INVASIVE WOODY PLANT SOCIAL SCIENCE REPORT

Understanding landowner motivations, barriers, and needs for tree and shrub management in Kansas and Oklahoma


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EXECUTIVE SUMMARY

Invasive tree and shrub species are rapidly converting grasslands into woodlands, leading to negative outcomes such as decreased forage availability and loss of vital bird habitat. Considering the numerous ecological and social factors driving grassland conversion across private lands, the task of private landowners to manage and mitigate woody encroachment can be multifaceted and unpredictable. This report examines various motivations, barriers, and future needs of landowners and land managers regarding invasive woody plant management decision-making. With this knowledge, conservation practitioners can better support these individuals in their ongoing efforts to manage invasive species.

Methods

The study involved an exploration of tree and shrub management in six counties across Kansas (Lincoln, Osborne, and Barber Counties) and Oklahoma (Woods, Beaver, and Roger Mills Counties). We collected and analyzed qualitative data related to motivations, barriers, and future needs of landowners and land managers through structured interviews (Appendix A; n=14) and focus groups (Appendix B; n=12). Topics included background information, management practices, assistance programs, and communications around invasive woody plant management. Although these data are not statistically representative of all the landowners in these counties, they do offer valuable insights into the factors influencing participants' behavior and perceptions. By combining individual and collaborative perspectives, the study aimed to provide effective recommendations for working with landowners on invasive woody plant management across the focal counties. For more detailed information on the research methodology, please refer to the full report and its appendices.

Key Findings

Management practices used

- Mechanical removal (including hand removal, skid steer, and dozer work), chemical application, and prescribed burning were most commonly used.
- Cost and time efficiency, effectiveness at killing trees, and availability of equipment were the primary reasons for using the aforementioned practices.

Motivations for management

- Visually seeing trees and shrubs on rangeland
- Assistance program availability
- Seeing neighbor’s improved rangeland due to management
- Environmental stewardship ethic
- Desire to increase production value of range

Barriers toward management

- Prescribed burning
    - Fear of unknown outcomes due to inexperience
    - Weather or ecological conditions preventing an effective burn
    - Lack of external support to conduct a prescribed burn
- Mechanical removal

    - Expense of fuel and certain pieces of equipment
    - Damage of tree and shrub removal on equipment
- Chemical spraying
    - Contamination of the watershed or other desirable tree/shrub species
    - Potential ineffectiveness in the long run

Future needs

- Establishment of more prescribed burn associations (PBAs) to help alleviate existing fears and provide labor and equipment to conduct a burn
- Increased funding and assistance programs to help overcome concerns related to the costs of management
- Formation of a community of practice to provide information around management

Assistance program improvements

- More funding and cost-sharing that is easily accessible for purchases such as equipment
- Increased technical assistance and mentorship
- Incentives for those who maintain intact grasslands
- Greater flexibility for landowners and their diverse operations

Recommendations

The following recommendations, based on the research findings, are meant to aid conservation delivery professionals, outreach specialists, and policymakers when working with producers and landowners on invasive woody plant management. For more detailed results of each recommendation, please refer to the full report.

Recommendations For Outreach Specialists And Conservation Delivery Professionals

1. **Collect background information to develop messages and recommendations that are relevant and resonate with your target audience.**
    - Gather relevant biological and social information.
        - Understand what woody plant species local landowners and managers are dealing with, management practices they use, and their perspectives on the most effective practices.
        - Investigate past practices they have used and their reasons for discontinuing those practices to develop messages and recommendations that are relevant and resonate with your target audience.

2. **Derive solutions to mitigate barriers and meet needs.**
    - Review the management needs and barriers stated above.
    - Connect landowners and land managers to tools and resources (information, funding, technical assistance, labor, etc.).
    - Emphasize and affirm existing motivations tied to stated barriers and needs.

3. **Investigate feasibility of future management approaches.**

- Investigate the management options referenced in this report to assess their feasibility within your community of interest.
- For example:
    - Assess properties to determine the effectiveness of using fire as a tree and shrub treatment option.
    - Work with producers to help them learn about the benefits of multi-species grazing and assess the feasibility of businesses that rent out goats and sheep to clear a property of saplings.

4. **Develop content for communications and outreach strategies.**
    - Create a guiding vision of success for tree and shrub management. Establish objectives and clarify expectations of management success at the beginning of any communications strategies.
    - Highlight the most effective tools for each species and density that are supported by biological effectiveness studies (if available), taking into account what people are already doing and the cost-effectiveness of these practices.
    - Set clear expectations about the time and financial requirements of each practice.
    - Utilize existing management motivations. In this study, that can include:
        - Activating an individual's environmental stewardship ethic by touching on points such as wildfire risk and wildlife conservation.
        - Sharing statistics on lost production value as a result of ineffective management.
        - Recruiting individuals who can showcase their management success to help convince other landowners to begin managing their own rangelands.
    - Incorporate producers' negative attitudes on invasive woody plants and the benefits of removal in communications materials to express the detrimental impacts caused by a lack of management and the benefits of removing trees and shrubs early.

5. **Use preferred sources and channels of information for outreach.**
    - Determine your specific community's preferred source(s) of information and communication channels (electronic, print, word of mouth, etc.) and use those outlets during outreach.

6. **Facilitate community-engaged planning and highlight success.**
    - Facilitate collaborative planning among or between landowners and conservation agency staff to lessen the labor and financial burden on individuals. Showcase success stories as a guide for collaboration. Use the resources listed in the full recommendations to find more information on collaborative frameworks, local prescribed burn associations, and lessons learned from past invasive woody plant partnership planning.

7. **Conduct outreach with landowners not managing for grass-based agricultural production.**

- Understand the unique needs of these populations (such as non-operating or recreation-based property owners) and conduct specific outreach. This can include:
    - Listening to non-operating landowners to more fully understand their perspectives and desired uses of the land (other than haying or grazing), then creating communication strategies that promote woody plant management tailored to their needs.
    - Working with recreation-based managers to overcome common misconceptions about grasslands, such as deer needing woodland habitat to grow large.

8. **Work with diverse landowners and managers.**
    - Understand what different types of landowners and land managers you have in your region, determine their unique needs related to invasive woody plant management, and conduct specific outreach based on those needs.
    - Consider cultural sensitivities, along with unique motivations and barriers when working with traditionally underrepresented groups, such as women and non-White landowners.

9. **Promote assistance programs by using existing motivations and facilitating better agency coordination.**
    - Use current motivations to promote program participation by sharing why landowners decided to participate in assistance programs and what they liked about them.
    - Work with the agencies providing assistance programs to help coordinate outreach efforts more effectively.
    - Share opportunities with landowners while streamlining their information-gathering process.

Recommendation For Policymakers

Update assistance programs as needed.

- Reduce complexity of program enrollment while increasing contract flexibility.
- Provide mentorship/information to participants throughout the entirety of the programs.
- Determine local gaps between the assistance available and what is needed.
- Bridge gaps by increasing funding/cost-share opportunities where appropriate.
- Shift focus to proactive rather than reactive management of already encroached properties by providing incentives for proactive landowners.

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INTRODUCTION

Invasive tree and shrub species are transforming grasslands into woodlands at an unprecedented rate (Morford et al., 2022), leading to a decline in foragable grasses and a loss of grassland habitat vital for migratory bird species (Coppedge et al., 2001; Briggs et al., 2005). From a social perspective, some of the major causes of grassland conversion include a legacy of fire suppression, a decline of native ruminant species, and the transition of grasslands into croplands (Briggs et al., 2005; Twidwell et al., 2013; Archer et al., 2017). These processes are often driven by human activities, such as agricultural expansion and urbanization, which can have far-reaching impacts on the grassland ecosystem. The loss of grassland habitat can also have significant economic consequences, as it can reduce the productivity of grazing lands and impact the livelihoods of those who depend on them.

Some of the primary ecological drivers that influence the rate of woodland transition include the soil profile and topography of a site and a changing climate (Archer et al., 2017; Gaskin et al., 2021). These social and ecological processes are inextricably linked, and together contribute to broader patterns of conversion (Londe et al., 2022). The loss of grasslands often leads to a decline in the abundance and diversity of native plant and animal species, while promoting the establishment of invasive woodland species. This can have cascading effects on ecosystem services, such as pollination and nutrient cycling, which also impact human well-being.

Given the complex drivers of grassland conversion, the ability of private landowners and land managers to mitigate invasive tree and shrub encroachment can be complex and at times uncertain. Understanding the diversity of landowner motivations, barriers, and future needs related to invasive woody plant management decision-making can reveal the key factors that either encourage or hinder management. This information can help conservation delivery practitioners and communications and outreach specialists to assist landowners to more effectively manage invasive woody plants and conserve grasslands.

Goal

The goal of this social science research was to understand landowner and land manager attitudes regarding invasive woody plant management to better inform and support grassland conservation through communication messages, products and tools that increase earlier and more effective woody plant management.

Primary Objectives

1. Understand the motivations, barriers, and future needs landowners or managers have regarding invasive woody plant management.
2. Determine how these factors differ for various types of landowners or land managers.
3. Use these results to provide recommendations that support conservation delivery and communications meant to drive invasive woody plant management.

Study population

The primary study population was landowners with ranching operations in six counties within Kansas and Oklahoma. We also interviewed a recreational land manager with a business focused on managing hunting properties and an Indigenous land manager working for the Cheyenne and Arapaho Tribes. Throughout the rest of the report, we will use the term participant, producer, and landowner/manager to refer to our primary study population.

METHODS

This study was focused on three counties in Kansas (Lincoln, Osborne, and Barber Counties) and three counties in Oklahoma (Woods, Beaver, and Roger Mills Counties), the locations of which represent a gradient of woody transition as shown in the Rangeland Analysis Platform (Figure 1). We collected qualitative data through a series of in-person focus groups and structured interviews that took place throughout 2023 to generate detailed information on opinions and decision-making related to invasive woody plants and their management. Interviews allowed us to understand these topics from an individual perspective and dig deeper into specific topics if needed. Conversely, focus groups allowed us to hear from a wider range of individuals and understand how opinions might change based on other perspectives. Combined, the data generated from these methodologies provide a deeper understanding of invasive woody plant management decision-making.

Although these qualitative data are not generalizable or statistically representative of the entire region, they do provide important insights on the range of ways that our study population thinks about and makes decisions related to invasive woody plants. Because we are using these social science data to inform and create outreach messages, we were more interested in the range of opinions within our study population rather than the relative proportions of specific opinions in the population. Given that we did not hear new responses to our questions by the end of our interviews and focus groups, we are confident that these data represent the range of opinions for our population of landowners with ranching operations across the six counties.

Project partners and an advisory team consisting of social scientists, conservation delivery professionals, communications and outreach specialists, and funding agency representatives provided feedback on the survey and focus group guides (Appendices A and B). Interview and focus group topics included the producers' background information (e.g., operation type, amount of time owning/managing), opinions related to tree and shrub encroachment, past and currently used invasive woody plant management practices, and future intended management practices. We also discussed motivations, barriers, and needs for conducting invasive woody plant management, knowledge, participation, and attitudes toward current assistance programs available, and communications around invasive woody plant management.

