

Article

Perceptions of NRCS Assistance with Prescribed Fires on U.S. Private Lands: A Regionally Stratified Case Study

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Abstract: The benefits of prescribed fires are recognized throughout the United States, but the ability to assist with prescribed fire application on private land by government agencies has many possible constraints and challenges. The Natural Resources Conservation Service (NRCS), a federal agency, is mandated to assist private landowners with meeting land management objectives, but the ability of employees to utilize prescribed fire as a management tool is complex. We conducted a regionally stratified online survey of NRCS employees across the United States to determine the barriers inhibiting their ability to assist private landowners with prescribed fire application. In January of 2020, we recruited 101 NRCS rangeland and grazing land specialists to participate in the survey with 50 completing the survey (regional sample size: Central $n = 14$, Northeast $n = 5$, Southeast $n = 12$, West $n = 19$). A majority (82%) of respondents thought prescribed fires were staying the same or increasing in number. Regional differences in assistance types were significant for conducting burns and providing technical education, but not for other assistance types. Regional differences for perceived constraints were also significant for how the public understands the risks of prescribed fire and the ecological constraints but not for state policy, federal policy, liability, or public understanding of prescribed fire benefits. Overall and across regions, the NRCS survey participants perceived federal policies, liability, and private landowners' lack knowledge of prescribed fire limits their ability to assist in the utilization of prescribed fire. Creating a national policy that allows a streamlined process for NRCS employees to assist with prescribed fire implementation and collaborative initiatives to improve private landowner knowledge gaps has the potential to improve prescribed fire application across the United States.



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1. Introduction

Wildfire frequency and intensity due to changes in climatic conditions and historic fire suppression policies have led to elevated concerns about hazardous fuels in an era of catastrophic wildfires [1–3]. Land management agencies have made efforts to reduce hazardous fuels through multiple methods but are not reducing them fast enough or in needed areas to avoid wildfire disasters [4]. Prescribed fire has been identified as one of the most effective management tools to reduce hazardous fuels, but it is affected by public attitudes, policies, and resources [5–9]. A collaborative approach between private landowners and land managers focused on fuel reduction and mitigation can help meet these objectives [10]. Furthermore, adjusting internal and national policies and training could allow for federal agencies to work more closely with private landowners in conducting prescribed fires [11]. As a result, these efforts would bolster a nationwide initiative to increase prescribed fire utilization to meet hazardous fuels reduction program goals [4].

The United States Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) employees are ideal candidates to collaborate with private landowners to improve prescribed fire applications because of their current role in providing conservation and agricultural production assistance through their mandated mission. Such assistance is known to include helping to conduct a prescribed fire, providing educational material, providing equipment, assisting with writing prescribed fire plans, visiting a planned burn site, and/or outsourcing resources to other organizations. Thus, the NRCS has an opportunity to be the intersection between federal management agencies and private landowners because they have the mandate and equipment to assist with prescribed fire application. Furthermore, they have fewer barriers when collaborating with private landowners than agencies such as the United States Forest Service (USFS) and the Bureau of Land Management (BLM). If either of these agencies want to assist with prescribed fire application on private lands, they work under a Good Neighbor Authority project (GNA), while the NRCS can work within their mandated objectives to assist private landowners [12]. GNAs are novel agreements that allow for federal entities to implement projects in partnership with state agencies, yet they can be highly variable and be hindered by funding, bureaucratic hurdles, and resistance among staff [12].

Regardless of the agency, management agencies need national and public support to increase prescribed fire planning and application [13]. Public support for prescribed fire and private landowners' affinity to utilize it is affected by cognitive and emotional associations individuals have with fire [14–18]. Both internal resource constraints and internal and external liability concerns affect the decision-making process for prescribed fire utilization [19–21]. Furthermore, ecological constraints such as burn windows can limit the ability to conduct prescribed fire [7,22,23]. Furthermore, environmental conditions and burn bans can limit the ability to conduct prescribed fire. Addressing the barriers that challenge management agencies, such as the NRCS, who are mandated to work with private landowners and assist in management goals, will help to understand management and policy shifts needed to assist private landowners in safe prescribed fire applications. Fortunately, there has been an increase in public tolerance of prescribed fire and an increase in viewed benefits of prescribed fire to the landscape [24–28].

