Communications and Attitudes Across Jurisdictional Lines During Post-Fire Ecological Restoration Collaborations

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Authorization to Submit Thesis

This thesis of Hope Harvey-Marose, submitted for the degree of Masters of Science with a Major in Natural Resources and titled, "Communications and Attitudes Across Jurisdictional Lines During Post-Fire Ecological Restoration Collaborations," has been reviewed in final form. Permission, as indicated by the signatures and dates below, is now granted to submit final copies to the College of Graduate Studies for approval.

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Abstract

Wildfire seasons are changing from a seasonal and typical management season to a year-round global problem. Magnifying this change is a dramatic uptick in uncharacteristic catastrophic wildfire trends. These fires are responsible for decreases in local wildlife populations worldwide and a multitude of other societal issues due to increases and redistribution of human populations resulting in an ever-expanding Wildland Urban Interface (WUI). In the United States there are multiple land management agencies working within differing ecological landscapes that manage wildfire and ecological restoration pre-and-post-wildfire. There are no overarching management rules for all agencies pertaining to post-fire ecological restoration aside from the National Environmental Policy Act (NEPA), so we examine what management gaps exist due to the patchwork of management across the United States. Our study analyzed survey data (n=80) from diverse employees involved in post-fire ecological restoration efforts. Survey participants include employees from state, federal,private, tribal and nongovernmental organizations. Our goal was to examine the attitudes and perceptions of each agency towards one another with respect to their fire management and restoration methods. We observed complicated results based on each agency's unique perceptions, organizational ideologies, values and opinions about ecological restoration post-wildfire and how interjurisdictional fire events impact restoration and the decisions made during ecological restoration. The results suggest that despite many of these agencies being near or even next to one another or having overlapping collaboration efforts (meaning potentially being in close enough proximity to be on ecologically similar landscapes despite differing management methods) the methods used during post-wildfire ecological restoration vary depending on what jurisdiction a manager is currently working under. This complicates the restoration process during large-scale fire events. Further, the results suggest that the opinions of those surveyed in differing agencies can depend on what jurisdiction they currently belong to. Based on this research, we suggest multi-agency collaboration specifically with more frequent and/or effective communication that is specific to each agency's needs. This will emphasize the importance of working across the landscape's jurisdictional boundaries and accommodating each agency's differing policies and goals within of times fragmented ecosystems.

Acknowledgements

I would like to acknowledge the support of my advisor, Dr. Randall Brooks. He took me on as a graduate student doing a project from the ground up for better or for worse. I would also like to acknowledge the help of my committee members, Dr. Eva Strand and Dr. Philip Stevens. Both were invaluable in their guidance and knowledge. Especially to Dr. Eva Strand who helped guide and shape my graduate career at the very beginning when I made the jump from MNR to M.S and was desperately searching for help and guidance.

Dedication

This is dedicated to my parents for fostering an environment of curiosity, compassion and courage. Without them I would not have come this far, and without their support I would not be pursuing my passion for academics as I am now. Also, this is dedicated to my sister who has worked tirelessly in wildland fire, worked through the Camp Fire of 2018 and was willing to live with me during this last fire season while we both worked the wildland fire season.

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Introduction

There is a vast amount of knowledge related to how individual management agencies' approach ecological restoration methods together. This includes, but is not limited to, studies specifically examining the Collaborative Forest Landscape Restoration Program (CFLRP) created by the USDA Forest Service and the tensions that came of the program (Butler 2010). More broadly, some research as focused on if collaboration is, in fact, leading to improved resource management at all (Conley et al. 2003).However, there is very limited research concerning restoration in a post-fire landscape within the confines of relationships and attitudes, but there is an abundance of literature pertaining to specific restoration practices, for example literature focusing on specific aspects of ecosystem restoration including lichens and shrubs such as sagebrush (Ketner-Oostra et al. 2006 & Davies et al. 2020). Restoration tends to happen at an agency level rather than an ecological and

Figure 1: Dispersal of federal, state and private lands in Washington. Each color represents a different land management agency. Predominantly US Forest Service land, this map also shows a fair amount of Bureau of Indian Affairs, some US Fish and Wildlife Service and—unique to Idaho—a substantial amount of wilderness.

landscape level—though we can see more emphasis on landscape scale in recent years (Aronson et al. 2017). Depending on each agency's particular set of values or mission statement, restoration goals and methods are not always alike from one agency to another.

Figure 1 illustrates the increasing lack of "buffer" ecosystems—or the existing landscapes between each management agency and their jurisdiction—and the agencies working on ecologically similar lands within Washington (Driscoll et al. 2010).With the aforementioned ecosystems and landscapes in mind, this study was designed to determine what, if any, differences exist between agencies conducting post-fire restoration on ecologically similar landscapes, and what challenges are present when multiple agencies collaborate. This was accomplished by surveying employees across jurisdictions, to examine whether different sets of values and mission statements across jurisdictions impact how employees interact with their jurisdictional counterparts. Further, do those participating in restoration efforts perceive these differences in management styles, values and attitudes and do they see a negative impact when working in a post-wildfire landscape collaboratively after a large-scale fire event?

Chapter 1

Literature Review

Land management agencies across the United States make up a patchwork of jurisdictions to be managed according to the guiding principles each agency determines is most appropriate. Because each of the agencies have differing methodologies, it is important to understand how agencies interact when wildfire crosses the jurisdictional lines as well as how agencies collaborate during the post-wildfire restoration process. Studying what these interactions look like, and their management methodologies, is important when trying to improve the post-wildfire collaboration processes to potentially avoid friction between staff belonging to specific agencies. While literature pertaining to restoration in general is abundant such as restoration of riparian habitat (Holmes et al. 2004); planting of various plants, shrubs and trees for restoration (Harrington 1999); wetlands and people's preferences about the kind of restoration implemented (Milon et al. 2006); and even climate change and its implications on restoration (Harris et al. 2006), literature examining the cross-boundary and interjurisdictional efforts of agencies post-fire event is less abundant. Based on the lack of literature specific to post-fire events and the inner workings of agencies during restoration efforts, we use qualitative social science research to fill the gap evident in the current literature in cross-boundary restoration. Given each agency's individual values and missions, this research would contribute to the legacy of literature and round out the body of literature available on cross-boundary restoration efforts of post-fire event. More research is needed on the impact cross-boundary efforts have on not only the ecology of the landscape but the abilities of agencies to restore the landscape effectively during interjurisdictional restoration attempts given differing attitudes and perceptions.

Literature pertaining to how people and their attitudes influence management exists, including how residents around fires perceive post-fire management. Kooistra et al. (2018) found a positive relationship between peoples' strong beliefs in the ecological importance of wildfire and how it is negatively related to the loss of land. The way a fire impacts a community, their economic state and the history between agencies and their adjoining communities all play a role in what attitudes and perceptions people have towards the agencies (Ryan et al. 2008).

However, hardly any literature exists that examines the collaboration process pertaining to restoration itself post-fire and how the relationships and attitudes between agencies impact their abilities to collaborate during restoration. Interagency collaboration can take many forms. In 2010, the USDA Forest Service enacted the Collaborative Forest Landscape Restoration Program (CFLRP) to fund ecological restoration on a landscape-scale (Schultz et al. 2012). To negate the tensions and animosity between one agency's staff and another's staff or organization, researchers suggested that an "arm's-length" approach to these aforementioned collaborative groups has often been adopted by certain jurisdictions within the USFS in an attempt to avoid legal ramifications under the Federal Advisory Committee Act of 1972 (FACA). Due to FACA determining that an agency taking advice from a collaborative requires transparency and inclusivity, agencies are more likely to tread with care when working on collaborative efforts (Butler et al. 2010, Butler et al. 2015). Other organizations and government land management agencies on the federal and state level have teamed up with nongovernmental organizations attempting to achieve these cross-boundary projects effectively (Bothwell 2019).

In California this interaction took the form of a state, private and federally funded collaboration known as the all lands approach to management and found that using this all lands approach meant that not only were wildfire treatment projects more successful on a landscape scale they were more readily funded (Kelly et al. 2015). Funding is key to successful collaborative efforts, specifically multi-year funding which has been found to speed up restoration efforts when implemented (Cyphers et al. 2019). Collaborative efforts still face much adversity. A study published in the Oxford Journal of Forestry found that even though interviewees could cite multiple benefits to collaborative efforts they were also able to cite at least one negative factor that caused roadblocks during the collaboration (Bothwell 2019). One such drawback and potential roadblock to collaboration is the animosity and friction that can occur between agencies during collaboration, and specifically the collaborations requiring community involvement, as examined by Butler (2010). Ultimately, if an ecologist is aware of the social constraints during ecological restoration it encourages not only better predictions of these outcomes but is shown to boost the overall success of the restoration project in general (Buckley et al. 2006).

There is also reason for the social and ecological systems to be considered when it comes to local stakeholders and their opinions not only about land management in general, but the restoration practices implemented around them (Petursdottir et al. 2013). These relationships between agencies, landowners and other stakeholders can further support quick implementation of project needs, and conversely the lack of those initial relationships can hinder projects and their implementation (Flores 2019). Yet another hindrance to the collaboration and restoration process lies within the motivation behind restoration (Stanturf et al. 2014). Typically, motivations are similar but vague and only generally fall into the notion of sustainability or ecosystem repair (Clewell 2006). Avoiding this vagueness and generalization of restoration will mean maintaining two objectives during the restoration planning process. These include determining where to start (degraded ecosystems) and where to end the restoration projects (healthy forest), and what kind of human influence planners want to see in the future (Stanturfet al. 2014).

Surveying employees across jurisdictions, this study aims to examine whether the differing sets of values and mission statements across jurisdictions impacts how employees interact with their jurisdictional counterparts. Further, do these differences in management styles and values negatively impact each agency and their ability to work in a post-wildfire landscape collaboratively after a large-scale fire event or can these differences offer a more holistic approach to post-fire ecological restoration.

