LANDOWNER PERCEPTION OF INFORMATION ABOUT PRESCRIBED FIRE: INFLUENCE ON THE APPLICATION OF THIS LAND MANAGEMENT TOOL IN THE SOUTHERN GREAT PLAINS

A Thesis

by

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ABSTRACT

Prescribed fire is an important management tool on many rangelands. However, evidence that this tool is effective for mitigating multiple problems faced by landowners has not led to substantial increase in its adoption. Lack of knowledge about the safe application of this tool has often been cited as a reason for not applying it, which has led to calls for more education and outreach efforts to fill this knowledge gap. However, even when education is provided to landowners, adoption rates often do not increase substantially. When examining education improvement strategies, credibility often emerges as a primary determinant of information acceptance. Previous research indicates the relationship users have with a particular source and medium of information heavily influence their acceptance of the information. My research attempts to identify facets of information, other than credibility, that potentially influence information acceptance; these include: reliability, clarity, relevance, accessibility, and shareability. This research explores how those factors affect landowner perceptions about sources and mediums that disseminate information about prescribed fire. The hypothesis is the perception of information and the users' relationship with that source/medium plays a more significant role than previously thought. This hypothesis is tested using data derived from telephone interviews of key informants and online Internet-based survey of members of the Texas and South Western cattle Raisers Association and the Texas Wildlife Association. The results of this study provide guidance for government agencies and landowner entities, such as prescribed burning associations, for improving their information dissemination practices in order to enhance landowner perception and adoption of prescribed fire.

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Chapter 1 – Introduction

<u>Background</u>

Prescribed fire is a land management tool that has been shown to be cost effective and that can inhibit woody plant encroachment, improve livestock grazing, prolong maintenance treatments, and reduce fuel loads and, therefore, wildfire risks (North et al., 2012). However, there is widespread resistance by landowners, landowner representative groups, government officials, and insurance companies to the use of this important land management tool despite the evidence of its efficacy (Donovan et al., 2007, Ryan et al., 2013, Toman et al., 2004). This has, in part, been linked to the lack of knowledge about this tool among landowners and government agency representatives (Toledo et al., 2013). Consequently, improved education efforts could create more positive perceptions about and use of prescribed fire among these groups and, therefore, increase the likelihood that this land management tool will be more broadly implemented (Kreuter et al., 2008).

Developing and implementing effective education and outreach tools for prescribed fire requires an understanding of past and current education efforts and the perceptions of the target audience about them. Previous research suggests there are ways in which landowner groups can build community support, social networks, and collaborative efforts to engage other landowners in prescribed fire implementation efforts (Toman et al., 2006; Bodin et al., 2009; Weir et al., 2016; Reed et al., 2018), all of which may play an important role in the effectiveness of information dissemination efforts. Unfortunately, the preceding research was conducted in a broad land management improvement context and may be of limited value when seeking to understand resistance to the application of prescribed fire by landowners who perceive this management tool to be risky compared to other land management practices. By determining

whether perception of information sources and mediums influence the acceptance of information and, therefore, application of prescribed fire practices, research can illuminate the context that may be missing in current prescribed fire outreach and education endeavors (MacKeracher et al., 2018). Improved knowledge about the perception of current education materials can inform future efforts to improve dissemination practices in order to increase the use of prescribed fire.

The goal of this study is to determine if the perceptions (including trust) about sources and mediums of information about prescribed fire are correlated with the application of prescribed fire by landowners. To address this, I obtained data from and government agencies, landowner representative associations and landowners using a 3-step approach including focus groups meetings, telephone questionnaire interviews, and an Internet-based survey.

Literature Review

Prescribed Fire

Previous research found that landowners who observed or actively engaged in prescribed fire on another person's property are more likely to apply this tool on their land (Toledo et al., 2012). However, before an observer applies prescribed fire, it is likely the observer will seek information when deciding if prescribed fire is an appropriate action. During this decision-making process the information received about prescribed fire must be deemed trustworthy in order for the decision maker to accept its validity and participate in the use of prescribed fire.

Previous studies have concluded that simply providing information is insufficient to influence attitudes and behavior in a way that lead to better environmental outcomes (Kreuter et al., 2008; MacKeracher et al., 2018). Furthermore, Benett (2016) stated that, while information content is important, the perception of information (including how trustworthy it is) influences support for and efficacy of environmentally sustainable decision making. Such information is

often disseminated by government agencies and Winter et al. (2010) emphasized that there is a general initial trust in government agencies (both state and federal) and that trust is critical for risk management.

Prescribed Fire Education/communication

Landowner groups may offer the opportunity to obtain information from a more trusted source compared to less personal information sources that may be viewed with more skepticism (Winter et al., 2010). One reason is that landowner groups may provide more consistent information than other sources that may provide contradictory information and confuse relevant stakeholders, preventing them from making informed and coherent policy/management decisions. While there is no one size fits all for education and communication of information, some similarity or approach and content is ideal (MacKeracher et al., 2018).

Prescribed burning associations and direct experience are leading contributors to increasingly positive attitudes towards the use of prescribed fire (Toledo et al., 2014; Scasta et al., 2015; Dupey et al., 2018). Prescribed burn associations can ease much of the concern many landowners have about cost and liability when conducting burns in which (Toldeo et al., 2012). Additionally, observing the effects firsthand creates a much higher chance landowners will utilize this tool (Jacobson et al., 2001), and education for prescribed burning is met with much more open arms if stakeholders are given the chance to see the process (Bates et al., 2009).

Future Implications

Previous literature indicates organizations, such as prescribed burn associations, peer-to-peer networks, and collaboration efforts improve knowledge about this type of land management tool and substantially improve its usage (Toledo et al., 2014). To implement more widespread use of prescribed burning, land management entities and government agencies are encouraged to

expand current message campaigns, decrease liability while increasing financial incentives for applying prescribed fire, and direct education programs at specific target audiences (Yoder et al., 2004; Reed et al., 2018). This suggests that education practices aimed at informing landowners about the use of prescribed fire need to be reevaluated.

This need can be addressed by determining what information sources and media and facets of information associated with them are or are not used by landowners. For example, some landowners may choose to obtain information about prescribed fire from the Natural Resources Conservation Services (NRCS) or Texas Parks and Wildlife Department (TPWD) because they consider them to be credible. Frequently, such landowner support entities provide accounts of information sources landowners utilize; however, often the assessment is not based on scientifically rigorous research.

Identifying whether the medium and source of information influences the perception and acceptance of information about prescribed fire could provide valuable insight about where people prefer to obtain information and the medium(s) they prefer to use to obtain such information. Equally important is determining what information characteristics (e.g., credibility, reliability, accessibility, relevancy, shareability, and clarity) affect landowner use of information about prescribed fire. This knowledge can help guide entities in shaping their information dissemination practices (Hays, 2000) to not only target appropriate mediums of information dissemination but present it in ways that the information appears credible, reliable, accessible, shareable, clear, and relevant to the user of the information, increase its acceptability and ultimately lead to the increased implementation of prescribed fire in the future.

Knowledge gap

Previous research suggests that prescribed fire is an important and effective tool in land management for various purposes (Donovan et al., 2007; Kreuter et al., 2008 Toledo et al., 2014). Despite this evidence, prescribed fire has not been widely adopted as a woody plan management tool (Kreuter et al., 2008). In response, government agencies and prescribed fire practitioners have fostered groups, such as prescribed burn associations, to more widely implement prescribed burning (Weir et al., 2016). However, such entities only have a basic understanding about how adaptive management practices influence land management decision making processes (Lyons, 2008). For example, Fuhlendorf et al., (2017) highlight the need for land managers to focus more on the variability in landscapes when applying prescribed fire rather than focus on predictability and homogenous trends, which has tended to be the traditional emphasis. However, there is minimal literature or credible evidence to suggest agencies and fire practitioners have clear knowledge about the mediums and sources of information landowners are likely to use to decide whether or not to apply prescribed fire and how this tool can be used to attain either heterogeneous or more homogeneous outcomes (in the context of information dissemination though). Without understanding preferred sources, mediums, and perceptions towards prescribed fire information, efforts to promote the use of prescribed fire will lack focus and efficacy.

Organization of Thesis & Hypothesis

The thesis consists of this introductory chapter, two data chapters and a summary of research chapter. The two data chapters are as follows.

Chapter 2 reports on a data set obtained via Telephone Interviews of government agency and landowner association representatives. It focuses primarily on how social media, compared

to traditional means of communication, is perceived as a source/medium of information by fire practioners for education and communication related to prescribed burning.

Chapter 3 reports on a set of data collected via an Internet-based survey from landowners who are members of Texas and Southwestern Cattle Raisers Association and Texas Wildlife Association. It focuses primarily on how perceptions towards information sources and mediums influence the acceptance of information and if that acceptance is correlated with application of prescribed fire.

Chapter 4 synthesizes the main findings and gives the overall implications to the results presented for future studies to draw upon.

The overarching goal of the research is to determine which facets of information influence acceptance of information and by extension the application of prescribed fire. This goal will be addressed by testing the following two hypotheses:

Hypothesis 1 – The extent to which landowners use a source of information about prescribed fire when deciding whether to use that management tool is positively correlated with their perceptions about; trust of, preference for and degree of use of that source of information.

Hypothesis 2 – The extent to which landowners use various mediums that provide information about prescribed fire when deciding whether to use that management tool is positively correlated with their perceptions about; trust of, preference for and degree of use of that information dissemination medium.

Chapter 2 – Education through Social Media

Introduction

Prescribed fire is a land management tool that has been shown to be cost effective, can effectively control woody plant encroachment, improve livestock grazing, prolong maintenance treatments, and reduce fuel loads and, therefore, wildfire risks (North et al., 2012). However, there is widespread resistance by many landowners, landowner representative groups, government officials, and insurance companies to the use of this important land management tool despite the evidence of its efficacy (Donovan et al., 2007, Ryan et al., 2013, Toman et al., 2004). This has, in part, been linked to the lack of knowledge about this tool among landowners and some officials (Kreuter et al. 2008; Toledo et al., 2014). Improved education efforts could create more positive perceptions about and use of prescribed fire and a greater likelihood this land management tool will be more broadly implemented (Kreuter et al., 2008).

The purpose of the Telephone survey reported in this chapter was to synthesize themes that arose from focus groups conducted in College Station and San Angelo in Texas in December 2016 and Stillwater in Oklahoma in January 2017. A major theme that emerged from the round table discussions was the need to improve education practices in order to increase prescribed fire on a larger scale. Accomplishing this requires research to determine what current education efforts are effective and to identify limitations of those that are ineffective.

Social media may not be well suited to the current aging rural landowner demographic may, however, information derived from research used to make decisions regarding prescribed fire might be effectively disseminated via social media platforms to the incoming younger generation of land managers. Face-to-face adult learning has been shown to be found to be the most effective method for engaging current landowners in the use of prescribed fire (Kreuter et

al, 2008). Social media represents another way for information disseminators to reach out and engage landowners, government officials and other important stakeholders through adult learning by increasing the number of mediums that can be utilized for information about prescribed fire.

A survey conducted in 2012 by Lund et al. (2017) determined that 49% of landowners are 45-64 years old. As a result, there will inevitably be an increasing shift in landowners to a younger generation in the near future. The Pew Research Center (2018) found that in 2017, 69% of adults use at least one social media platform. More specifically, 58% of rural residents used social media and with the inevitable changing land manager demographic, that ratio is likely to grow (Pew Research Center, 2018). This provides a strong possibility to increasingly use social media for information dissemination about prescribed fire. In order to examine if this assertion is true, traditional means of communication need to be compared with social media to understand the relative presence, availability and utility of and preference for mediums for prescribed fire information.

Adult learning was first suggested by Knowles (1980) in an attempt to separate education practices for adults and children because adults learn differently than youth in several ways. Adults are generally self-directed, draw from previous experiences, and focus on practical concepts. All of these elements are required for landowners to decide whether or not to implement prescribed fire. Therefore, the theory of adult learning has been shown to be relevant when developing outreach efforts to increase prescribed fire implementation (Kreuter et al., 2008). As this research focuses on education issues related to prescribed fire, adult learning is the most appropriate method to utilize for the qualitative data analysis included in this study (Merriam, 2001).

Literature Review

Science Education/Communication

A comprehensive understanding of landownership and management motivations is required to illuminate their decision-making process in regards to land management practices (Sorice et al, 2014). With such knowledge, government agencies and prescribed fire practitioners can target information about prescribed fire to better defined groups of landowners based on ownership motivations (Wilmer et al, 2017*)*. Sugimoto et al., (2017) indicated that social media are frequently used to disseminate information used in the scientific community and by university systems to share knowledge with a wider community, which is often where landowner representative groups and government agencies obtain information.

For government agencies and landowner entities to develop effective communication and out-reach strategies for promoting prescribed fire, entities must clearly understand landowner management behaviors and how these behaviors might change (Bodin et al, 2009, Illingworth 2017*)*. Additionally, these agencies must understand their role as educators in the broader context of science education in order to most effectively disseminate information and so as to not repeat, confuse or alienate intended landowner groups (Bertoul-garcia et al, 2018*)*. Gikas & Grant (2013, p.19*)* state that the role can be filled with social media platforms because the "content can be more context aware, authentic, and situated in the surroundings where the learning is more meaningful to the learner. Learners can personalize the way they interact with the course content." This helps to determine how to shape education for current and future information consumers. Social media can facilitate collaborative adult learning, emphasized by Kreuter et al. (2008) when applying prescribed fire. Application of prescribed fire promotes collaboration among landowners through the development of written burn plans, assessment of

site conditions, and assistance with fire management on the days of the burn. The previously mentioned knowledge is thought to be retained at much higher rates when collaborative information mediums such as social media are accessed because often, information users are shown the relationship between the information and themselves (Dumbford & Miller 2018).