We aimed to understand the perceived challenges NRCS employees face when collaborating with private landowners to apply more prescribed fire across landscapes. Understanding the challenges of collaborating with private landowners to assist with applying prescribed fire could help to influence state and national policies relating to prescribed fire application. Our specific objectives were to understand (1) the NRCS's perceptions of private landowners' utilization of prescribed fire and (2) the national and regional NRCS employee's perceptions on the constraints of working with private landowners on prescribed fires.

2. Materials and Methods

2.1. Participants

The participants for this study were rangeland and grazing land specialists with the NRCS. We further delineated NRCS employees across the United States into NRCSs regional management areas because fire management capacity and public cultural acceptability of prescribed fire may be different across regions (Figure 1).

2.2. Procedures

Utilizing a contact list from an NRCS rangeland management specialist, we contacted potential participants through email, requesting their participation in the survey. The online survey was conducted through the University of Wyoming's online survey platform (Appendix A). Confidentiality was maintained by using non-descriptive identifiers, rather than names or identifiable information in data storage and analyses [29]. The survey was voluntary, and participants had the right to decline participation. The survey was conducted between 5 January 2020 and 31 January 2020. A week before the survey was

sent out, we emailed each potential participant about the online survey, the details of the project, and the overarching goals [29–32]. Following the survey's initial release, we sent a reminder a week before the end of the survey [29–32].

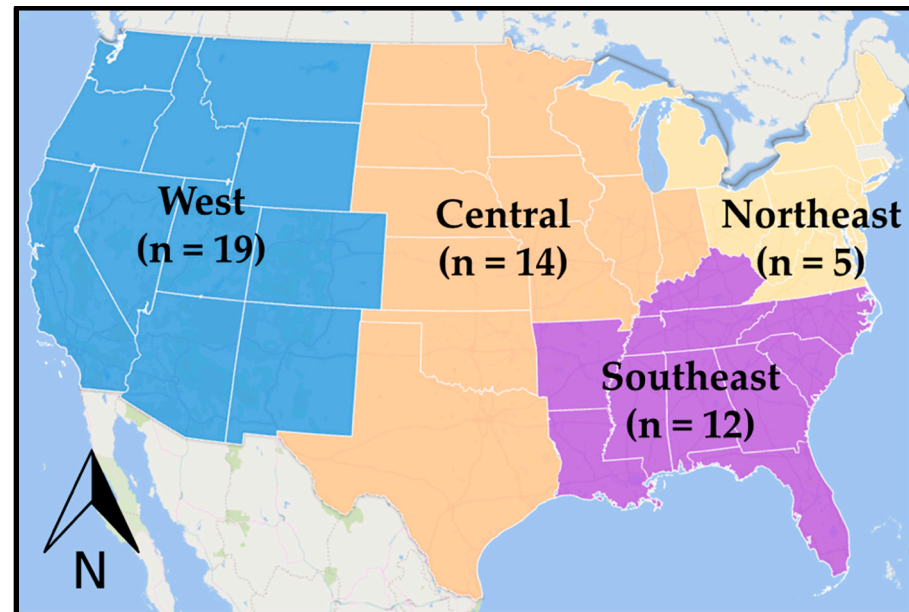


Figure 1. USDA NRCS regional management map and participant sample size in the United States as stratified in this survey.

2.3. Survey Development

We designed the survey under three categories of research questions focused on perceptions of wildfire and prescribed fire, experience, constraints of working with private landowners, and demographic background. In the first category, we developed three questions to understand NRCS employees' perceptions of temporal trends in wildfire and prescribed fire, using a 5-point response scale ranging from 1 = "Decreased Greatly", 2 = "Slightly Decreased", 3 = "No Change", 4 = "Slightly Increased", 5 = "Greatly Increased", and including an option of "I am not sure".

In the second category, we developed questions to understand NRCS employees' experience and constraints working with private landowners, using a 5-point response scale ranging from 1 = "Decreased Greatly", 2 = "Slightly Decreased", 3 = "No Change", 4 = "Slightly Increased", 5 = "Greatly Increased", and including an option of "I am not sure." Then, we created a question to determine NRCS employee's interaction with private landowners ranging from zero to five or more times. If they had interacted with a private landowner, there were six follow-up questions with bivariate Yes/No response options that focused on NRCS employees' interactions with private landowners (conduct a prescribed fire, provide education, provide equipment, assist with prescribed fire plans, visit site, and/or outsource resources to other organizations). Finally, we constructed five questions focused on the potential barriers for assisting private landowners (state and federal policy, liability, understanding of risk and benefits of prescribed fire, and ecological) using a 5-point response scale ranging from 1 = "Decreased Greatly", 2 = "Slightly Decreased", 3 = "No Change", 4 = "Slightly Increased", 5 = "Greatly Increased", and including an option of "I am not sure." There was also an option to write in a response to for other constraints that were not listed.