Methods: Survey Design

This survey was constructed using the online and self-administering platform Survey Monkey (www.SurveyMonkey.com) according to the design principles of Dillman et al. (2014) with the primary goal of keeping non-response error, measurement error, sampling error and coverage error low. The survey was sent to multiple federal agencies and private organizations specifically targeting land managers, staff participating in eco-restoration and certain branches of wildland fire. The link was posted to multiple Facebook groups, Reddit forums and disseminated via text and email. This anonymous survey was designed in cooperation with Dr. Randall Brooks who advised in goal setting and whether they had been met by the survey questions; Gary Macfarlane in order to examine effectiveness with non-federal organizations including non-governmental organizations (NGOs); Scott Sprague M.S. Natural Resources to determine quality and simplicity of data collection; and Jeff

Handel from the Forestry and Fire Management Division at the Nez Perce tribe for readability and appropriateness to tribal government fire programs. All piloting was completed prior to the disbursement of the survey link.

The survey was created and designed to ascertain land managers' and firefighters' knowledge of fire restoration techniques and methods across jurisdictions. Firefighters were included based on the project work firefighters participate in pre-and post-season to identify the communication or non-communication they observe before and after fires, and to determine attitudes towards other agencies. The questions were specifically designed to identify a person's knowledge of their own techniques and the techniques and methods of their agency's counterparts during interagency events and restoration attempts as it pertains to agencies that overlap or work next to another agency, tribe or organization. Questions about communication in general and communication between agencies were used to determine interagency effectiveness when managing post-fire restoration attempts on either overlapping or abutting land.

Prior to any participants opening the link to the survey, Dr. Randall Brooks, Eva Strand and Phillip Stevens provided insight and critique concerning the questions asked to ensure the goals of the survey and the research questions were being met. The survey was then sent to the Internal Review Board (IRB #19-133) at the University of Idaho for review to ensure all guidelines were being met and that the questions remained appropriate for the research being conducted. After approval, the survey was made available for Survey Monkey from September 2019 until March 2020.

The questions were tailored to land managers, ecologists, biologists and other governmental staff involved in the restoration processes including firefighters. There were 80 participants and of those participants 6 were excluded from the findings because those participants had not finished the survey in full. The completion rate of the survey was 92%.

The survey was designed to target resource managers and wildland firefighters to understand a more holistic view of ecological restoration beginning with ignition. However, during the initial pilot stage of this survey, it was determined that rather than all firefighters at any experience level, higher experience levels would be necessary to achieve the results desired. As a result, the firefighters asked to participate were thinned out based on experience level. Many self-eliminated due to the niche components to the survey, but

dissemination efforts emphasized both a higher experience level and higher education, though the latter was not a completely discriminating factor.

Before beginning the survey, the survey listed four definitions for participants to read. We defined *post-fire ecological restoration* to avoid confusion with post-fire rehabilitation*, Burned Area Emergency Response (BAER), Burned Area Rehabilitation (BAR)* and *Overlapping Lands*.

We hypothesized that the results will show a need for improved collaboration or agreement on ecosystem-wide restoration methods, priorities and goals based on available literature reviewed for this survey.

Qualitative Data Collection

There were three open ended questions included in the survey for a total of 31 questions. The first two open ended questions were similar with question number 8 asking "What do you perceive as the biggest differences between your agency's methods to ecological restoration post fire versus other agencies? (Ex. seeding, planting, tree removal, etc.)" and similarly question number 12 asking "In general, what are the largest perceived differences between yours and other agency's methodologies negative or positive? (This can refer to bureaucratic or restoration methods.)". Question 8 (Appendix A) referred specifically to the methods used post-fire during restoration projects while number 12 referred to the general differences between agencies not specific to ecological restoration. The third open ended question number 31 was part of the demographic portion of the survey asking participants to volunteer the zip code to their work location.

Within certain quantitative questions—i.e. multiple-choice questions—we included an option to elaborate further on their answer. If survey participants elected to elaborate further upon their answer, the short-answer questions were then coded with the underlying themes presented within each answer. Examples of themes included in this research include funding, priorities, good/bad management and under staffing. Each theme was investigated and analyzed for importance using Excel Spreadsheet for easy organization and identification. Each of the questions with an option for further short-answer elaboration was analyzed for above mentioned themes. After cleaning up the qualitative data, those themes were then ranked by pervasiveness. Bar graphs were constructed to better convey and interpret thematic results from all qualitative questions as well as tallying the amount of

List of Demographic Questions
What best describes the agency you work for?
How many acres do you or your agency manage?
How many years have you been in your profession?
What is your level of education?
What is your age group?
Which best describes your occupation?
In what ZIP code is/was your work located? (enter 5-digit ZIP code; for example, 00544 or 94305)

Table 1: List of demographic questions asked within the Post-Fire Restoration Knowledge Survey (2020).

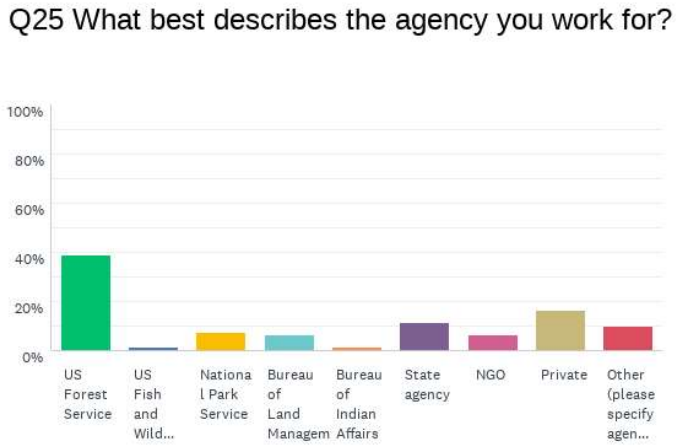

Figure 2: bar graph showing the distribution of jobs self-identified by participants during survey. Because two of the identified occupations appear as 2 or less, continued data

times a participant conveyed a negative opinion about a particular management organization.

Results: survey questions

Using the demographic questions given within the survey we ran one-way ANOVA's on each question participants answered. After running each question against the demographic data (Table 1), we found that 4 of those questions showed significance ($P<0.05$). The way participant's perceived post-fire ecological restoration by other agencies showed statistically significant when tested against number of acres a participant works on and the specific agency participants indicated they work for. When further testing the acreage, a Tukey post hoc test determined that there was statistical significance when tested against how many acres a person works on the test determined participants indicating they

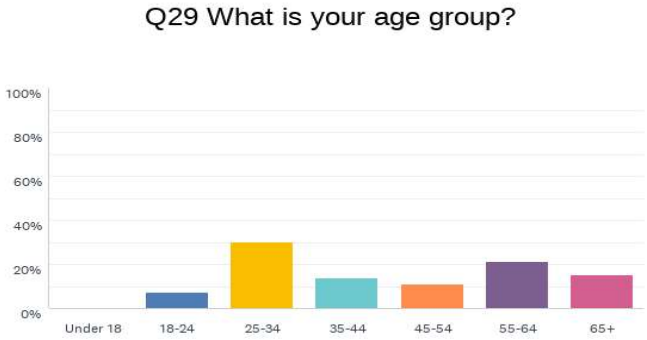

Figure 3: participants were predominantly between the ages of 18-24 and 25-34. The second majority was between 55-34 and 65+.

worked on7,500 acres and >10,000 acres was significant. Though the one-way ANOVA showed significance between participant's perception of other agencies and the specific agency a participant worked for, the Tukey post hoc could not be tested as the number of participants indicating they belong to a specific agency did not vary enough (variables at 2 or less. Figure 2). The way in which participant's perceived communication and cooperation were statistically significant when tested against age. The Tukey post hoc showed there was a significant difference between the way the participants answered between 18-24-year-old and 55-64-year-old (Figure 3). 18-24-year-olds were more likely to see fewer problems within the way their agencies communicated with other agencies, where those aged 55-64 were more likely to answer on the other side of the spectrum and viewed more problems in the communication and relationships between agencies. When asked about agency boundaries and if fire suppression was performed by more than one agency, the one-way ANOVA showed significance, but because there was only 1 US Fish and Wildlife employee, the Tukey post hoc was not performed.

Perceptions of Post-fire Ecological Restoration:

Responses to participant's perceptions pertaining to their and other agencies' post-fire ecological restoration methods (questions 1 and 2 in Appendix A) showed similar results. For question 1, participants predominantly described their perceptions of post-fire ecological restoration on a Likert scale (Table 2)of "not at all valuable" to "extremely valuable" as "very valuable" (n=30; 37.97%). When asked about other agencies' post-fire ecological restoration on the same Likert scale they similarly answered with "very valuable" in the majority (n=33; 41.77%).

Likert Scales Used:
Very unlikely-very likely
Not at all valuable-Very valuable
Very negative-very positive
None at all-A great deal
Not at all effective-extremely effective

Table 2: table showing Likert scales used within the Post-Fire Restoration Knowledge Survey (2020).

Perceived Communication and Its Value:

Participants were asked how valuable they believed communication between land management agencies (question 2 Appendix A) was to themselves and their own agency. Participants perceived communication between agencies to be "very valuable" once again (n=33; 41.25%). When asked in general what their perception of interagency communication was (question 3) on a Likert scale of "not at all effective" to "extremely effective", the majority of participants perceived interagency communication as only "somewhat effective" (n=37; 49.33%).

