt overlooked by the county, describing Timber Lakes as a significant and long-term contributor to the county tax base yet seeing little benefit to their community in return, particularly in terms of access to public services such as professional response to medical emergencies. Much of the reported distrust between residents in Timber Lakes and the county revolved around the construction of a small fire station that had been built in Timber Lakes several years prior on land donated to the county by the POA. The station houses an engine but is not staffed and primarily serves as a staging area for firefighters travelling from the Heber City Fire Department approximately a 25-minute drive away. Although residents described themselves as grateful for the fire station, the absence of trained professionals and a perceived legacy of strained relationships with those who would respond raised concerns about safety in the community, with one resident explaining: "*Even if there is a fire in Timber Lakes, the firefighters are not going to respond from Heber to the fire station in Timber Lakes. So, the fire station in Timber Lakes is eye candy.*" Residents felt that their experience with the fire station was exemplary

of county oversight of Timber Lakes:

> *Somebody, it was a realtor, went through and figured out that we provide something like 15 percent of the tax revenue for Wasatch County. And, I mean, that's an awful lot, and I don't think we get a whole lot of representation in the county. I mean, we're sort of the red-headed stepchild. We have our own first responders out here. We have a fire station with no firemen and no equipment… I don't think that's right with the amount of revenue we provide.*

Residents felt that the county would not be a trustworthy or unbiased regulator for their community based on these ongoing interactions. However, they were more willing to consider regulation if it was introduced by federal or state bodies such as the U.S. Forest Service or the Utah Division of Fire, Forestry and State Lands.

Residents and professionals described the Timber Lakes POA as one plausible avenue for implementing future wildfire regulations in their community. They hoped that the presence of an existing regulatory structure such as the POA could engender consistent community compliance or local control and was seen and more trustworthy than county governments. However, respondents also felt that the POA would need to adapt to better represent residents and improve its ability to implement existing regulations such as the consistent enforcement of burn bans. Focus group participants indicated that they had reported other residents who breached fire pit or burn ban regulations to the POA with little effect or repercussions. They also described how inconsistencies in the timing of burn bans across the POA, county, and National Forest had created confusion about when it was safe to burn.

Residents and professionals in both Timber Lakes and Story described ongoing social change within their populations, with particular attention paid to increasing numbers of second-home or absentee landowners who displayed different priorities and values associated with fire management or risk mitigation. More specifically, residents in both communities described some newcomers as being either: (1) unaware of wildfire risk and normative risk reduction practices already existing in each community; or (2) who did not plan to support or implement mitigation measures because it was of lesser concern to them, often citing the presence of insurance on their property or additional primary homes elsewhere. The perception of these seemingly differing attitudes motivated primary homeowners or longer-term residents to focus on the need for additional regulations related to managing actions on new or part-time residents' properties. The existing presence of and familiarity with the POA in Timber Lakes led residents to support enforcement of new regulation using this existing platform. As one resident explained:

> *I think if there were proper requirements, and reasonable requirements, that there is definitely people who don't want to be told what to do with their land, but the reality is when they sign up to purchase a lot in Timber Lakes, or in any community, there are CC&Rs* [Covenants, Conditions, and Restrictions]. *Our CC&Rs aren't all that great, but they can be enforced.*

Ongoing conversations about wildfire management in both Story and Timber Lakes included discussions about the potential values and consequences of becoming incorporated towns. This change had the potential to instill a formal government for the area that could regulate various aspects of shared or private property and open up avenues for access to other management resources, including emergency services. Efforts toward incorporation were met with opposition in both locations, though for differing reasons and to a differing degree.

Residents and professionals in Story outlined how the growing part-time population of residents expected access to urban services such as garbage disposal and that growing development would require better infrastructure. However, while incorporation could help achieve these needs, it would fundamentally change the identity of the community by creating a greater dependence on government entities and sacrificing some local-level control or independence. Story residents' distrust in government led them to believe that this approach would not be as effective. Professionals who served Story also expressed less need for incorporation because of the ongoing success different agencies had in working with the community:

> *It's the cooperator relations that have been fostered between State, Federal, County governments. That everybody's pitching the same message, that we all feel like we work together well as a team. So, it's easier with the approach to the general public when everybody has a good working relationship across those agency fence boundaries.*