The demographic category contained three questions regarding the state in which the NRCS employee worked, the number of years they had held that position, and their level of education. The states in which the employee worked and the number of years in the position were open ended and survey participants were asked to write in their response. Finally, a comment section was included at the end of the survey for participants

to write in their thoughts about the survey and if there were some other issues that needed to be considered. The survey instrument was approved by the University of Wyoming Institutional Review Board (IRB) under protocol #20191114RW02599 “NRCS and Private Landowner Collaboration Challenges for Prescribed Burning”.

2.4. Analysis

We first conducted a descriptive analysis of the survey responses to understand the mean distribution of perceptions of prescribed fire and wildfire, geographic distribution of assisting private landowners, and constraints of prescribed fire applications. This summary information provides a starting point for future inquiry about NRCS limitations and perceptions of wildfire management. Responses about working with private landowners were reclassified into a binary yes and no response. Furthermore, perceptions of prescribed fire and wildfire responses were reclassified into agree, neither disagree nor agree, disagree, and not sure. We stratified individual responses by NRCS management region instead of state to improve participant confidentiality and provide a useful spatial representation for NRCS (Figure 1). We used Chi-square tests of association to determine if inter-regional response patterns differed significantly using the *freq* procedure in SAS Enterprise Guide 7.1.

3. Results

The time and resource constraints limited our ability to expand the survey beyond the initial contact list. Of the 101 survey questionnaires sent to NRCS employees (two were returned to sender), we received 50 valid responses for a response rate of 50%, which has been suggested to be adequate for surveys to avoid biased results [29]. Responses varied across the United States, with 14 (28%) from NRCS’s Central region, 5 (10%) from NRCS’s northeast region, 12 (24%) from NRCS’s southeast region, and 19 (38%) from NRCS’s west region (Figure 1).

The amount of time respondents had worked in their area was 11.6 years (SE = 11.79, range of 1 to 60). All of the respondents either had a bachelor’s degree (70%) or a graduate/professional degree (30%). Nationally, 23 (46%) respondents felt the number of prescribed fires stayed the same, while 18 (36%) felt that prescribed fire application was increasing over the past two years. Furthermore, 23 (46%) respondents felt the number of wildfires has stayed the same, while 13 (26%) felt that wildfires were increasing over the past 2 years.

The majority of respondents considered the utility of prescribed fire application by private landowners as average (24%), below average (23%), and poor (20%) (Figure 2).

