OXFORD

Research Article - education & communication

Comparing Land Manager and Community Perceptions of a Colorado Prescribed Fire Outreach Program

Katie McGrath Novak[1],[*],[©], Sarah McCaffrey,[2] and Courtney A. Schultz[1],[©]

[1]Public Lands Policy Group, Department of Forest and Rangeland Stewardship, Colorado State University, Fort Collins, Colorado, USA. [2]Rocky Mountain Research Station, Fort Collins, Colorado, USA.

*Corresponding Author: Email: katie.mcgrath@colostate.edu

Abstract

Researchers and practitioners often emphasize the importance of effective community engagement around forest management projects to address possible barriers to implementation related to a lack of social acceptance. Using qualitative methods, we examined a public outreach program to understand the goals and perceptions of those providing and receiving information about forest management. We found that many community members were initially drawn to learn about wildfire risk mitigation, but their informational needs shifted toward broader forest ecology over time, suggesting that communication strategies and topics must also evolve over time. Some common terms used by land management professionals were unclear to public audiences, sometimes leading to feelings of dissatisfaction with outreach. One-on-one meetings and experiential group learning were perceived by information providers and community members to be useful strategies for outreach. Our findings can be used to improve ongoing outreach in this study area and inform similar efforts elsewhere.

Study Implications: We interviewed community members and land management professionals to understand what they believe to be effective forms of public outreach related to prescribed fire. We found that community members' goals for learning changed over time, requiring outreach efforts to cover a range of topics and strategies. Community members were unfamiliar with some agency jargon, leading to confusion and dissatisfaction with outreach. One-on-one meetings and experiential group learning were widely considered to be the most useful outreach strategies. Our work can be applied to improve similar outreach programs in other areas in the future.

Keywords: outreach, communication, prescribed fire, qualitative research, landowners

In recent years, many land managers across the United States (US) have been working to increase the pace and scale of fuels treatments as part of an overall effort to restore natural fire regimes and mitigate wildfire risk (Wildland Fire Executive Council 2014). Prescribed fire and mechanical thinning are common management techniques used in this work. Although restoring the natural process of fire with prescribed fire can be a cost-effective management tool, a range of internal and external agency barriers have been identified that can inhibit its use (Miller et al. 2020, Quinn-Davidson and Varner 2011, Schultz et al. 2019). Although public concerns about smoke and escape may limit public support for the practice in some areas, studies have shown that those concerns tend to decrease as knowledge and familiarity with the practice increases

(McCaffrey and Olsen 2012). As a result, researchers and practitioners alike often emphasize the importance of effective community engagement to increase social acceptance of prescribed fire, especially when a burn is conducted near homes (McCaffrey 2015, Mylek and Schirmer 2019).

A key question then is what type of outreach is most effective at increasing social acceptance of fuels treatment work, including prescribed fire. Research has found that the vast majority of residents in fire-prone areas across the US possess a general understanding of the risks and ecological benefits associated with fire and support use of prescribed fire. This work also indicates that engagement efforts that build trust and understanding of a particular practice are most effective in building support for forest management practices and wildfire mitigation (McCaffrey and Olsen 2012, Toman et al. 2006, Toman et al. 2012). However, although an expanding body of research has applied theories of learning, behavior change, and social marketing to the broad field of natural resources conservation (Ardoin et al. 2013), these theories have not been widely used in the context of communication efforts specifically relating to prescribed fire. In addition, few research efforts have looked at a specific outreach program and how well it has addressed the needs of both the information providers and their target audience.

Literature Review: Strategies for Successful Community Outreach

A key distinction in studies examining community outreach is whether the focus is on attitude change (i.e., generating acceptance or support for a concept) or behavior change (i.e., encouraging the target audience to perform a certain task or form a new habit) (Kusmanoff et al. 2020). A common assumption of outreach efforts is that individuals will change their attitudes and behaviors in response to hearing scientific information on a given topic; this "deficit" or "transfer-of-knowledge" approach assumes that a lack of public knowledge is the primary reason for conflict or lack of action (Ma et al. 2012, Nisbet and Scheufele 2009). However, research has shown that progression from learning about a topic to changing attitudes or behavior is not linear and depends on a complex mix of contextual factors, including values, politics, and expert knowledge (Ardoin et al. 2013, Kollmuss and Agyeman 2002, Monroe et al. 2006, Nisbet and Scheufele 2009).