Interagency Cooperation:

Participants were asked if they would work with another agency in restoration efforts (question 4) on a Likert scale of "very unlikely" to "very likely" the majority of responses believing it was both "likely" and "very likely" they would participate in a restoration project with another agency ("likely" n=36; 45%. "Very likely" n=36; 45%). Question 5 asking if the participants' agency had any cooperatively managed lands corresponded with question 6 asking them to specify which agency, they were referring two in question 5. When asked about cooperatively managed lands, most participants answered "yes" (n=36; 62.07) while the remainder answered "no" (n=22; 37.93%). shows the participants' responses to question 6 where most indicated the other agency on their cooperatively managed land was the US Forest Service (n=15; 30.61%) with State agencies coming in at the second highest (n=10; 20.41%).

Interagency Relationships:

When describing how valuable the relationship between the participants' land management agencies and other land management agencies on a Likert scale of "not at all valuable" to "extremely valuable" participants largely believed their relationship was "very valuable" (n=33; 41.25%). When asked how they perceived these relationships (question 11)

most believed the relationship was “positive” (n=35; 43.75). When asking if fire suppression on cooperatively managed lands was performed by both or multiple agencies (question 16) the overwhelming majority believed that “yes” (n=53; 67.09%) fire suppression was performed by all agencies involved in that cooperatively managed land. Then participants were asked about ecological restoration after a fire event and if the restoration was also performed by multiple agencies on cooperatively managed lands. Here we see an equal number of participants answering “yes” (n=27; 34.18) and “no” (n=27; 34.18).

Advantages and Disadvantages:

Participants were asked if they believed there were perceived drawbacks to other agency’s methodologies compared to their own (question 9 Appendix A). The majority of participants chose “unsure” (n=38; 48.10%), but it is interesting to note that the second majority was “yes” (n=21; 26.58%) which was nearly equal to the amount of participants who did not see any drawbacks at all (n=20; 25.32%). Participants were then asked if they perceived any advantages to other agencies’ methodologies (question 10 Appendix A), The majority again was “unsure” (n=28; 35.44%), followed by “yes” (n=26;32.91%) and “no” (n=25; 31.65%).

Fire Suppression and Emergency Action:

The survey asked to what degree the participants’ agency relied on Burned Area Emergency Response (BAER) and Burned Area Rehabilitation (BAR) for their restoration and rehabilitation (question 14) with participants largely believing their agency only used BAER and BAR a “moderate amount” (n=24; 40.68). When asked how valuable the participant believed BARE and BAR was to their agency respondents believed it was “very valuable” (n=21; 35.59) despite only relying on it a moderate amount.

Fire Suppression and Culturally Important Sites:

The survey asked how the participants believed fire impacted culturally important sites (question 20) with the majority believing it only had a “neutral” (n=31; 39.24%) impact on those sites. When asked about whether fire suppression techniques change if there are culturally important plants on that land (question 21) participants chose a majority both “yes” (n=30; 37.97%) and “no” (n=30; 37.97%). When participants were asked if the presence of culturally important plants changed the way they would approach post-fire

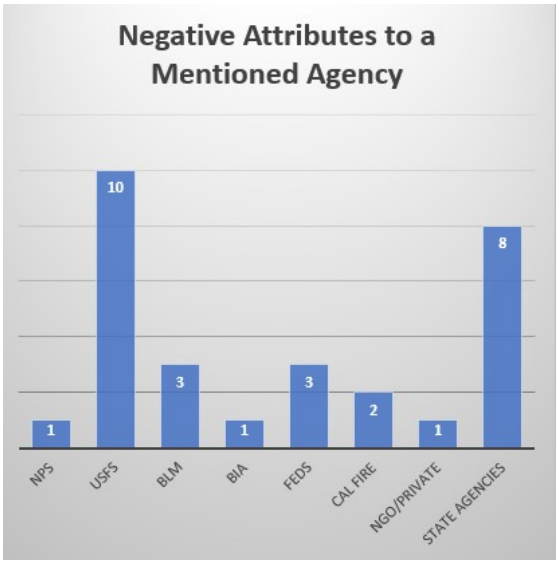

Figure 4: Showing the amount of times participants negatively attributed restoration differences to other specific agencies in question 2 (Appendix B). The highest mentioned was the USFS followed by State agencies.

ecological restoration (question 22) "yes" (n=36; 45.57%) was in the majority despite those same plants receiving less attention during fire suppression itself.

Coding

There were two specifically open-ended questions to interpret. The first being "what do you perceive as the biggest differences between your agency's methods to ecological restoration post fire versus other agencies (Ex. Seeding, planting, tree removal, etc.)". The second was similar. "In general, what are the largest perceived differences between yours and other agency's methodologies negative or positive (this can refer to bureaucratic or restoration method)." Each question that had both quantitative as well as qualitative data were input into Excel and examined for themes along with the two main qualitative questions. After tallying each theme, the questions deemed the most similar were then combined to get an overall look at the most frequently mentioned themes and they were then translated into a bar graph.

Then, we broke down each specific question with open-ended answers. Starting with the two main qualitative questions, we also broke down certain questions with a corresponding bar graph showing the amount of times participants negatively attributed a specific land management agency to their answer. Not every question had open-ended questions attributing negative connotations to a specific agency, so we show only two bar graphs pertaining to this topic.

While examining the predominant themes throughout certain questions, it was ascertained that participants were attributing certain methods and other negative differences between their agencies and others with specific agencies. Because of this, the amount of times an agency was mentioned throughout the questions was tallied in order to better understand the relationships between each agency according to participants (Figure 4).This

trend dwindled for the most part and only two graphs were created as fewer participants mentioned specific agencies as they continued the survey.

The results show that there may be some underlying concerns shared by participants as seen in Figure 4. What we can discern is that within the group of participants that felt compelled to share more within the short answer portion of Question 2 (Appendix B), the majority expressed need for improvement when working with US Forest Service (USFS) State agencies during post-fire restoration efforts. As seen above in Figure 4, out of the 29 participants who chose to give a short answer response, 10 specifically mentioned USFS and 8 mentioned State agencies. The other agency—or agencies—mentioned by participants were state agencies. However, it is important to remember that rather than concerns working with state agencies attribute or behavior, they were mentioned more so because they are generally perceived as having less funding or resources and having fewer experts within their agencies when it comes to restoration practices. It was expressed by participants that it can be positive to work on a local scale as state agencies tend to do.

This brings us to another point worth mentioning. It would appear some participants perceived disadvantages to working alongside other agencies including differing politics within agencies and funding levels. In addition, the core values and priorities the organizations in questions were also seen as a major negative difference across the board. Below that, we can see that poor restoration methods were perceived by participants as well as a lack of cooperation between agencies.

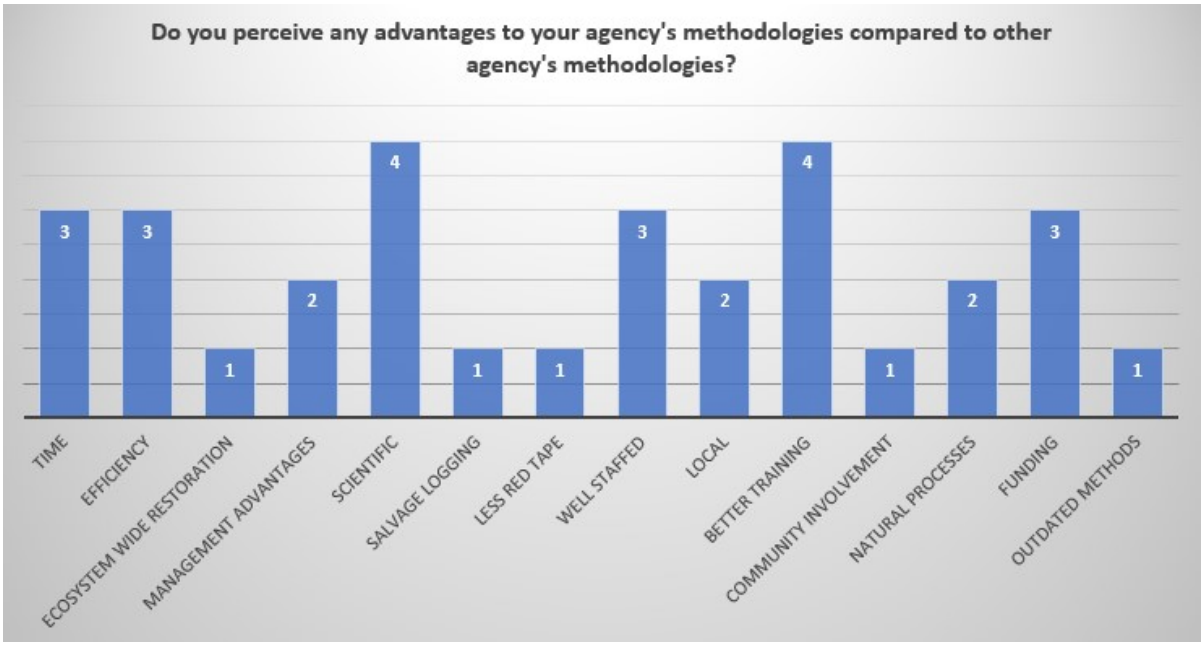

Figure 5: Showing perceived advantages to other agency's methodologies pertaining to post-fire restoration. Among the most prevalent themes were "scientific" in which participants conveyed their belief that certain agencies had what they would call "experts" in the restoration field and "better training".

Again, we tallied the amount of times a specific agency was mentioned within the short-answer questions. Though we do not see nearly as many mentions of these organizations, we still see of those mentioned, USFS is again mentioned most along with the BLM. Because this particular question was meant for quantitative purposes with a short-answer after the multiple choices, there were fewer short-answers to examine leading to few responses shown in Figure 5.

According to survey participants, there were many perceived advantages to their agency's counterparts as well. It was reported that certain agencies were better trained and used science to back their restoration projects. They were also considered more efficient and having more time to complete projects, allowing plants and fauna to recover more effectively post-fire.