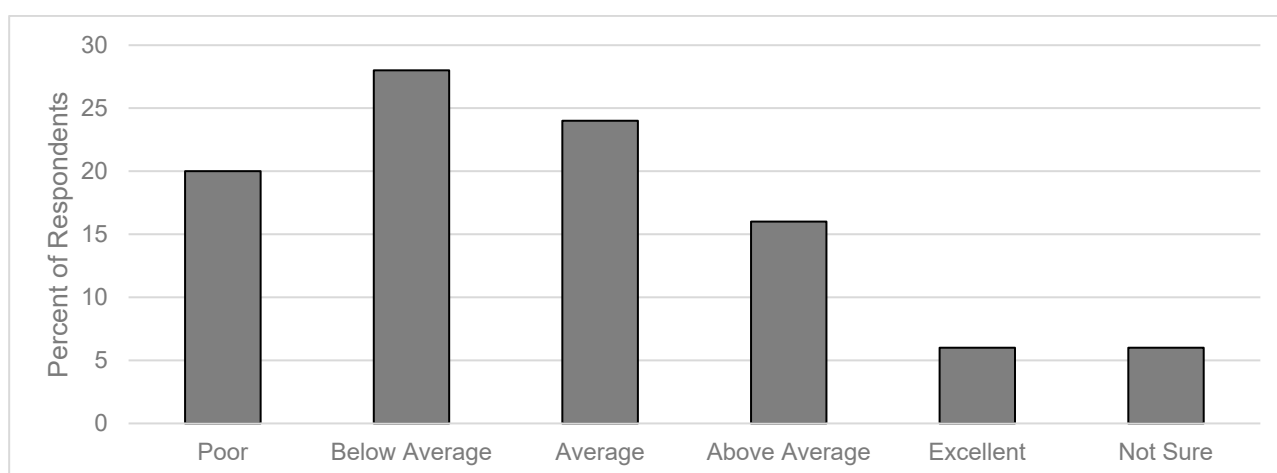


Figure 2. Results of NRCS survey respondents regarding landowner utilization of prescribed fire. Regional sample size: Central $n = 14$, Northeast $n = 5$, Southeast $n = 12$, West $n = 19$. Chi-square test p -value for a regional effect was $p = 0.410$ and was non-significant.

When respondents worked with and assisted private landowners with different aspects of a prescribed fire (48%), the most common assistance was providing education, visiting a site, and providing contact information to another organization for help (Figure 3). The respondents were least likely to provide equipment or conduct a prescribed fire (Figure 3). The regional differences were significant for conducting burns, with 100% respondents from the West region reporting not helping to conduct prescribed burns (Figure 3). Regional differences were also significant for providing educational assistance with more than half of respondents from the Northeast and West regions reporting not providing education about prescribed burning (Figure 3).

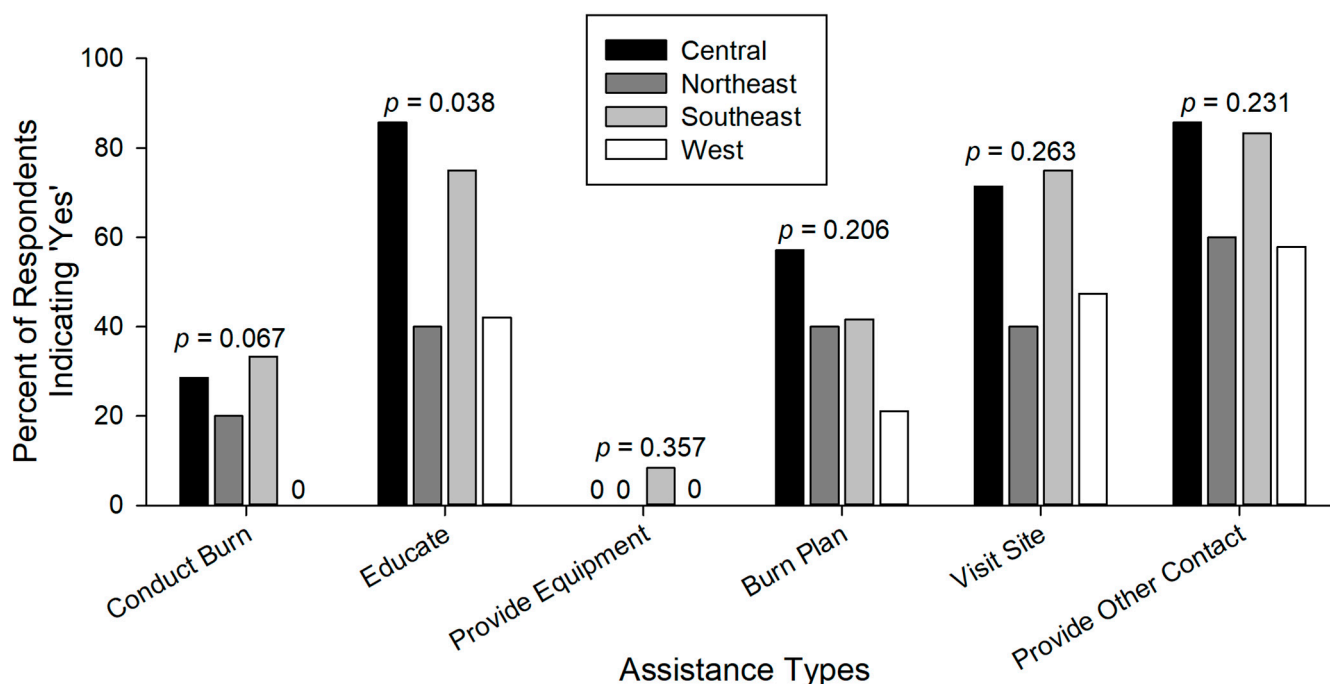


Figure 3. Different types of assistance that survey respondents ($n = 50$) have provided private landowners with when planning a prescribed fire, stratified by region and presented as the percentage of respondents responding that they do provide this assistance. Chi-square test p -values for regional effects are presented above each Assistant Type.