Residents in Timber Lakes were so socially diverse that professionals and residents felt that voluntary collective action to address wildfire risk was unlikely to be consistent. Professionals in Timber Lakes indicated that residents in the area needed to strengthen some common organization or governing body that would allow for more consistent or enforceable standards in the absence of shared norms:

> *Until Timber Lakes wants to become more cohesive as a community, I don't see any of these programs creating enough interest [for them] to want to do them. If they were to incorporate I would think that would be great, because they would have to come together, and they would have some common goals of some things, and some responsibilities.*

While residents in both Timber Lakes and Story preferred informal organization of wildfire adaptation strategies and had less support for formal government, they were supportive of certain government programs designed to assist local landowners. For instance, residents in Timber Lakes were highly supportive of an invasive thistle spraying program organized by the county, primarily because the county provided equipment and chemicals while residents contributed their time and effort to the project on their private property or common areas. Those who did not remove thistles could potentially receive fines. Residents indicated that support for this program stemmed from the flexibility to lead their own efforts at little cost, and because they were able to see negative consequences enforced by those who did not abide.

4.2. Conditions for support of regulatory approaches

Residential and professional focus group participants indicated that the financial burden of wildfire risk reduction on private property represented a significant barrier to independence in both communities. Residents struggled to justify the costs of vegetation management or retrofitting to their properties despite the potential risk posed by future fires. Many explained that an inability to pay for mitigation left them reliant on financial assistance in the form of cost-share programs or grants from government agencies. Participants described how this reliance on cost-share programs caused some cognitive dissonance among people who wanted to be independent, but that the programs could be a motivating factor for those who were unsure about whether to conduct mitigations on their property. As one Story resident explained:

> *One thing I would say, the cost is a very important matter. I mentioned earlier before we started that I took advantage of some kind of a government-funded effort to help me thin stuff out at my property. And I admit if I didn't get that money, I probably wouldn't have done that.*

Residents in Timber Lakes and Story both described reductions in their insurance premiums as a potentially viable incentive that could catalyze risk reduction activities on their property. However, residents worried that the insurance industry might not find such programs profitable in states like Wyoming and Utah.

Residents did indicate some support for additional taxation if it would be used specifically for work in Timber Lakes or could allow for the employment of fire professionals who would be based out of their fire station. Story residents also were interested in additional taxation to support their already established local volunteer fire department. They hoped that additional income from taxes could be used to assist with training and to station full-time personnel during summer months

who could conduct outreach with residents.

Several focus group participants in Timber Lakes expressed interest in training to become a volunteer firefighters and access equipment in their local fire station, which they felt would generate greater local benefit from the fire station. However, they cited the level of commitment – approximately 1,500 hours of training—as a barrier to their participation. Several community members had formed a Citizen Emergency Response Team (CERT) consisting of residents who were trained in first aid and could act as first responders to community emergencies until professionals arrived. Members of the CERT hoped that by recruiting new members, they could increase their local capacity to respond while reducing their dependence on county-level services.

4.3. Adapting management to meet community needs

Studied communities differed in their preferences for local leadership of wildfire risk reduction efforts and the way in which those leaders should interface with other partners. In Story, pushing regulatory approaches or new management actions through the volunteer fire department was described as most appropriate to participants, as this was considered the most 'formal' and trustworthy organization in the community. As such, participants described the volunteer fire department as the most effective outlet for spreading messages and action through the community. One participant summarized this sentiment as such:

> *...the most cohesive force we have in the community is our fire department. The community will support it. Having said that, our fire department's very small. We need to figure out a way to augment the fire department. Then you figure out a way to have some of more seasoned citizens carry on somebody's functions such as communication, fire mitigation.*

Participants in Timber Lakes described a slightly higher resident tolerance for regulatory approaches due to required compliance of their POA CC&Rs. They indicated that the best and most effective avenue for introducing and implementing regulation in the community entailed amendments or additions to their CC&Rs. That process would not be easy because changes require a vote, and a certain percentage of homeowners had to submit a ballot for the initiative to pass. Meeting that threshold would be increasingly difficult in a community that features a large contingent of absentee or second-home owners. Residents and professionals discussed the need to identify a community leader or committee who would take responsibility for wildfire-related issues within the POA, but were unsure who this individual would be. They discussed the need for 'neighborhood captains' who could informally organize a small subsection of the community to address fire. Each captain's responsibilities might include engaging neighbors in discussion about mitigation or ensuring the safety of those nearby during evacuation.