The "stages of change" model suggests that different communication strategies may be necessary depending on a person's stage of readiness to learn and act (Ardoin et al. 2013). Studies also show that people use multiple information sources throughout each incremental stage of their learning process (Monroe et al. 2006). Mass media outlets can be useful in the early stages of outreach, when the primary goal is general awareness and basic information dispersal, but in the later stages, when the goal is to change attitudes or behavior, this method tends to be less effective (McDaniel 2014).

For attitude or behavior change, research suggests that engaged, participatory outreach methods are more effective in delivering messages that are both relevant and relatable to a target audience in a way that is more likely to lead to change (Monroe et al. 2006, Nisbet and Scheufele 2009, Toman et al. 2006). Fire studies also have found that interactive communication is preferred by the public and is associated with an information source being considered useful and trustworthy (McCaffrey and Olsen 2012, Steelman et al. 2015).

Studies have also shown that outreach can reach a broader audience when it is designed to facilitate sharing of information among community members in a process commonly referred to as social diffusion or peer-to-peer sharing (Green et al. 2019, McKenzie-Mohr and Schultz 2014, White et al. 2019). Peer-to-peer sharing can be facilitated in discussion groups or in-person events that help reduce hierarchical structure and can act as a useful tool to recruit less involved community members (Ma et al. 2012, Niemiec et al. 2019). One identified way to facilitate peer-to-peer sharing is by leveraging "opinion leaders" or "model landowners" (i.e., community members who are highly motivated to participate in community events and actively manage their land) (Langer 2008, Ma et al. 2012, Monroe et al. 2006). Although landowners are most likely to turn to forestry professionals for research, legal advice, and logistical information about land management, for practical advice they may be more likely to engage with fellow landowners who have similar lived experiences (Kueper et al. 2013, Ma et al. 2012). Thus, information providers can reach broader audiences by encouraging, supporting, and empowering model landowners to recruit and share knowledge with others in their community (Niemiec et al. 2019).

Together, this work suggests that the most effective outreach method may depend on its objective. For example, a study that investigated community perceptions of timber projects found that positive interactions between federal forest managers and community members were strong predictors of public acceptance of projects but also found that many active community members were unaware of common management terms and concepts (Olsen et al. 2012).

As a result, negative interactions were often attributed to a sense that personnel were not being transparent about projects or did not meaningfully consider public input. The authors therefore recommended a two-level approach to public outreach: a general information campaign to promote understanding of concepts and a more focused campaign to delve into individual projects and create opportunities for interactive learning.

The purpose of this study is to assess effectiveness of a specific outreach effort around prescribed fire and forest restoration by comparing the perspectives of management personnel, who provided information to the public, and members of the public, who received information. Comparing the perspectives of information providers and outreach targets side-by-side and with existing literature can offer a holistic understanding of why certain strategies were used, the degree to which they achieved their intended objective, and how they might be improved in a way that achieves the goals of both the information providers and outreach targets. The study sought to answer the following research questions:

1. What were information providers' goals for the outreach program, and what strategies were employed to achieve those goals?
2. What were community members' goals, and how did they evaluate the effectiveness and areas of improvement for the outreach program in meeting their needs?

Methods

This case study examined how the USDA Forest Service (USFS) worked with its governmental and nongovernmental partners to communicate with local landowners about specific land management projects. We primarily focused on outreach on the Canyon Lakes Ranger District of the Arapaho-Roosevelt National Forest related to a cross-boundary prescribed fire project known as the Magic-Feather Collaborative Forest Restoration Project. Located along the Northern Colorado Front Range, the Arapaho-Roosevelt National Forests and Pawnee National Grassland is working to increase the pace and scale of treatments to reduce wildfire risk and improve landscape health, with a particular emphasis on areas around three small communities northwest of Fort Collins. A series of projects, including the more than 6,000 acre Magic-Feather project, were designed to meet these goals using mechanical thinning and prescribed fire on both public and private lands.

As the planned work affects both public and private parcels of land, public acceptance is seen as a key component in successful implementation of the projects. Thus, the USFS has worked with several partners in the area to develop an outreach program to provide information to members of the community. Key partners included the Natural Resources Conservation Service (NRCS), Coalition for the Poudre River Watershed (CPRW), The Nature Conservancy (TNC), and local volunteer fire departments. The USFS manages the largest parcels of land in the area and, with the largest number of employees, has the highest capacity for project implementation. NRCS has focused their efforts on outreach and providing funding for treatments on larger parcels of private land. TNC has often been the organization that implements activities on private lands. CPRW, a local nonprofit organization, was able to facilitate funding for work on smaller parcels of private land and assist landowners planning projects according to individual needs and preferences. CPRW has also been the primary organizer of many outreach events that often include representatives from partner organizations.