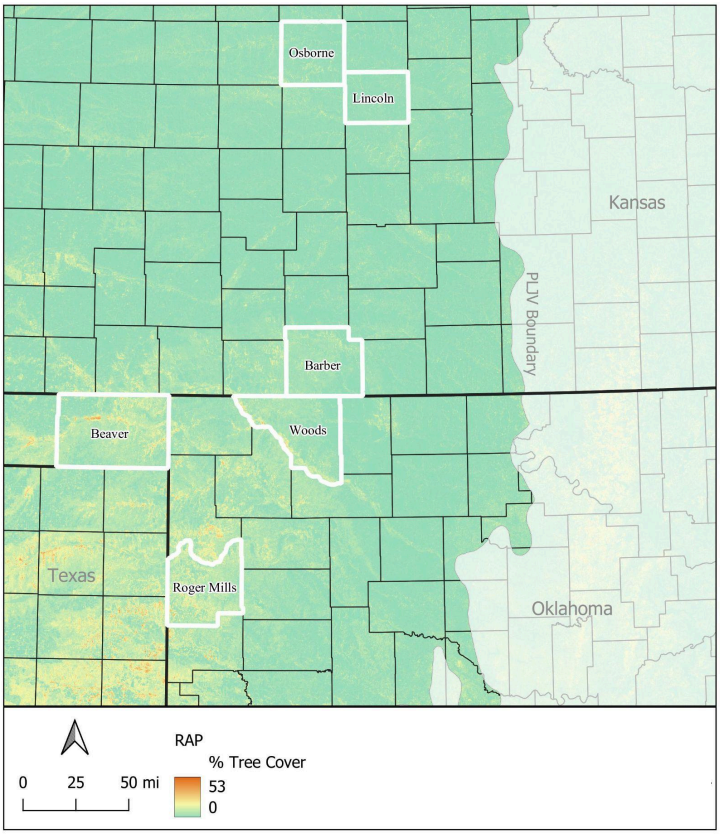

Figure 1. Locations of the six focal counties taking part in this study. The red to green gradient represents a visualization of woody transition, as provided by the Rangeland Analysis Platform. Red represents a higher proportion of tree cover and green lower.

We developed our participant invite list by asking project partners at USDA Natural Resources Conservation Service, Kansas Grazing Lands Coalition, and local conservation districts to send us the names and contact information of landowners residing and managing rangeland within the focal counties. To recruit participants, the team contacted landowners on the aforementioned invite list by email and telephone to assess their interest in participating in one of the focus groups. Each individual who agreed to attend was sent a reminder text one week and then one day prior to the meeting. The meeting dates were planned for the winter months to maximize producer involvement and availability.

We held two focus groups in each county, one round in February 2023 and another in November 2023. These focus groups each lasted 1.5 hours and were held in public venues with lunch or dinner provided. The team also conducted two structured interviews with producers in each of the six focal counties for a total of 12 interviews. Lastly, we held two additional interviews, one with an Indigenous land manager in Oklahoma who works with Indigenous producers and is thus knowledgeable about the unique motivations and barriers that they face, and another with a Kansas-based land manager who manages property for hunting purposes, representing a different and important perspective that wasn't part of our main data collection. We conducted these additional interviews from groups that we didn't include in our initial recruitment to determine if we heard any unique motivations, challenges, and experiences.

Caution should be taken with extrapolating these results, as these two individuals do not represent the entire population of recreation managers or Indigenous producers.

Audio data was recorded at each interview and focus group and then transcribed and coded using NVivo 14 software (Lumivero, 2023). After analyzing data from the first round of focus groups, we then organized and facilitated an additional round of six focus groups with the same producers later that year to ensure the validity of the results and refined the data as needed. During the first half of these meetings, the participants were presented with the key social science findings and were given the opportunity to confirm the accuracy of the data or provide suggested changes. They were then shown the communication messages that were created from the data and asked to provide their feedback through a process of message testing.

KEY FINDINGS

Below are the key findings from the focus groups and interviews, with results distinguished by the type of participant (interviewee or focus group participant). The findings are organized by discussion topic. Please click on the link following each finding to see a bulleted list of the data in greater detail, or refer to Appendix C for the full dataset.

Focus Group Participants

Each focus group ranged from 7-11 participants with an average of eight individuals at each meeting (Table 1).

Table 1. Numbers of individuals who participated in the 12 focus groups held across Kansas and Oklahoma during the winter and fall of 2023 (participants in second set of focus groups were a subset of the first)

County	State	Number of Participants	
		Feb 2023	Nov 2023
Lincoln County	Kansas	11	7
Osborne County	Kansas	7	7
Barber County	Kansas	9	7
Beaver County	Oklahoma	7	8
Woods County	Oklahoma	8	9
Roger Mills County	Oklahoma	8	7

Opinions About Trees and Shrubs

Both the interviewees and the focus group participants were asked their general opinions about trees and shrubs, including why they viewed certain species as either good or bad.

Positive Perceptions Of Trees and Shrubs

Most interviewees and focus group participants agreed that some trees are important as shade and windbreaks for livestock, if they can be maintained at an appropriate density level. Many others believed certain tree species to be beneficial for wildlife and the ecological health of the surrounding area, such as plum thickets serving as quail habitat or cottonwoods supplying vital nutrients to the ground through their riparian root system. The Indigenous land manager stated that eastern redcedars can give off a pleasant odor, and the Cheyenne and Arapaho Tribes have ceremonial uses for the tree. Still, this individual saw it as part of their job to educate their community that the current state of the landscape is not natural. (See complete data.)

Negative Perceptions Of Trees and Shrubs

When asked why some tree and shrub species are bad or detrimental to grasslands, the majority of participants mentioned the negative impacts of woody species on water and grass quality and quantity. They understand through experience that many of these species are persistent and difficult to kill. Some of the interviewees and focus group participants also added that cattle tend to avoid certain tree and shrub species due to the fact that they're inedible, grow thorns, or simply occur at a density where it becomes impossible for the cattle to navigate those pastures. (See complete data.)

Tree and Shrub Management

The research team asked the participants a variety of questions related to their personal experience with tree and shrub management.

Tree, Shrub, And Grass Species That Producers Are Currently Managing For Prevention Or Removal

Producers across the six focal counties are overwhelmingly managing against eastern redcedar (*Juniperus virginiana*) encroachment. This was followed by managing honey locust (*Gleditsia triacanthos*), sumac (*Rhus*), eastern cottonwood (*Populus deltoides*), siberian elm (*Ulmus pumila*), and sagebrush (*Artemisia tridentata*), followed by a variety of other tree and shrub species less commonly mentioned. (See complete data.)

Current Tree and Shrub Management Practices

Participants reported using a variety of practices to manage against tree and shrub encroachment. The majority used some form of mechanical removal, most notably with a skid steer, discbine, dozer, or removal by hand. Several others used chemical treatments, prescribed burning, or mowing saplings to stunt their growth. (See complete data.)

Reasons For Using Specific Practices

When the research team asked participants why they decided to use certain tree and shrub removal practices, many noted the cost and time efficiencies associated with those forms of management, specifically with using larger machines (e.g., skid steer) for removal versus removal by hand tools (e.g., clippers, chainsaw). Some also mentioned the wide-scale effectiveness of practices such as prescribed burning, while other participants stated that the availability of equipment influenced their decision of whether or not to carry out specific practices. (See complete data.)

Past Management Practices

Many participants referenced using various forms of chemical spray in the past, although they no longer employ those practices. Others reported previously using prescribed burning, a tree puller, or hand tools. (See complete data.)

Reasons For Stopping Practices

When asked why they stopped using certain practices, several participants noted that the practices they were employing were ineffective against tree and shrub encroachment in the long run. Some mentioned that contamination of groundwater and mortality of desired species were reasons they stopped using chemical treatments in particular. Other pertinent reasons for stopping practices included disruption of the ground with tree pulling, a lack of moisture to conduct a prescribed burn, cost inefficiencies, or machinery degradation. (See complete data.)

Opinions On The Most Effective Practices

Many of the interviewees and focus group participants believed the most effective combination of practices was cutting down trees and shrubs followed by pile burning. (See complete data.)

Motivations To Start Managing Trees/Shrubs

When asked what initially motivated them to begin managing invasive woody plants on their property, several participants reported visually seeing the tree and shrub encroachment on their rangeland as an important motivator. This was followed by the availability of assistance programs to offer financial or technical help with the management, or speaking with other producers and seeing their neighbor's improved rangeland as a result of effective management. Others noted that their land stewardship ethic led to a desire to leave the land better than they found it, while some producers were motivated to increase the production value of their range. The Indigenous land manager shared that hazardous fuels reduction for community protection along the wildland-urban interface was the primary motivation for the fire program to begin its prescribed burning efforts. (See complete data.)

Motivations To Continue Management

Many producers reported visually seeing the improvements to the rangeland as a motivation to keep managing after initial treatment. Others again referenced their land stewardship ethic as a reason to continue managing. Some participants also desired to increase their production value and earn a return on investment, while others understood that long-term maintenance is required to keep trees and shrubs off their property. The recreational land manager shared a story of seeing quail and pheasant populations rebounding after a non-managed tract of land was cleared of invasive trees and shrubs, citing wildlife habitat conservation as an additional motivation for proper management. (See complete data.)

Frequency Of Management

Participants voiced different management frequencies depending on the type of management used. For prescribed burning, the responses varied from once a year to once every three years depending on the level of encroachment. For mechanical removal and chemical practices, some producers also mentioned using these treatments multiple times a year or whenever it was most convenient. (See complete data.)

Visual Cues To Determine When It's Time To Manage

The majority of participants mentioned actually seeing the size and density of the trees increasing as their main indicator to begin management. Others referenced observing the impact of encroachment on grass health, watching their cattle avoid encroached pastures, being unable to access certain areas due to tree density, or noting that the ecological conditions made it possible to conduct a prescribed burn. (See complete data.)

The Indigenous land manager described a modeling procedure which factors in variables such as fire load, types of fuels, whether it's a higher or lower fire risk year, and which fuels are located in close proximity to surrounding communities to determine the best time to conduct a prescribed burn when wildfire risk is low. By conducting assessments around human structures, such as homes or agricultural operations, the Cheyenne and Arapaho Fire Program is able to determine areas with the greatest risk of wildfire to prioritize treatment. (See complete data.)

Changes To Management Decision-Making Based On Tree/Shrub Density

The participants shared that their management decision-making changes based on the age, height, and density of trees and shrubs present on their rangeland. Many producers reported using chemical spray, loppers, an ax, or a skid steer with a tree puller to remove saplings from the ground while they are still young. A dozer was required for trees larger than three feet tall, while a tree saw, tree shears, or a chainsaw was needed for trees that grew over six feet in height or occurred at a density where it was difficult to bring in machinery. After a certain density level, it became necessary to mechanically clear the fenceline and create a fire break before considering a prescribed burn. From there, rotational burning can be conducted every few years to maintain the grassland. (See complete data.)