> *If we had it organized, if you have a chief on this section of road. Like you would do Birch and we would do Greenbrier and you're making sure that the people on your road were aware of where is your closest fire exit.*

Residents in both communities expressed a desire to see their appointed 'leaders' take charge of public education about wildfire risk reduction. Education was frequently viewed as a suitable alternative to regulation, as representatives from both communities indicated that issues with wildfire risk reduction were caused by a lack of awareness among second homeowners or visitors. They felt that education would encourage greater action, and that this approach was feasible moving forward. Story residents and professionals indicated that education about evacuation, including possible routes and decision-making about timing, would be most beneficial for their community as the area had limited ingress and egress. In addition to evacuation, those in Timber Lakes were also interested in understanding potential fire behavior and areas of higher risk in their valley in order to target areas for hazardous fuel reduction and to motivate homeowners to take voluntary action. Regulatory approaches were considered more of a 'last resort' to force residents into taking action and felt that leading with education might overcome the need for regulation. As one resident in Timber Lakes explained:

> *We can put together, we've done it on other projects, we can put together a grassroots project that would probably save ourselves. Starting even with awareness, like [name] said, just people knowing, or saying, "Hey, here's the things that you can do." You can't force everybody to do it. But we can get started.*

5. Discussion

This research sought to better understand support or opposition to voluntary and regulatory approaches for wildfire management in two unincorporated communities. We found that residents in both Story, WY, and Timber Lakes, UT, expressed differing levels of opposition to various forms of regulation as a consequence of varied interactions with government and negative experiences with existing regulations. However, each population was willing to support some regulatory approaches that were specifically tailored and unique to their community, especially if those efforts allowed them the opportunity to act at the local level, govern efforts themselves, and produce tangible benefits for their community. We discuss these results in the following sections as they relate to the three considerations for collective action that this study focused on and provide suggestions for encouraging collective action in other circumstances.

Support for certain types of property-level adaptation activities observed in both our study communities was tied to existing interactions or collaborations (including the lack of collaboration) with extra-local organizations. Members of Timber Lakes were more willing to support regulations on their property if it was required through POA CC &Rs and implemented in a consistent manner. Distrust in the county government fostered interest in channeling regulated risk reduction efforts through the POA, creating a locally-driven effort to address wildfire that is similar to those observed in other communities with their own regulatory boards (Winter et al., 2009; Stidham et al., 2014). Absence of a local government in Story led residents away from regulatory approaches and towards support for more incentivized approaches such as tax breaks or reductions in insurance premiums. The opposition towards any effort that penalized resident actions in Story reflected and is driven by their shared identity as a 'lawless' population. Residents did not want to have their actions restricted as a consequence of previous experiences and displayed little interest in collaborative efforts beyond their community as a result. This example illustrates how the specific form of adaptation leadership and relationships, preferred structure of collaboration, and ultimate form of preferred property-level residential adaptation outlined in Fig. 1 are the product of primary interactions that influence community-level support for wildfire management approaches. The outcome of those interactions then influence community-level support for various regulatory wildfire management approaches by dictating whether they fit local culture and might be carried forward into the future. More specifically, local independence and community identity (characteristics outlined in Fig. 1) were highly influential factors affecting both Timber Lakes and Story's adaptive capacity to wildfire. Residents in both communities wanted to organize internally at the community level first before considering recruiting trusted organizations to support them and sought to develop approaches that reflected their community identity. This finding may be indicative of other rural communities adapting to wildfire in the Western U.S. and beyond (Brenkert-Smith, 2007; Paveglio et al., 2015b); however, more research is needed to understand how this preference for independence may translate to actions in other unincorporated communities first.