When asked if participants had positive relationships with other agencies, many participants indicated they have positive relationships. However, most answers had some kind of caveat containing a negative answer, whether it was a feeling of dismissal or general negative interactions with other agencies. This was also reflected in question 12 (Appendix A) asking about the participant's perception of their relationship with other agencies.

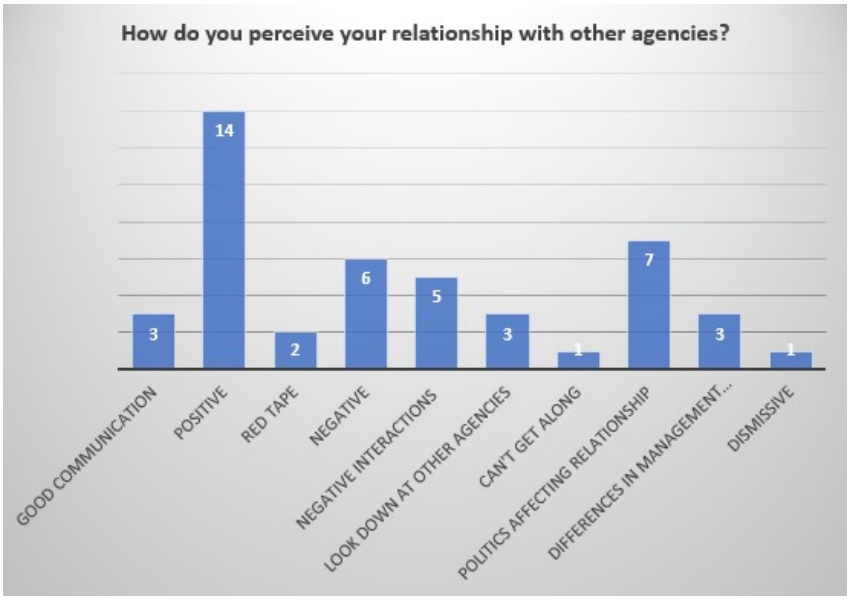

Figure6: Showing the participants perceived relationship with other agencies.

There were many differences reported in general (Figure 7), however the highest tallied difference according to our coding was money once again. As mentioned above, not only are other agencies perceived as having more money and resources, but other agencies are also seen as having less funding and potentially fewer resources. I.e., according to participants, the USFS is perceived as having more funding and resources to work with where state agencies are seen as having less funding and fewer resources to work with during post-fire restoration efforts and likely in general. This bolsters the negative opinions about said state agencies in terms of performance and skill level during restoration projects post-fire. However, some responses suggested having smaller state agencies meant greater ability to do restoration with experts local to the area, meaning locality encourages higher expertise in their local landscape. Different management methods and end goals were the second highest tallied after coding with participants reporting that there is no “cookie-cutter” management style and furthering the assertion that management should be done on a landscape scale between agencies when in cooperative efforts.

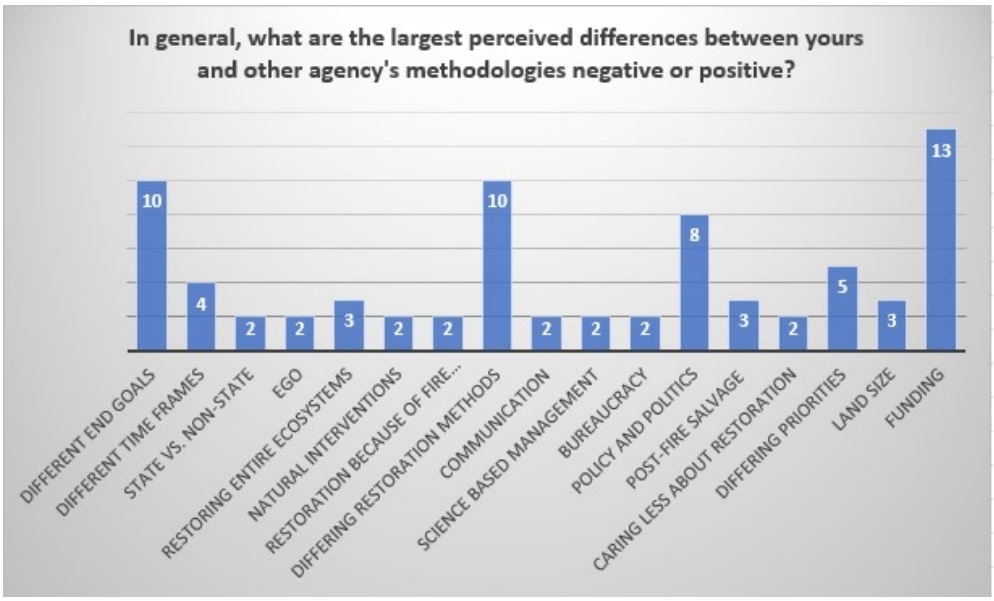

Figure 7: The general differences between agencies and their methodologies. The highest reported after coding was "money" or funding and "different end goals" as well as "different restoration methods".

Finally, our questions pertaining to tribal and cultural lands during restoration efforts were combined for overall simplicity (Figure 8). Though fire is a natural occurrence on

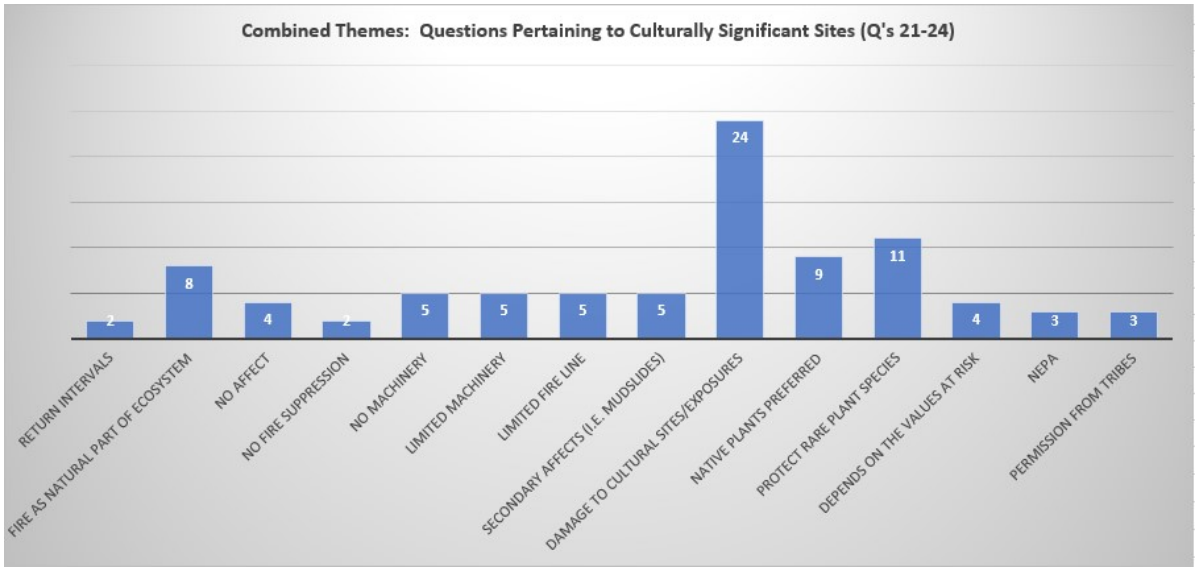

Figure 8: combined themes of questions 21-24 having to do with cultural, archeological and protected sites. Predominantly, damage to cultural sites including archeological site exposures after fire were mentioned the for the majority of these questions.

cultural or tribal land, the act of firefighting itself was perceived as damaging to these sites by many participants. Whether it was because of the methods firefighters use to dig line or

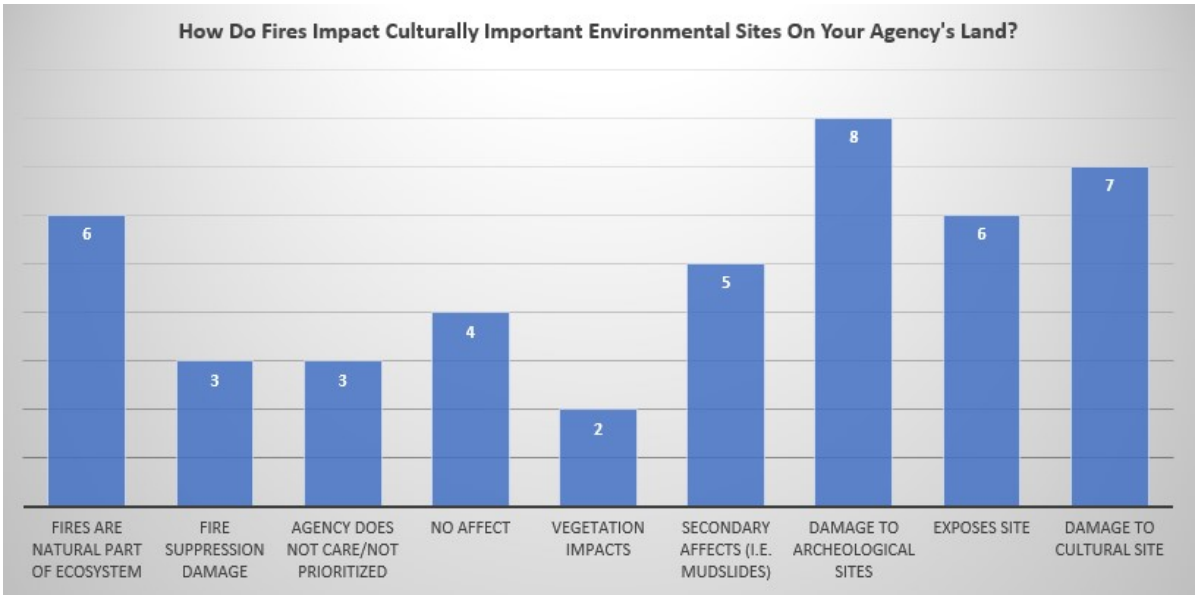

Figure 9: themes pertaining to how fires impact culturally important sites. Damage to both archeological and cultural sites was mentioned the most.