Future Management Practice Interest

Several participants noted prescribed burning as a future practice they would be interested in pursuing. This was followed by interest in the use of heavy mechanical equipment that could reach trees growing in canyons that were otherwise difficult to access. A few other focus group attendees mentioned being potentially interested in exploring multi-species grazing that uses small ruminants like sheep and goats to remove young trees. (See complete data.)

Barriers To Using Specific Practices

Participants shared several barriers that prevented them from effectively conducting management. Prescribed burning had the most barriers reported, with the most common barrier being a fear of unknown outcomes, weather or ecological conditions preventing an effective burn, and lack of external support to conduct a prescribed burn. With mechanical removal, producers were primarily concerned with the expense of fuel and certain pieces of equipment, such as a skid steer or feller buncher, or the damage tree and shrub removal caused on their equipment. Others mentioned that chemical spraying could contaminate the watershed or other desirable tree/shrub species, and that spraying could sometimes be ineffective at managing the trees/shrubs. The Indigenous land manager also shared that for any mechanical clearing taking place around culturally significant sites, an archaeological survey is required to search for graves, artifacts, etc., often delaying management timelines. (See complete data.)

Needs For Effective Management

Participants gave several examples of the support needed for more effectively management in the future. Many discussed the need for the establishment of more prescribed burn association to coordinate burning efforts, while others stated the need for an increase in assistance programs to provide technical assistance and funding opportunities to help them reduce management costs. Other responses included a desire for producer-led workshops to demonstrate effective management, an increase in the availability of contracted labor to help with management, and more government support for tree and shrub management, such as through changes to state and federal burning policies. (See complete data.)

The Indigenous land manager discussed the importance of establishing a multi-entity partnership in the future, consisting of private, non-profit, and municipal actors cooperating and pooling resources to plan large-scale burning efforts across multiple acres, based on a mutual understanding of their shared goals. The interviewee envisioned this collaborative crossing jurisdictional lines and maintaining constant communication so that they could quickly initiate a burn when the conditions allowed for it. They mentioned that hiring liaisons trusted by local communities would also be important to communicate on the collaborative's progress and reported success. (See complete data.)

Working With Other Producers

The research team asked participants a few questions related to working with other producers in their surrounding area.

Practices Other Producers Use

When asked about the practices other producers in the area use, most participants referenced prescribed burning and chemical spraying. Others stated they've seen neighbors use mechanical removal and the combination of cutting and then burning trees. (See complete data.)

Collaboration With Others

Many participants shared that collaboration only occurred when they conducted prescribed burns. Those that burned used multiple processes to collaborate, but they typically involved coming together with neighbors and the prescribed burn association (if applicable) to develop an effective burn strategy. This included extensive pre-burn planning and focusing on one community burn at a time. (See complete data.)

The Cheyenne and Arapaho Tribe's Fire Program works closely with local fire departments to assist with one another's work. The fire program also works outside of the Cheyenne and Arapaho Tribes jurisdiction, assisting other Indigenous Nations in the surrounding region as needed. The fire program also uses a detailed process for planning and communicating about an intended burn to minimize unintended fire consequences. (See complete data.)

Communication With Neighbors

Beyond prescribed burning, most participants stated that they do not communicate with neighbors on invasive woody plant management efforts. The exception was aerial spraying or mechanical removal that could potentially impact a neighbor's property. (See complete data.)

Sharing Management Importance With Producers Owning Intact Grasslands

Participants stated that if they could share the importance of tree and shrub management with someone who owns and/or manages intact grasslands, they would stress the need for proactive management while trees and shrubs are still in the sapling stage. They would also explain the impact that trees and shrubs have on water availability and grass health once they grow to a certain size and density. Additionally, the Indigenous land manager said that they would share the importance of hazardous fuels reduction, making the case that producers can either manage trees and shrubs now or when a wildfire is approaching their home or other vital infrastructure. (See complete data.)

Information For Someone Starting Management

For someone that was just getting started with management, several producers stated that they would share expectations about the long-term maintenance required to deal with trees and shrubs. They would also recommend talking to neighbors or their local Natural Resources Conservation Service office to gain more information and find a mentor or technical expert to provide guidance. Other participants stressed the importance of learning the differences in how to manage particular species of trees and shrubs. The Indigenous land manager would particularly point the individual toward sources where they can acquire funding and receive whatever technical information was needed. (See complete data.)

Opinions About Non-Managing Landowners

Study participants also described issues they perceive with those in their region who were not managing tree and shrub encroachment. This theme was not a part of the interview guide or focus group script, but rather came up independently by participants multiple times throughout the data collection.

Problems With Non-Managing Landowners

Some of the challenges participants experience with landowners who are not removing or managing trees and shrubs include the perception that these landowners don't fully understand the problems associated with tree and shrub encroachment. Participants said that many of the properties owned by non-managing landowners were used as hunting properties and that hunters prefer more trees for deer habitat. Participants believed that these properties are responsible for tree and shrub seeds spreading onto their lands, and that non-managing landowners don't want to spend any money on tree removal. Likewise, renters often prefer not to spend their time and financial resources to manage trees and shrubs on someone else's land, given the lack of return on investment once their contract ends. (See complete data.)

Providing Information For Those Not Managing

When asked what type of information is needed for individuals who are not actively managing their properties' trees and shrubs, participants stressed the need for education about the negative impacts of encroachment, including visually demonstrating the results of poor management. Other participants stated the importance of listening to non-managing individuals to understand their perspectives and uses for the land itself and adapting tree/shrub management information to appeal to their needs. (See complete data.)

The recreational land manager specifically mentioned how many deer hunters harbor the common misconception that large woodlands are essential for growing larger deer, as the interviewee stated seeing some of the biggest whitetails in the country in proximity to intact grasslands. This misconception is often coupled with realtors who promote eastern redcedar forests as being valuable for hunting. When asked what type of support is needed to address this issue, the land manager felt that education is the most important component to consider. They shared multiple stories of educating their clients from the Eastern United States on the fact that trees aren't required to harvest large deer. Additionally, they showed their clients pictures of a treeless landscape from several decades ago when hunting became abundant in the region, providing evidence for their argument that large forests are not necessary for good hunting opportunities. They believed that visually sharing before and after pictures is one of the most impactful ways to overcome this misconception. Now, the land manager is frequently contacted by Quail Forever employees requesting access to their properties to invite guests and educate them on the importance of invasive woody plant management. (See complete data.)

Similarly, the Indigenous land manager expressed frustration associated with managing a parcel of land that borders properties whose owners are not conducting any sort of tree and shrub management. They described how trees and shrubs from a neighboring property will continue to encroach on cleared lands under a patchwork management scenario, and again highlighted the need for regional coordination and cooperation. To resolve this issue with non-managing landowners, the representative stated that they would match them with a mentor or technical expert in the field who could give them honest information about the necessity of woody plant management. (See complete data.)

Perceptions Of Management Success

The focus group participants were asked to provide two definitions of success for tree and shrub management.

Success For Rangeland

On their rangeland, many focus group participants stated that success looked like healthy, intact grasslands with no eastern redcedar trees present, and deciduous trees used only for shade or windbreaks. (See complete data.)

Success For Community

Regarding success at the community level, focus group participants also referenced having all eastern redcedar trees removed in a healthy grassland ecosystem, maintaining viable Lesser Prairie-Chicken populations, and being at a maintenance level for all other tree and shrub species across the larger region. (See complete data.)

Opinions On Assistance Programs

The research team asked participants several questions related to the current assistance programs available that provide tree and shrub management support. (See complete data for programs producers are aware of and those they have participated in.)

Reasons Against Participation

When asked why they did not participate in certain programs they were aware of, participants referenced that complex program requirements served as a barrier to enrollment. Others mentioned that the programs prioritized land that already had trees versus promoting proactive management before trees and shrubs became a problem. Participants also mentioned that there was not enough funding available for management to make participation worth their time and effort. (See complete data.)

Reasons For Participation

When asked why they decided to participate in management programs, producers primarily stated that they enrolled in programs simply because the programs were available and they were qualified to participate. They also understood the benefits that programs could have on their land regarding tree and shrub removal, and they had a conservation professional who encouraged them to participate. (See complete data.)

Positive Program Aspects

Many participants appreciated the technical assistance and funding they received from the assistance programs, as well as the friendliness and availability of program staff. (See complete data.)

Negative Program Aspects

Some of the program components participants did not like included the contract requirements that stipulated type(s) of management and specific locations to manage. They also thought that inconsistent program administration, seemingly hidden program requirements, and prioritization of encroached lands over proactive management made participation difficult. Both the recreational land manager and the Indigenous land manager also referenced the lag time between when an individual applies for an assistance program and when they can access the funds and actually begin managing. (See complete data.)

Program Modification

When asked how they would modify current assistance programs, the majority of interviewees mentioned that more funding and cost-sharing opportunities would be ideal. The Indigenous land manager would specifically like to see funding that is easier to access and able to be used for equipment purchases. They would also like to see more processes in place that make it easier to establish local prescribed burn associations to scale up the number of burning efforts taking place across the landscape. Others stated that increased technical assistance and mentorship could be valuable, along with enforcement or penalties for those not managing and incentives for those who maintain intact grasslands. The programs should also become more flexible for the diversity of landowners and operations that are present across the landscape. (See complete data.)

Communications

The study participants also discussed various aspects of communication as it related to tree and shrub management, their current and desired information sources, their barriers and needs related to information, and the correct terminology to use in communications and outreach.

Correct Terminology To Use

Many participants stated that when they were discussing trees and shrubs, they often referred to shrub treatment as brush management and used woody/tree encroachment when they were talking about trees. They tended to use the particular species name when discussing trees as well. Given that the Indigenous land manager is a member of the fire program, they referred to tree and shrub management simply as fuels management. (See complete data.)

Current And Trusted Information Sources

When asked about their ideal information sources for tree and shrub management, most participants mentioned relying on government conservation agencies, such as the Natural Resources Conservation Service, other producers (including through their local prescribed burn association and conservation district), or the internet for acquiring useful information. They also depend on neighboring producers, government agencies such as state and federal wildlife agencies, and universities for information on general grazing management. They had the most trust in other producers as an information source, followed by local Natural Resources Conservation Service and Farm Service Agency staff with whom they have long-standing relationships. Participants stated that electronic communications such as text messages, emails, mobile phone apps, and websites could be good information sources for tree and shrub management in the future. Some also desired more in-person meetings and using various media outlets frequented by producers to share information on management, such as the Cowboy Radio Station or RFD-TV. In contrast, the Indigenous land manager felt that that Cheyenne and Arapaho Tribal producers preferred print material to find information, such as pamphlets and booklets. (See complete data.)

Informational Needs

Several participants stated that they need information on how to manage particular species rather than trees and shrubs as a whole, while others would like more information on when and how to use chemical application as a treatment option. (See complete data.)

Barriers To Information Gathering

Participants struggled with the lack of a current list of available assistance programs. They also mentioned that they didn't have the time to find and gather new information or attend workshops. An ideal process for the participants would be for the agencies providing assistance programs to coordinate more effectively to share opportunities and streamline the information-gathering process. (See complete data.)