Local independence in both Story and Timber Lakes evolved as a product of distrust towards government. Informal efforts to address wildfire risk were most prominent in Story as a result of resident interactions with government organizations from different areas of the U.S. Enduring social norms regarding fire risk reduction among residents aligned with a drive to be independent from government at any level. This finding supports and extends existing literature that discusses rural or unincorporated communities and their successes with sustained and informal self-regulation that was deeply rooted in the character of informal or unincorporated communities (Wilkinson, 1991; Paveglio et al., 2015b; Jakes et al., 2010). It also is captured by underlying characteristics outlined in Fig. 1, including "risk reduction initiatives among agencies or locals," locals understanding of local fire suppression responsibilities and limitations," and "local independence or distrust of government." While efforts to remain independent in Story increased local capacity and collective action, Timber Lakes residents' lack of collaboration with county government led to limited avenues to reduce fire risk, as they did not have access to the resources they felt they needed to improve local capacity. Conflict or disagreement with government entities has been found to create long-lasting impacts on collaboration and community adaptation to wildfire in other rural U.S. communities (Edgeley and Paveglio, 2017; Paveglio et al., 2015b; Carroll et al., 2011). Our cases indicate how absence of collaboration with extra-local organizations may limit access to risk-reduction resources, restricting options for risk reduction initiatives among agencies and locals and requiring residents to explore routes to self-sufficiency that reduce government dependence. These findings support and extend existing wildfire literature by identifying that regulation may offer an opportunity to reduce conflict in some rural communities.

Residents in both communities were willing to support voluntary and regulatory approaches if they felt that the benefits outweighed the costs to their area, particularly if that benefit was financial or reduced their community's need for extra-local support to address fire risk. Support for regulatory approaches varied across our cases based on whether residents felt those efforts were fair in both their application and its outcomes for community members. Similar results have emerged from other US research on community mitigation (e.g. Winter et al., 2009; Adger et al., 2016). However, the success of incentives as an alternative to mandatory actions depends on funding to support these efforts, and it is unclear whether communities are able to sustain these approaches without external support. Fostering approaches that pair wildfire risk reduction with some benefit that would be of interest to a community and its residents is a leverage point for increasing collective action. Efforts to identify these and other characteristics of local context shown in Fig. 1 can formally or informally incentivize communities to increase their adaptive capacity and reinforce a need to create place-based approaches to wildfire planning and management. Focus on these mitigation approaches at the community level in both cases gives further credibility to risk reduction efforts that emerge from bottom-up, grassroots efforts.

Changing demographic characteristics, particularly a growth in part-time residents, was a key factor driving heightened support for regulatory approaches in Timber Lakes. The opportunity to enforce more consistent mitigation efforts as a substitute for inconsistent voluntary mitigation made regulatory approaches appealing. Frequent turn-over and a decline in full time residents have been identified as barriers to collective action in a vast number of WUI communities across the west, particularly those that attract amenity migrants and offer access to public lands or recreation like Timber Lakes (Stedman, 2006; McCaffrey et al., 2011). They are also represented by the characteristic "number of second/seasonal homeowners and turnover rate" in Fig. 1. In communities with some formalized regulating body like a POA, regulations on future developments may offer one approach to fostering risk-mitigation behaviors among incoming residents. Community evolution across the U.S. will likely require continual revision and adaptation of approaches to mitigation efforts that meet the needs and challenges of these changing populations. The research presented here contributes to this by outlining the routes rural unincorporated communities may take to address wildfire in the absence of government collaboration. Our results suggest that one predominant challenge to this process remains the balancing of considerations made by both long-term and newer residents. More specifically, that challenge entails negotiating between the differing attitudes they may have towards voluntary actions or mandatory wildfire risk reduction enforced by local governments or property associations.

Discussion in both communities frequently focused on prioritizing the need for education over regulatory approaches. Community members wanted to see wildfire education initiatives introduced as a way to raise awareness of fire risk primarily among new or part-time homeowners. However, a vast body of literature finds that education does not necessarily translate into action to address wildfire risk (e.g. Eriksen and Gill, 2010). Providing opportunities for residents to determine whether mitigation actions were impactful was a core need among residents in both populations who wanted to protect vegetation for aesthetic reasons (Hesseln, 2018). Furthermore, focus group participants also described the value of community "spark plugs" or champions – individuals who are well known and act as ambassadors for a community in an informal or formal capacity. Spark plugs were capable of carrying out educational efforts, that existing wildfire social science research note are helpful, but difficult to sustain long term (see also Koebele et al., 2015). It also is represented by the characteristic "presence of local champions" in Fig. 1. The research presented here suggests that for our study communities (and likely others with similar local social context) there is an increasing disconnect between opposition for regulatory approaches and the ability of education to create sustained and effective change at the community level. Moving away from a dependence on the perceived success of education as a motivator for voluntary mitigation actions requires the development of approaches that specifically address inaction or inconsistent participation while still promoting leadership and control at the local level.