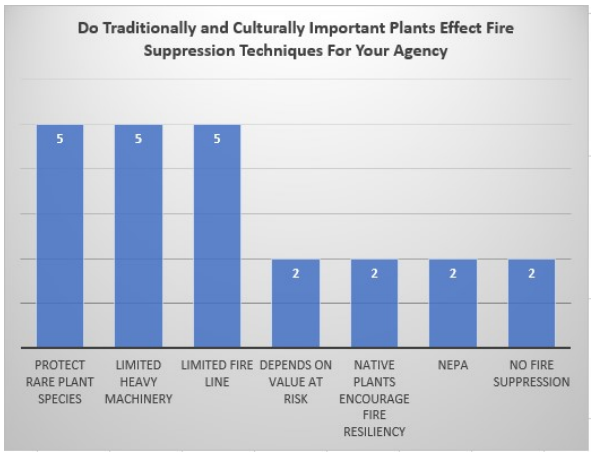

Figure 10: themes tallied pertaining to what a participant's agency does when culturally important plantsare threatened.

the machinery used—such as dozers and tractors—these sites are perceived to have been damaged due to the suppression process itself (Figure 9).

Looking closer at the data, participants perceptions concerning the impact fire and fire suppression has on cultural or archeological sites was largely negative. Out of the 45 responses collected, only 4 of those responses perceived wildfire itself as positive on their cultural or archeological sites and of those 45 responses, two wrote that agencies did not care about the wellbeing of those sites, and another asserted that tribal cultural sites were simply not prioritized by other agencies during suppression efforts. This resulted in the

largest response being there is overall negative damages to cultural sites after a fire has come through followed by damage to artifacts and site exposure during wildfire events and the subsequent suppression efforts (Figure 9). However, when asked if culturally important plants impact fire suppression tactics for their agency, most participants answered in the positive, citing that there may be limited machinery and fire line use on cultural sites, no machinery and that their agency does—in fact –try to protect the native plant species under threat (Figure 10). Because this data is largely anecdotal and only about half of the participants elected to describe these tactics, no solid conclusions can be drawn here.

Discussion

Within the literature, there seems to be a lack of information related to agencies and how they work together specifically within the context on post-wildfire restoration and collaboration. This research project attempted to fill that gap by assessing the attitudes, perceptions and attitudes each agency inherently has towards one another. Our hypothesis stated that our survey results may find a lack of cohesion between agencies and a lack of collaborative efforts across landscapes. While we were not able to definitely prove or disprove the hypothesis based on our survey data and results, there were several interesting results deserving discussion.

Although the results from this survey were mixed, when examining the results presented, participants seemed to have more neutral answers than either positive or negative. This may be the result of a lack of understanding or knowledge about the topics discussed within the survey. Others with more expertise on the subject would likely have more to say within the short answer than the multiple choice answers, where someone with less experience or expertise may opt out of the discussion entirely. However, the connection between the way an individual sees post-fire restoration and how many acres a participant works on and the occupation they work for is interesting.

Our data showed mostly neutral responses to our survey questions, thus it may be that the participants had relatively little knowledge pertaining to their management practices and how collaboration works across landscapes. This is an issue in-and-of-itself in that given our responses we can partially see that this lack of knowledge may mean that collaborative processes and management are not well discussed either within agencies or across

landscapes to other agencies. Given our relatively small sample, we cannot come to any conclusion on this issue, but further investigation may more insight on the issue.

While the results of this survey on a quantitative level are largely inconclusive, the qualitative—short answer—component to the survey provided insight on the survey questions. Within these short-answer questions we see consistent funding issues within each agency and their restoration projects. Because of funding and resource issues, many agencies are perceived as lacking in not only funding but in staffing and experts in the restoration field. Although, other survey participants claim that the smaller local nature of state agencies contribute to their increased knowledge and ability to restore land.

Our other findings included the coding and trends (figures 9 and 10) in which culturally important sites and archeological sites were seen as potentially damaged not only because of the wildfires themselves but because of the fire suppression techniques used. This includes machinery and chemical suppressants used on these lands. There was some disagreement in that our findings also showed that agencies were aware of and considerate of protected plants on cultural lands but included in those same responses were participants admitting that their agency either does not hold protected plants as valuable enough to protect during a fire event and may, in fact, simply not care that they are threatened (Figure 9). Though the responses stating their agency may not take culturally important plants into consideration during fire suppression are in the minority, it is important to keep them in mind when discussing these issues. Particularly when cultural sites are involved, there is no reason to believe those practices (agencies not viewing cultural plants as important enough to protect) can be disruptive to a cohesive and tension free collaborative environment.

In the literature we see a reliance on restoration with BAER and BAR when it comes to the function of local ecology, erosion and seeding (Beyers 2004 and Kruse et al. 2004), but when surveyed it would appear that the results show only a moderate amount of reliance on the BAER and BAR teams post-wildfire. This may call into question the functionality of the BAER and BAR team as a long-term restoration method, however not conclusively. While considered valuable to each organization, results of the Post-Fire Restoration Knowledge Survey (2020) also showed that do rely on BAER and BAR at least a moderate amount. However, participants likely having a specific job function within their agency

outside of BAER and BAR may skew the results and results may show some sampling error for this question.

Most questions resulted in a mean around 3 on the Likert scale, meaning they were generally only somewhat happy with cooperation, communication and post-fire ecological restoration processes on the Likert scale or they simply knew nothing about it. This lack of excitement or knowledge about post-fire ecological restoration and the relationships between agencies can be attributed to the survey's lack of demographic variety (sampling error). While a variety of people took the survey, most of them were young (<34 years), working in a fire position and working for the USFS. This lack of diversity may explain the lackluster results and general lack of enthusiasm shown in the results.

However, what we can glean from this survey is that while people are willing to work with other agencies in restoration work post-fire, they do not know enough about other agencies to be able to say what it is they do differently and what it is they may or may not do well. This may also be attributed to the lack of diversity (I.e. Sampling error in participants and their self-identified agencies) and younger age groups. However, while it does appear intuitively that we perceive a lack of knowledge within the younger population of participants, we can conversely see that with age comes more knowledge of not only what participants believe and perceive other agencies are doing pertaining to their restoration.

Age appears to be a factor in what the participants of this survey were able to tell us. This survey implies that with age comes more knowledge of not only their agency's counterparts, but more knowledge of the pitfalls and disadvantages to interagency communications.

To be able to more fully understand this relationship, we need more time and participants to complete the survey. As it is, there was not enough information collected to fully comprehend what the potential implications are. In addition, focus groups and in-depth interviews would greatly increase our understanding of the intricacies and nuances within this field of study.

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Conclusion

No conclusion can be drawn pertaining to the issue at hand. As far as how collaboration impacts post-fire ecological restoration and if there is a negative or positive impact, again we cannot know based on these findings. As a result of this inconclusiveness, we have two recommendations going forward. The first is to conduct interviews between differing agencies with cooperatively managed lands in order to ascertain the opinions and perceptions of agencies' staff related to post-fire ecological restoration and collaboration. This is to forgo the process of conflicting results and sampling error. The second is to conduct on the ground research post-wildfire to study how each agency and stakeholder conducts ecological restoration post-fire, and whether the interactions between the agencies impact negatively or positively the outcome of that restoration process. Based on these findings, it is not for us to say whether or not there is a real behavioral problem within any specific agency; however it is worth mentioning that the perceptions within agencies about their counterparts can be pervasive and negatively impact the continued collaboration and cooperation agency to agency.

Appendix A

Copy of Disseminated Survey:

1. How has land management in terms of post-fire ecological restoration been perceived by yourself and others in your land management agency?

- Not at all valuable
- Not so valuable
- Somewhat valuable
- Very valuable
- Extremely valuable

2. How has land management in terms of post-fire ecological restoration been perceived by yourself and others in your land management agency?

- Not at all valuable
- Not so valuable
- Somewhat valuable
- Very valuable
- Extremely valuable

3. How have you and others perceived post-fire ecological restoration by other agencies (federal/state/non tribal agencies)?

- Not at all valuable
- Not so valuable
- Somewhat valuable
- Very valuable
- Extremely valuable

4. How have you perceived the communications and cooperation between land management agencies and your own?

- Not at all valuable
- Not so valuable
- Somewhat valuable
- Very valuable
- Extremely valuable

5. Would you work with another agency in restoration work?

- Very unlikely
- Unlikely
- Neither likely nor unlikely
- Likely
- Very likely

6. Does your land management agency have any cooperatively managed or overlapping lands with another agency/organization?

- Yes
- No

7. If yes, which agency?

- US Forest Service
- US Fish and Wildlife Service
- National Park Service
- Bureau of Land Management
- Bureau of Indian Affairs

- State
- NGO
- Private

8. How would you describe the relationship between your land management agency and other agencies?

- Not at all valuable
- Not so valuable
- Somewhat valuable
- Very valuable
- Extremely valuable

9. What do you perceive as the biggest differences between your agency's methods to ecological restoration post fire versus other agencies? (Ex. seeding, planting, tree removal, etc.)

Question Title

10. Do you perceive any drawbacks to other agency's methodologies compared to your agency's methodologies?

- Yes
- No
- Unsure

If yes, please specify

11. Do you perceive any advantages to your agency's methodologies compared to other agency's methodologies?

- Yes
- No
- Unsure

If yes, please specify

Question Title

12. How do you perceive your relationship with other agencies?

- Very negative
- Negative
- Neutral
- Positive
- Very positive

Please comment on this relationship

13. In general, what are the largest perceived differences between yours and other agency's methodologies negative or positive? (This can refer bureaucratic or restoration method.)