Qualitative methods were used for this study as they allowed us to understand the underpinnings of key players' perceptions and opinions. Semistructured interviews were conducted with a list of flexible questions that enabled interviewees to focus on areas of interest or expertise. Our interview participants were separated into two groups.

The first group, referred to as "information providers," were natural resource management professionals who played a major role in developing and implementing prescribed fire and thinning projects and related outreach efforts. For this group, we initially identified five individuals who were most involved in outreach for around treatments; an additional three interviewees were then identified based on recommendations from these interviews. These eight interviewees represented the primary organizations involved in developing and implementing outreach in the area. The interview guide for information providers included questions about outreach goals, strategies used, the role of collaboration, and perceptions of the program's effectiveness in achieving set goals. The second group, referred to as "outreach targets," were landowners and members of the public who received some form of information from the information providers. The interview guide for outreach targets included questions about their goals for learning, perceptions of strategies used, and preferences for receiving information moving forward. Although learning and communication are not always unidirectional, this

dichotomous separation of natural resources professionals from community members allowed us to understand how formal outreach tactics were perceived by their intended audience.

Because we wanted to speak with people who we knew had been reached in some way, initial interviewees were selected by convenience from lists given to us by the NRCS and CPRW. The lists included the names and email addresses of people who had received one-on-one information or attended at least one outreach event. Although the USFS also has email lists dedicated to outreach, these lists are broader, and we wanted to focus on those who had been involved with more active outreach around the project. Together, these lists consisted of thirty-four contacts, and we eliminated four contacts who had been involved with outreach more than 1 year prior to the start of our interviews. Ultimately, we contacted thirty people from the lists and fifteen accepted our invitation to be interviewed; we also contacted seven more people who were recommended to us by our interviewees, and two accepted our invitation.

Interviews were conducted during the summer and fall of 2019 and usually lasted 45 minutes to an hour. Interviews were recorded with consent from participants at a location of their choosing. Recordings were transcribed by a third party, Rev.com. Transcripts were reviewed by the lead author for errors and uploaded to a qualitative data analysis software, Dedoose. A systematic process of coding was used to organize and analyze each transcript. Initial emergent codes were related to our research and interview questions, which had been informed by existing literature on public outreach and science communication (e.g. McCaffrey 2015, Ardoin et al. 2013, Ma et al. 2012), and additional codes were developed as new ideas emerged from the transcripts. From these codes, based on analysis of excerpts for each code, we derived the results and conclusions found below. Integrated throughout are quotations that illustrate notable concepts in the interview participants' own words. To give context to the quotations while maintaining confidentiality, quotes are labeled with whether the participant is an information provider or outreach target.

Results

Information Providers' Goals for the Outreach Program

Most information providers said their primary goal was to develop an attitude of understanding and acceptance of projects within the community; many land managers saw public disapproval as an important factor impeding their ability to implement projects. They often used the term "social license" to describe this goal, as if gaining community acceptance was a type of certification required for them to be able to complete the work. This goal was most frequently mentioned by interviewees from the USFS and TNC, likely because their organizations had the most capacity to implement burns. Informational campaigns were usually open to the public but were most strongly geared toward community members who lived near projects and would be most directly affected. In the following quotation, one information provider described the perceived importance of making the public feel comfortable with prescribed fire.

> *We need to facilitate that information and get that to the public so that they understand why we may be working with fire differently on the landscape... We have to develop that social license so that they're comfortable.* (Information Provider)

To promote positive attitudes toward prescribed fire, information providers shared with audiences the scientific and practical basis for its use. Topics often included fire behavior, forest ecology, and the prescribed fire planning process. Providers also explained practical details about different partners' roles, required training, and use of equipment.

Providers' secondary goal for the outreach program was to promote behavior change in private landowners by encouraging them to conduct thinning and prescribed fire projects on their own lands. This part of the campaign primarily focused on larger landowners and those in highest-priority fire mitigation areas. Providers often assisted with grant applications, forest inventories, and other financial and logistical tasks for landowners working on their land. Although all information providers supported this goal, it was emphasized most by interviewees from NRCS and CPRW, the organizations most involved with private lands.