In order to retain knowledge gained through social media platforms, Dumbford & Miller (2018) suggest that focusing on learner engagement is the strongest predictor of effective learning. Collaborative learning interactions with diverse groups of people are also crucial elements of engagement; compared to more traditional means communication, social media can facilitate engagement by reaching a larger audience. Evans (2014, p. 943) suggests that "Students who viewed purely social tweets from their tutor rated tutors significantly higher on a measure of credibility than the group that viewed only scholarly tweets." Utilizing social media, such as Twitter, Facebook and Instagram, for scholarly communication could be a way to improve engagement for younger people (who will become the primary land management decision makers in the coming years) and by extension enhance the learning process for effective prescribed fire information dissemination among this demographic group.

Toledo et al, (2014) discussed how landowner interaction with prescribed fire groups was strongly correlated with positive perception towards and future use of this land management tool. Toledo et al (2012) suggested that prescribed burn associations (PBAs) are effective ways to improve perceptions about prescribed fire due to their informal volunteer membership structure and the way they facilitate of peer-to-peer learning. The use of social media for communication among PBA members can enhance such learning by providing a platform where member-oriented information can be easily accessed. An important finding by Dumbford & Miller (2018, p. 460) was that learners had "greater course success when using social media (Facebook) for

chat and messaging with instructors and tutors" instead of using institution provided

communication platforms because of the informal nature of information dissemination through

social media platforms. The findings from Kreuter et al (2008) about the importance of peer-to-

peer learning in the application of prescribed fire is relevant because social media may facilitate

such learning among landowners, government agencies, and landowner entities thereby

potentially improving the perceptions towards prescribed fire.

Decision making/adaptive management

Fuhlendorf et al (2017) discuss how the focus on "premises" or "averages" have led to an

incomplete understanding of the processes' that influence natural resource management.

Additionally, Miller (1999, pg. 18) stated, "Institutions are (generally) built on major premises

and long-held beliefs that are deeply imbedded in educational systems, laws, policies, and norms

of professional behavior." Such findings indicate that there may be considerable inertia that

inhibit changes needed to improve land management through the adoption of important practices,

such as prescribed fire. Institutions that incorporate prescribed fire as an adaptive management

tool should be cognizant of change and not fixed in certain premises or paradigms. To

comprehensively assess management decisions, Mcfadden et al. (2011) described a combination

of adaptive management strategies that emphasize cumulative experience of differing aspects of

adaptive work, including goal setting, planning, implementation, monitoring, assessment, and

adaptation to changing conditions. In the context of prescribed fire, the assessment phase has not

been adequately addressed. In part, this may be due to a lack of clear understanding of

information consumption patterns, which may be one reason why prescribed fire is not more

widely utilized (Williams 2011; Mcfadden, 2011; Allen et al, 2011). Information consumption patterns are dynamic and understanding how they change over time is an ongoing process (Lyons et al, 2008). Understanding information consumption patterns also engages relevant stakeholders in what they perceive to be useful, insightful, relevant, credible, reliable, clear, and accessible.

Based upon previous research (Kreuter et al., 2008; Toledo et al., 2012; Toledo et al., 2014), the prescribed fire community has often implemented inappropriate methods for assessing adaptive strategies with respect to information dissemination. A possible way for this assessment to occur, could come in the form of recognizing the ongoing feedback that occurs in multiple phases of education, i.e. dynamic peer-to-peer learning. Simply recognizing the importance of ongoing feedback for peer-to-peer learning often leads to increased cooperation among decision makers, in this case, information disseminators (Allen et al., 2001; Lynam, 2007), and is critical for improved education practices that enhance collaboration between researchers, practitioners, and landowners (Gibbons et al, 2008). Cooperative education seems to be more effective when knowledge is "linked" by showing the relevance of how the information affects different groups and not simply sharing it among these groups (Roux et al, 2006).

A potential method to address inadequacy of current approaches to information dissemination about prescribed fire is adaptive governance, which facilitates adaptive, learning-based responses to change and coordination across multiple groups including agencies, landowners, and government officials within complex social–ecological systems (Schultz et al., 2015). In order to manage the complexity inherent in social-ecological systems that incorporate periodic fire, adaptive governance encourages information disseminators to utilize diverse information outlets, including social media that may play a key role in learning-based adaptive management because this medium facilitates communication among diverse stakeholders.

Approaches to land management that utilize adaptive governance enhance the capacity for collaboration across diverse interests, sectors, and institutional arrangements (Schultz et al., 2015).

Much of the research directed at prescribed fire has focused on the biophysical effects of this land management tool and much less has addressed the social aspects surrounding implementation. There are instances in which social barriers to prescribed fire implementation are examined (Twidwell et al., 2013, Toledo et al., 2012, Toledo et al., 2014, Sorice et al., 2014). However, the efficacy of the use of various communication tools to overcome barriers to landowners' use of prescribed fire have not been studied.

Methods

This study was conducted using telephone interviews with representatives of landowner associations and government/non-government entities. The survey sample was derived by obtaining contact information for key informants known to Morgan Russell, Texas A&M Agrilife Extension Range Extension Specialist, and John Weir, Oklahoma State University Associate Range Extension Specialist, both of whom have an extensive network of contacts in the prescribed fire community. Purposive snowball sampling was the used to obtain additional contacts. This method was applied by asking the interviewees for contact information of two additional potential survey participants. The process continued until information saturation occurred. A total of 66 individuals were interviewed.

Two interview protocols were developed and used according to the nature of the survey participants' relationship with landowners. The two categories of interviewees were those who were affiliated with landowner representative associations (Prescribed Burn/Fire Management

Associations, Katy Prairie Conservancy, Oaks and Prairie Joint Venture, The Noble Foundation, and Oklahoma Cattlemen Association) and those who were affiliated with a government agencies or non-government organization (Natural Resource Conservation Service, US Fish and Wildlife Service, Texas Parks & Wildlife Department, Texas Forest Service, Texas A&M University AgriLife Extension, Oklahoma Department of Wildlife Conservation, Oklahoma Department of Agriculture Forestry and Food, Oklahoma Conservation Commission, Oklahoma State University Extension, Emergency Services District and The Nature Conservancy). The two semi-structured survey protocols used to administer the survey to these two landowner representative associations and government agencies or non-government organizations are presented in Figure 2.1 and Figure 2.2, respectively.

To anonymize data from interviewees each interview was assigned a code. This included an abbreviation for their respective organization, (e.g., TFS for Texas Forest Service), a number for the state (1 for Texas and 2 for Oklahoma), and a number of the interviewee from each organization (e.g TFS 1.1, TFS 1.2, etc.)

A codebook was developed to identify themes that emerged from the survey responses. Three people coded each transcribed interview and intercoder reliability tests were conducted to identify more robust themes in the data. The reliability scores for the themes and subthemes adopted were: Percent Agreement and Cohen's Kappa.

Figure 2.1. Government Agency and Non-Government Origination interview protocol. (Items that are bolded are the interview questions in which the figures in results are derived from)

 In general, does your agency promote prescribed fire use?
1. If so, please explain how it does this?
2. What is your opinion of prescribed fire as a brush control/land management tool?
3. What information sources or experiences informed this opinion?
4. Have you personally experienced or been involved with prescribed fire?
5. If so, please explain how?
6. In general, do you support the use of prescribed fire?
7. Please explain?
8. **In general, would you describe your land management decisions as risk-averse, risk-neutral, or risk-prone?**
9. Please explain your response in the context of land for which you provide management advice.
10. How do Prescribed Burn Associations compare to government agencies in regards the provision of information on prescribed fire?
11. Are they an effective substitute to government agencies as disseminators of information about prescribed fire?
12. On average, how do you rank concern about the following risks of using prescribed fire -- greatest risk to lowest risk: personal injury or fatality, property damage from escaped fire, smoke hazards, wildlife mortality, aesthetic effects on the landscape?
13. Have you had any personal experience with any of these concerns?
14. Do you think this ranking is different for landowners, and if so how?
15. How do you think the demand for prescribed fire as a wildlife management tool compare to its demand as a range management tool (brush control, forage improvement, etc.) on lands your agency manages?
16. How about among private landowners?
17. Which is the most likely challenge that someone who wishes to apply prescribed fire will face: limited knowledge and expertise, shortage of resources (personnel, equipment, money), lack of assistance with development of prescribed burn plans, or inability to apply fire when it is most effective due to weather conditions or burn bans, etc?
18. In general, do you think the Smokey the Bear Campaign has encouraged or discouraged the use of prescribed fire?
19. Has the Smokey the Bear campaign affected your perceptions about fire in general and about the use of prescribed fire in particular?
20. How do you think the Smokey the Bear campaign has affected landowner perceptions about fire in general and about the use of prescribed fire in particular?
21. **Do you provide information to landowners about prescribed fire? If yes, how do you typically communicate with landowners about this issue?**
22. Do you find any particular kind of messaging more effective than others?
23. **Has the expansion of social media made it easier to quickly and effectively disseminate information or give advice about the use of prescribed fire?**
24. Please recommend two other people in your organization who we could approach for additional interviews? We would like to contact one person who actively supports the use of prescribed fire and one person who may have greater concerns about the use of this management tool.
25. If we have any further questions or need to clarify any of your answers, may we contact you again?

Figure 2.2. Landowner Representative Association interview protocol. (Items that are bolded are the interview questions in which the figures in the results are derived from)

1. What is your current role in the organization _____ (fill in blank of organization we're talking to)?
2. Are you a landowner?
3. If so, how much do you own?
4. **Would you describe your land management decisions as risk-averse, risk-neutral, or risk-taking?**
5. Please explain your response in the context of land for which you are legally and fiscally responsible.
6. What is your opinion of prescribed fire as a brush control/land management tool?
7. What information sources or experiences informed this opinion?
8. Are you a member of your local PBA?
9. If yes, which one _____
10. In general, do you personally use or support the use of prescribed fire?
11. Please explain?
12. Have you personally participated in the application of prescribed fire use?
13. If yes, on your own land -- Y/N
14. If yes, on another person's land -- Y/N
15. If you have not used or do not support the use of prescribed fire, to what extent have state and local liability concerns affected your perspectives about this land management tool?
16. **In your opinion, how readily available to you is information and expertise about the use of prescribed fire?**
17. **Have you ever received information on social media about prescribed fire issues?**
18. If yes, from what social media platforms did you get such information?
19. **If no, would receiving information about prescribed fire be useful to you?**
20. **If no, would you be more inclined to use prescribed fire if you saw lots of social media posting positive information about this land management tool?**
21. How do Prescribed Burn Associations compare to government agencies in regards the provision of information on prescribed fire?
22. Are they an effective substitute to government agencies as disseminators of information about prescribed fire?
23. On average, how do you rank concern about the following risks of using prescribed fire -- greatest risk to lowest risk: personal injury or fatality, property damage from escaped fire, smoke hazards, wildlife mortality, aesthetic effects on the landscape?
24. Have you had any personal experience with any of these concerns?
25. Do you think this ranking is different for landowners, and if so how?
26. **Which is the most likely challenge that someone who wishes to apply prescribed fire will face: shortage of knowledge and expertise, shortage of resources), lack of assistance with development of prescribed burn plans, or inability to apply fire when it is most effective due to, for example, burn bans, others?**
27. In general, do you think the Smokey Bear Campaign has encouraged or discouraged the use of prescribed fire?
28. Has Smokey Bear affected your perceptions about fire in general and about the use of prescribed fire in particular?
29. Has this message confused you in any way?
30. **Do you provide information to landowners about prescribed fire? If yes, how do you typically communicate with landowners about this issue?**
31. What are the primary sources of information that landowners are likely to use when considering the use of prescribed fire on their land?
32. **Has the expansion of social media made it easier to quickly and effectively disseminate information or give advice about the use of prescribed fire?**
33. **Do you take the social media posts about prescribed fire seriously?**
34. **Are social media an effective tool for this?**
35. Do you prefer the face to face interaction when obtaining information about land management issues, such as the use of prescribed fire?
36. Could you recommend two colleagues for our interview process? One of whom does use prescribed fire and one who doesn't?
37. If we have any further questions or need to clarify any of your answers, may we contact you again?

Based on these scores, response rates from the 66 transcribed interviews were first categorized

into traditional and social media relevance, and then within each medium category responses

were further categorized into three subcategories. For the traditional media category,

subcategories included communication preference, education presence, and risk perception. For

social media, subcategories included educational availability, utility, and attitudinal influence

(Table 2.1).

To focus the themes further, I assigned positive, neutral, or negative inclinations to the

three response subcategories within each of the two of information medium categories,

traditional and social media. I then gave context to each category by identifying salient quotes

from the transcribed interviews, and then assigning a value to the context response. For example,

when asked "Has the expansion of social media made it easier to quickly and effectively

disseminate information or give advice about the use of prescribed fire?" I examined the quotes

coded to this specific subcategory and,

Table 2.1. Telephone interviewee response coding structure

Code	Traditional			Social Media		
	Communication Preference	Education Presence	Risk Perception	Attitudinal Influence	Educational Availability	Utility
	1= Traditional 2= Electronic 3= Social media	1= Present & good 2= Present & bad 3= Not present	1= Risk averse 2= Risk neutral 3= Risk taking	1= Positive influence 2= Neutral 3= Negative influence	1= Used 2= Not used 3= Not mentioned	1= Effective 2= Not effective 3= Depends 4= Not mentioned
ALES1.1	2-Electronic communication was preferred by the respondent	2-Traditional education presence was present and bad for the respondent	1-When taking risks, the respondent believed being risk averse was the best option	1-Social Media had a positive influence on attitudes for this respondent	3-Education through social media was not mentioned by respondent	2-Social Media utility was not effective according to the respondent

based upon the response, determined if social media was used, social media was not used, social media was not mentioned and input the value of 1, 2, or 3 into the table. Table 2.1 illustrates this methodology.