14. Are other agencies involved in fire suppression on your agency's culturally important sites?

- Yes
- No

- Unsure

15. After a fire event, to what degree will your agency/organization rely on Burned Area Emergency Response (BAER) or Burned Area Rehabilitation (BAR) for restoration and rehabilitation?

- None at all
- A little
- A moderate amount
- A lot
- A great deal

16. How valuable is BAER and BAR to your agency/organization?

- Not at all valuable
- Not so valuable
- Somewhat valuable
- Very valuable
- Extremely valuable

17. If agency boundaries are overlapping or adjoining, is fire suppression on those overlapping lands performed by both agencies?

- Yes
- No
- Unsure

18. After a fire on overlapping land, is ecological restoration performed by both agencies?

- Yes

- No
- Unsure

19. How would you rate interagency communication during post-fire ecological restoration?

- Not at all effective
- Not so effective
- Somewhat effective
- Very effective
- Extremely effective

20. In general, how would you rate interagency communication?

- Not at all effective
- Not so effective
- Somewhat effective
- Very effective
- Extremely effective

21. How do fires impact culturally important environmental sites on your agency's land?

- Very positive
- Positive
- Neutral
- Negative
- Very negative

Please specify

22. Do traditionally and culturally important plants effect fire suppression techniques for your agency?

- Yes
- No
- Unsure

If so, please explain

23. Does the presence of culturally significant plants impact the way you approach post-fire ecological restoration?

- Yes
- No
- Unsure

If yes or no, please explain

24. Are these culturally significant sites treated differently than other non-cultural sites during post-fire ecological restoration efforts?

- Yes
- No
- Unsure

Please explain

25. What best describes the agency you work for?

- US Forest Service
- US Fish and Wildlife Service
- National Park Service
- Bureau of Land Management

- Bureau of Indian Affairs
- State agency
- NGO
- Private
- Other (please specify agency or organization)

26. How many acres do you or your agency manage

- <500 acres
- 500-999 acres
- 1000- 2499 acres
- 2500 - 7499 acres
- 7500 - 10,000 acres
- >10,000 acres

27. How many years have you been in your profession?

- 0-5 years
- 5-10 years
- 10-19 years
- 20-29 years
- 30-39 years
- 40+ years

28. What is your level of education?

- Some High School

- High School Diploma
- Some College
- Associate's Degree
- Bachelor's Degree
- Master's Degree
- PhD

29. What is your age group?

- Under 18
- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65+

30. What is your ethnicity?

- White or Caucasian
- Black or African American
- Hispanic or Latino
- Asian or Asian American
- American Indian or Alaska Native
- Native Hawaiian or other Pacific Islander
- Another race

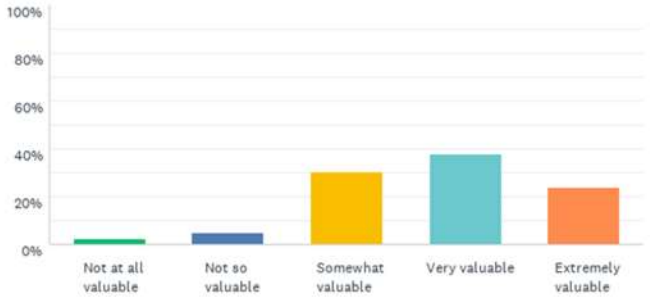
31. Which best describes your occupation?

- Fire related
- Forestry related
- Restoration related
- Natural resource related
- Range related
- Other (please specify)

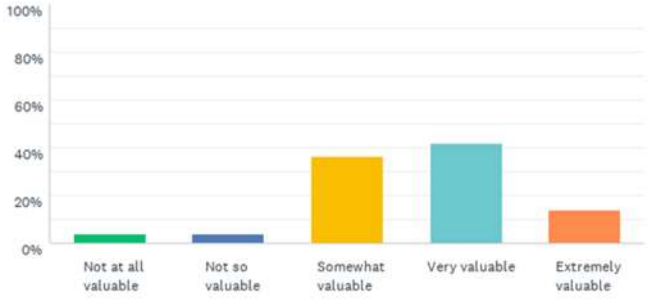
32. In what ZIP code is/was your work located? (enter 5-digit ZIP code; for example, 00544 or 94305)

Appendix B

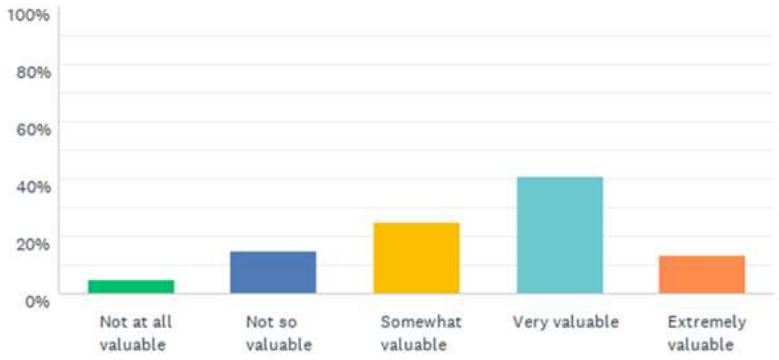
1. How has land management in terms of post-fire ecological restoration been perceived by yourself and others in your land management agency?



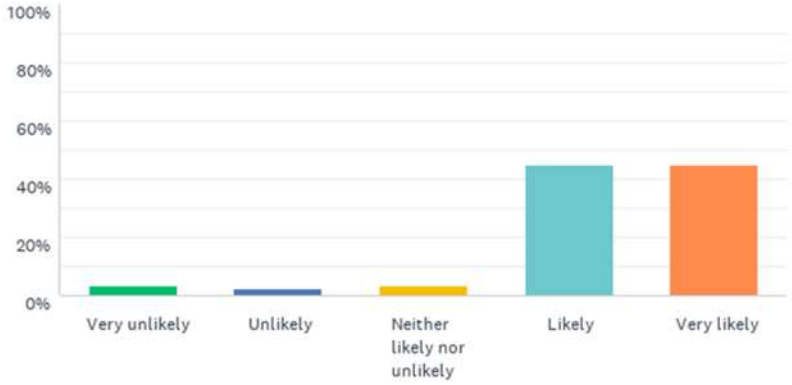
2. How have you and others perceived post-fire ecological restoration by other agencies (federal/state/non tribal agencies?)



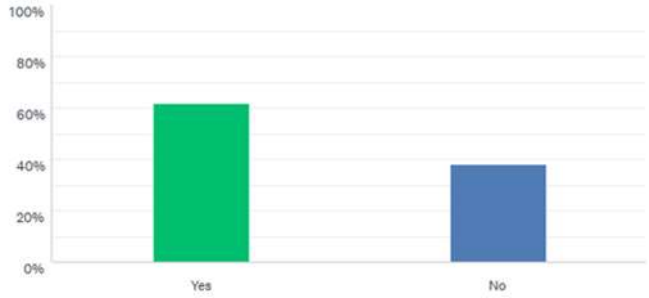
3. How have you perceived the communications and cooperation between land management agencies and your own?



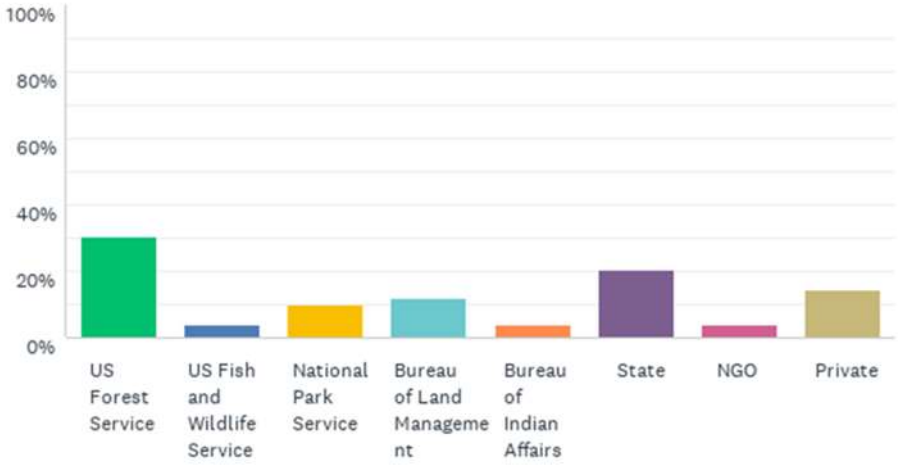
4. Would you work with another agency in restoration work?



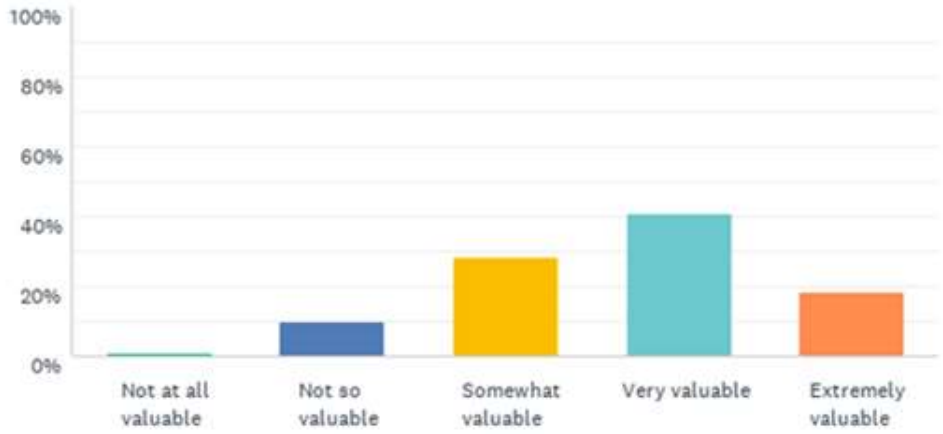
5. Does your land management agency have any cooperatively managed or overlapping lands with another agency/organization?