RECOMMENDATIONS

The data collected and analyzed through the focus groups and interviews have provided valuable insights on the perceptions of landowners and managers related to invasive woody plant management, particularly highlighting their various motivations, barriers, and needs for accomplishing this work. In this section of the report, the research team provides a series of recommendations to assist conservation delivery professionals, outreach specialists, and policymakers in applying these results by supporting on-site conservation efforts and bolstering communication strategies regarding the control of invasive trees and shrubs.

Recommendations For Outreach Specialists And Conservation Delivery Professionals

1. **Collect background information to develop messages and recommendations that are relevant and resonate with your target audience.**

   It's important to understand both the social and biological aspects of invasive woody plant encroachment and management. It's just as important to understand what management practices local landowners/managers use and their perspectives on the most effective practices as it is to understand the most biologically effective tools to manage the plant species of concern.

   Biological information: Use the Natural Resources Conservation Service's Rangeland Analysis Platform to determine the extent of woody vegetation in your area of interest (USDA, n.d.). Explore the Natural Resources Conservation Service's Ecosystem Dynamics Interpretative Tool to determine the appropriate Ecological Site Descriptions for your area of focus (USDA, n.d.). The target species and the practices employed to manage them will differ geographically depending on the location of the producer's operation.

   Social information: Engage with producers to understand what practices they are using and why, while also investigating the past practices producers have used and their reasons for discontinuing those practices to develop messages and recommendations that are relevant and resonate with your target audience. If you don't have time or resources to do this, you can find some information on common perspectives in this report or in the invasive woody plant social science literature review (Roberts et al., 2023) that summarizes landowner motivations, barriers, and future needs for invasive woody plant management across the Great Plains. The U.S. Census of Agriculture can provide information about the demographics of agricultural producers in your area. If you are unsure how to devise a strategy to collect this information, consult a social scientist by using this tool to find one in your area. This guide for integrating social science into bird conservation is also a great resource on how to collect social science information and integrate it into conservation delivery.

   Understanding local concerns and addressing the woody plant species of highest priority, based on the level of encroachment in a region, will help to align producer interests with conservation delivery objectives, and to develop messages that are relevant and resonate with your target audience.

2. **Derive solutions to mitigate barriers and meet needs.**

   Review the stated management needs to addressing barriers in this report and connect landowners and land managers to useful tools and resources (information, funding, technical assistance, labor, etc.). Emphasize and affirm existing motivations tied to stated barriers and needs.

For prescribed burning, the need for external support and labor can be addressed by the establishment of prescribed burn associations in areas where they do not currently exist. These associations can help with the coordination of burning efforts by alleviating existing fears and providing labor and equipment to conduct a burn. Review the Great Plains Fire Science Exchange's Prescribed Burn Association Interactive Map to identify the presence or absence of PBAs in and around your area of interest (Great Plains Fire Science Exchange, 2022).

The issue of rising fuel costs and equipment expenses related to mechanical removal of trees and shrubs can be ameliorated with increases to funding and a greater number of assistance programs available, which can help overcome concerns related to the costs of management, while resources like equipment can be shared by members of a community. With chemical spraying, establishing a community of practice around management can help individuals learn more about the most effective tree and shrub removal practices via hands-on demonstration from other producers. For an example of a community of practice success story against invasive woody plant encroachment, refer to the Central Platte Rangeland Alliance in the Loess Canyons, Nebraska (University of Nebraska, 2021).

3. **Investigate feasibility of future management approaches.**

Investigate the management approaches referenced by producers in this report to assess their feasibility within your community of interest. In this study, the most common practices producers were interested in pursuing included prescribed burning, using heavy mechanical equipment to remove woody plants from canyons, and using small ruminants such as goats and sheep for multi-species grazing efforts as these ruminants eat trees and brush that cattle do not prefer to eat. An area can be assessed to determine the effectiveness of using fire as a tree and shrub treatment option. You can also work with local producers to help them learn about the benefits of multi-species grazing (Walker et al., n.d.). In some areas, people have set up businesses where they rent out goats and sheep to producers for a certain amount of time.

4. **Develop content for communications and outreach strategies.**

Create a guiding vision of success for tree and shrub management. Establish and clarify these objectives from the start to aid in formulating communication strategies that aim to move toward these goals. Use a framework such as the University of Kansas's Center for Community Health and Development's process for developing and communicating a vision (Developing and Communicating a Vision, Community Tool Box, 2019).

Highlight the most effective tools for each woody plant species and density, supported by biological effectiveness studies (where possible) and taking into account what people are already doing and the cost-effectiveness of these practices. For more information on cost comparisons, see Ahamad (2022). Make sure to give clear expectations about the time and financial requirements of each practice.

Use messages and content that appeals to existing management motivations. For example, touching on points such as wildfire risk and wildlife conservation can activate an individual's environmental stewardship ethic. Sharing statistics on lost production value as a result of ineffective management can also catalyze management behavior (example statistics here). Finally, recruiting individuals who can showcase their management success may help encourage other producers to begin managing their own rangelands.

Also incorporate producers' negative attitudes on invasive woody plants and the benefits of removal in communications materials to express the detrimental impacts caused by a lack of management and the benefits of removing trees and shrubs early.

5. **Use preferred sources and channels of information for outreach.**

   Determine what your specific community desires as a communication source(s) and use those outlets during outreach. In this study, most participants said they relied on government agencies like the Farm Service Agency and Natural Resources Conservation Service, other producers, and the internet when finding new information, but they trust other producers and local agency staff the most. Producers especially prefer to learn from one another and can appreciate the expertise from another producer who has successfully managed a problem species.

   In the future, electronic communications such as text messages, emails, phone apps, and the internet were cited as preferred information channels for tree and shrub management, along with more in-person meetings and using various media outlets to spread information, such as the Cowboy Radio Channel or RFD-TV. In contrast, Tribal producers prefer print materials such as pamphlets and booklets.

6. **Facilitate community-engaged planning and highlight success.**

   Many tree and shrub management practices require landowners and managers to communicate and collaborate with their surrounding neighbors, most notably when planning for a prescribed burn. This often entails selecting an ideal burn date, sending out a group message with pertinent information, and then holding a meeting to discuss a burn strategy (to discuss considerations with fence lines, fire breaks, hotspots, etc.). Adopt and facilitate collaborative processes such as this to serve as a starting point for planning effective management strategies that require a community-wide approach. These processes among or between landowners and conservation agency staff can also lessen the labor and financial burden on individuals. Use these resources to find more information on collaborative frameworks, local PBAs, and lessons learned from past invasive woody plant partnership planning.

7. **Conduct outreach with landowners not managing for grass-based agriculture.**

   First work to identify these landowners' unique needs for the land. Listen to understand their perspectives and desired uses of the land other than grazing, then conduct specific outreach

tailored to these populations on the importance of invasive woody plant management that fits within these goals and needs.

For example, work with landowners who manage their land for hunting opportunities to overcome common misconceptions about grasslands, such as that deer need a woodland habitat to grow large. The University of Nebraska-Lincoln's Eastern Redcedar Science Literacy Project can help to communicate accurate information about invasive woody species with a variety of audiences (University of Nebraska-Lincoln, n.d.).

8. **Work with diverse landowners and managers.**

   Understand what different types of landowners/managers you have in a region, determine their unique needs, and conduct specific outreach based on those needs. Review the Family Forest Research Center's Tools For Engaging Landowners Effectively website to find examples of collaborative strategies tailored to your population of interest (Family Forest Research Center, 2015). Keep in mind that it takes time to create relationships with individuals or even to begin working with organizations who already have pre-existing relationships with these populations.

   Consider cultural sensitivities, along with unique motivations and barriers when working with traditionally underrepresented landowners (women, producers of non-White racial or cultural groups, etc.). For example, the Central Grasslands Roadmap's Partnership and Collaboration Toolkit can help conservation professionals by providing a list of resources with information related to working with Indigenous and First Nation communities (Central Grasslands Roadmap, n.d.).

9. **Promote assistance programs by using existing motivations and facilitating better agency coordination.**

   Promote program participation by sharing why producers initially decided to participate in assistance programs and what they liked about specific programs. To streamline the information-gathering process for producers, work to summarize the main selling points for each program and help agencies coordinate their information sharing, communication, and delivery of these programs.

Recommendation For Policymakers

Update assistance programs as needed.

Reduce complexity of program enrollment and provide management information and mentorship opportunities throughout the program to empower landowners and improve their ability to manage grasslands more effectively.

Conduct specific landowner outreach to determine if gaps exist between landowner needs and support that assistance programs provide. Then increase funding and cost-share opportunities,

technical assistance, and contract flexibility where appropriate to accommodate the diverse needs of landowners and the various operations they undertake across the landscape.

Shift focus to proactive rather than reactive management of already encroached properties by providing incentives for proactive landowners.

CONCLUSION

Invasive tree and shrub species are one of the largest threats to grassland ecosystems. These trees and shrubs must be actively managed to prevent future encroachment and reduce the density of trees and shrubs in areas that have already been invaded. Understanding community specific landowner and land manager motivations and barriers toward trees and shrub removal is essential in creating outreach programming that promotes effective management practices. Long-term management is crucial to securing the resilience of grasslands into the future. The data and resulting recommendations derived from this study can help conservation delivery practitioners promote invasive woody plant management in ways that resonate with producers and help support effective communication and outreach strategies around invasive woody plant management for a diversity of audiences.

APPENDICES

Appendix A: Interview Guide

Background information

First, I'd like to talk a little bit more about your operation.

1. How long have you owned or managed this rangeland property?
2. (If applicable) How long has this rangeland been with your family?
3. What are the primary uses of this rangeland?
4. Do you use your rangeland for any additional/secondary purposes?

   (*Prompt: It doesn't have to just be for livestock production, could be for hunting too, either personal hunting use or leasing it to other hunters, family recreation, gas/oil/solar production, etc.)*

5. What general land changes (if any) have you noticed occurring since you began managing this rangeland?

   (Prompt: ag practices, woody plants, water quality and availability, soils, weather, etc.)

   a. What about throughout your county or surrounding area?

Opinions related to tree and shrub density

6. What is your opinion about trees and shrubs moving onto the rangeland you own and/or manage? *(As needed, specify that we are referring to rangeland in CIG county)*
   a. (*Depending on what they say*) Why do you feel this way?
7. When you think about the trees and shrubs on your rangeland, what types of species occur there?
   a. Which of these species do you think are good? Why?
   b. Which of these species do you think are bad? Why?
   c. Which unwanted species do you currently manage for prevention or removal?
      i. Which would you like to manage for prevention or removal but are not right now?
   d. Is there a term that you use to describe all the trees and shrubs that are unwanted? (*Prompt: Like brush?)*

i. For the rest of the interview, please think about the tree and shrub species that you don't want when answering our questions. If you think of a specific species for one of the questions, please let me know. I'm also going to try to use the term you mention throughout, but if I use tree/shrub please know that I mean **(TERM).**

For the rest of this interview, we define tree and/or shrub management as any practice that removes or prevents the spread of tree/shrub species. This can include practices such as prescribed burning, mechanical control, chemical control, grazing management, and others.