Information Providers' Perceptions of Outreach Strategies Used

Information providers used a suite of techniques to deliver information. They all indicated that providers most often initiated contact with community members to share information; however, they hoped that as projects became more widely accepted and results more visible, more community members would initiate contact with providers, especially landowners interested

in planning projects on their property. Providers perceived group activities, such as prescribed fire and thinning tours, community meetings, open houses, and presentations at community meetings and social events to be very useful, particularly in reaching new people and helping them develop positive attitudes toward projects. However, nearly all providers felt that one-on-one communications, like home visits, personal phone calls, or email communications were the most effective way to achieve their goals, especially the goal of encouraging landowners to implement projects on their property. The strategies most broadly seen as least effective were unidirectional information delivery techniques such as social media, press releases, and print media.

Information providers heavily emphasized the positive impact of collaboration with the other organizations, noting that without shared capacity and consistency of messaging across multiple organizations, the outreach program would not be as extensive.

> *When I run into [a community member], and I'm saying the same thing NRCS or The Nature Conservancy... if we're all speaking the same language and have the same intent, I think it catches on in the community much better than if people are getting slightly mixed messages.* (Information Provider)

> *I think we're trying to communicate as a coalition,... as opposed to just the federal government doing its own thing. We're all in this together.* (Information Provider)

Though most providers believed that it was too early to determine outcomes of the outreach initiative, they were, overall, in agreement that the response so far seemed positive. Most felt that the negative feedback they received came from a vocal minority, and that most community members were supportive of projects after learning about them. At the time of interviews, NRCS and CPRW were working on several projects on private land that providers believed had resulted from the outreach program.

Outreach Targets' Informational Goals

Among community members we spoke with, a strong sense of wildfire risk appeared to be a key initial information motivation. Of fifteen community members interviewed, eleven primarily sought out information about wildfire protection for their home or community. Six referenced the 2012 High Park Fire, a more than

87,000 acre wildfire that narrowly avoided the study area, as a main motivator for seeking such information. For some, the High Park Fire was the first time they felt their home or community could be at risk; others always knew fire was a possibility but viewed the High Park Fire as a catalyst for taking mitigation action.

> *Well, you see fires on TV. When I moved [to this area] in 2012, that was the summer the High Park Fire was burning. So I think wildfire in general was at the top of my mind as I thought about the risk to any development or investment I made on the property.* (Outreach Target)

> *I think behind everything, my real goal is to have this place not burn down. We lost a cabin in [the High Park Fire].... So I fear fire, but at the same time I really appreciate the fire mitigation work that's being done around here. I'm excited about it and I support it. I want to participate if I can.* (Outreach Target)

Only two outreach targets did not mention fire mitigation as a goal in any way; both of these people emphasized overall "forest health" as their primary concern when seeking information or planning projects. However, most participants indicated that once they learned about prescribed fire or thinning in the context of wildfire mitigation and then learned about the other ecological benefits the practices can provide, such as improved wildlife habitat and ecosystem resilience, these ecological benefits often became additional goals, sometimes even overtaking wildfire mitigation as the primary goal. The evolution of these goals over time seemed to be partially attributed to outreach targets' developing understanding of forest management concepts, strategies, and goals. Most differentiated between forest health and fire mitigation, with forest health considerations focused on factors like individual tree health, wildlife abundance, and fire mitigation specifically related to protecting structures.

Notably, outreach targets often interpreted the term "forest restoration" differently than information providers. Providers tended to use the term to encompass a range of management goals, including restoring a certain fire regime, reducing wildfire risk, and improving overall forest health, whereas several outreach targets interpreted the term in a more literal sense to mean restoring the forest to a historical state. As a result, because community members' goals ranged from defensible space to wildlife abundance and beyond, they did

not always see forest restoration as compatible with their goals.

> "[Our goal] is more like landscape design than it is just flat-out forest management. I'm taking a broader perspective in how we want the land to function, how we want it to serve [our needs], rather than just trying to re-establish the historic, 1800s ponderosa forest. I know that's important too … It's just not for us locally." (Outreach Target)

Outreach Targets' Perceptions of the Outreach Program

Although information providers generally felt that they were usually the ones initiating contact, several community members we spoke with indicated that they had first initiated one-on-one contact. One small landowner described the lack of communication they received before they contacted a provider: *It wasn't outreach…. Nobody "out-reached" to us. I asked.* Many of the community members we spoke with fit the description of model [land]owners, individuals who are "especially passionate about and dedicated to good land management, eager to help others," (Langer 2008) which may explain why they initiated contact with information providers and accepted our invitation for an interview.