Our results indicate that a combination of local interest in grassroots efforts, paired with a distrust of county, state or federal governments produced divergent preferences for local leadership on wildfire risk reduction in both communities regarding adaptation leadership and collaboration for collective action. Timber Lakes residents backed regulatory and voluntary efforts would be overseen by their POA, while Story residents sought to support leadership through the local volunteer fire department and its affiliated local champions. Resident support for partnerships centered around specific local organizations that were perceived as responsive to community interests and needs. Interest in small community-based organizations contrasts an increasing body of research highlighting the need for collaboration beyond the local level to address wildfire across scales (Coleman and Stern, 2018). Much of the support for community-agency partnerships reflected select positive experiences with government funding or resources that facilitated autonomous and self-organized benefit to each community—for example, access to thistle-spraying resources. These programs allowed residents to benefit from government oversight without a perception of losing local control over decision-making about private property management.

Absence of willingness or ability to pay for mitigation could leave residents in both communities reliant on government funding to reduce their risk. However, the continuity of such projects or funding may be uncertain, which could leave communities potentially vulnerable if these finite financial resources were no longer available. This dependence on external support for risk reduction has been identified in other studies as the 'disaster mitigation paradox' or guardianship model, where efforts to address risk more broadly through community-level efforts such as fuel breaks remove responsibility for mitigation at the individual parcel level (Steelman, 2008). There is a clear need to explore how communities can sustainably reduce wildfire risk in the absence of outside assistance or grants, including willingness or ability to

pay for collective efforts that would create benefits at the community level (Hamilton et al., 2018; Penman et al., 2017). In Timber Lakes, many residents did not have the skill sets required to remove large trees near their homes. Potential responses to this local context may be to develop programs that link residents with local contractors or residents with the skills and equipment to conduct the work safely. Another option may be to create opportunities for residents to develop the skills necessary to reduce forest fuels (e.g. tree felling trainings, forest stewardship classes). Such community-driven approaches to address wildfire can offer opportunities for residents to collaborate with agencies or other organizations in ways that enhance local efforts and support collaboration across boundaries while still affording community members control over their situation (Williams et al., 2012; Lachapelle and McCool, 2012).

6. Conclusion

This study advances existing understandings surrounding community adaptation to wildfire by highlighting the context-dependent nature of support for regulatory wildfire risk reduction in more rural and unincorporated communities. Our results suggest that the interconnectivity of property-level residential adaptation, the structure of collaborative processes, and preferences for leadership or decision-making relationships among residents and organizations pursuing adaptation are core drivers of support or opposition for various voluntary and regulatory approaches to wildfire risk reduction. The factors influencing each of these three considerations are driven by existing local context (Paveglio et al., 2012, 2015a), and highlight the potential for variation in preferences and needs across WUI communities with regards to regulation. Our findings suggest that factors influencing support or opposition for regulation were therefore products of key local social context. For example, options that preserve or strengthen community identity and allow for community oversight in decision-making may be more attractive to rural residents when considering whether to support or adopt a wildfire risk reduction approach. Specifically, residents may seek to understand whether management actions will affect their values or address genuine needs in their community when determining the place-specific path necessary for wildfire risk reduction. Such findings indicate that the incorporation of local perspectives into wildfire planning remain essential for streamlined adoption of new approaches in rural areas.

Flexibility in wildfire mitigation and management approaches can better reflect the diversity of social contexts that comprise the wildland-urban interface, and help design tailored processes that respond to divergent community needs comprising the process of fire adaptation. Engaging communities in decision-making and design of approaches to wildfire risk reduction while partnering with trusted agencies or organizations may offer one path for producing sustained collective action at the local level. However, the exact form of those pathway components may differ across locales given the site-specific culture, circumstances and preferences for organization that help define human communities.

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