Agreement across regions was apparent in the regional response proportions for federal policy, liability, and public understanding of prescribed fire benefits as the constraints to assisting private landowners in prescribed fire application (all p -values > 0.05 ; Table 1). The regional perceptions about state policy were insignificant ($p < 0.05$; Table 1) yet difficult to interpret. However, regional differences were significant ($p < 0.05$) regarding the perceptions of the public understanding of risk; Northeast region employees generally disagreed with the notion of risk, while perceptions were mixed in other regions (Table 1). Similarly, trending significant regional differences ($p < 0.10$) for ecological constraints were found where West and Southeast region employees more often agreed with the notion of ecological constraints as limitations to burning whereas Northeast and Central employees generally disagreed with this notion (Table 1).

Table 1. Survey respondents’ perceived constraints of assisting private landowners with prescribed fire application at a regional scale. Chi-square test p -values for regional effect noted in the bottom row. The largest value in each column for each region are bolded.

Region	Answer	Federal Policy	State Policy	Liability	Public Understands Benefits	Public Understands Risks	Ecological Constraints
Central ($n = 14$)	Agree	43%	36%	36%	22%	43%	28%
	Neither Disagree nor Agree	14%	21%	43%	14%	7%	28%
	Disagree	36%	36%	21%	64%	50%	43%
	Not Sure	7%	7%	0%	0%	0%	0%
Northeast ($n = 5$)	Agree	60%	20%	20%	0%	0%	20%
	Neither Disagree nor Agree	20%	0%	40%	0%	0%	20%
	Disagree	20%	60%	20%	80%	80%	40%
	Not Sure	0%	20%	20%	20%	20%	20%
Southeast ($n = 12$)	Agree	75%	42%	83%	42%	42%	75%
	Neither Disagree nor Agree	0%	17%	9%	9%	17%	17%
	Disagree	8%	8%	0%	50%	42%	0%
	Not Sure	17%	33%	9%	0%	0%	9%
West ($n = 19$)	Agree	47%	42%	63%	16%	37%	58%
	Neither Disagree nor Agree	21%	27%	27%	16%	32%	26%
	Disagree	32%	27%	5%	68%	32%	16%
	Not Sure	0%	5%	5%	0%	0%	0%
Chi-square test statistic		9.966	10.674	13.553	14.193	17.137	15.950
p -value		0.353	0.299	0.139	0.116	0.047	0.068

Regionally, survey respondents have variable perceptions about some but not all constraints private landowners deal with when considering the use of prescribed fire (Table 1). However, all regions felt that federal policy was a constraint of helping private landowners. There should be some hesitancy when analyzing the northeast region NRCS employee responses because of the low response rate (5). The low response rate in the northeast response might be from the lack of prescribed fire culture. As one participant expressed from the northeast region in the comment section:

“Prescribed burning is not regularly used in the NRCS toolkit with landowners in [our state]. I am not aware of any private landowners applying for burn permits with the state. The state will very occasionally burn small areas for habitat/ecology projects—but to my knowledge, these burn events are very rare (maybe 1 burn every 10 years or so).”

4. Discussion

Catastrophic wildfires continue to spread across the United States, and management agencies are tasked with finding creative and innovative strategies to reduce hazardous fuels and limit the spread of wildfires [2,4–6,33]. The capacity to increase prescribed fire application on public and private lands through collaborative efforts is a pivotal tool for land managers [10]. This study illustrates the perceived challenges the NRCS has when working with private landowners to improve prescribed fire application.

Ecological constraints such as burn windows, interpretation of weather data, burn bans, and topography can impact the ability to conduct a prescribed fire, but social and political constraints are also perceived as detrimental hurdles that hinder the ability for private landowners and land management agencies to increase prescribed fire application [7,11,14,27,28]. While education, site visits, and providing contacts to other organizations can help private landowners with prescribed fire application, the limited capacity to provide resources, equipment, and in-depth engagement that has been suggested to improve prescribed fire in other studies is not being met [34,35]. Improving the capacity for NRCS to assist private landowners could increase prescribed fire application to meet management objectives.