In contrast, outreach targets' perceptions of what strategies were most effective generally echoed those of providers. One-on-one communication was by far seen as the most helpful form of outreach, especially for landowners planning projects. Presentations at community meetings and recommendations from neighbors were often seen as the most effective ways to initiate contact. At tours and presentations, outreach targets appreciated hearing from experts and being able to ask questions. These preferences are outlined in quotations from two outreach targets, below:

> *I'm a person that learns by seeing and doing, so I think the tour that [NRCS] took us on was invaluable. To be able to go up there to the other land and see [the treatment] first-hand and walk around and see the crew up there working. That's huge.* (Outreach Target)

> *What I felt [was] good about that particular presentation is I felt like we had some actual experts talking to us. I looked at that as very positive…. We weren't listening to somebody who didn't know a whole lot more than I did.* (Outreach Target)

The ability to see examples of projects at different phases of implementation (for example, through tours of project areas) was described by community members as highly useful in developing an understanding of project goals and outcomes. Many also noted how visually pleasing project areas were after implementation. Several outreach targets said that seeing historical photographs provided a baseline of what is natural in these landscapes and helped them to visualize how fire might behave differently on treated and untreated areas. This ability to visualize before-and-after effects on a landscape was considered especially useful for landowners planning work on their land. Several noted that they chose to move forward with a project after seeing positive results elsewhere in the community, and some referenced specific landscapes in the community to describe their preferences for treatments. For example, multiple people shared the assumption that mechanical projects would create a uniform grid of trees across the property; the idea of this negative aesthetic initially deterred them from participating. However, seeing aesthetically pleasing treatments helped them decide to plan projects on their own land. Below, two landowners, who at the time of interviews were in the early phases of planning mechanical thinning projects on their land, discuss how important it was to be able to visualize projects during their decision process.

> *The tour helped me see that it could look very natural… It wouldn't be an artificial-looking grid. We could still have the wildlife habitat and have a healthier piece of property at the same time.* (Outreach Target)

> *I think seeing [thinning projects] is fundamental. My attitude is in the process of changing. I'm still resistant [to thinning] to a certain extent…. I want to take my wife to [a tour] to show her… She's probably more resistant than me, but I think once we get out there it's going to be similar to a meadow that we have. There are a few trees and they are super healthy ponderosa and it is a lovely place…. I think imagining more of our property like [the meadow] is something I couldn't have done without going to that [tour].* (Outreach Target)

Social media did not seem to reach many people in this community, with the exception of the NextDoor application (app), which many outreach targets said they used to gather up-to-date information about things happening in the community. Besides this app, only

one outreach target mentioned gathering information and updates from social media.

Although interviewees preferred interactive communication initially to understand management goals and plans and activities they could undertake, once they gained a basic understanding, most outreach targets wanted to be kept up-to-date about what projects to expect in their area, but no longer needed in-depth explanations about how and why it was happening. At this point in the learning process, most outreach targets preferred to get ongoing information in the form of email notifications.

Interestingly, none of our outreach target interviewees expressed a preference for information from nongovernmental partners over government agencies, although several shared the information providers' perception that this preference was common in the overall community. The following quotations highlight two landowners who supported government projects, but thought most of their neighbors would not.

> *I'm wanting to get a hold of my neighbors to see if they are interested [in collaborating on a thinning project]. I get the sense they're kind of anti-government people. Actually, the neighbor that I met the very first week I was here, in that very first conversation he told me what idiots the National Forest Service are. They had been talking about prescribed burns and he said, 'I wouldn't trust them.'* (Outreach Target)

> *I think there's a little bit of stigma still, especially with the older generation of ranchers. There's still a little bit of trepidation and hesitation to work with a governmental agency because no one wants to be told how to manage their land.* (Outreach Target)

Our interviewees were generally supportive of projects regardless of organizational affiliation; rather, preference toward one organization or another seemed to depend more on individual relationships with land management professionals. In several instances, particularly when recalling interactions with the small nonprofit CPRW, outreach targets could remember the first name of the information provider they spoke with but could not identify which organization that person represented. This suggests that the personal relationship they built with the information provider was more influential than the reputation of the organization and that organizational reputation may be tied to the individual information provider.

The greatest challenge community members faced in their information gathering efforts came after they had developed a basic understanding of prescribed fire. They no longer needed the big-picture background knowledge given at tours, events, and through one-on-one communication but more site-specific information about upcoming projects in their area. At this point, many people told us they had more difficulty gathering the desired information independently, with a few stating that they relied on personal communication from an information provider to learn about upcoming learning opportunities.