Results

Absolute counts of responses from the 66 interviewees are presented first based on (Table 2.1). Key themes from the subcategories are subsequently presented with salient quotes from interviewees representing each of the possible values in each subcategory.

Absolute Counts of Interview Responses

Of the 66 interviewees, half felt the current education efforts through non-social media platforms is present and effective at reaching intended audiences (Figure 2.3) Surprisingly though, many interviewees, including agency representatives also felt that education efforts were not effective at communicating information to the targeted audiences. This indicates that government agencies and landowner representative entities need to reevaluate how information is disseminated.
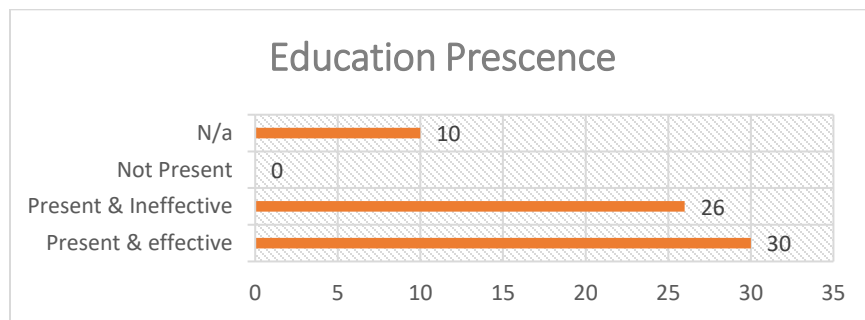

Figure 2.3. Frequency distribution of responses to the question, In your opinion, how readily available to you is information – excluding social media – and expertise about the use of prescribed fire?

Almost two thirds (62%) of the interviewees felt that when they were generally risk neutral when making land management decisions, or they responded "it depends" (i.e. what the risk situation they are currently in calls for if implementing prescribed fire) (Figure 2.4). This highlights the overarching idea that when disseminating information about prescribed fire, no one way suits all landowners, because when landowners make decisions about risk (for land management purposes), respondents have different approaches each time. More importantly, traditional information dissemination could be better utilized to reflect the attitude of "it depends" (on their current land management risk situation) when discussing the risks of applying prescribed fire for specific landowner goals.
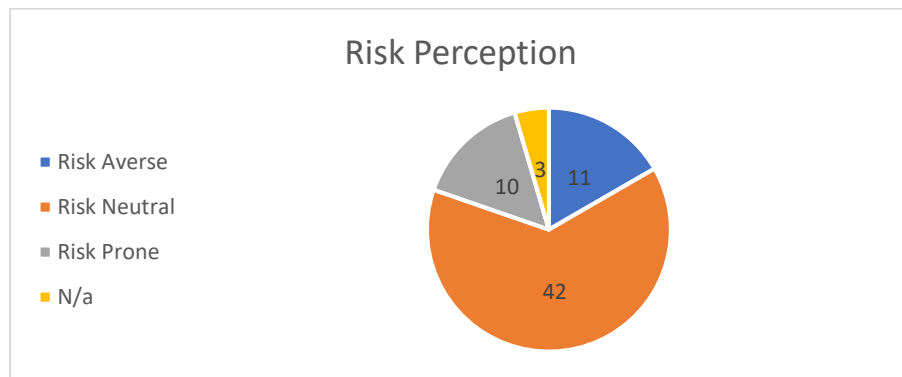

Figure 2.4. Frequency distribution of responses to the question, In general, would you describe your land management decisions as risk-averse, risk-neutral, or risk-taking?

While many interviewees took social media seriously, 27% felt that such platforms were irrelevant to them (Figure 2.5). In the broader scheme of information outlets, the 31% neutral response choice suggests that almost a third of the interviewees felt that the reliability of information disseminated through these sources is uncertain.
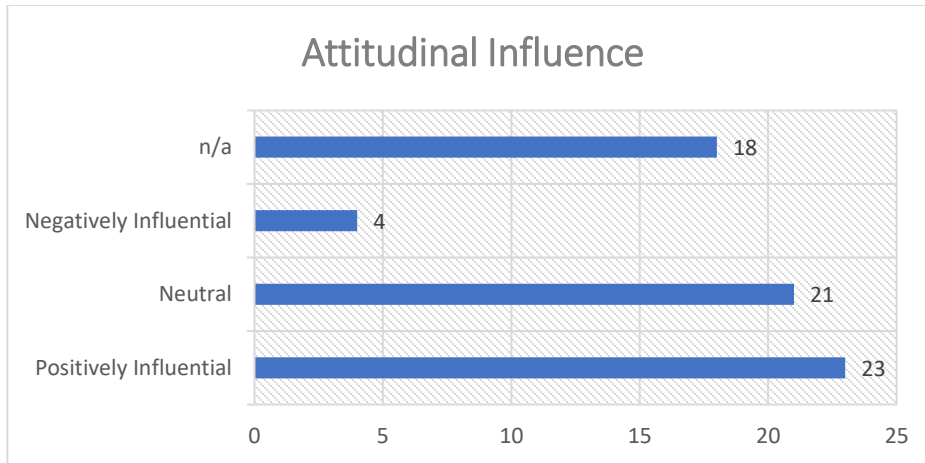
Figure 2.5. Frequency distribution of responses to the question, Do you take the social media posts about prescribed fire seriously?

Over half of the interviewees felt that information about prescribed fire can be obtained via social media (Figure 2.6), but a third indicated they had not received information from this platform. When considering social media as an information dissemination tool, assessment of effectiveness of these platforms is critical. While the highest response was that social media was effective, and almost equivalent number of interviewees indicated that effectiveness of social medias is dependent on the source, e.g. person/entity, from which the information came from. If the source was not trusted, then the information was often deemed false.
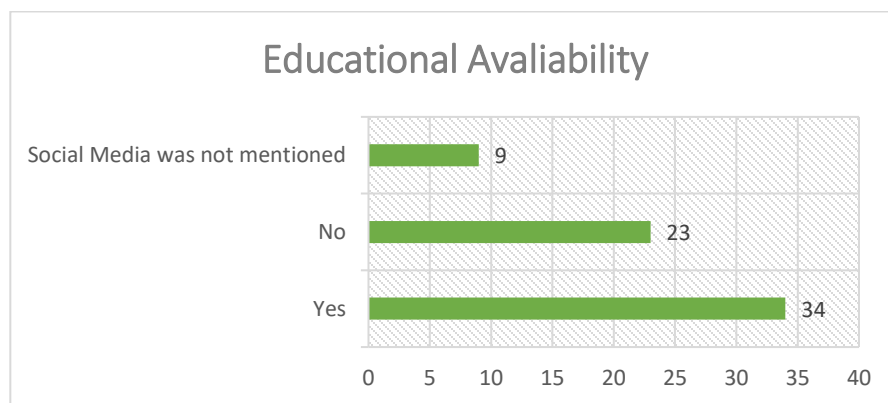

Figure 2.6. Frequency distribution of responses to the question, Have you ever received information on social media about prescribed fire issues?
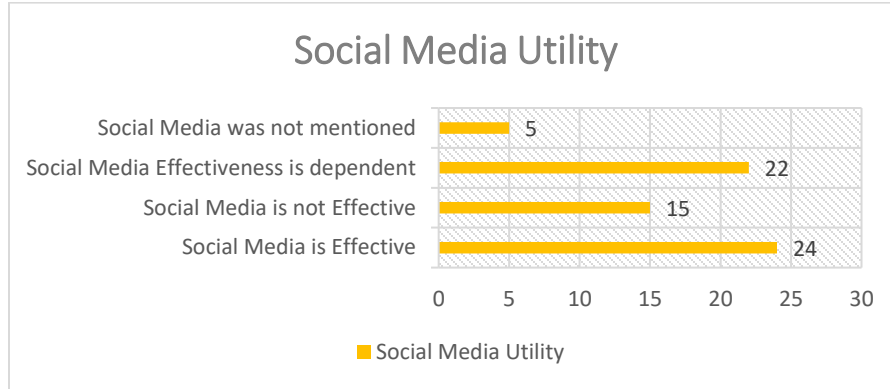
Figure 2.7. Frequency distribution of responses to the question, Has the expansion of social media made it easier to quickly and effectively disseminate information or give advice about the use of prescribed fire?

Key Themes from Traditional and Social Media Information Sources

<u>Traditional Communication for Education Purposes</u>

Communication Preference – How do you typically communicate with landowners?

The interviewees indicated that tractional communication methods (in person consultations and printed materials) are still most frequently used (71%), followed by electronic media (Email, text, website, phone, and television = 24%), and then social media (Facebook, Instagram, and Twitter = 5%). Given the potential value of social media for disseminating information among diverse stakeholders who are interested in prescribed fire, this indicates a subtidal opportunity for change.

Education Presence – In your opinion, how readily available to you is information and expertise about the use of prescribed fire?

When referring to education attempts by government agencies and landowner entities, several interviewees believe the general public fears fire more than landowners, perhaps in large part due to the Smokey Bear fire suppression campaign, which does not differentiate prescribed

fire and uncontrolled fire. Several interviewee quotes indicate that education efforts appear to be changing public perspectives.

1. **Traditional education is Present & good –** "I've got a whole step process that I've put together from starting the preparation of fire to the completion to even a year after with pictures, what the landscape looks like after fire. I … sit down with (landowners) and show them the whole process on my computer with a little slide show that I put together … If they're willing to do a prescribed fire, I'll work with them on every step of the way."

2. **Traditional education is present & good** – "As the Forest Service comes out and they start talking about conducting prescribed fires, and educating and communicating the benefits of that, and the outcomes of that, I think that the public is slowly coming along …."

3. **Traditional education is present & bad –** "... you hear a lot of negativity against fire, and when you drive into some of our towns they have a cut out of Smokey the Bear that says the fire risk. It makes people feel like there's not a lot of difference between a wild fire and a prescribed fire."

Risk Perception – In general, would you describe your land management decisions as risk-averse, risk-neutral, or risk-prone?

When asked about fire risk, interviewee response varied according to three risk orientations including risk taking, risk neutral, and risk averse. Quotes from interviewees that relate to these response categories include:

1. **Risk averse** – "I'm pretty much risk-averse when it comes to using prescribed fire because we know that even with the best-laid contingency plans you can still have the fire get away from you"

2. **Risk neutral** – "It's not a one size fits all answer. I've certainly tried to mitigate as much risk as possible on any particular burn site. And then you have to weigh the options on how bad could the consequences be if this fire got away from me in this area."

3. **Risk taking** – "It's calculated risk and we do a lot of management and write up prescriptions accordingly to reduce the potential for having an escaped fire or having something go wrong. But, the reality is that there is always the potential for some adverse risk or something that will go unprepared for to happen on a prescribed burn."

Theme 2: Social Media communication for Education Purposes

Attitudinal Influence – Would you be more inclined to use prescribed fire if you saw lots of social media posting positive information about this land management tool?

The interviewees indicated that information derived from social media about prescribed fire must be trusted in order for them to utilize that information and that trust is very source dependent. There has to be an interest in using social media to begin with to see social media posts about prescribed fire. The following quotes illustrate the influence of social media on the positive, neutral and negative perceptions of prescribed fire:

1. **Positive Influence** – "(Social Media) has helped but you have to be leery about the quality of the information being thrown out there. They need to be credible sources."

2. **Neutral** – "Yeah, (Social Media) obviously does because we're always looking at our phones and on email and on the net and everything. Information is flown out all over the place, whereas before you would have to talk to somebody and someone would have to knock on your door, send you a letter. … It also has increased the possibility of incorrect information getting out there, but it's information nonetheless."

3. **Negative Influence** – "I think (Social Media) is something that the landowners have to take into consideration, as to where the information's coming from."

Educational Availability – Has the expansion of social media made it easier to quickly and effectively disseminate information or give advice about the use of prescribed fire?

The interviewees indicated they believe that social media is available to be used and can be utilized by those interested in learning about prescribed fire but that social media has not yet reached its potential as a prescribed fire information tool. This is primarily due to the ageing landowner demographic, the type of activity that prescribed fire represents, and uncertainty about the credibility of the source compared with other information mediums that are available to landowners. The following quotes illustrate this perspective:

1. **Social media was used** – "Yeah, we pursue (social media) as a strategy and are in our infancy of building a social media presence to be able to disseminate the information that we've collected, but we're not quite there yet. So, we do think it's a good idea but haven't … seen it that much."

1. **Social media was used** – "… I watch a few different pages on social media that provide some information about burning and the positive effects of using fire … I've

always wondered how mainstream those things are for most of the clientele we work

with, but I do think there's a benefit with the use of those."

2. **Social media was not used** – "(Social media have) enhanced the ability to

disseminate information. (However) I'm not sure it has given us a greater ability to

disseminate information about prescribed fire"

Utility – Is social media an effective tool for this (education)?

Interviewees indicated that social media have the potential to be effective information

dissemination platforms for prescribed fire but this potential has not yet been reached.

Underpinning this conclusion are perceptions that social media are not appropriate for the current

landowner demographic and that the effectiveness of social media as reliable source of

information depends upon the source of the information. If landowners were to use this particular

medium it could be effective as indicated by the following quotes:

1. **Social media is effective** – "It's a great communication tool…..but I do realize the

value because it spreads the message so quickly."