Tree and shrub management practices

(IF THEY INDICATED IN Q7C THAT THEY MANAGE TO REMOVE TREES/SHRUBS, PROCEED WITH QUESTION SET. IF THEY DON'T MANAGE, SKIP TO Q17.)

8. Why did you start managing to remove or prevent trees and shrubs in the first place?
    a. How long have you been managing trees and shrubs on your rangeland?
    b. What visual cues do you use to begin tree and/or shrub management on specific areas of your rangeland?

    (*Prompt*): Cattle behavior, tree size, neighboring property, etc.

        i. (*If applicable*): Could you show me these indicators on your rangeland after the interview?
    c. What motivates you to continue managing trees and shrubs?
    d. Are the visual cues you look for during retreatment different than the visual cues you look for during initial treatment?
9. What specific tree and/or shrub removal practices do you currently use on your rangeland?
    a. Why do you use these specific practices?
    b. How frequently do you use each of these practices?
    c. At what approximate scale or size of your rangeland do you employ each of these practices?
    d. How do you work with neighbors on any of your management practices?
        i. How do you communicate with your neighbors when planning these management practices?
        ii. Do you conduct any of these management practices in partnership with your neighbor?

10. I'd like you to think now about other producers in your area and how they manage their trees and shrubs.
    a. What tree and shrub management practices are they using?
    b. If you were to tell neighbors why it's important to manage trees and shrubs early, what would you tell them?
11. Have you stopped using certain tree or shrub management practices that you used to use in the past?
    a. If so, why are you no longer using these practices?
12. Are there tree and/or shrub management practices you would like to use, or would like to explore using, but are not using currently?
    a. What is the single biggest barrier that stops you from doing this work?
        i. Are there any other factors that prevent you from doing this work?
    b. What type of help or support would you need to do these practices in the future?
13. Which one of these pictures represents the majority of your rangeland? *(Provide handout with photos of four different levels of density and have them mark the percentage of their land that falls into each level of density. Select all that apply)*
14. What tree and/or shrub management practices do you all feel are most effective on your rangeland?
15. Three-parter (*refer to density handout*): When do you change your management practice to be more effective? Why do you change it? What do you change it to?
16. How confident do you feel in your ability to successfully manage unwanted trees/shrubs at all densities?
    a. What would motivate you start managing when there are little to no trees or shrubs visible?

Incentive programs

Next we want to ask you some questions about programs that are available to help producers with tree and shrub management for prevention or removal.

17. What programs have you participated in, either currently or in the past, that provide technical or financial assistance for tree and shrub management?

(ONLY ASK SUB-QUESTIONS IF THEY HAVE PARTICIPATED, AND SEPARATE OUT BY SPECIFIC PROGRAM IF MORE THAN ONE. IF THEY HAVEN'T PARTICIPATED, SKIP TO Q17C):

a. What type of management assistance have you received through this/these program(s)?
b. What have you liked about this/these programs?
c. What have you disliked about this/these programs?

18. Other than the program(s) you've participated in, what other programs do you know about that help landowners/producers with tree or shrub prevention or removal?
    a. Why did you choose not to participate in those programs?
19. (ONLY ASK Q17A/B IF THEY ARE NOT ENGAGING IN ANY MANAGEMENT):
    a. Why don't you manage to prevent or remove trees and/or shrubs?
    b. Is there anything that would motivate you to begin management to remove trees and shrubs?
    c. What programs do you know about that help landowners or producers conduct management to remove trees and shrubs?
        i. Have you used any of these other payment programs in the past?
            1. If so: Which programs did you use? Why did you stop using them?
            2. If no: Why not?
20. While we don't have a plan to create a new incentive program right now, we could potentially explore this option in the future. If you could create a new incentive program for tree and shrub management, what would that program look like?
    - *If financial* –What kind of financial incentive is needed? What amount is sufficient?
    - *If technical* – What types of assistance is needed?
    - *If knowledge* - What type of information is needed?
    a. Out of the factors you just mentioned, what would you say is the one component that is most essential to include?

Communications around tree and shrub management for prevention/removal

21. What information are you lacking about tree and shrub management that would help you manage your rangelands more effectively?
22. If you were new to managing trees and shrubs, what piece of information would be the most helpful to know before beginning?
23. What is the best way to provide information to landowners who are not currently managing trees and shrubs on their rangeland?
24. Where do you typically go for information about tree and/or shrub management for prevention and removal?

25. How would you like to receive information on tree and/or shrub management in the future?

    (Prompt: Who should it come from? What format should it take?)

26. Who do you trust to provide useful information about tree and shrub management?
27. *(Only ask if there's extra time)* Where do you get information about other types of grazing lands management?

Thank you for your time. Is there anything else that you would like to add?

Do you have any questions or clarifications that I can address?

(*If applicable*): We are also running focus groups as part of this effort and are still looking for producers in your county to participate. Are you interested in attending? Can you recommend any other individuals who may be interested in attending?

(*If applicable: Go into the field to see visual indicators post-interview. Ask permission to take pictures.*)

Appendix B: Focus Group Questions

TYPES OF MANAGEMENT

So now let's get an understanding about trees and shrubs on your rangeland property. What is your opinion about trees and shrubs moving onto the rangeland you own and/or manage?

When you think about the trees and shrubs on your rangeland, what types of species occur there?

- Which of these species do you think are good? Why?
- Which of these species do you think are bad? Why?

For the rest of this meeting, we define tree and/or shrub management as any practice that removes or prevents the spread of tree/shrub species. This can include practices such as prescribed burning, mechanical control, chemical control, grazing management, and others.

For those of you who conduct management to remove or prevent trees and/or shrubs, which unwanted species do you concentrate on?

- What type(s) of management do you use?
    - What visual cues do you use to let you know when to begin management and what type of management strategy to use?

      (*Prompt*): Cattle behavior, tree size, neighboring property, etc.

    - Do you communicate with your neighbors when planning these management practices?
    - Do you conduct any of these management practices in partnership with your neighbor?
- How often do you carry out this management?
    - How does this management change based on density of trees or shrubs, or the type of tree/shrub targeted?
- When in the life cycle of the plant is the most effective time to manage unwanted trees and shrubs?

Regarding the species that you don't want - Is there a term that you use to describe all the trees and shrubs that are unwanted? (Prompt: Like brush?)

For the rest of the meeting, please think about the tree and shrub species that you don't want when answering our questions. If you think of a specific species for one of the questions, please let us know. I'm also going to try to use the term(s) you just mentioned throughout, but if I use tree/shrub know that I mean **(TERM).**

MOTIVATIONS, BARRIERS, AND NEEDS

Next, we are interested in hearing your reasons for managing trees and shrubs on your rangeland.

- Why did you first start managing to remove or prevent unwanted trees and shrubs?
- What motivates you to continue managing trees and shrubs?
- What types of management have you wanted to do, but haven't yet?
- What management actions have you done in the past, but no longer do?
    - Why did you stop?
- What is the single biggest barrier that stops you from doing this work?
    - Are there any other factors that prevent you from doing this work?
- On the flip side of things, what types of support or help do you need to continue or expand your current tree and/or shrub management practices?

SUCCESS

Now, we would like to capture your opinions around success in tree and/or shrub management.

Overall, what does successful tree and/or shrub management look like on your rangeland property?

- What about on a larger community landscape, like at the county level?

Let's talk a little bit about the current density of trees and/or shrubs on your rangeland **(notetaker passes around handouts with photos of four different levels of density)**. Can you please look at these photos and let us know which one of these pictures represents the majority of your rangeland?

Now we want to understand what you think are the most effective management strategies for different densities of unwanted trees and shrubs *(ask one at a time, go around in a circle for three-parter)*.

- Three-parter (*write out on sheet of paper ahead of time*): When do you change your management practice to be more effective? Why do you change it? What do you change it to?
- (*Open back up here*) Of these practices, which are the most cost-effective?
- How does your level of confidence in your ability to manage trees/shrubs change based on the encroachment level you're dealing with?
    - What would motivate you to start managing when there are little to no trees or shrubs visible?

TREE AND SHRUB MANAGEMENT PROGRAMS

- What types of programs are you aware of that help producers manage unwanted trees and shrubs? This could be in the form of financial help, advice and information, or access to equipment or labor to help with management.

  (*Prompt*): Ask about the names of specific programs if responses are vague.

- What has your experience been with these different programs (if any)?
- While we don't have a plan to create a new incentive program right now, we could potentially explore this option in the future. If you could create a new incentive program for tree and shrub management, what would that program look like?
    - *If financial* –What kind of financial incentive is needed? What amount is sufficient?
    - *If technical* – What types of assistance is needed?
    - *If knowledge* - What type of information is needed?
- Out of the factors you just mentioned, what would you say is the one component that is most essential to include?

COMMUNICATIONS

Now we'd like to drill down a bit deeper into how you get information about tree and shrub management for prevention or removal.

- What information are you lacking about tree and shrub management that would help you manage your rangeland more effectively?
- Where do you typically go for information about tree and/or shrub management?
    - *Clarify that this doesn't have to be from a formal document or message, could be learning from their parent, neighbor, etc.*

- How would you like to receive information on tree and/or shrub management in the future?
    - *(Prompt: Who should it come from? What format should it take?)*
- Who do you trust to provide useful information about tree and shrub management?
- Now we want you to imagine you were a landowner who was new to management trees/shrubs on your rangeland. If you were just getting started, what piece of information would be most helpful to know?
- What is the best way to provide information to landowners who are not currently managing trees and shrubs on their rangeland?

Appendix C: Full Dataset

Background Information

The research team asked the 12 interviewees a variety of questions related to the history of their operation, along with perceptions of any changes they may have witnessed occurring on their rangeland and throughout their community since they began owning or managing the land.

Operation

The majority of producers (n=11) managed cattle as their primary use of the land. One other interviewee stated that they primarily took part in custom grazing. When asked about any secondary uses of the land, the majority of those that answered mentioned they lease a portion of their land for hunting purposes.

- Primary Use
    - Cattle operation *(11 interviewees)*
    - Custom grazing *(1 interviewee)*
- Secondary Use
    - Lease for hunting *(3 interviewees)*
    - Farming *(1 interviewee)*
    - Haying *(1 interviewee)*
    - Lease stocks for cow-calf *(1 interviewee)*

Length Of Time Owning/Managing

Nearly all of the producers interviewed self-reported the length of time they've been responsible for owning or managing their rangeland. Responses were evenly mixed and ranged from less than 10 years to over 40 years.

- Less than 10 years *(3 interviewees)*
- 10-20 years *(2 interviewees)*
- 30-40 years *(3 interviewees)*
- Over 40 years *(2 interviewees)*

Length Of Time In Family

When asked about the length of time the rangeland had been in the possession of the interviewee or their family, the majority (n=7) reported owning the land since the late 1800s or early 1900s. One additional interviewee stated that they took ownership of the land in the late 1900s.