6. If yes, which agency?

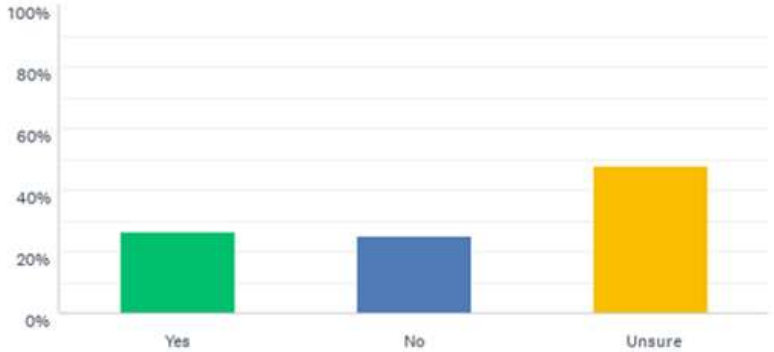


7. How would you describe the relationship between your land management agency and other agencies?

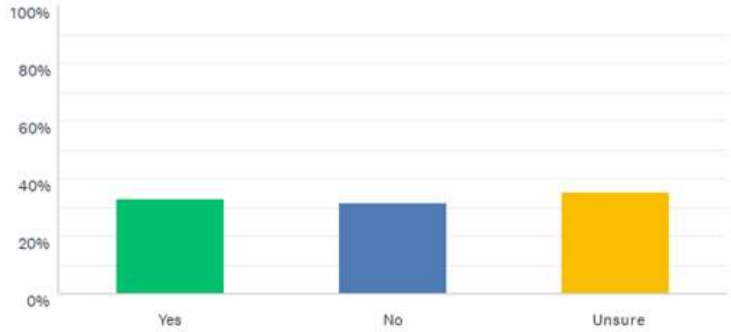


8. What do you perceive as the biggest differences between your agency's methods to ecological restoration post fire versus other agencies? (Ex. Seeding, planting, tree removal, etc.)

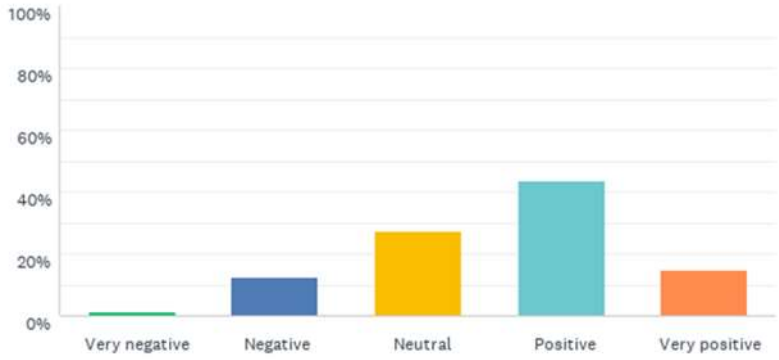
9. Do you perceive any drawbacks to other agency's methodologies compared to your agency's methodologies?



10. Do you perceive any advantages to your agency's methodologies compared to other agency's methodologies?



11. How do you perceive your relationship with other agencies?



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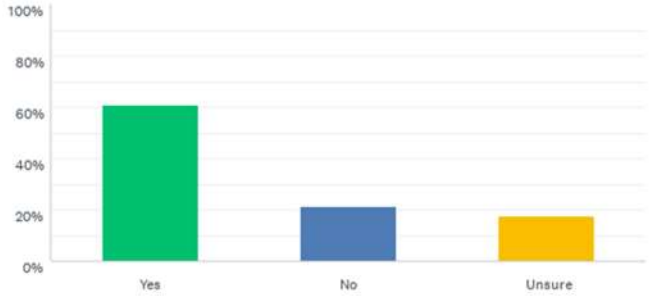
13. Are other agencies involved in fire suppression on your agency's culturally important sites?



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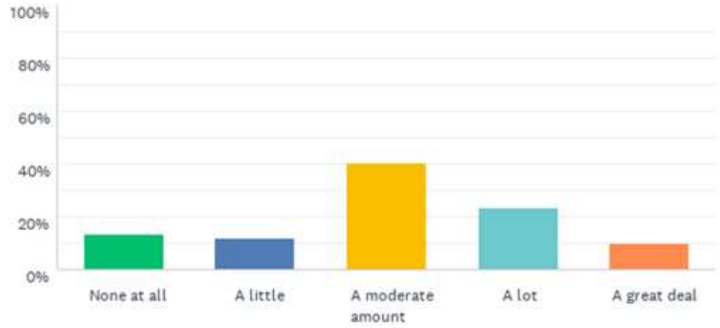
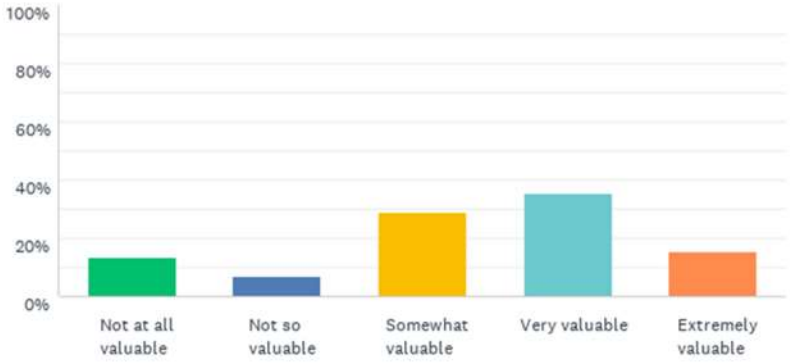
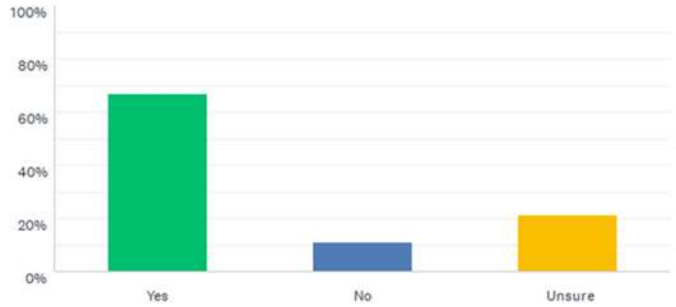


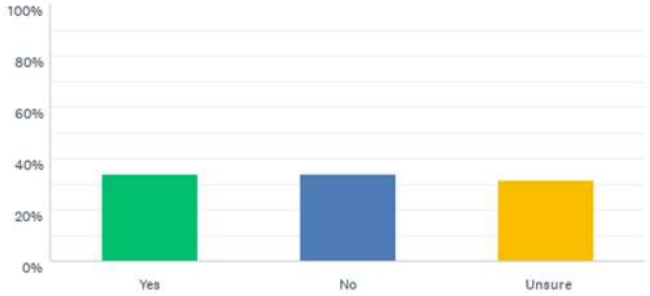
15. How valuable is BAER and BAR to your agency/organization?



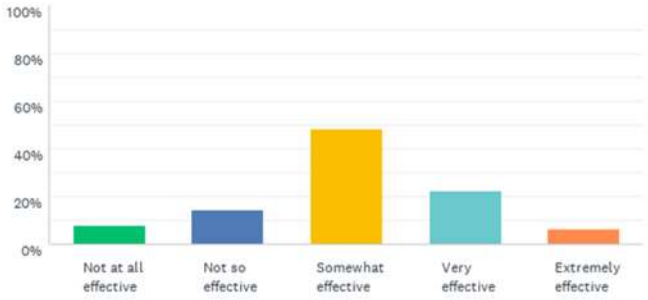
16. If agency boundaries are overlapping or adjoining, is fire suppression on those overlapping lands performed by both agencies?



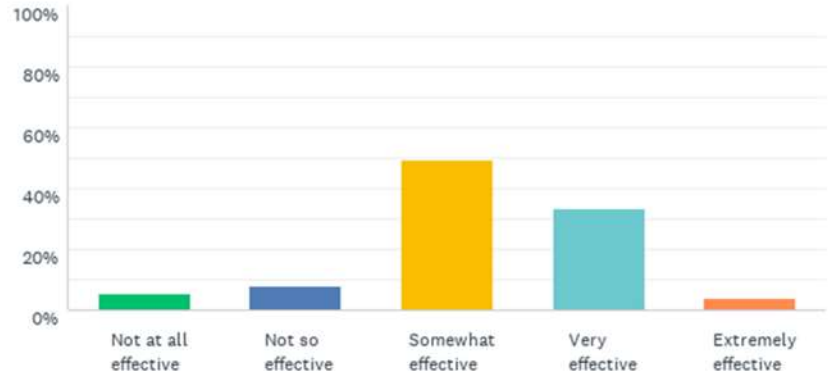
17. After a fire on overlapping land, is ecological restoration perfored by both agencies?



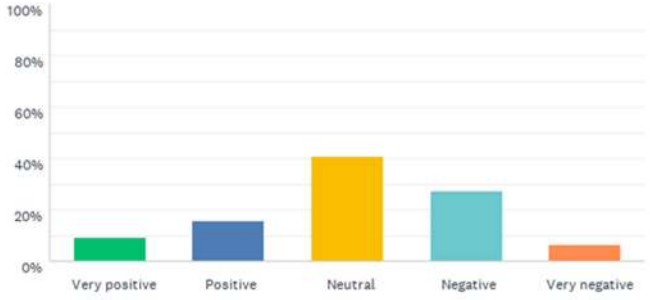
18. How would yourate interagency communication during post-fire ecological restoration?