2. **Social media is Ineffective –** "… the group of people that I deal with are generally

older, and don't participate that much in social media. It has come up quite a bit, in I

would say the past five years. I have a lot more producers that I see on Facebook and

Twitter, and things like that. But, (in general) ... I think it reaches more of the middle

age to younger crowd, as opposed to the rural area where I'm at. I have quite a few

producers that are 60 years old, and older. It just doesn't work that well with them."

3. **It depends** – "I don't know if we're at the point where producers want to communicate that issue that way. … I think we need to get there, but I'm not sure we're there."

Discussion

Before conducting the telephone interviews, I believed that social media could be a catalyst for improving dissemination practices for prescribed fire and by extension, enhanced the utilization of prescribed fire. However, I found that, while prescribed fire practioners sometimes do use social media for communication purposes, often they do not trust the source nor the information derived from that source.

Many quotes stated that it depends on who the information is coming from, so the lack of trust is not necessarily about social media platforms, although that may also play a role, but rather the credibility of the information source. The idea that perception of information source is a driver of its effectiveness for disseminating information is not new (Bate et al., 2009, Bennet, 2016, MacKeracher et al., 2018); however, in the literature regarding prescribed fire there is little mention of source and medium perception relating to prescribed fire, which according to the interviewees is important.

Kreuter et al. (2008) found that peer-to-peer learning is very effective in improving landowner perceptions about prescribed fire because it addresses adult learning preferences. While social media can be used to facilitate peer-to-peer learning, it represents a less personal learning environment than the face-to-face interactions exhibited in that research. Toledo et al. (2014) reported that landowners who experienced prescribed fire first hand were more likely to use it. While social media does represent a medium in which the positive effects of prescribed fire can be portrayed, one interviewee stated "if you meet with them out there on their front

porch and go look at their place with them, you'll get a lot better message across to them."

Social media are not able to provide hands-on and face-to-face participation like some of the

more traditional means of education, such as field-based interactive management activities.

Dumbford and Miller (2018) described how online platforms can be positive for engagement of

learners but negative for collaboration, which is necessary for expanding the use of prescribed

fire by landowners (Kreuter et al., 2008, Toledo et al., 2012, Toledo et al., 2014).

The importance of the people interviewed believing social media to be insufficient as an

education and information dissemination tool for prescribed fire is that the interviewees were

almost all experienced fire practioners and familiar with speaking to landowners and other

important stakeholders in the prescribed fire community. Their opinion is influential in how

educators can spread the message that prescribed fire is an important land management tool to

reduce the risk of wildfires by removing accumulated fuel loads.

The breakdown of social media into the three sub categories provide a basis for

addressing the general perceptions of social media as a whole in examining; trust of (Attitudinal

influence), preference for (Education Availability), and degree of use (Utility). In addressing the

perception for social media as a whole, information disseminators may have an indication as to

how a source of information may be received on a social media platform. Without understanding

the perception towards an information medium, the perception towards the information source

may be an uninformed one.

One can deduce from the above results that social media may serve as a supplement but

not a substitute for more traditional means of disseminating information about prescribed fire.

What these results imply is one very important idea; perception of the source and medium decide

where prescribed fire professionals disseminate information about this land management tool is critical. If the user does not trust the information source or medium, they are unlikely to use it.

<u>Conclusion</u>

Social media can be a supplement to more traditional information dissemination vehicles for improving prescribed fire information dissemination practices. Due to the increasing of social media usage by the current aging population and especially the younger incoming generation of rural landowners and managers, it is imperative to explore further the potential greater use of social media as a supplementary tool for adult education. The major hindrance to adoption of social media more widely is the perception by landowners, agency representatives, and government officials of uncertain reliability. Understanding which sources of social media platforms are perceived to be trustworthy and useful will begin to shed light on how to improve these perceptions in the future.

Chapter 3 – Information Perceptions

Introduction

Evidence from the telephone interview portion of the research project suggested that social media could be an effective information dissemination tool, but was dependent on credibility. In order to provide better insight how to improve education practices around prescribed fire, I pose the following two questions: (1) "Are current mediums and sources of information on prescribed fire credible to landowners, policy makers, and other important stakeholders?" (2) "If the source/medium of information is perceived to be credible to the consumer, why is prescribed fire education and outreach endeavors still met with scrutiny?"

Many elements of information affect the perceptions of intended audiences. These elements include but are not limited to credibility, reliability, relevance, clarity, accessibility, and shareability. When coupled with credibility, these facets of information may provide greater clarity about how information is perceived and accepted. Research suggests that credibility and trust play a critical role in information acceptance (Reichelt et. al, 2014. Turner et. al, 2016), but there is limited information about other factors affecting land manager perceptions about information.

Once these elements of information are better understood, research can begin to examine if the perceptions are related to application of prescribed fire. Such knowledge is invaluable to government agencies, policy makers, and landowner representative groups who are interested in promoting prescribed fire. This allows them to identify different types of landowners who are primarily interested in the trustworthiness (credibility and reliability) of such information, easily understood and therefore useful information about prescribed fire (relevance and clarity), and easily searchable and accessed information on prescribed fire (accessibility and shareability).

Combining demographical data and previous experience with prescribed fire can clarify what is important to certain categories of landowners. For example, relatively inexperienced younger landowners with limited college education may find clarity more important to be able to use the information while a more experienced older fire practitioner may consider reliability more important for the information to be useful. Prescribed fire educators with such knowledge may be better able to tailor the nature and content of their outreach endeavors to fit various types of landowners in a changing landowner landscape.

Literature Review

Information acceptance is discussed in the context of three overarching themes that can be applied to different sources and mediums of information. The first is "trust" that encompasses credibility and reliability, the second is "use" that encompasses clarity and relevance, and the third is "preference" that refers to accessibility and shareability.

Trust of Information (Credibility and Reliability)

Evidence suggests that prior knowledge plays a large role in deciding the credibility of information (Westerman et al., 2014) and that credibility of information is significantly tied to previous beliefs (Liu, 2004). Benett (2016) provides a model that highlights how previous values, beliefs and social structure precede perceptions that inform individuals' support for environmental action decisions. Moreover, perception of credibility of information varies according to the consumers of information. For example, experts often rely more on published references while regular information consumers focus on the visual appeal of the information to determine if it is credible (Liu, 2004). According to Bates et al. (2009) making information appear more credible and trustworthy is paramount in promoting information sources as better than others to non-academic information consumers. Reichelt et al (2014) and Turner et al

(2016) concur that, to many information consumers, the appearance of credibility is more important than including expert knowledge in the content. These findings imply that, to effectively convey credibility and reliability to information consumers, interfaces on certain mediums should be user friendly, show connections to other users by listing contact information, credentials, and a balance of opposing viewpoints regarding the relative benefits of applying prescribed fire or other land management alternatives.

Usefulness of Information (Relevance and Clarity)

Perceptions of information are likely tied to the ease of understanding what is presented to consumers and how this is significant. Reed et. al (2014) provided a schematic to effectively convey information to consumers outside academic circles through a 6-step process that includes design, represent, engage, impact, reflect and sustain. The importance of this process is focused on making the information easily understood and ensuring its suitability to the relevant stakeholders with the understanding that information dissemination is an iterative process that requires constant updates to meet the needs of new information users. Laurance et. al (2012) found that, committing to improved communication efforts is synonymous with improving relevance to information consumers because starting dialogues with practioners, the general public and popular media increases the chance that research findings are broadly understandable. These authors believe that few people who are outside academic circles read scientific literature and because of this "publishing a scientific paper is desirable but far from sufficient to communicate one's findings. Communicating beyond academic circles is what most readily distinguishes research that is implemented in conservation contexts from that which has little practical impact" (Laurence et. al., 2012, p.167). The co-production of information in these

knowledge exchange realms improves salience, credibility, and legitimacy of the information to non-academic consumers (Peters et.al 2018).

Assumptions made by information creators and disseminators are often inconsistent with relevance and clarity of the information presented. For example, Cash et. al (2003, p.8808) conclude that communication effectiveness suffered when it is unidirectional and that "Linking knowledge to action requires open channels of communication between experts and decision makers but also requires that participants in the resulting conversation understand each other." Effective knowledge systems facilitate mutual understanding, have the relevant actors perform specific functions and exhibit constant reevaluation to emphasize the relevance to diverse stakeholders. Dilling and Carmen (2011) agree that ensuring opportunities for iteration need to be deliberate to create an academic culture set on acknowledging information consumer's needs to aid in their decision-making processes. An example they presented was an Information Broker whose sole purpose was to bridge that gap between the knowledge information scientists produce and the requirements of non-scientists require. This emphasizes the link between clarity of information presented by scientists and relevance to consumers.

Preference of Information (Accessibility and Shareability)

Dissemination of information has evolved practices for land management, including prescribed fire. Shen (2018) highlighted that different stages of information acquisition call for different communication channels, exchange mechanisms, and sharing platforms. Burn severity mapping, rangeland fuel loads, fire weather indexes are examples of different types of data that require alternate acquisition and dissemination approaches. In a study regarding climate change information, Peters et. al (2018 p. 253) indicated that "It is not enough for federal agencies to make climate information accessible across agencies and regions, they must also foster a culture

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that has an expectation of sharing" Feder and Savastano (2006) described that, due to their

credibility, community leaders (but not those represented by government entities) proved most

effective at transmitting knowledge to others. Kreuter et. al (2008) described that prescribed

burning associations exemplify that characteristic by providing easy access to information

through the involvement of community leaders. Krishnan and Patnam (2014) found that utilizing

neighbors for technology adoption proved much more effective than extension services, while

Genius et. al (2014) noted that extension and peer-to-peer information transmission are

complementary and increase effectiveness.

Majetic and Pellegrino (2018) reported that participants of their study had much higher

confidence in and regard for scientifically derived information when they tested the veracity of

the information. This suggests that government agencies and landowner entities that wish to

make information readily available to landowners need to teach the intended target groups how

to utilize the agency's or entity's preferred information dissemination medium, thereby enabling

the target groups to make the information more accessible to peers without the agency's or

entity's oversight. The importance of these studies is that each of the studies highlight the

importance of easy information sharing mechanisms that improve adoption of differing

environmental management strategies.

A single approach for disseminating information is, however, likely to be of limited value

because different users obtain information in different ways (MacKeracher et al., 2018).

Therefore, to be effective, information disseminators should shape their message in ways and use

a range of outlets that are meaningful for different stakeholders. For example, Hays (2000)

provided an important foundational study that examines the perceptions about internet-based

education methods on natural resource management. This survey identified which educational

aspects are considered important issues by private landowners in natural resources, and found

that respondents information dissemination needs were generally not being met. Winter (2010)

discussed how trust is not the only factor influencing the approval and perceived effectiveness of

land management actions, suggesting that, while credibility is a strong determinant of positive

perceptions about information, other factors also influence the formation of perceptions. More

studies are needed to complement Hays' findings, including determining the importance of

reliability, clarity, accessibility, shareability, and relevance for users of information about

prescribed fire.

Methods

The survey population or this study were the members of the Texas and Southwestern

Cattles Raisers Association (TSCRA) and Texas Wildlife Association (TWA) who are on the

mailing list for their Association's newsletter. This survey population was selected due to the

geographical location in the Southern Great Plains of most of the members along with their

potential use of prescribed fire. An electronic link provided by Qualtrics to enabled survey

participants to access the questionnaire and automatically store respondents' data, was included

in each Association's weekly newsletter that members received by email during a 4-week period.

The SCRA survey began October 15th and closed November 15th, 2018 and TWA survey ran

from November 29th to December 29th, 2018.

Survey participants were restricted to landowners who owned at least 50 acres of land

because prescribed fire is unlikely to be used on smaller acreages. At the beginning of the

questionnaire, the survey participants were asked if they owned at least 50 acres. If respondents

indicated no, they were taken to the end of the questionnaire and excluded from the study. An IP

address tracker was included in the questionnaire to prevent multiple responses from the same

individual, and a date marker was used to separate responses from the two Associations. Survey

participants were allowed one week after starting the survey to complete it. Protocol 3.1 at the

end of the document represents the questions included in the questionnaire. Categories of

questions include demographics, previous experience with prescribed fire and how the

respondent learned about and accessed information about prescribed fire. Descriptive statistics

for the respondent data were obtained using the Qualtrics software.

Results

Approximately 17,000 landowners received access to the survey questionnaire, with

about 10,000 being TSCRA members and about 7,000 being TWA members. A total of 470

landowners submitted a completed questionnaire, providing a response rate of 2.76%. Such low

response rates are not uncommon for email-based surveys and because of this the survey data are

considered exploratory and cannot be extrapolated to the whole population of the two

Associations. Accordingly, the results and associated discussion refer only to the respondents

and are not extrapolated to the broader population. The following subsection provides descriptive

information about respondents and their landholdings, whereas the subsequent subsections each

address a key question in the questionnaire.

Respondent Characteristics

Of the survey respondents, 33% were 70 years of age or older and 52% ranged in age

from 49-69 years of age, and over 87% of respondents were male, which is consistent with other

studies of landowner demographics (Lund et al., 2017). Most (62%) of the respondents indicated

that less than 25% of their household income was generated from their property, and only 18%

obtained more than half of their come from their land. By contrast, 45% of the respondents lived

on their land full-time, and 24% indicated they were absentee landowners. A large majority

(90%) of respondents indicated they themselves of they and a family member were the primary household decision makers.

Reasons for owning land can influence the decision to use prescribed fire. Approximately 68% of respondents owned their land primarily for livestock production purposes, with another 10% indicating that wildlife use is the reason for ownership. Familiarity with prescribed fire is also an important aspect of this study. Of the respondents, 62% indicated they have applied prescribed fire before, 27% indicated they had received assistance with planning or application of prescribed fire on their land, and 13% were members of prescribed burn/fire management associations. The following subsections provides more detailed information about respondents'' experience with prescribed fire.