- Late 1800s *(3 interviewees)*
- Early 1900s *(4 interviewees)*
- Late 1900s *(1 interviewee)*

Changes To Rangeland

Half of the interviewees reported seeing an increase of invasive woody plant encroachment as the primary change on their rangeland since they began owning and/or managing the site. Another two interviewees mentioned that they increased irrigation on their land. Only one

interviewee mentioned that they had seen a decrease in cedar trees and a larger quantity of groundwater as a result of effective invasive woody plant management.

- Invasive woody plant encroachment *(6 interviewees)*
- Increased irrigation *(2 interviewees)*
- More drought *(1 interviewee)*
- More erosion *(1 interviewee)*
- Increase in flowers and pollinator species *(1 interviewee)*
- Fewer cedar trees and more water due to invasive woody plant management *(1 interviewee)*

Changes To Surrounding Community

The majority of interviewees reported an increase of invasive woody plant encroachment in their surrounding community as well, reflecting the changes they've seen on their rangeland.

- Invasive woody plant encroachment *(8 interviewees)*
- More prescribed burning *(1 interviewee)*
- Increase in larger agricultural operations *(1 interviewee)*
- More wind turbines *(1 interviewee)*
- Depletion of oil/gas market and residual infrastructure left on landscape *(1 interviewee)*
- Increased awareness of invasive woody plant species *(1 interviewee)*
- Increased awareness of grass as a holistic environment *(1 interviewee)*

Opinions About Trees and Shrubs

Both the interviewees and the focus group participants were asked their general opinions about trees and shrubs, including why they viewed certain species as either good or bad.

General Opinions

Overall, two interviewees and two focus group participants believed that a good or beneficial tree did not exist, while three other interviewees view invasive woody plant management as a never-ending war against encroaching tree and shrub species. Two additional focus group participants believed it was a good thing that their respective communities have come to identify invasive woody plants as an issue. Participants had varying levels of tolerance for individual tree species.

- No good trees *(2 interviewees, 2 focus groups)*
- Management is never ending *(3 interviewees)*
- Community has identified invasive woody plants as an issue *(2 focus groups)*
- Extremely challenging to manage *(2 interviewees)*
- Cottonwoods and elms are good *(2 focus groups)*
- Tamarisk is most prevalent/worst issue *(2 interviewees)*
- Other *(all mentioned once)*:
    - Beautiful trees; all cedars aren't bad; can be beneficial in small numbers; prefer they not encroach; prefer conifers over leaf trees; encroachment happens faster on overgrazed lands; cedars are not invasive just mismanaged; problem is intensifying; hedge apple and honey locusts bigger issue than cedars; brush bigger issue than invasive trees; elms are bad, invasive woody plants are like a noxious weed; taking over; nuisance; harmful, persistent, relentless; hate them

Positive Perceptions Of Trees and Shrubs

Most interviewees and focus group participants agreed that some trees are important as shade and windbreaks for livestock, if they can be maintained at an appropriate density level. Many others believed certain tree species to be beneficial for wildlife and the ecological health of the surrounding area, such as plum thickets serving as quail habitat or cottonwoods supplying vital nutrients to the ground through their riparian root system.

- Providing shade and windbreaks for livestock *(8 interviewees, 6 focus groups)*
- Benefits to wildlife and the ecology of an area *(6 interviewees, 5 focus groups)*
- Products you can make from trees/shrubs *(3 interviewees)*
- Trees that are part of the cultural legacy of a place *(1 interviewee)*
- No issue with trees/shrubs at appropriate density *(1 focus group)*

Negative Perceptions Of Trees and Shrubs

When asked why tree and shrub species are bad or detrimental to grasslands, the majority of participants mentioned the negative impacts of woody species on water and grass quality and quantity. They understand through experience that many of these species are persistent and difficult to kill. Additionally, five interviewees and two focus group participants added that cattle tend to avoid certain tree and shrub species due to the fact that they're inedible, grow thorns, or simply occur at a density where it becomes impossible for the cattle to navigate those pastures.

- Trees and shrubs that are persistent and/or difficult to kill *(8 interviewees, 5 focus groups)*
- Detrimental impacts to water and grass *(9 interviewees, 2 focus groups)*
- Cattle avoidance due to density, thorns, and inedible species *(5 interviewees, 2 focus groups)*
- Invasive trees and shrubs led to a lack of grassland diversity *(1 interviewee)*
- Make grasslands less productive *(1 focus group)*
- High cost of maintenance *(1 focus group)*
- Non-native species overtaking native *(1 focus group)*

Tree And Shrub Management

The research team asked the participants a variety of questions related to their personal experience with tree and shrub management.

Tree, Shrub, And Grass Species That Producers Are Currently Managing For Prevention Or Removal

Producers across the six focal counties are overwhelmingly managing against eastern redcedar encroachment (n=14). This was followed by honey locust, sumac, cottonwood, elm, and sagebrush, and then by a variety of other tree and shrub species less commonly mentioned.

- Eastern redcedar *(8 interviewees, 6 focus groups)*
- Honey locust *(2 interviewees, 6 focus groups)*
- Sumac *(4 focus groups)*
- Cottonwood *(4 focus groups)*
- Elm *(3 focus groups)*
- Sagebrush *(3 interviewees)*
- Yucca *(1 interviewee, 2 focus groups)*

- Tamarisk/salt cedar *(2 focus groups)*
- Plums *(2 focus groups)*
- Buck brush *(2 focus groups)*
- Blackberries *(2 focus groups)*
- Other *(all mentioned once)*: cactus; silverleaf; russian olive; mulberries; circle brush; joint grass; old world bluestem; persimmons; skunk brush; mesquite; bur oak; hedge apples; chinaberry trees; ragweed

Species Desired To Manage In The Future

The research team also asked the interviewees which tree and shrub species they had a desire to manage in the future. Only four interviewees responded to this question, and the results included older cottonwoods, snake weed, yucca plants, and thorny locusts.

- Older cottonwoods *(1 interviewee)*
- Snake weed *(1 interviewee)*
- Yucca plant *(1 interviewee)*
- Thorny locusts *(1 interviewee)*

Current Tree And Shrub Management Practices

Participants reported using a variety of practices to manage tree and shrub encroachment. The majority used some form of mechanical removal, most notably with a skid steer, discbine, or dozer. Several others used chemical treatments, prescribed burning, or mowing saplings to stunt their growth.

- Mechanical removal *(10 interviewees, 6 focus groups)*
    - General/other mechanical *(8 interviewees, 6 focus groups)*
    - Skid steer *(6 interviewees, 2 focus groups)*
    - Removal by hand tools *(6 interviewees, 1 focus group)*
    - Discbine *(2 focus groups)*
    - Dozer *(2 focus groups)*
- Chemical *(6 interviewees, 6 focus groups)*
- Prescribed burning *(2 interviewees, 4 focus groups)*
- Mowing *(3 interviewees, 1 focus group)*
- Grazing *(2 interviewees)*
- Pile burning *(1 interviewee)*
- Small ruminant grazing *(1 focus group)*

Reasons For Using Specific Practices

When the research team asked the participants why they decided to use certain tree and shrub removal practices, many noted the cost and time efficiencies associated with those forms of management. Some also mentioned the effectiveness of practices, while other participants stated that the availability of equipment influenced their decision about whether or not to carry out specific practices.

- Cost/time efficiency *(4 interviewees, 1 focus group)*
- Effectiveness of practice *(3 interviewees, 2 focus groups)*
- Availability of equipment *(3 interviewees, 1 focus group)*
- Safety of conducting burns with fire breaks *(1 focus group)*

Past Management Practices

Many participants referenced using various forms of chemical spray in the past, although they no longer employ those practices. Others reported previously using prescribed burning, a tree puller, or hand tools.

- Chemical spray *(5 interviewees, 1 focus group)*
- Prescribed burning *(1 interviewee, 1 focus group)*
- Tree puller *(1 interviewee)*
- Hand tools *(1 focus group)*

Reasons For Stopping Practices

When asked why they stopped using certain practices, several participants noted that the practices they were employing were ineffective against tree and shrub encroachment in the long run. Some mentioned that contamination of groundwater and mortality of desired species were reasons to stop using chemical treatments in particular. Other pertinent reasons for stopping practices included disruption of the ground with tree pulling, a lack of moisture to start a prescribed burn, cost inefficiencies, or machinery degradation.

- Ineffectiveness of practice *(2 interviewees, 4 focus groups)*
- Contamination of water and mortality of surrounding vegetation *(2 interviewees, 1 focus group)*
- Disrupting ground *(1 interviewee, 1 focus group)*
- Lack of moisture *(1 interviewee, 1 focus group)*
- Cost inefficiency *(1 interviewee, 1 focus group)*
- Machinery degradation *(1 interviewee, 1 focus group)*
- Assistance funding ended *(1 interviewee)*
- Change to a chemical free ranch *(1 interviewee)*
- Lack of support from fire department *(1 focus group)*

Opinions On The Most Effective Practices

Many of the interviewees and focus group participants believed the most effective combination of practices to employ was cutting down trees and shrubs mechanically or by hand followed by pile burning.

- Mechanical removal followed by stacking and burning *(3 interviewees, 1 focus group)*
- Mechanical removal *(1 interviewee, 2 focus groups)*
- Prescribed burning *(1 interviewee, 2 focus groups)*
- Clipping via hand removal in conjunction with chemical spraying *(2 interviewees)*
- Aerial spraying *(1 interviewee)*
- Mowing *(1 interviewee)*

Motivations To Start Managing Trees/Shrubs

When asked what initially motivated them to begin managing against invasive woody plant encroachment, several participants reported visually seeing the tree and shrub encroachment on their rangeland as an important motivator. This was followed by the availability of assistance programs to help with the management, or speaking with other producers and seeing their improved rangeland as a result of effective management. Others noted that their land

stewardship ethic led to a desire to leave the land better than they found it, while some producers are motivated to increase the production value of their range.

- Visually seeing the tree and shrub species taking over rangeland *(7 interviewees, 2 focus groups)*
- Availability of assistance programs to help with management *(4 interviewees, 3 focus groups)*
- Seeing positive management results in neighbors' fields *(3 interviewees, 3 focus groups)*
- Desire to leave range better than they found it *(2 interviewees, 4 focus groups)*
- Increasing the production value of the rangeland *(2 interviewees, 3 focus groups)*
- Intrinsic value of healthy grass *(2 interviewees, 3 focus groups)*
- Understanding how much water cedars and other evergreens use *(2 interviewees, 2 focus groups)*
- Ability to make management decisions on the rangeland *(1 focus group)*

Motivations To Continue Management

Many producers reported visually seeing the improvements to the rangeland as a motivation to keep managing after initial treatment. Others again referenced harboring a land stewardship ethic as a reason to continue managing. Some participants also desired to increase their production value, while others understood that long-term maintenance is required to combat encroachment.

- Visually seeing improvements to range as a result of management *(6 interviewees, 5 focus groups)*
- Desire to leave range better than they found it *(6 interviewees, 3 focus groups)*
- Increasing the production value of the rangeland *(6 interviewees, 3 focus groups)*
- Understanding the long-term maintenance needs to combat trees and shrubs *(3 interviewees, 4 focus groups)*
- Cattle preference for healthy, open rangeland *(3 interviewees, 2 focus groups)*
- Benefits to prairie chicken conservation and management *(1 focus group)*

Length Of Time Managing Trees And Shrubs

The length of time interviewees had been managing tree and shrub encroachment ranged from 1 to over 25 years, with the average being 10-15 years.