> *We're still somewhat isolated. If [an information provider from NRCS] doesn't tell us about an opportunity, or somebody else tells us about an opportunity, I don't know where to find other opportunities.... We're hoping that we have good enough relationships now with various people in the National Forest Service and Park Service [etc.], so that when an opportunity presents itself, they'll say 'Let's reach out to [them] and see if they are interested in being a part of it.'* (Outreach Target)

Several interviewees suggested it would be useful to have a central website or notification system to help community members gather information on their own, as existing resources do not cover all different entities' prescribed burns, thinning projects, and wildfires in one place. The following quotation details one outreach target's idea for such a website; several others made similar recommendations.

> *To be honest, sometimes I'm frustrated at how difficult it is to find fire information even when I'm actively seeking it.... I think what would be really helpful is … if you could sign up for some sort of notification system in a similar way of severe weather notifications. And even pick a region, within 50 miles, or 100 miles, wherever, of any location and be notified by an automatic email any time there's a controlled burn, a spot fire, or an actively burning wildfire. It'd be nice to get those alerts in advance.... I don't know. That may even exist already. But I haven't found it.* (Outreach Target)

Discussion

Information providers' two primary goals were to (1) promote attitudes of understanding and acceptance of various forest management activities, particularly use of prescribed fire, and (2) encourage landowners in priority areas to conduct prescribed fire and thinning projects on their lands. To achieve their goals, providers used a suite of tools including presentations, project

tours, social media, email listservs, and one-on-one communication. The content of communications most often focused on the science and ecology behind prescribed fire and thinning, the project planning and implementation process, and the roles of different partners. When encouraging certain behaviors in landowners, providers also shared information about funding and capacity-building opportunities.

Building on existing literature that shows that outreach strategies should change over time to suit the target audiences' evolving needs (Ardoin et al. 2013, McDaniel 2014, Monroe et al. 2006), we saw clear evidence that outreach targets' topical information needs also changed over time. Nearly all of the community members we interviewed perceived that their community was at high risk for wildfire; this is what led most of them to seek information initially, with primary learning goals related to home and community protection. However, as they learned more about larger forest management concerns and ecological benefits of treatments, these benefits often became the primary goal for work on their land rather than fire risk reduction.

Providers and outreach targets generally agreed about which communication strategies were most successful. Previous studies show that interactive forms of communication are most effective (Monroe et al. 2006), so it is unsurprising that both outreach targets and information providers preferred events where community members could interact with providers and ask questions (e.g. tours, events, one-on-one consultations). Given the limited capacity for one-on-one outreach that providers expressed, project tours may be the most effective way to provide interactive communications to a wider audience. Both information providers and outreach targets agreed that unidirectional information like social media was less effective for this community, except for the NextDoor app, which was widely used by outreach targets to connect neighbors within the community. Visual examples, like touring project sites, appear to have been especially useful for changing the attitudes of outreach targets who had negative preconceived notions about the aesthetic impacts of a treatment. These visual examples were also useful for encouraging landowners to conduct projects on their own land. For this latter target audience, more impactful strategies were those that included assistance (e.g., labor or funding) that helped landowners overcome capacity-related barriers and increased their sense of self-efficacy (White et al. 2019).

A fairly consistent challenge for outreach targets was that, after having gained a baseline understanding of ecological benefits of a practice, they struggled to gather information independently on specific actions they could take beyond wildfire risk mitigation. They suggested that information providers could potentially ease this burden by creating a consolidated website with selected resources, or providing a hand-out with reliable, up-to-date, and area-specific resources to people who attend outreach events or have a home visit. At the time of the interviews, the Northern Colorado Fireshed Collaborative, to which many of our information providers belong, was developing a website[1]. This website has since gone live and hopefully will help address these concerns; however, it is beyond the scope of this research to evaluate its content or effectiveness.

Of note is that the term "forest restoration" was not always well understood by outreach targets nor was it perceived to resonate with some of their goals for learning or project-planning. Information providers tended to use the term broadly to encompass activities beyond "restoring ecosystem characteristics consistent with the historical range of variability" to also consider general ecological processes that increase system resilience. This disconnect in how different audiences may interpret a term is an important point that providers may want to keep in mind in their outreach efforts. Research has shown that a key component of effective outreach is for information providers to understand the knowledge and beliefs of their audience(s) and tailor information to fit each audience, including using language that will resonate (Monroe et al 2006). In this study, the provider focus on "forest restoration" writ large sometimes created the perception that they were not concerned with addressing goals of outreach targets who understood "restoration" as only encompassing restoring to a past condition. Many terms common to an organization can have specific meanings that may or may not match those of the community they are working with. This is one reason why interactive conversations are a critical part of effective outreach, as the ability ask clarifying questions increases the potential for identifying differences in language interpretation (Monroe et al. 2006).