Experience with Prescribed Fire

Tables 3.1 and 3.2 provide frequency disruption of responses relating to the benefits of and decision making about prescribed fire, respectively. With respect to the general benefits of using prescribed fire and the wildfire mitigation befits of this management tool, those respondents who had experience with prescribed fire had a significantly more positive perspective ($x^2 = 44.89, p = .001$ and $x^2 = 13.27, p = .012$ respectively) (Table 3.1) with significance levels set at .05. In particular, over two thirds of the respondents with prescribed fire experience had a very positive perspective of the general benefits of prescribed fire and strongly agreed with its wildfire mitigation benefits, while less than half of those without such experience agreed strongly with these benefits.

Table 3.1. Effect of experience with prescribed fire on frequency distribution of responses about general benefits of this land management tool (N=293) and wildfire mitigation (N=353). (Numbers represent frequency count and percentage)

General opinion of prescribed fire as a land management tool?		Very negative	Negative	Neutral	Positive	Very positive	Total
Experience with prescribed fire	Yes	0 (0.0%)	8 (4.5%)	5 (2.8%)	45 (25.3%)	120 (67.4%)	178 (100%)
$x^2 = 44.89$ $p = .001$	No	1 (0.9%)	9 (7.8%)	2 (1.7%)	59 (51.3%)	44 (38.3%)	115 (100%)

Risk of Wildfire is reduced by periodic prescribed fire.		Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Experience with prescribed fire	Yes	5 (2.3%)	3 (1.4%)	6 (2.8%)	60 (28.0%)	140 (65.4%)	214 (100%)
$x^2 = 13.27$ $p = .012$	No	5 (3.6%)	3 (2.2%)	8 (5.8%)	59 (42.4%)	64 (46.0%)	139 (100%)

Overall, 70% of respondents reported they were at least well informed when making decisions about prescribed fire and almost half (47%) felt they were well or very well informed in this regard. However, perspectives about how well informed they felt they were was influenced by both their participation in prescribed fire and assistance they had received with planning or application of prescribed (Table 3.2). While the majority of respondents with and without prescribed fire experience felt they were at least somewhat well informed, significantly more respondents with prescribed fire experience felt they were very well informed ($x^2 = 73.36, p = .001$) with significance levels set at .05. Similarly, a higher proportion of respondents who had received assistance with burn plan development or with the application of prescribed fire felt they were very informed when deciding whether or not to apply this tool ($x^2 = 45.04, p = .001$) with significance levels set at .05.

Table 3.2. Effects of participation in prescribed fire (N=260) and assistance with planning or application of prescribed fire (N=256) on respondents' perception of how well informed they are when making decisions about the application of this land management tool. (Numbers represent frequency count and percentage)

How well informed do you feel you are when making decisions about using prescribed fire?		Very un-informed	Un-informed	Informed	Very informed	Unsure	Total
Participated in prescribed fire application $x^2 = 73.36$ $p = .001$	Yes	19 (12.2 %)	19 (12.2%)	67 (42.9%)	51 (32.7%)	0 (0.0%)	163 (100%)
	No	3 (2.9%)	31 (29.8%)	63 (60.6%)	2 (1.9%)	5 (4.8%)	104 (100%)

How well informed do you feel you are when making decisions about using prescribed fire?		Very un-informed	Un-informed	Informed	Very informed	Unsure	Total
Assistance with planning or application of prescribed fire $x^2 = 45.04$ $p = .001$	Yes	12 (11.9%)	8 (7.9%)	46 (45.5%)	35 (34.7%)	0 (0.0%)	101 (100%)
	No	10 (6.5%)	42 (27.1%)	81 (52.3%)	18 (11.6%)	4 (2.6%)	155 (100%)

Information Elements

The survey participants were asked to indicate the most important characteristic of information that persuades them that the information is acceptable. By far the largest proportion (60.4%) indicated that credibility was the most important followed by reliability (14.6%), both of which represent trustworthiness. The characteristics that represent usefulness (relevance and clarity) were collectively most important for only 14.2% and those that represent ease of information access (accessibility and shareability) were most important to only 10.8% of the respondents.

Trustworthiness of Sources and Media

Participants in the focus group meeting and telephone interviewees frequently commented that they distrust internet-based information, and that they find information provided through face-to-face interactions and printed materials more compelling. For example, one telephone interviewee commented; "[The internet] has helped but you have to be leery about the quality of the information being thrown out there. They need to be credible sources … landowners have to [question] where the information's coming from." By contrast, the internet-based survey respondents did consider information provided in websites to be "Often" trustworthy. In part, this more positive perspective might be related to the fact that the respondents were inclined to participate in my internet survey and, therefore, may have been more favorably predisposed to internet-based information than the people who participated in the focus group meetings and telephone interviews. Figures 3.1 and 3.2 illustrate survey respondents' perceptions about the trustworthiness of information sources and media pertaining to prescribed fire.

Figure 3.1 indicates there was least uncertainty about the trustworthiness of the NRCS, CES, TPWD, TPWD and PBAs as information sources. PBA's were the most highly rated information sources with approximately 40% of the respondents stating this source was always trustworthy. The NRCS was a close second in this regard, followed by TFS, TPWD and then CES. By contrast there was considerable uncertainty among the respondents about information trustworthiness of the Oklahoma Departments of Agriculture Food & Forestry (OK Dept of AFF)and Wildlife Conservation (OK Dept of WC), The Nature Conservancy (Nature Con), the Noble Research Institute (Noble), and other landowners who are not members of a PBA.
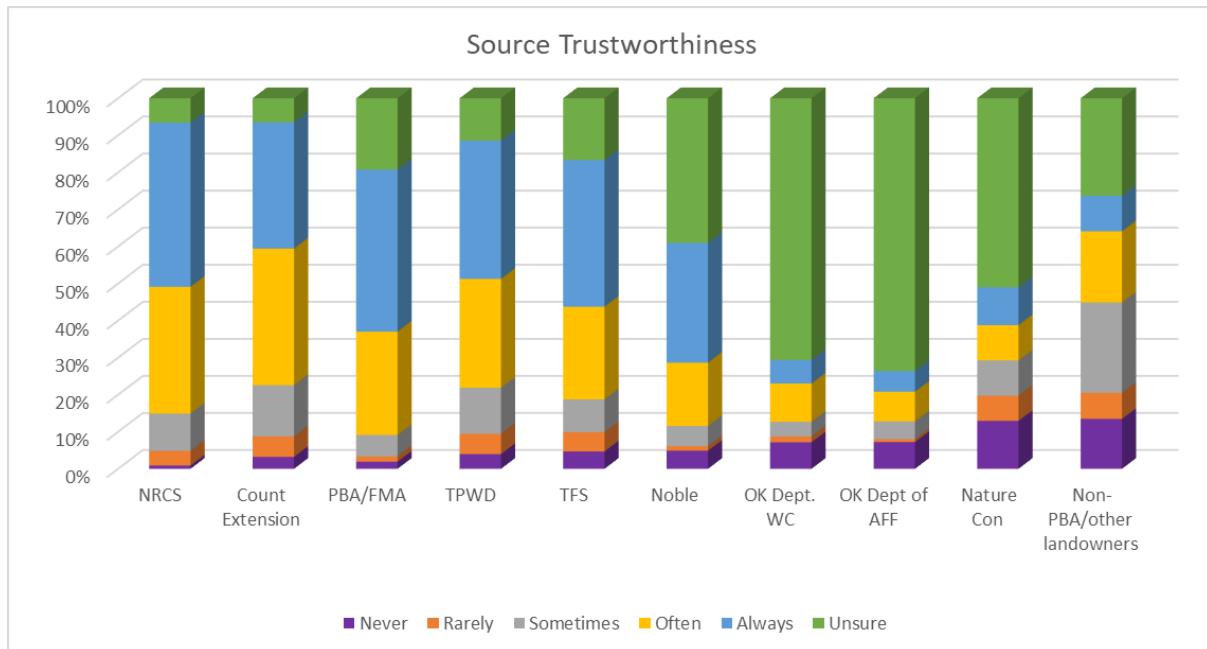
Figure 3.1. Response patterns to the question, "In general, how trustworthy are the following information sources?"

Figure 3.2. indicates contrasting perspectives and respondents about conventional, electronic and social media platforms for information dissemination. Whereas there was a low level of uncertainty about the trustworthiness of information provided via face-to-face communications and printed materials, there was a high degree of uncertainty and distrust about all three social media platforms (Facebook, Twitter and Instagram). The perceived level of trustworthiness of electronic media (telephone, Internet, email, text messages and television) was between these two extremes. These patterns are informative given the increasing skepticism

about the veracity of information delivered via electronic and especially social media platforms.
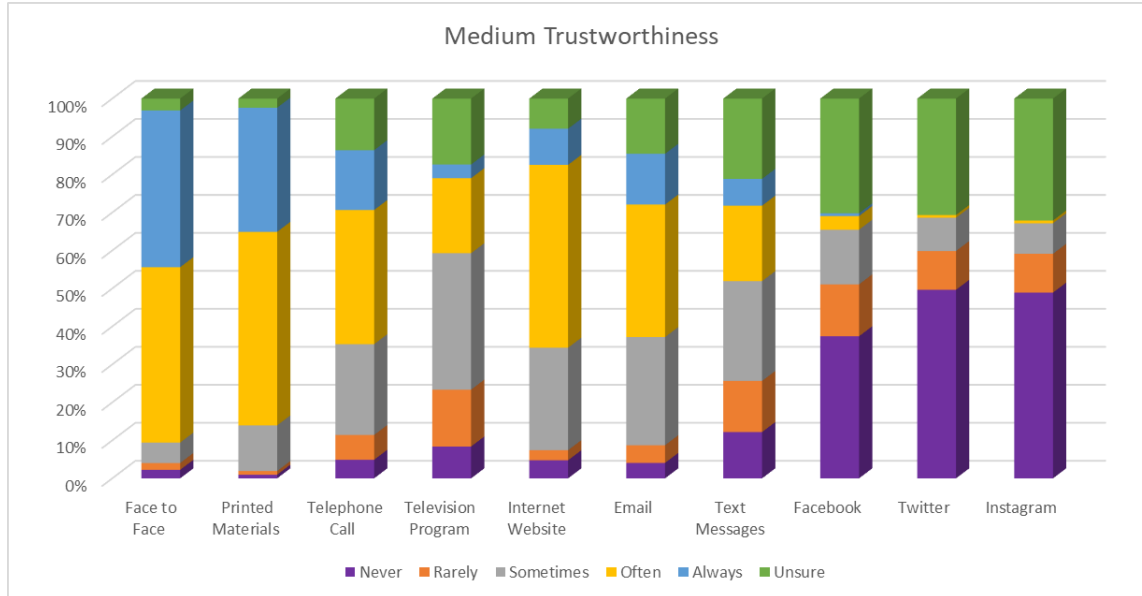
Figure 3.2. Response patterns to the question, "In general, how trustworthy are the following information mediums?"

Usefulness of Sources and Mediums

PBA's/FMAs were again cited as the highest rated source with approximately 35% of respondents stating this source was "always" useful. Giving evidence that landowners find the information from this source to be useful to them. Texas Forest Service was another highly rated source for respondents with approximately 25% of respondents finding this source useful. Overall most respondents found government agencies to be useful but surprisingly most were unsure about the usefulness of the nature conservancy.