- 1-2 years *(3 interviewees)*
- 3-5 years *(1 interviewee)*
- 10-15 years *(3 interviewees)*
- 16-20 years *(1 interviewee)*
- 21-25 years *(1 interviewee)*
- Over 25 years *(2 interviewees)*

Size Or Scale Of Management

The research team also asked interviewees the size or scale of their rangeland where they're managing against tree and shrub encroachment. Responses varied from 10% or less of their range to the entire property, with an average of 21-30%.

- 10% of rangeland or less *(1 interviewee)*
- 11-20% *(1 interviewee)*

- 21-30% *(3 interviewees)*
- 100% *(2 interviewees)*
- Varies *(3 interviewees)*

Frequency Of Management

Participants voiced different management frequency depending on the type of management used. The responses varied from once a year to once every three years. For mechanical removal and chemical practices, some producers also mentioned using these treatments multiple times a year or whenever it was most convenient.

- Prescribed burning
    - Ongoing every year *(3 interviewees, 1 focus group)*
    - Every three years *(1 interviewee)*
    - Every year for six years *(1 interviewee)*
- Mechanical removal
    - Whenever it's convenient *(2 interviewees, 3 focus groups)*
    - Every four months *(1 interviewee)*
    - Every year *(1 focus group)*
    - Every 2-3 years *(1 interviewee)*
    - One time treatment *(1 interviewee)*
- Chemical
    - Every year *(2 interviewees, 1 focus group)*
    - Whenever it's convenient *(1 interviewee, 1 focus group)*
    - 1-2 times a year *(1 interviewee)*
    - Every other year *(1 interviewee)*
    - Every three years *(1 interviewee)*
- General (no specific practice given)
    - Whenever it's convenient *(2 focus groups)*
    - Every year *(1 focus group)*
    - Every other year *(1 focus group)*

Visual Cues To Determine When It's Time To Manage

Regarding the visual cues participants use to determine when it's time to manage, the majority of participants mentioned actually seeing the size and density of the trees increasing. Others referenced observing the impact of encroachment on grass health, watching their cattle avoid encroached pastures, being unable to access certain areas due to density, or noting that the ecological conditions made it possible to conduct a prescribed burn.

- Visually seeing tree size and density increasing *(7 interviewees, 3 focus groups)*
- Seeing impacts of trees and shrubs on grass health *(1 interviewee, 1 focus group)*
- Cattle migration patterns, avoiding encroached pastures *(1 interviewee, 1 focus group)*
- Lack of access due to density *(2 interviewees)*
- Ecological conditions (increased moisture, lower fuel load, etc.) decreasing fire risk *(1 interviewee)*

Changes To Management Decision-Making Based On Tree/Shrub Density

The participants shared that their management decision-making changes based on the density of trees and shrubs present on their rangeland. For saplings, many producers reported using chemical spray, loppers, an ax, or a skid steer with a tree puller to remove trees from the ground while they are still young. A dozer was required for trees larger than three feet tall, while a tree saw, tree shears, or a chainsaw was needed for trees that grew over six feet in height or occurred at a density where it was difficult to bring in machinery. After a certain density level, it became necessary to mechanically clear the fenceline and implement a fire break before considering a prescribed burn. From there, one participant mentioned conducting rotational burning every three years.

- Dispersal and Recruitment
    - Carry loppers or an ax in your truck to remove younger trees *(2 focus groups)*
    - Use chemical spray for smaller trees then switch to mechanical when they grow larger *(2 focus groups)*
    - Use a skid steer with a tree puller to remove saplings *(1 interviewee)*
- Encroachment
    - Use general mechanical practices for larger trees *(3 focus groups)*
    - Use general mechanical practices for more dense encroachment phase *(1 interviewee, 1 focus group)*
    - Use a dozer for trees larger than three feet tall *(2 focus groups)*
    - Use a tree saw for trees larger than five-six feet tall *(1 interviewee)*
    - Use tree shears and/or a chainsaw for larger trees *(1 interviewee)*
- Woodland Transition
    - Use general mechanical practices for more dense encroachment, followed by fire *(1 interviewee, 3 focus groups)*
    - Start with a fire guard/fence line followed by mechanical, then fire *(2 focus groups)*
    - Start with clearing the fenceline, followed by mechanical *(1 focus group)*
    - Move from snipping to chainsaw depending on the size of the tree, followed by fire *(1 interviewee)*
    - Conduct rotational burning every three years *(1 focus group)*

Management Confidence

When asked how confident they were in the tree and shrub management practices they employed, participants cited varying levels of confidence dependent on the species in question or the size of the tree. Others expressed low confidence due to factors such as understanding the need for long-term commitment, the high costs of conducting the management, and dealing with challenging topography.

- Varying confidence
    - Dependent on the species *(3 interviewees)*
    - Dependent on size of tree *(1 focus group)*
- Low confidence
    - Need for long-term commitment *(3 interviewees)*
    - High cost of management *(2 interviewees, 1 focus group)*
    - Topography (e.g., rugged terrain) can be a challenge *(2 interviewees)*

    - Struggle to conduct management as an older producer *(1 interviewee)*
    - Fast rate of regrowth *(1 focus group)*

Future Management Practice Interest

Several participants noted prescribed burning as a future practice they would be interested in pursuing. This was followed by the use of expensive, heavy mechanical equipment that could reach trees growing in the canyons that were otherwise difficult to access. Four other focus group attendees mentioned being potentially interested in exploring multi-species grazing.

- Prescribed burning *(5 interviewees, 4 focus groups)*
- Heavy mechanical equipment *(3 interviewees, 1 focus group)*
- Multi-species grazing *(4 focus groups)*
- Chemical *(2 interviewees, 1 focus group)*
- Other: Mulching; carbon sequestration; grazing with virtual fences; high stock grazing; hot wire; general sagebrush management *(all mentioned once)*

Barriers To Using Specific Practices

The participants shared several barriers that prevented them from effectively doing this form of management. Prescribed burning had the most barriers reported, the most common being a fear of unknown outcomes with using fire, climate or ecological conditions preventing an effective burn, and lack of external support to conduct a prescribed burn. With mechanical removal, producers were primarily concerned with the expense of fuel and certain pieces of equipment, or how tough the tree and shrub removal could be on their equipment. Others mentioned how chemical spraying could contaminate the watershed or other desirable tree/shrub species, and the practices could sometimes be ineffective at managing the trees/shrubs.

- Prescribed burning
    - Fear of fire risk and unknown outcomes *(7 interviewees, 5 focus groups)*
    - Climatic/ecological conditions *(6 interviewees, 4 focus groups)*
    - Lack of administrative support to conduct burn *(2 interviewees, 4 focus groups)*
    - Lack of time to conduct burn *(2 interviewees)*
    - Lack of labor to conduct burn *(1 focus group)*
    - Lack of equipment to conduct burn *(1 focus group)*
    - Smaller properties needing more coordination *(1 focus group)*
    - Cost of making fire breaks and other burn preparation *(1 focus group)*
- Mechanical removal
    - Expense of fuel and certain pieces of equipment *(2 interviewees, 3 focus groups)*
    - Tree/shrub management is tough on equipment *(3 focus groups)*
    - Lack of mechanical expertise to operate and sustain equipment *(1 interviewee)*
    - Dry conditions causing fire risk with equipment *(1 interviewee)*
    - Topography in the canyons makes it difficult to access trees *(1 interviewee)*
    - Land disturbance by tearing up the ground *(1 focus group)*
    - Takes a lot of time to do the work *(1 focus group)*
    - Lack of federal assistance *(1 focus group)*
- Chemicals
    - Contamination of watershed and other desirable species *(3 interviewees)*

    - Inefficiency/ineffectiveness of spraying *(2 interviewees, 1 focus group)*
    - Costs of purchasing chemicals and spraying *(1 interviewee)*
- Mulching
    - Inability of grass to grow beneath the mulch *(1 interviewee)*
    - Finding and purchasing equipment to mulch *(1 focus group)*
- Multi-species grazing
    - Fear of unknown outcome with new species introduction *(1 focus group)*
    - Cost of fencing and management *(1 focus group)*
- Rotational grazing
    - Costs of putting up dividing fences *(1 interviewee)*
- High stock density grazing
    - Issues with scalability *(1 focus group)*

Barriers To Using General Practices

The participants also discussed general barriers for conducting management, the two largest hindrances being the rising cost of fuel, labor, and equipment, as well as a lack of available contract labor to do the work.

- Rising expenses of fuel, labor, and equipment *(4 interviewees, 4 focus groups)*
- Lack of contracted labor available to do the work *(4 interviewees, 2 focus groups)*
- Federal policies in place *(2 interviewees, 1 focus group)*
- Climatic/ecological conditions (specifically dealing with drought conditions and trees/shrubs growing in draws) *(2 focus groups)*
- Lack of time to do the work *(2 focus groups)*
- Lack of support *(1 focus group)*

Needs For Effective Management

Participants gave several responses for support that is needed for more effectively managing into the future. Many discussed the presence of a prescribed burn association to coordinate burning efforts, while others stated the need for an increase in assistance programs and funding opportunities. Other responses included education via demonstration of effective management from other producers, an increase in the availability of contracted labor, and more government support for tree and shrub management.

- Increase of assistance programs and funding opportunities *(4 interviewees, 4 focus groups)*
- Presence of prescribed burn associations *(4 interviewees, 4 focus groups)*
- Peer to peer learning via management demonstration of management *(3 interviewees, 4 focus groups)*
- Increase in contract labor availability *(3 interviewees, 3 focus groups)*
- More government support/oversight throughout the management process *(2 interviewees, 3 focus groups)*
- Availability of equipment, tools, and technologies *(1 interviewee, 1 focus group)*
- Business for contracted small ruminant grazing *(1 focus group)*

Working With Other Producers

The research team asked participants a few questions related to working with other producers in their surrounding area.

Practices Other Producers Use

When asked about the practices other producers in the area use, most participants referenced prescribed burning and chemical spraying. Others stated they've seen neighbors use mechanical removal and the combination of cutting and then burning trees.

- Prescribed burning *(4 interviewees)*
- Chemical spraying *(3 interviewees, 1 focus group)*
- Mechanical removal *(3 interviewees)*
- Cutting and burning *(2 interviewees)*
- Mulching and grinding *(1 interviewee)*
- Multi-species grazing *(1 focus group)*

Collaboration With Others

In regard to collaborating with other neighbors, many participants shared that collaboration only occurred when they conducted prescribed burns. Those that burned used different processes to collaborate, but they typically involved extensive pre-burn planning, focusing on one community burn at a time, and coming together with neighbors and the prescribed burn association to develop an effective burn strategy.