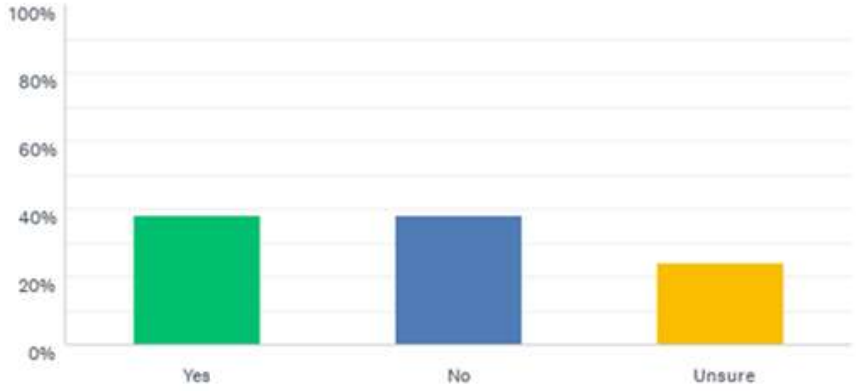
19. In general, how would you rate interagency communication?



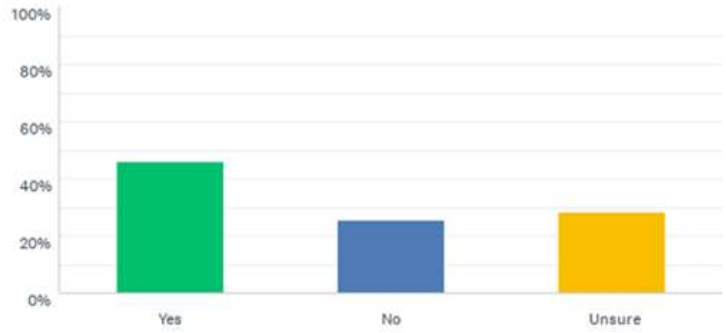
20. How do fires impact culturally important environmental sites on your agency's land?



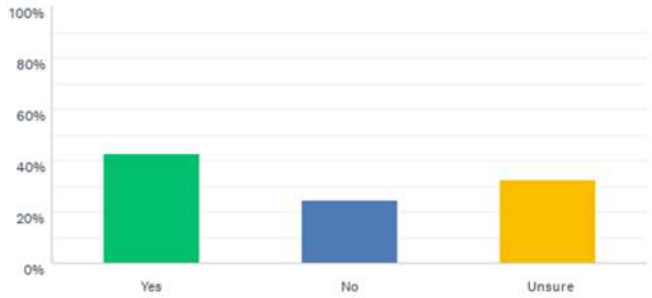
21. Do traditionally and culturally important plants effect fire suppression techniques for your agency?



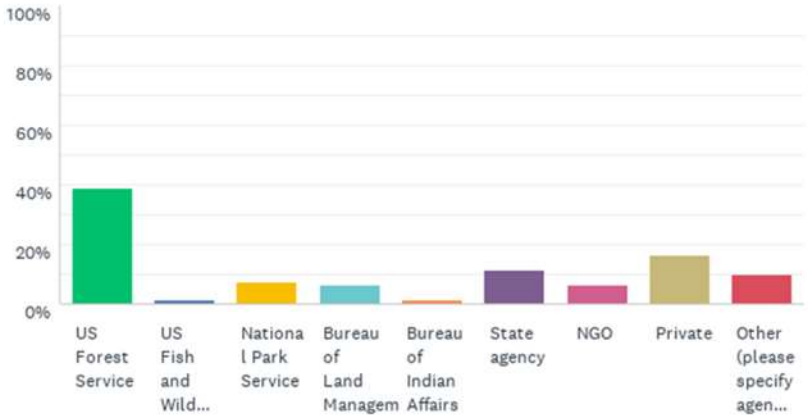
22. Does the presence of culturally significant plants impact the way you approach post-fire ecological restoration?



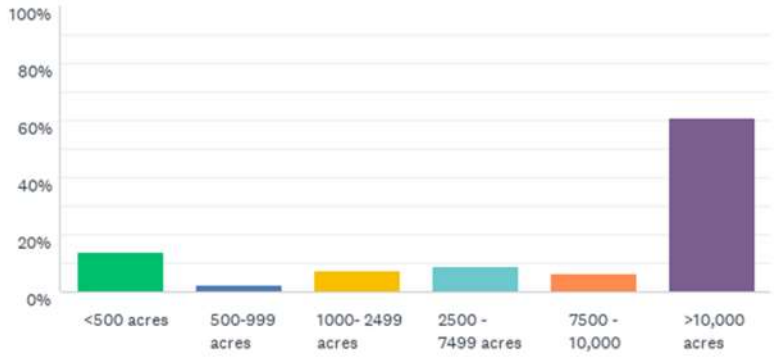
23. Are these culturally significant sites treated differently than other non-cultural sites during post-fire ecological restoration efforts?



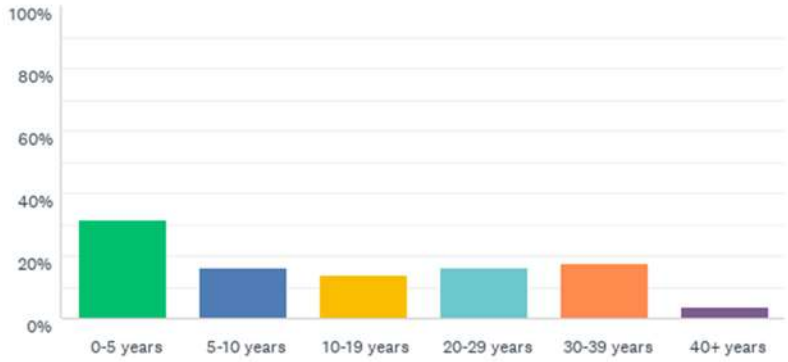
24. What best describes the agency you work for?



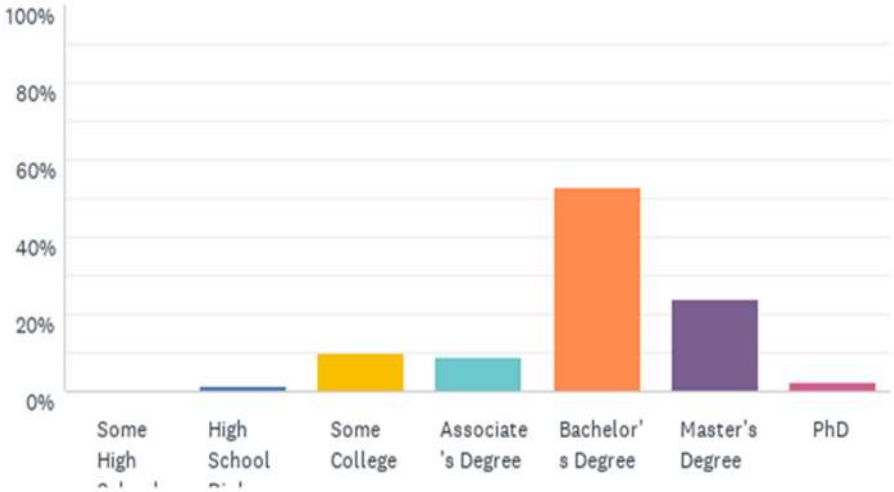
25. How many acres do you or your agency manage?



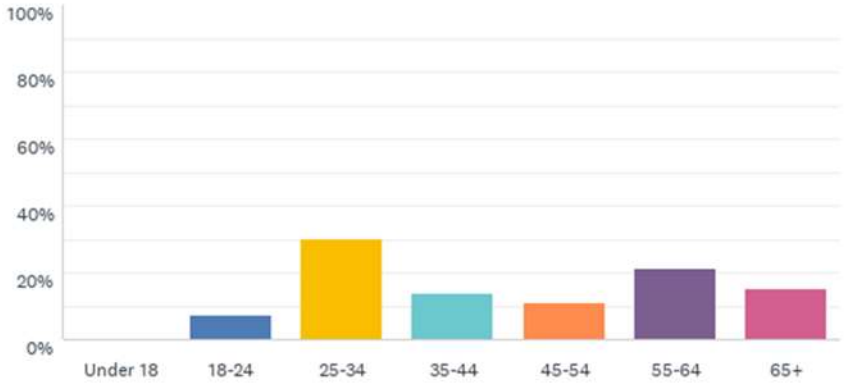
26. How many years have you been in your profession?



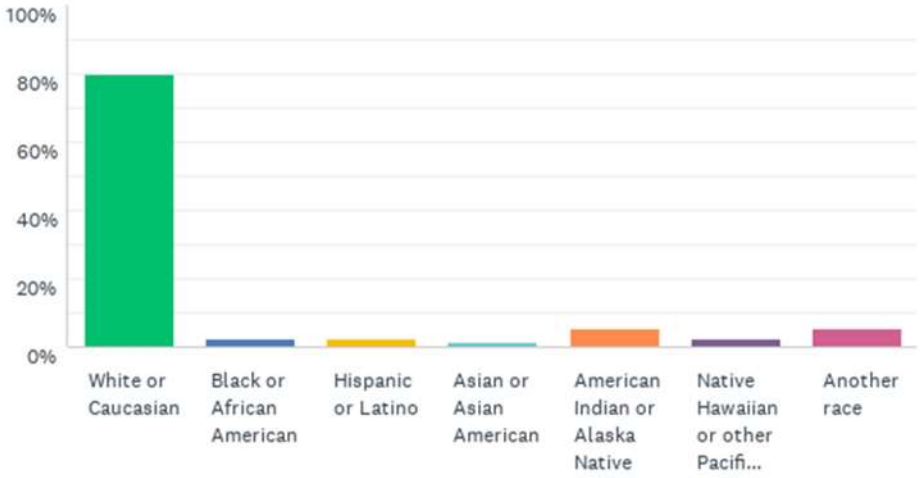
27. What is your level of education?



28. What is your age group?



29. What is your ethnicity?



30. Which best describes your occupation?