Face to face and print materials were often cited as being "always" or "often" useful. Two mediums that should be highlighted are internet email and text message. Both represent interpersonal communication in similar formats but email was rated as often useful 30% more of time as compared to text messaging.
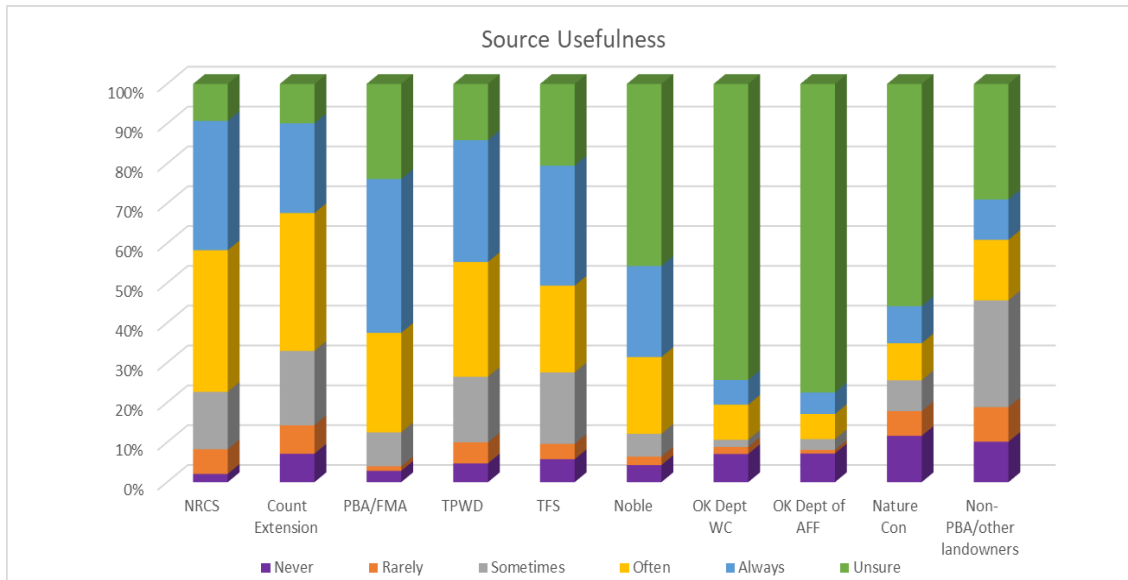
Figure 3.3. Response patterns to the question, "In general, how useful are the following information sources?"
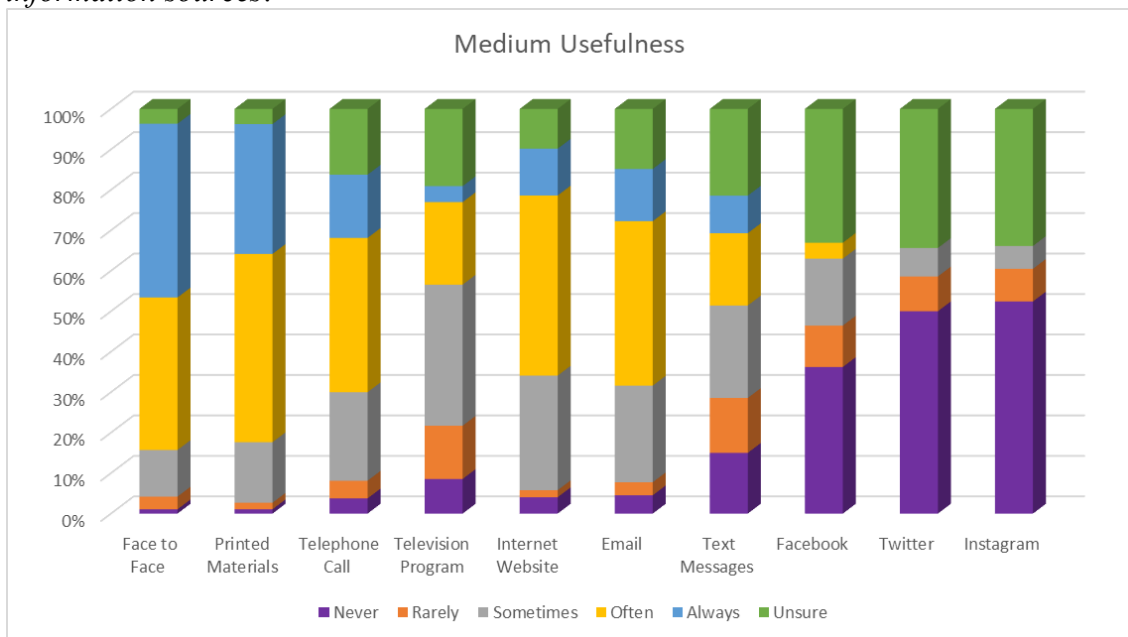
Figure 3.4. Response patterns to the question, "In general, how useful are the following information mediums?"

Preference for Information Sources and Media

When asked about what sources of information they use to obtain prescribed fire

information, the five primary sources for both recipients and on-recipients of assistance were the

federal Natural Resources Conservation Services (NRCS), County Extension Service (CES), private Prescribed Burn Associations (PBA), and the state Texas Parks and Wildlife Department (TPWD) and Texas Forest Service (TFS) (Figure 3.5). However, those who had not received such assistance tended to reach out much more frequently to their CES and TFS than those who had received such assistance, suggesting that these two entities could plan an important role for encouraging more landowners to apply prescribed fire on their land.
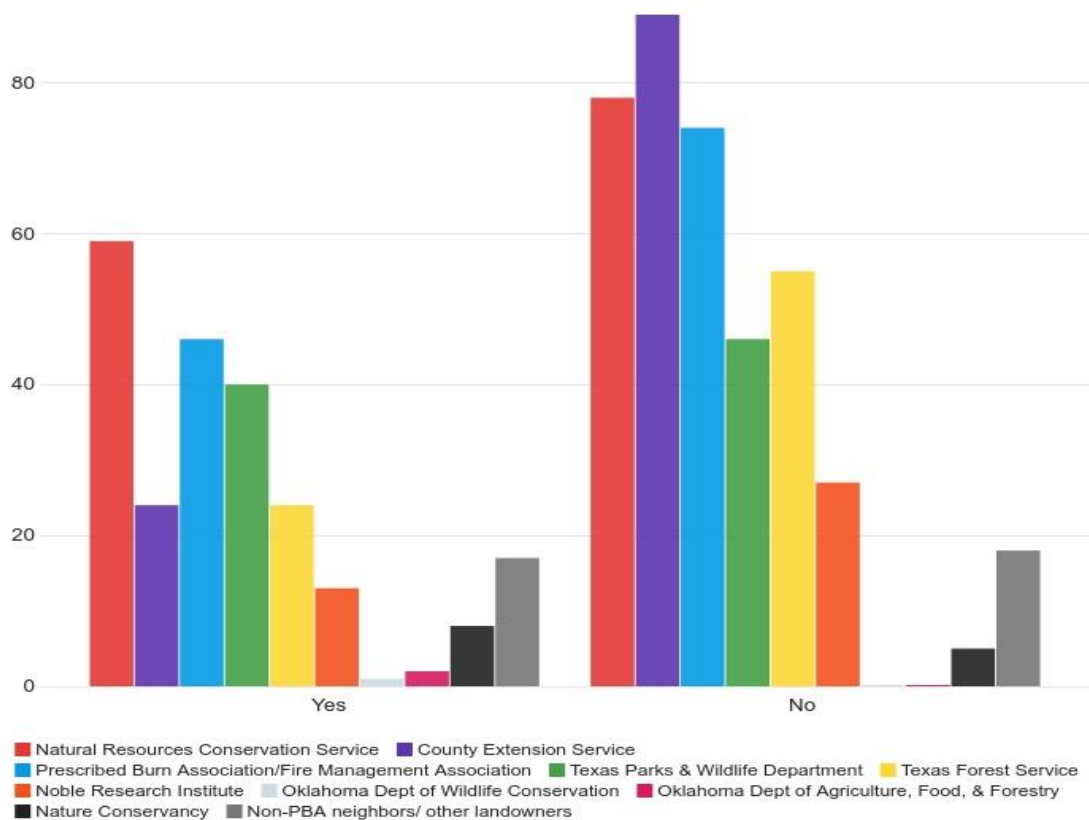
Figure 3.5. - Frequency distribution of preference sources of information about prescribed fire by respondents who had (Yes) and had not (No) received assistance during the last 10 years with the application of this land management tool.

In response to the question about what mediums they use to obtain information about prescribed fire, respondents who had and those who had not received assistance with the application of prescribed fire in the last 10 years obtained information primarily from face-to-

face contacts and printed materials (Figure 3.6). By contrast, those who had not received such

assistance used electronic information mediums, including telephone, internet websites, and

social media, more frequently that those who had received assistance. This may be due to the fact

that those who had received assistance had already obtained such information via conventional

mediums and did not have to seek it from the less traditional electronic mediums to obtain it, and

it suggests that electronic media may be able to play and important role to persuade more

landowners to use fire.
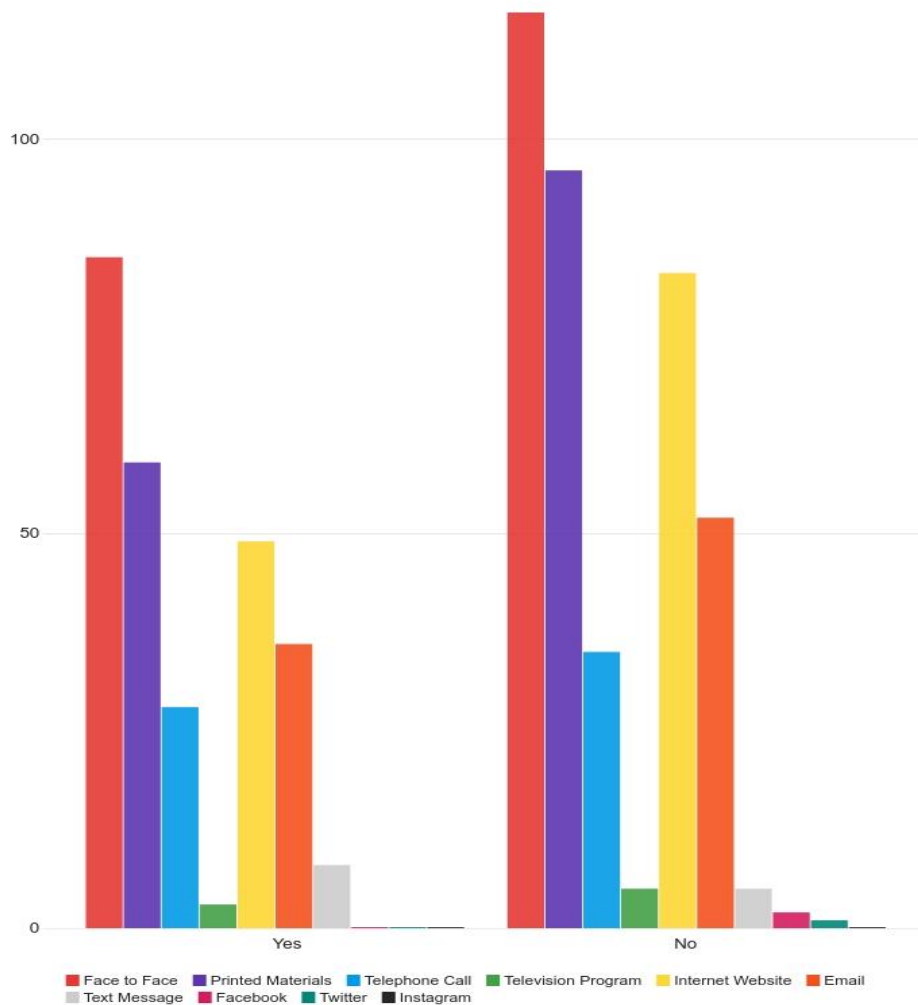
Figure 3.6. Frequency distribution of preferred mediums for obtaining information about prescribed fire by respondents who had (Yes) and had not (No) received assistance during the last 10 years with the application of this land management tool.

Future use of mediums

Having identified the preferred platforms from which respondents currently prefer to obtain prescribed fire information (face-to-face and printed materials and, to a lesser degree electronic platforms, including the internet), it is also important to determine how this might change int eh future so that the information disseminators can adapt to changing demand. Figure 3.7 indicates the likelihood that respondents will use various platforms in the future.
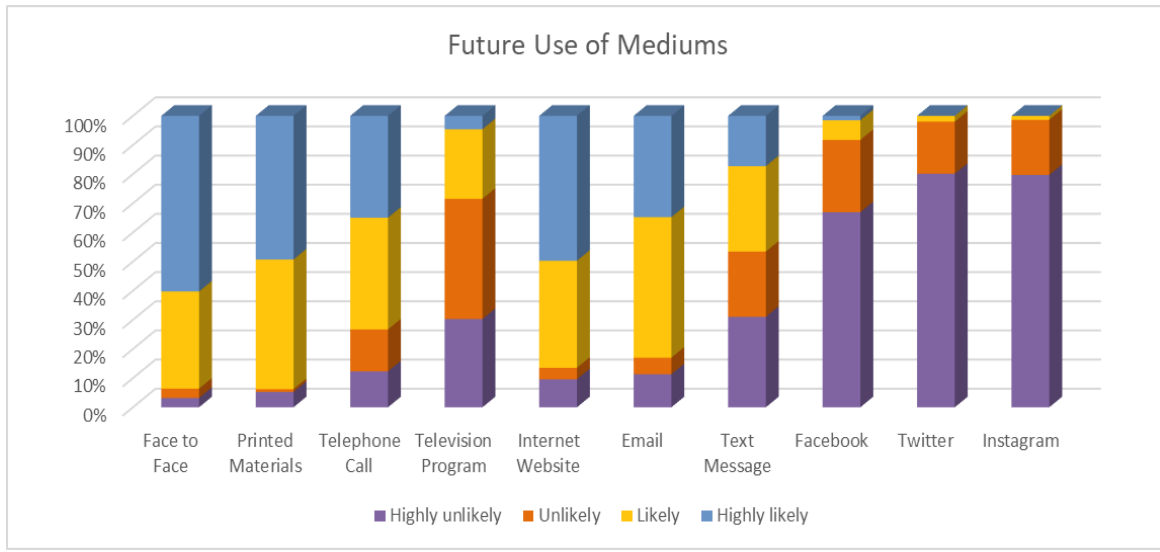
Figure 3.7. Frequency distribution of response to the question, "In the future, how likely are you to use the following mediums of information about prescribed fire?"

While face-to-face and printed materials remain the most likely platforms that the respondents will use to obtain information about prescribed fire in the future, the internet is a close third choice, and email follow thereafter. However, social media remain a highly unlikely way that information about this management tool will be obtained by the people who participated in the survey. However, a younger generation of landowners may be more inclined to relay on social media than the current generation, which largely exceeds 50 years of age.

Discussion

        Reichelt et al. (2014) and Turner et al. (2016) finding that credibility is the primary determinant of information acceptance was corroborated by my survey of TSCRA and TWA members. Additionally, a subtidal proportion of respondents considered reliability to be the most important determinant of information acceptance, however, this characteristic may not be independent from credibility. Bates et al (2009) found that the appearance of credibility when promoting information resonates with information consumers, and if dissemination practices are considered to be consistently credible over time, the information is perceived to be inherently reliable, or in other words, trustworthy. Most of the agency sources of information were considered to be trustworthy, but not ubiquitously to the same degree, which may, in part, explain why prescribed fire is not applied by more landowners. Information about prescribed fire that is disseminated by the NRCS, CES, TFS, and TPWD may be perceived as credible, but other factors may inhibit landowners from using that information to apply fire on their land. For example, Toledo et al. (2014) and Benett (2016) and found that social norms as well as previous values and beliefs affect perceptions that inform individuals' decisions about environmental actions, including the application pf prescribed fire.