Although this small case study provides a number of useful insights, several limitations should be noted. Despite many interviewees' belief that a vocal minority of people who disapprove of prescribed fire or government agencies exists in the community, we did not find this amongst our sample, which was drawn from lists of people who attended outreach events. To some

degree this may reflect sampling bias created by our interest in hearing from those who had in some way actively received information. Individuals who disapprove of projects or the agencies completing them may be less likely to request a home visit, attend an outreach event, or sign up for a listserv. In addition, individuals who disapprove of the USFS might not have responded to our request for an interview, which stated that the project was funded by the USFS Rocky Mountain Research Station. Finally, our findings might be skewed toward positive perceptions of outreach and projects, as our sample contained a large number of individuals who could be described as model landowners (Langer 2008). Model landowners would likely be the most motivated to dedicate time for an interview and to support land management actions in their community, no matter the land management entity's affiliation.

It would be useful in the future to assess the prevalence of the dynamics found in our limited sample by developing a survey for the larger area. This would provide a quantitative assessment of our findings, reach a broader audience, and investigate longer-term effects of the outreach efforts.

Conclusions

Although caution should be used given the study limitations, findings from this case study highlight several dynamics that information providers may want to consider when developing fuel treatment outreach programs. Because the sense of wildfire risk seemed to be an initial driver for community members to seek information, early phases of outreach may be most effective if framed in the context of community protection from wildfire. This initial framing might capture the attention of a greater number of community members and increase the perception of matching goals. However, findings also indicate that a singular focus on wildfire protection and risk reduction may be overly narrow as individuals gain greater understanding of forest management goals over time and become more interested in and focused on the ecological benefits of land management efforts. Additionally, research suggests that rather than fear appeals, like those that focus only on wildfire risk, effective messaging specific to behavior change tends to highlight positive social norms, build self-efficacy, and incrementally introduce benefits of the desired action (Ardoin et al. 2013, McKenzie-Mohr and Schultz 2014, Monroe et al. 2006, Peters et al. 2013). Therefore, although a conversation might begin with,

"forest management can mitigate future wildfires in your community," the bulk of the discussion might highlight

- simple, incremental steps for creating defensible space, and resources available to assist with costs and labor (to build efficacy),
- community members who have already completed prescribed fire and thinning projects (creating a descriptive social norm), and
- ecological benefits of the planned or desired activity, such as improved wildlife habitat and ecosystem health (to address goals that often arise as people develop deeper understandings of forest health).

Although a study limitation was that several of the community members we spoke with appeared to be model landowners, their comments also highlight one way this particular group could be a useful means for information providers to broaden their reach within communities, as they may be better positioned to share information and help spread the burden of initiating contact, thereby improving providers' capacity-related challenges. If they feel there is a good chance of receiving a positive response from their neighbors, model landowners may be more likely to start a conversation and recruit new people to speak with providers (Kueper et al. 2013, Niemiec et al. 2019). Therefore, working with model landowners to recruit neighbors and friends could be an effective way to facilitate peer-to-peer sharing and reach less-motivated community members.

Acknowledgements

Funding

Endnote

[1] The website is: https://nocofireshed.org.

Literature Cited

Ardoin, N., J. Heimlich, J. Braus, and C. Merrick. 2013. *Influencing conservation action: What research says about environmental literacy, behavior, and conservation results.*, New York, NY: National Audubon Society. 80 p.

Green, K.M., B.A. Crawford, K.A. Williamson, and A.A. DeWan. 2019. "A meta-analysis of social marketing campaigns to improve global conservation outcomes" *Social Marketing Quarterly* 25(1):69–87.

Kollmuss, A., and J. Agyeman. 2002. "Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? " *Environmental Education Research* 8(3):239–260.

Kueper, A.M., E.S. Sagor, and D.R. Becker. 2013. "Learning from landowners: Examining the role of peer exchange in private landowner outreach through landowner networks" *Society & Natural Resources* 26(8):912–930.