The regional variability of perceived constraints by NRCS employee for assisting private landowners reveals a need to construct regionally strategic plans to address these constraints. However, an initial focus should be to alter federal policy by providing a national unifying policy guiding prescribed fire use. Our study coincides with Weir's (2019) assessment that federal policies should be adjusted so the NRCS can better assist private landowners when conducting a prescribed fire and lessen concern for liability [11]. The legal barriers compound a reduction in fire culture at the federal level and, without support, reduces agencies' willingness to assist private landowners with prescribed fire applications [36]. The national policies are supplemented by state policies that may compound the inefficiencies for prescribed fire application and restrict NRCS employees from assisting private landowners due to liability concerns [11,25,26,37–40]. The combination of state policies interwoven in federal policy may hinder NRCS employees. This may be the case because federal policy relative to liability may be more influential in dictating the ability to assist private landowners than state policy. If NRCS employees were supported on a federal level to assist private landowners to conduct a prescribed fire, a shift in fire culture could advocate for shifts in state legal barriers [25,26].

There is also a need to provide education and resources to private landowners to improve the technical expertise of prescribed fire application [14,41]. Elucidating the perceived risks associated with safe prescribed fire application may help alleviate the concerns for liability and a willingness to collaborate with the NRCS or other stakeholders [42,43]. More specifically, the Southern and Central Great Plains have improved education through active engagement with private landowners with the establishment of the Prescribed Burn Associations (PBA) [34,35,43,44]. This is supported by the NRCS's recognition that private landowners are not fully aware of the benefits and risks associated with prescribed fire. NRCS personnel can help to bolster public education by working with and supporting Prescribed Fire Councils (PFC and PBAs whose focuses are to improve public knowledge of prescribed fire (PFC) or facilitate safe experiences associated with prescribed fire (PBA)) [34,35,43–45]. These groups may already be utilized as a result of NRCS currently shifting support and information to other entities for prescribed fire assistance.

5. Conclusions

The overall survey sample ($n = 50$) results should be utilized with caution because of the limited contacts lists we were able to utilize for the study. NRCS employees work throughout the United States and the prescribed fire culture and utilization will differ between regions and states. As a result, more surveys are needed to understand the breadth of perceptions of prescribed fire and wildfire by NRCS employees and perceived barriers to assisting private landowners with prescribed fire application. However, this study helps to shed light on the challenges the NRCS faces when trying to assist private landowners and reach management objectives. Collaborating with local and national stakeholders such as PFCs and PBAs can engender new initiatives to improve the NRCS's ability to work with private landowners and instill a fire culture that improves landscapes across the United States [43–45].

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Institutional Review Board Statement: The survey instrument was approved by the University of Wyoming Institutional Review Board (IRB) under protocol #20191114RW02599 "NRCS and Private Landowner Collaboration Challenges for Prescribed Burning".

Informed Consent Statement: Informed consent from all subjects involved in the study was considered on the notion of participation is consent.

Data Availability Statement: Data may be available upon request pending privacy and anonymity.

Conflicts of Interest: C.S. is employed by the USDA-NRCS. No other conflict of interest exists.

Appendix A. Survey Instrument

Prescribed Fire Challenges

A survey of your views

THANK YOU FOR YOUR COOPERATION!

All of your responses will be kept confidential.





Applying Prescribed Fire to the Landscape

This questionnaire is part of a study conducted by Natural Resource Conservation Service and University of Wyoming to learn what you think about prescribed fire and private landowners' application of prescribed fire. This study is a regional assessment of NRCS field staff to better understand state differences between prescribed fire programs. Please take a few minutes to complete this questionnaire. It is important we hear from all NRCS employees that may address prescribed fire questions and applications. Your input is critical for this evaluation. Your views are important and give us a better understanding of your partnership capability with private landowners. Please keep in mind that we are interested in everyone's responses. Please finish this online questionnaire no later than 31 January 2020. The survey should take about 10 min to complete. The final question provides you with an opportunity to share additional thoughts you may have about prescribed fire challenges.

Your responses will remain confidential and at no time will your name be associated with any of your responses

If you have any questions or comments about this study, please contact Ryan Wilbur at rwilbur@uwyo.edu or Derek Scasta at jscasta@uwyo.edu.

THANK YOU FOR YOUR ASSISTANCE!

Your General Thoughts about Fire. The following questions will help us understand how you think about fire in general.

1. Based on your experience, how has the number of wildfires in the area where you work changed over the **past 2 years**? (Please circle only one.)