        Cash et al. (2003, p.8088) also emphasize that trust is only part of information acceptance and stated information "effectiveness suffered when communication was largely one-way" which is often how information dissemination occurs, with a large proportion of respondents having to find information themselves and are not receiving it via a two-way conversation. Laurance et. al (2012) support my findings that while information may appear credible to landowners, the information may not be presented in a format that facilitates comprehension by landowners. Nearly 25% many of the respondents in my survey felt that feel these sources are "Rarely" or

"Never" useful. Cash et al (2003) emphasized that specific "actors" perform specific functions, perhaps in spite of the information sources being useful overall to respondents, agencies and landowner entities are attempting to do too much by disseminating information through mediums in which landowners may not feel to be as useful. Alienating information consumers that may require two-way conversations instead of self-reliant information consumption. What contradicts this proposed explanation is the trust of and degree of use for text messaging, email, and social media, which represent examples of potential two-way information exchanges. Many respondents believed that these mediums were not as useful as their counterparts such as: printed materials and internet websites. Perhaps a reason why these mediums are not considered useful is in part due to the inappropriate information dissemination attempts from both consumer and creator for those specific mediums. Dilling and Carmen (2011) support this belief due to relevance and clarity of information being driven by an iterative process of information exchange instead of self-reliant information consumption. Interestingly though, the difference between information sources and information mediums trust of and degree of use for was in general similar to one another.

Being able to access and further share information is critical since information dissemination will not occur through only one outlet (MacKeracher et al., 2018); therefore, dissemination must occur through multiple outlets in order to be most effective. In order to understand which outlets are most effective one must have evidence to suggest which mediums are most trustworthy, and which mediums are most useful. Kreuter et al .(2008) and Krishnan & Patnam (2014) support my sentiment that PBA's provide easy access to information on prescribed fire, more importantly my results indicate that PBA's are considered trustworthy and useful. Winter (2010) also support the notion that trust is not the only factor in perceived

effectiveness of land management decisions. In order to begin to trust information a landowner must first be able to find information on the topic at hand. Shen (2018) believe that different stages of information acquisition call for different mediums of information that should be utilized. Peters et. al (2018 p. 253) highlighted the fact the issue of science education in stating "It is not enough for federal agencies to make climate information accessible across agencies and regions, they must also foster a culture that has an expectation of sharing". Despite this literature indicating access and sharing of information increases acceptance. Respondents indicated that accessibility and shareability is a lower priority when compared to trust and degree of use. What this does show however, is how preference of information influences trust and degree of use of information for information dissemination purposes.

Hypothesis 1 – The extent to which landowners use a source of information about prescribed fire when deciding whether to use that management tool is positively correlated with their perceptions about; trust of, preference for and degree of use of that source of information.

This hypothesis can be accepted because of the results highlighting instances where landowners trusted, utilized, and preferred to receive information from as compared to other specific sources of information.

Hypothesis 2 – The extent to which landowners use various mediums that provide information about prescribed fire when deciding whether to use that management tool is positively correlated with their perceptions about; trust of, preference for and degree of use of that information dissemination medium.

This hypothesis can be accepted because of results indicating that in several different medium's respondents indicated that these mediums were trustworthy, useful and preferential as compared to other mediums.

In the present, information disseminators have few peer-reviewed studies that refer to specific sources and mediums landowners might use for land management education. Future educators can refer back to this study when comparing future landowner information usage habits, instead of anecdotal accounts which were often cited by telephone interviewees and focus group participants. This will provide future research evidential support that can allow effective communication by information disseminators on correctly identifying specific kinds of information sources and mediums that are perceived to be effective for specific kinds of information. For example, the NRCS could be perceived to be more useful at providing printed materials on fire behavior while a local PBA is extremely useful at providing local liability information. On the contrary, the NRCS is very ineffective at providing information on proper equipment needed during a burn. Without the initial questions of "Which source & medium is used? and "How is the source/medium perceived?" the above example will go incorrectly answered more often than not.

<u>Conclusion</u>

Education being identified as a hindrance to prescribed fire is only the first step. Information disseminators must understand the perceptions towards information sources & mediums, and the target audiences overall experience with prescribed fire in order to effectively engage potential users of this land management tool.

There will be a shift in landowner demographics. When this shift occurs is unknown. The point of this research isn't to say if landowners will or will not accept information presented, but how likely acceptance might occur based on trust, use, and preference of information. Information disseminators cannot properly assess where and how to disseminate information to

landowners until it is understood what works well and what does not, therefore addressing

deeper related issues within education about prescribed fire not previously examined.

Chapter 4 – Thesis Summary

Main Findings

Prescribed fire in the southern great plains is a natural phenomenon. This tool has been shown to be a cost-effective in land management for combating woody plant encroachment, improving grazing capacity for livestock, and reducing the risk of wildfires occurring. Despite this, prescribed fire is often met with scrutiny and not as widely utilized when compared to other land management strategies. In an effort to examine why this occurs, this research set out to address the social impacts that may influence prescribed fire implementation.

During focus group meetings with landowners, government agencies, government officials, and landowner entities. Education was consistently cited by those previously mentioned as a reason prescribed fire is not more widely utilized in the southern great plains. These anecdotal statements often did not discuss why current education efforts were considered ineffective. Given the rise of technology as a form of information dissemination, social media represent a potential information medium that could improve education efforts directed at implementing more widespread use of prescribed fire.

To further synthesize education related issues about prescribed fire, a telephone interview was conducted for government agencies and landowner representative associations in Texas & Oklahoma who were involved with prescribed fire on a regular basis. Results continued to indicate that education was a determining factor for increased implementation with 54% of respondents indicating that education was ineffective or not applicable to them for traditional sources of information. When examining the efficacy of social media, respondents highlighted that while social media was often present in prescribed fire information dissemination. The

utility of social media is source dependent or ineffective for providing information 56% of the time. Furthermore, respondents indicated a preference of utilizing traditional information sources 71% of the time. The takeaway from the interviews was that of source dependent trust. If social media was found to be untrustworthy, perhaps other mediums (and other sources) of information could be as well. Overall, while social media is present for prescribed fire dissemination purposes, results show that this information medium is a supplement to traditional mediums of information and not a substitute.

In order to address source and medium trust, a web-based survey targeted at landowners in Texas & Oklahoma was conducted in landowner groups of Texas & Southwestern Cattle Raisers Association and Texas Wildlife Association. Due to a low response rate of 2.76% the following results are preliminary. To further examine education being a barrier to prescribed fire implementation, landowners were asked about previous experience with prescribed fire and self-reported perception towards being informed about prescribed fire. Results indicated that 47% of respondents were at minimum well informed. Despite this, 60% of respondents had not received any prior assistance with planning or implementing a prescribed burn showing that trust was a factor in information sources and mediums was a factor in their decision-making process about whether or not to utilize prescribed fire.

An interesting point to be made stemmed from one particular question that asked "What element of information is most important to you in order for you to accept the information?" results showed that while credibility of information was most highly rated with 61% of respondents, elements such as: reliability and relevance were still present as well, with 14.6% and 9.6% respectively. Indicating that trust, is the primary factor in information acceptance, but not the only factor.

The idea of multiple information elements being present was further illuminated in showing that many sources of information were very similar in ratings of trust. Government agencies as a whole were generally trusted e.g. The Noble Research Institute was often or always trustworthy 56% of the time. As for the trust in mediums of information, a result that stood out was the trust in internet websites (58% indicated always) but the lack of trust in text messaging (33% indicated always) when text messaging represents a direct interpersonal type of communication.

After examining trust of information, the use of information which represents relevance and clarity, must also be considered. The differences between information mediums was abundantly clear in that most respondents considered face-face always useful 43% of the time and Facebook to be never useful 41% of the time. As for the use of information sources, respondents indicated a lower overall use of specific sources e.g. the NRCS being always useful 33% of the time and County Extension being "always" useful 20% of the time. These results indicate that despite high trust in these sources, the usefulness of the source is a separate element to consider.

Implications

The importance in recognizing which specific sources and mediums of information are most trusted and most useful is invaluable when attempting to improve education efforts for prescribed fire. The above results can give evidence to suggest the sources most often trusted, degree in which they are used, and the preference for them. Now that this is established, landowner entities and government agencies can direct landowners to the most appropriate method of information dissemination that gives the best chance for prescribed fire to be implemented. Without the above examples of trust, degree of use, and preference for of specific

information sources and mediums. Information disseminators will continue to give anecdotal accounts of how to improve education about prescribed fire and not understand the deeper-rooted issues that are required to improve it. Which is that you cannot simply make information available to landowners, information disseminators must ensure the information is coming from a trusted source and the source is considered useful. Even after that occurs, information disseminators must still consider the medium preference for that information. Unless these three points are considered, education efforts for prescribed fire will continue to be ineffective.

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Appendix

Qualtrics Internet Survey Protocol

SOCIAL AND REGULATORY BARRIERS TO THE USE OF PRESCRIBED FIRE BY PRIVATE LAND MANAGERS IN THE SOUTHERN GREAT PLAINS

A Survey of Landowners in Texas and Oklahoma

Introduction

The ***PURPOSE*** of this study is to address the barriers to the use of prescribed fire by private land managers in the Southern Great Plains. This region is largely comprised of private landholdings and, in recent decades, has experienced not only substantial woody plant expansion but also increases in the incidence of catastrophic wildfires. The study provides actionable science to address these issues.

Before we get started, we wish to provide some information about the use of ***TERMS*** in this survey questionnaire.

A. ***Prescribed fire*** refers to application of a planned fire for the purposes of fuel load reduction, invasive woody plant management and/or forage quality regeneration.

B. ***Wildfire*** refers to a fire that is uncontrolled and often results in serious damage to property and even life.

C. ***Prescribed Burn Association (PBA)*** and ***Fire Management Association (FMA)*** refer to landowner cooperatives that share knowledge, experience, and equipment among contributing members.

D. ***Certified Prescribed Burn Managers*** is an individual who has successfully completed a prescribed fire training course, conducted a specified number of prescribed burns, obtained sufficient insurance, and been licensed by his/her respective state government.

E. In this questionnaire we refer to the rural property that you own and/or manage in Texas or Oklahoma as "*Your Land*".

Initial Question

Are own or manage at least 50 acres of land in rural Texas or Oklahoma?
❏ Yes   ❏ No

If you checked ***No***, please place the questionnaire in the postage paid envelope provided and send it back to us immediately. This will ensure you do not receive further mailings.

If you checked ***Yes***, please complete the entire questionnaire. We thank you in advance for your valuable time in participating in the study.

BEGIN SURVEY →

Section A: In this section we seek input about your experience with prescribed fire on YOUR and OTHER'S land, prescribed fire assistance that various entities may have provided, and your experience with wildfire.

1. **Have you participated in any prescribed fire OUTSIDE of Texas and Oklahoma?**
   ❑ Yes ❑ No

2. **Have you participated in any prescribed fire WITHIN Texas and Oklahoma?**
   ❑ Yes ❑ No

3. **If you answered *Yes* to Question 2, please indicate in the table below the number of prescribed fires conducted and acres burned. If *No*, please proceed to Question 4.**

	Total from 2008-2016	Total in 2017	Don't know
# of burns on YOUR land	_____ fires	_____ fires	❑
# of burns you assisted on OTHER's land	_____ fires	_____ fires	❑
# of acres burned on YOUR land	_____ acres	_____ acres	❑
# of acres burned on OTHER's land	_____ acres	_____ acres	❑

4. **Have you been provided assistance with the planning or application of prescribed fire on your land during the last 10 years?**
   ❑ Yes ❑ No

5. **If you answered *Yes* in Question 4, please fill in the following table. Write the number of prescribed fires for which you received ANY assistance from each entity listed on the left. If *No*, please proceed to Question 6.**

	Total from 2008 - 2016	Total in 2017	Don't know
Prescribed Burn Association (PBA) or Fire Management Association (FMA)	___	___	❑
Non-PBA neighbors / other landowners	___	___	❑
State Extension Service	___	___	❑
Other state agency (please specify) _____ __	___	___	❑

Natural Resources Conservation Service	___	___	❑
Other federal agency (please specify) _____ __	___	___	❑
Non-profit or private organization (please specify) _____ ____	___	___	❑

6. **If any of the following entities provided assistance with prescribed fire on your land, please indicate how useful it was and if you will seek their assistance again. (*If used in the past, check TWO boxes per line, one for Usefulness and one for Future Use)*

	Usefulness			*Future Use*		
	Yes	*No*	*Unsure*	*Yes*	*No*	*Unsure*
Prescribed Burn Association (PBA) / Fire Management Association (FMA)	❑	❑	❑	❑	❑	❑
Non-PBA neighbors / other landowners	❑	❑	❑	❑	❑	❑
State Extension Service	❑	❑	❑	❑	❑	❑
Other state agency named above in Q5	❑	❑	❑	❑	❑	❑
Natural Resources Conservation Service	❑	❑	❑	❑	❑	❑
Other federal agency named above in Q5	❑	❑	❑	❑	❑	❑
Non-profit/private organization named above in Q5	❑	❑	❑	❑	❑	❑

7. Have you ever had first-hand experience with wildfire?   ❑ Yes   ❑ No

8. If you answered *Yes* in Question 7, please indicate the extent to which you were affected by wildfire. (*ONE check per line*). If *No*, please proceed to Question 9.