Kusmanoff, A.M., F. Fidler, A. Gordon, G.E. Garrard, and S.A. Bekessy. 2020. "Five lessons to guide more effective biodiversity conservation message framing" *Conserv. Biol.* 34(5):1131–1141.

Langer, J. 2008. *Family forest owners: Insights into land-related stewardship, values, and intentions.* Report for The Sustaining Family Forests Initiative, New York, NY: GfK Roper Public Affairs and Media. 69 p.

Ma, Z., D.B. Kittredge, and P. Catanzaro. 2012. "Challenging the traditional forestry extension model: Insights from the Woods Forum Program in Massachusetts." *Small-scale Forestry* 11(1):87–100.

McCaffrey, S. 2015. "Community wildfire preparedness: a global state-of-the-knowledge summary of social science research" *Current Forestry Reports* 1(2):81–90.

McCaffrey, S., and C. Olsen. 2012. *"Research perspectives on the public and fire management: A synthesis of current social science on 8 essential questions.".* Northern Research Station, Newtown Square, PA: USDA Forest Service Gen. Tech. Rep. GTR- NRS-104. 40 p.

McDaniel, J. 2014. "Building trust, establishing credibility, and communicating fire issues with the public." *Fire Science Digest* 17:1–12.

McKenzie-Mohr, D., and P.W. Schultz. 2014. "Choosing effective behavior change tools" *Social Marketing Quarterly* 20(1):35–46.

Monroe, M.C., L. Pennisi, S. McCaffrey, and D. Mileti. 2006. *Social science to improve fuels management: a synthesis of research related to communicating with the public on fuels management efforts.* North Central Research Station, St Paul, MN: USDA Forest Service Gen. Tech. Rep. GTR NC-267. 42 p.

Miller, R.K., C.B. Field, and K.J. Mach. 2020. "Barriers and enablers for prescribed burns for wildfire management in California" *Nat. Sustainability* 3(2):101–109.

Mylek, M.R., and J. Schirmer. 2019. "Thinking about fuel management: The potential of integrative complexity theory to inform design of communication about fuel management used to reduce wildfire risk, society, and natural resources" *Society and Natural Resources* 32(9):983–1002.

Niemiec, R.M., R. Willer, N.M. Ardoin, and F.K. Brewer. 2019. "Motivating landowners to recruit neighbors for private land conservation *Conserv. Biol.* 33(4):930–941.

Nisbet, M.C., and D.A. Scheufele. 2009. "What's next for science communication? Promising directions and lingering distractions *Am. J. Bot.* 96(10):1767–1778.

Olsen, C.S., A.L. Mallon, and B.A. Shindler. 2012. "Public acceptance of disturbance-based forest management: factors influencing support." *International Scholarly Research Notices* 2012(4):1–10.

Peters, G.Y., R.A.C. Ruiter, and G. Kok. 2013. "Threatening communication: a critical re-analysis and a revised meta-analytic test of fear appeal theory." *Health Psychology Review* 7(sup1):S8–S31.

Quinn-Davidson, L.N., and J.M. Varner. 2011. "Impediments to prescribed fire across agency, landscape and manager: an example from northern California." *Int. J. Wildland Fire* 21(3):210–218.

Schultz, C.A., S.M. McCaffrey, and H.R. Huber-Stearns. 2019. "Policy barriers and opportunities for prescribed fire application in the western United States." *Int. J. Wildland Fire* 28(11):874–884.

Steelman, T.A., S.M. McCaffrey, A. Knox Velez, and J.A. Briefel. 2015. "What information do people use, trust, and find useful during a disaster? Evidence from five large wildfires." *Nat. Hazards* 76(1):615–634.

Toman, E., B. Shindler, and M. Brunson. 2006. "Fire and fuel management communication strategies: Citizen evaluations of agency outreach activities." *Society and Natural Resources* 19(4):321–336.

Toman, E., M. Stidham, B. Shindler, and S. McCaffrey. 2012. "Reducing fuels in the wildland-urban interface: Community perceptions of agency fuel treatments." *Int. J. Wildland Fire* 20(3):340–349.

Wildland Fire Executive Council. 2014. *A National Cohesive Wildland Fire Management Strategy.* Washington, DC, USA. Available at https://www.forestsandrangelands.gov/documents/strategy/reports/1_CohesiveStrategy03172011.pdf. Date accessed 14 January 2022.

White, K., R. Habib, and D.J. Hardisty. 2019. "How to SHIFT consumer behaviors to be more sustainable: A literature review and guiding framework." *J. Marketing* 83(3):22–49.