Decreased Greatly		Stayed the Same		Increased Greatly	I Am Not Sure.
1	2	3	4	5	6

2. Based on your experience, how has the number of prescribed fires used by private landowners in the area where you work changed over the **past 2 years**? (Please circle only one.)

Decreased Greatly		Stayed the Same		Increased Greatly	I Am Not Sure.
1	2	3	4	5	6

3. How do you think the number of prescribed fires in the area where you work needs to change in the **next 2 years**? (Please circle only one.)

Decreased Greatly		Stayed the Same		Increased Greatly	I Am Not Sure.
1	2	3	4	5	6

4. How important is it to you that the change in prescribe fire numbers you indicated in Question 3 occur over the **next 2 years**? (Please circle only one.)

Not at All Important		Somewhat Important		Very Important	I Am Not Sure.
1	2	3	4	5	6

Your Opinion about Prescribed Fire Application by Private Landowners. The following questions will help us understand how you think about prescribed fire application by private landowners in general. Please answer the following questions to tell us what you think of private landowners and the decisions they make.

5. To what extent are you concerned about prescribed fire application by private landowners in the area where you work? (Please circle only one.)

Not at All Important		Somewhat Important		Very Important	I Am Not Sure.
1	2	3	4	5	6

6. Overall, how would you rate private landowner application of prescribed fire in the area where you work? (Please circle only one.)

Poor	Below Average	Average	Above Average	Excellent	I Am Not Sure.
1	2	3	4	5	6

Experience working with Private Landowners. Please tell us about what you do to address black bear-human interactions in your life and why you choose to take those actions.

7. In the past two years, how often have you helped plan a prescribed burn with private landowners? (Please check one) (If 0 times, please skip to question 9)

0 Times	1–2 Times	3–4 Times	5 or More Times	Excellent	I Am Not Sure.
1	2	3	4	5	6

8. In the past 2 years, have you taken any of the following actions to help private landowners apply prescribed fire? (Please check one for each item.)

Yes		No		Yes	No
a. Conduct the prescribed burn	<input type="checkbox"/> 1 <input type="checkbox"/> 2	e. Visit a site	<input type="checkbox"/> 1 <input type="checkbox"/> 2		
b. Provide educational material about prescribed fire application	<input type="checkbox"/> 1 <input type="checkbox"/> 2	f. Provide contact information to another organization to help with a prescribed burn	<input type="checkbox"/> 1 <input type="checkbox"/> 2		
c. Provide equipment	<input type="checkbox"/> 1 <input type="checkbox"/> 2	h. Other (Please indicate) _____	<input type="checkbox"/> 1 <input type="checkbox"/> 2		
d. Assist with a burn plan	<input type="checkbox"/> 1 <input type="checkbox"/> 2				

9. In the past two years, how many prescribed burns have you assisted private landowners? (Please check one for each item.)

0 Times	1–2 Times	3–4 Times	5 or More Times	I Am Not Sure.
1	2	3	4	5

10. Below are several statements that describe how you might see potential constraints in assisting private landowners in prescribe burns. Please check the box that best describes your level of agreement with each statement.

	Strongly Disagree	Slightly Disagree	Neither	Slightly Agree	Strongly Agree	I Am Not Sure.
a. Federal policy restricts my ability to help private landowners in assisting in prescribed burns.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6
b. State policy restricts my ability to help private landowners in assisting in prescribed burns.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6
c. Liability restricts my ability to help private landowners in assisting in prescribed burns.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6
d. Private landowners are well educated about prescribed fire benefits	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6
e. Private landowners are well educated about prescribed fire risks	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6
g. Ecological factors (i.e., weather, burn widow, topography, etc.) restrict my ability to help private landowners in assisting in prescribed burns	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6
h. Other (Please indicate) _____	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6

Background Information. The following questions will help us understand more about NRCS employees. All responses are confidential.

11. What state do you work in? _____

12. How many years have you been working in your current position? _____

13. What is your highest level of education? (Please check one.)

- ☐ 1 High school graduate or GED
☐ 2 Vocational or trade school
☐ 3 Some college
☐ 4 Associate's Degree (2 year)

[]₅ Bachelor's Degree (4 year)

[]₆ Graduate/Professional Degree

14. Please use the space below to provide any additional comments you may have about prescribed fire challenges and working with private landowners in your capacity.

THANK YOU FOR YOUR TIME AND ASSISTANCE!

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