	Not affected	*Somewhat affected*	*Substantially affected*	*Severely affected*
Loss of forage	❑	❑	❑	❑
Loss of trees	❑	❑	❑	❑
Loss of or damage to fences	❑	❑	❑	❑
Loss of or damage to buildings and vehicles	❑	❑	❑	❑
Loss of livestock or pets	❑	❑	❑	❑

Personal injury	❑	❑	❑	❑
Injury to other people you know	❑	❑	❑	❑
Death of a person you knew	❑	❑	❑	❑

9. **To what extent do you agree with each statement about wildfire?** *(ONE check per line)*

	Strongly disagree	*Disagree*	*Neutral*	*Agree*	*Strongly agree*
The risk of wildfire is reduced by periodic prescribed fire	❑	❑	❑	❑	❑
Prescribed fire can escape and cause a wildfire	❑	❑	❑	❑	❑
There is no relationship between the use of prescribed fire and wildfire	❑	❑	❑	❑	❑
Prescribed fire is less dangerous than wildfire	❑	❑	❑	❑	❑

Section B: *In this section we seek to understand your attitudes and perceptions regarding the benefits and risks of using prescribed fire.*

10. Are you currently a member of a Prescribed Burn Association/Fire Management Association? ❑ Yes ❑ No

11. If *Yes*, which one? If *No*, please proceed to Question 12.

_____

12. If you are not currently a member, were you a member in the past? ❑ Yes ❑ No

13. What is your general opinion of prescribed fire as a management tool? *(Circle one)*

Very negative	*Negative*	*Somewhat negative*	*Neutral*	*Somewhat positive*	*Positive*	*Very positive*

14. How has your opinion about prescribed fire changed over time? *(Circle one)*

Much more negative	*More negative*	*Somewhat more negative*	*No change*	*Somewhat more positive*	*More positive*	*Much more positive*

15. Which of the following best describes the reason for your change in attitude towards prescribed fire? *(Circle one)*

First-hand experience with prescribed fire	*Second-hand knowledge of prescribed fire*	*First-hand experience with wildfire*	*Second-hand knowledge of wildfire*	*Other (please specify)* _____	*N/A due to no change in attitude*

16. In general, how LIKELY do you think each of the following possible negative consequences of applying prescribed fire listed may occur? *(ONE check per line)*

	Highly unlikely	*Unlikely*	*Somewhat unlikely*	*Somewhat likely*	*Likely*	*Highly likely*
Fatality / Personal injury	❑	❑	❑	❑	❑	❑
Damage to YOUR property	❑	❑	❑	❑	❑	❑
Damage to OTHER'S property	❑	❑	❑	❑	❑	❑
Smoke hazard	❑	❑	❑	❑	❑	❑
Other (please specify) _____ ___	❑	❑	❑	❑	❑	❑

17. In general, how CONCERNED are you about each of the following possible negative consequence of applying prescribed fire occurring? *(ONE check per line)*

	Not at all concerned	*Slightly concerned*	*Somewhat concerned*	*Moderately concerned*	*Extremely concerned*	*Unsure*
Fatality / Personal injury	❑	❑	❑	❑	❑	❑
Damage to YOUR property	❑	❑	❑	❑	❑	❑
Damage to OTHER'S property	❑	❑	❑	❑	❑	❑
Smoke hazard	❑	❑	❑	❑	❑	❑
Other (please specify) _____ __	❑	❑	❑	❑	❑	❑

18. **How USEFUL do you think prescribed fire is for mitigating wildfire in the following contexts?** *(ONE check per line)*

	Not useful	*Rarely useful*	*Occasionally useful*	*Generally useful*	*Always useful*	*Unsure*
In YOUR state	❑	❑	❑	❑	❑	❑
On YOUR property	❑	❑	❑	❑	❑	❑
On OTHER'S property	❑	❑	❑	❑	❑	❑

19. How USEFUL do you think prescribed fire is for attaining each of the following land management goals. *(ONE check per line)*

	Not at all useful	*Rarely useful*	*Occasionally useful*	*Generally useful*	*Always useful*	*Unsure*
Woody plant control	❑	❑	❑	❑	❑	❑
Forage improvement	❑	❑	❑	❑	❑	❑
Wildlife habitat	❑	❑	❑	❑	❑	❑
Watershed health	❑	❑	❑	❑	❑	❑
Fuel load reduction	❑	❑	❑	❑	❑	❑
Other (please specify) _____ __	❑	❑	❑	❑	❑	❑

20. To the best of your knowledge, are there any instances in which it is legal to conduct a prescribed fire during a burn ban? ❑ Yes   ❑ No

21. To the best of your knowledge, is it legal for a certified prescribed burn manager to conduct a prescribed fire during a burn ban? ❑ Yes   ❑ No

22. Have you ever conducted or assisted with a prescribed fire during a burn ban?
  ❑ Yes   ❑ No

23. Assuming it IS legal, please indicate how willing you are to conduct a prescribed fire during a burn ban in the following contexts. *(ONE check per line)*

	Very unwilling	Mostly unwilling	Somewhat unwilling	Somewhat willing	Mostly willing	Very willing
If you worked WITH a certified prescribed burn manager present	❑	❑	❑	❑	❑	❑
If YOU were a certified prescribed burn manager	❑	❑	❑	❑	❑	❑
With NO certified personnel present	❑	❑	❑	❑	❑	❑

24. Please indicate how well each opposite pair of words on each line below describes your decision-making process when deciding whether or not to use prescribed fire. *(Check only ONE box per line)*

	Very well	Quite well	Somewhat well	Somewhat well	Quite well	Very well	
Slow	❑	❑	❑	❑	❑	❑	*Fast*
Methodical	❑	❑	❑	❑	❑	❑	*Casual*
Analytic	❑	❑	❑	❑	❑	❑	*Intuitive*
Reasoned	❑	❑	❑	❑	❑	❑	*Felt*
Precise	❑	❑	❑	❑	❑	❑	*Approximate*
Solitary	❑	❑	❑	❑	❑	❑	*Collaborative*
Difficult	❑	❑	❑	❑	❑	❑	*Easy*
Risk-averse	❑	❑	❑	❑	❑	❑	*Risk-seeking*
Optimizing	❑	❑	❑	❑	❑	❑	*Approximating*
Calming	❑	❑	❑	❑	❑	❑	*Worrying*
Informed	❑	❑	❑	❑	❑	❑	*Uninformed*

Section C: *In this section we seek input about how informed you feel you are about prescribed fire and about sources of information about prescribed fire that you may or may not use.*

25. In general, how well informed do you believe you are when making decisions whether or not to use prescribed fire? *(Circle one)*

Very uninformed	Quite uninformed	Somewhat uninformed	Somewhat informed	Well informed	Very well informed	Unsure

26. Please indicate which of the information types you have used from each of the entities listed to obtain information about prescribed fire. *(Check ALL that apply)*

	Face to face	Print	Phone	TV	Web	Email	Text	Face book	Twitter	Instagram
Natural Resource Conservation Service	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
County Extension Service	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Prescribed Burn Association / Fire Management Association	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Texas Parks & Wildlife	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Texas Forest Service	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Noble Foundation	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Oklahoma Department of Wildlife Conservation	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Oklahoma Department of Agriculture, Food & Forestry	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Nature Conservancy	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑

Non-PBA neighbors / other landowners	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Other (please specify) _____ ____	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Other (Please specify) _____ ____	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑

27. Please indicate which of the following entities are your top choices when seeking information about prescribed fire? *(Check UP TO FOUR sources of information)*

❑ *Natural Resources Conservation Service*
❑ *County Extension Service*
❑ *PBA/FMA*
❑ *Texas Parks & Wildlife Dept*
❑ *Texas Forest Service*
❑ *Other (please specify)* _____

❑ *Noble Foundation*
❑ *Oklahoma Dept Wildlife Conservation*
❑ *Oklahoma Dept of Agriculture, Food & Forestry*
❑ *Nature Conservancy*
❑ *Non-PBA neighbors / other landowner*

28. Please indicate which of the following information mediums you prefer to use when seeking information about prescribed fire? *(Check UP TO FOUR mediums)*

❑ *Face to face*
❑ *Printed materials*
❑ *Telephone call*
❑ *Television program*
❑ *Internet website*
❑ *Other (please specify)* _____

❑ *Email*
❑ *Text messages*
❑ *Facebook*
❑ *Twitter*
❑ *Instagram*

29. If you initially obtained information about prescribed fire, did you subsequently obtain additional information?   ❑ Yes   ❑ No   ❑ N/A

30. Please indicate how likely you are to use the following information mediums in the future when seeking information about prescribed fire? *(ONE check per line)*

	Highly unlikely	Unlikely	Somewhat unlikely	Somewhat likely	Likely	Highly likely
Face to face	❏	❏	❏	❏	❏	❏
Printed materials	❏	❏	❏	❏	❏	❏
Telephone call	❏	❏	❏	❏	❏	❏
Television program	❏	❏	❏	❏	❏	❏
Internet website	❏	❏	❏	❏	❏	❏
Email	❏	❏	❏	❏	❏	❏
Text message	❏	❏	❏	❏	❏	❏
Facebook	❏	❏	❏	❏	❏	❏
Twitter	❏	❏	❏	❏	❏	❏
Instagram	❏	❏	❏	❏	❏	❏

31. Please indicate how TRUSTWORTHY and USEFUL you consider the following INFORMATION SOURCES with respect to prescribed fire. Write in the number that corresponds to that particular entity. *(Write ONE number per underscore)*

1 = Not at all   2 = Rarely...   3 = Sometimes ...4 = Often ...   5 = Always ...   U = Unsure ...

	Trustworthy	Useful
Natural Resource Conservation Service	____	____
County Extension Service	____	____
PBA/FMA	____	____
Texas Parks & Wildlife	____	____
Texas Forest Service	____	____
Noble Foundation	____	____
Oklahoma Dept of Wildlife Conservation	____	____
Oklahoma Department of Agriculture, Food & Forestry	____	____
Nature Conservancy	____	____
Non-PBA neighbors / other landowners	____	____
Other (please specify) _____	____	____

32. Please indicate how TRUSTWORTHY and USEFUL you consider the following MEDIUM with respect to information about prescribed fire. Write in the number that corresponds to that particular entity. *(Write ONE number per underscore)*

1 = Not at all   2 = Rarely...   3 = Sometimes ...4 = Often ...   5 = Always ...   U = Unsure ...

	Trustworthy	Useful
Face to face	____	____
Printed materials	____	____
Telephone call	____	____
Television program	____	____
Internet website	____	____
Email	____	____
Text messages	____	____

Facebook	____	____
Twitter	____	____
Instagram	____	____
Other (please specify) _____	____	____

33. From the list of information mediums provided below, please indicate the two MEDIUMS you would most likely use for each of the communication scenarios presented in following table *(Write ONE medium per underscore)*

Face to face program	*Printed materials*	*Telephone call*	*Television*
Internet website	*Email*	*Text message*	
Facebook	*Twitter*	*Instagram*	

Example:

Best way for YOU TO CONTACT agency reps or burn practitioners	Face to face	Facebook

Best way for agency reps or burn practitioners TO CONTACT YOU	_____	_____
Best way for YOU TO CONTACT agency reps or burn practitioners	_____	_____
Medium you would most likely use to OBTAIN information about land management	_____	_____
Medium you would most likely use to SHARE information about land management	_____	_____

34. When seeking or receiving information about prescribed fire, which of the following characteristics of the information are MOST IMPORTANT for you to trust the information? *(Rank Items 1-6. 1 being the highest, 6 being the lowest)*

   Credibility   Reliability   Relevance   Clarity   Accessibility Shareability

34. **Please indicate the extent to which you feel the characteristics identified in the previous question pertain to the sources and mediums of information you have utilized to learn about prescribed fire.**

_____

_____

_____

_____

Section D: *In this final section we request some demographic information to determine the extent to which response patterns are related to personal characteristics. Please be assured again that none of this information about you will be included in any report. Once the survey is completed, the information you provide cannot be linked to you as we will destroy all mailing lists. Further, all data will be anonymized and reported only in the aggregate.*

34. In what year were you born? _____

35. What is your gender? ❑ Female ❑ Male

36. **How many years of formal education did you receive?** *(Please include all years spent in elementary through high school, technical or vocational training, college, and graduate school)*

_____ (years)

37. In which COUNTY is your property located? _____

38. Please note the acreage of your land. _____ (acres)

39. How many years have you personally owned or managed the property?

_____ (years)

40. How many years has the property been in your family?

_____ (years)

41. What are your main motivations for owning and/or managing the property?

❑ Crop production   ❑ Livestock production   ❑ Wildlife   ❑ Investment

❑ Non-consumptive use/recreation   ❑ Other (please specify) _____

42. Who makes most of the day-to-day land management decisions for your property?

❑ You   ❑ You & a family member   ❑ You & a business partner(s)

❑ You & your land manager/foreman   ❑ You & your property lessee

43. Approximately how much of your time do you spend at your property?

❑ 0-25%   ❑ 26-50%   ❑ 51%-75%   ❑ 76-100%

44. Approximately what percentage of your annual household income is generated from your property?

❑ 0-25%   ❑ 26-50%   ❑ 51%-75%   ❑ 76-100%

On this page, please provide any additional information you would like regarding your perspectives on the benefits and risks of using prescribed fire, your concerns about wildfire, and the dissemination of information about prescribed fire. In particular, we would like to know what would encourage you to use prescribed fire on your land if you have not used it in the past or what would encourage you to apply prescribed fire more widely or more frequently if you have already used it on your land.

_____

_____

_____

_____

_____

_____

_____

**Thank you very much for your time and effort in completing this questionnaire.
It is only with your valuable feedback that we can provide insight to agencies, policy makers and legislators in an effort to promote to use this important management tool on private land throughout Texas and Oklahoma.**

END SURVEY