- Collaborating with neighbors on prescribed burns *(2 interviewees, 3 focus groups)*
- Collaborating with neighbors on general tree and shrub management (2 interviewees)
- Collaborating exclusively with family on general tree and shrub management *(2 interviewees)*
- Collaborating with neighbors on cattle management *(1 interviewee)*
- Collaboration varies depending on the individual neighbor *(1 interviewee)*
- Collaboration process
    - Prescribed burning
        - Plan a date for a burn, everyone meets over lunch to discuss strategy, including how to help neighbors out with protecting fencelines, fire breaks, hot spots, canyons, etc. *(2 interviewees, 1 focus group)*
        - Plan with neighbors/prescribed burn association for the possible burns in the year ahead, prioritizing who needs to burn *(2 interviewees)*
        - Send out text for group meet up and request RSVP *(2 interviewees)*
        - Aim for one burn in the community on any given day *(1 interviewee)*
    - Assistance programs
        - Collect management information from Natural Resources Conservation Service, get bill for work from contractor, get a check from Natural Resources Conservation Service and pay contractor *(1 interviewee)*

Communication With Neighbors

Beyond prescribed burning, most participants stated that they do not collaborate, or even communicate, with neighbors on general invasive woody plant management efforts. The

exception was aerial spraying or mechanical removal that could potentially impact a neighbor's property.

- Do not currently communicate with neighbors on management *(4 interviewees, 1 focus group)*
- Communicate with neighbors on planning for mechanical and prescribed burns *(2 focus groups)*
- Only communicate with neighbors on burning, not mechanical *(2 focus groups)*
- Communicate exclusively with family on management *(1 interviewee)*
- Communicate with neighbors on aerial spraying *(1 focus group)*
- Communicate with neighbors on how drought affects management *(1 interviewee)*

Sharing Management Importance With Producers Owning Intact Grasslands

Participants stated that if they could share the importance of tree and shrub management with someone who owns/manages intact grasslands, they would stress the need for proactive management while trees and shrubs are still in the sapling stage. They would also explain the impact that trees and shrubs have on water availability and grass health once they grow to a certain size and density.

- Importance of proactive management while trees and shrubs are still saplings *(9 interviewees, 6 focus groups)*
- The impacts of trees and shrubs on water availability and grass health *(2 interviewees, 1 focus group)*
- Understanding the long-term maintenance needs to combat trees and shrubs *(1 interviewee)*
- Increasing the production value of the rangeland *(1 interviewee)*

Information For Someone Starting Management

For someone that was just getting started with management, several producers stated that they would share expectations about the long-term maintenance required to deal with trees and shrubs. They would also recommend talking to neighbors or their local Natural Resources Conservation Service office to gain more information and find a mentor or technical expert to provide guidance. Other participants stressed the importance of learning the differences in how to manage specific species of trees and shrubs.

- Share expectations about the long-term maintenance of trees and shrubs *(3 interviewees, 4 focus groups)*
- Talk to neighbors and your local Natural Resources Conservation Service office *(2 interviewees, 3 focus groups)*
- Find a mentor or technical expert to provide guidance *(2 interviewees, 2 focus groups)*
- Learn how to manage individual species *(2 interviewees, 2 focus groups)*
- Provide economic costs of no management *(2 focus groups)*
- Learn how much water trees and shrubs consume *(2 interviewees)*
- Highlight the importance of maintaining healthy grass *(1 interviewee)*
- Promote a 'Defend the Core' mentality *(1 interviewee)*
- Understand the danger of seed spread *(1 interviewee)*

Opinions About Non-Managing Landowners

Study participants also described issues they perceive with those in their region who were not managing against tree and shrub encroachment.

Problems With Non-Managing Landowners

Some of the challenges participants experience with non-managing landowners includes how they don't fully understand the issue with tree and shrub encroachment, with hunters actually preferring more trees for deer habitat. Many of these properties are responsible for tree and shrub seeds spreading onto their neighbors' lands, and these landowners don't want to spend any money on tree removal. Likewise, renters often prefer not to spend their resources to manage trees and shrubs on someone else's land.

- Non-managing landowners don't understand the tree/shrub issue *(2 interviewees, 3 focus groups)*
- Lack of management from non-managing landowners leads to seed spreading *(2 interviewees, 3 focus groups)*
- Hunters want trees for deer habitat *(2 interviewees, 3 focus groups)*
- Non-managing landowners don't want to spend money on tree removal *(2 interviewees, 1 focus group)*
- Renters don't want to spend money on someone else's land *(2 interviewees)*
- Non-managing landowners don't care about improving the land *(1 interviewee)*
- Non-managing landowners enter into assistance programs and don't do the work *(1 interviewee)*
- Deer hunters buy land at higher value than ranching can support *(1 interviewee)*
- Risk of getting sued if fire spreads to land owned by non-managing landowner *(1 focus group)*

Providing Information For Those Not Managing

When asked what type of information is needed for individuals who are not actively involved in managing their property, participants stressed the need for education about the issues related to tree and shrub encroachment, including visually demonstrating the results of poor management. Other participants stated the importance of listening to non-managing individuals to understand their perspectives and uses for the land itself.

- Educate them on the issue of trees/shrubs *(2 interviewees, 1 focus group)*
- Visually show the results of poor management *(2 focus groups)*
- Listen to their opinions and uses for land *(1 interviewee, 1 focus group)*
- Identify and directly target them *(1 interviewee)*
- Share literature on topic *(1 interviewee)*
- Share information on billboards *(1 interviewee)*
- Work with OSU extension seminars *(1 interviewee)*
- Local producers directly work with individual non-managing landowners *(1 interviewee)*
- Expose non-managing neighbors to assistance programs *(1 interviewee)*
- Provide some sort of economic incentive to manage *(1 focus group)*
- Tax landowners for recreational use *(1 focus group)*
- Educate on the cost of managing large trees *(1 focus group)*
- Present a management plan to landowners *(1 focus group)*

Perceptions Of Management Success

The focus group participants were asked to provide two definitions of success for tree and shrub management.

Success For Rangeland

On their rangeland, many focus group participants stated that success looked like healthy, intact grasslands with no cedar trees present, and deciduous trees used only for shade or windbreaks.

- No cedars, but keep deciduous trees for shade *(3 focus groups)*
- Healthy, intact grasslands *(3 focus groups)*
- No trees at all *(1 focus group)*
- Cedars in a manageable shelter belt *(1 focus group)*

Success For Community

Regarding success at the community level, focus group participants also referenced having all cedar trees removed in a healthy grassland ecosystem, maintaining viable Lesser Prairie-Chicken populations, and being at a regional maintenance level for all other tree and shrub species.

- All cedars gone *(1 focus group)*
- Intact, healthy grasslands *(1 focus group)*
- Healthy Lesser Prairie-Chicken populations *(1 focus group)*
- Maintenance level for trees and shrubs *(1 focus group)*

Opinions On Assistance Programs

The research team asked participants several questions related to the current assistance programs available that provide support for management against tree and shrub encroachment.

Awareness Of Assistance Programs

- United States Department of Agriculture Natural Resources Conservation Service (USDA NRCS) Lesser Prairie-Chicken Initiative *(3 interviewees)*
- USDA NRCS Conservation Stewardship Program *(3 interviewees)*
- Various United States Department of Agriculture Farm Service Agency (USDA FSA) programs *(2 interviewees)*
- The Nature Conservancy Wildlife Habitat Incentive Program *(2 interviewees)*
- USDA FSA Grassland Conservation Reserve Program *(1 interviewee)*
- USDA NRCS Environmental Quality Incentives Program *(1 interviewee)*
- USDA NRCS Monarch Environmental Quality Incentives Program *(1 interviewee)*
- USDA NRCS Great Plains Grassland Initiative *(1 interviewee)*
- United States Fish and Wildlife Service Candidate Conservation Agreements with Assurances *(1 interviewee)*
- Prescribed burn associations *(1 interviewee)*
- Kansas Department of Wildlife and Parks Salt Cedar Program *(1 interviewee)*
- Kansas Grazing Lands Coalition programs *(1 interviewee)*

Reasons Against Participation

When asked why they did not participate in the programs they were aware of, participants referenced that complex program requirements served as a barrier to enrollment. Others mentioned that the programs prioritized encroached lands versus proactive management, and that there was not enough funding available for them to be involved.

- Complex program requirements *(2 interviewees, 3 focus groups)*
- Prioritizing encroachment *(2 focus groups)*
- Not enough program funding *(1 interviewee, 1 focus group)*
- Other: Don't qualify; difficult to get into; difficulty with enrollment; conflicting priorities; lack of trust; dissuaded by others; already did the management independently *(all mentioned once)*

Participation In Assistance Programs

- Current
    - USDA NRCS Environmental Quality Incentives Program *(2 interviewees, 6 focus groups)*
    - USDA NRCS Conservation Stewardship Program *(2 focus groups)*
    - USDA FSA Conservation Reserve Program *(2 interviewees)*
    - USDA NRCS Great Plains Grassland Initiative *(1 interviewee, 1 focus group)*
    - Various FSA programs *(1 interviewee)*
    - USDA NRCS Monarch Environmental Quality Incentives Program *(1 focus group)*
- Past
    - USDA NRCS Lesser Prairie-Chicken Initiative *(1 interviewee, 2 focus groups)*
    - Comanche Pool programs *(1 interviewee, 2 focus groups)*
    - Various NRCS programs *(2 interviewees)*
    - Various USFWS programs *(2 interviewees)*
    - USDA NRCS Environmental Quality Incentives Program *(1 interviewee)*
    - USDA FSA Conservation Reserve Program *(1 interviewee)*
    - Woods County Conservation District *(1 interviewee)*
    - Oklahoma Department of Wildlife Conservation *(1 interviewee)*
    - Prairie Resource Foundation DWP *(1 interviewee)*

Reasons For Participation

When asked why they decided to participate in the programs that they had, interviewees primarily stated that the program was available and they were qualified to join, they understood the benefits that the program could have on their land, and that they had an agency representative who encouraged them to participate.

- Program was available and they qualified *(1 interviewee)*
- Saw benefit to land improvement *(1 interviewee)*
- Having an agency representative/champion *(1 interviewee)*

Assistance Received From Programs

The majority of interviewees and a few focus group participants stated that they received funding to do the work through the assistance programs. Other interviewees also received technical expertise, and a few specifically referenced hiring a contractor to do the work.

- Funding to do the work *(7 interviewees, 2 focus groups)*
- Providing technical expertise *(4 interviewees)*
- Contracted labor *(2 interviewees*, *1 focus group*)

Positive Program Aspects

Many participants appreciated the technical assistance and funding they received from the assistance programs, as well as the friendliness and availability of program staff.

- Funding *(3 interviewees, 1 focus group)*
- Technical assistance *(4 interviewees)*
- Availability/friendliness of staff *(3 interviewees)*
- Educational opportunity *(1 interviewee, 1 focus group)*
- Ease of participation *(1 interviewee)*
- Short contract length *(1 focus group)*
- Accomplishing multiple objectives at once *(1 focus group)*

Negative Program Aspects

Some of the program components participants did not like included the requirements listed in the contract (e.g., stipulating type(s) of management and specific locations on the ranch), the difficulty of participating with inconsistent program administration, aspects of the program that they were not initially aware of, and the prioritization of encroached lands over proactive management.

- Program requirements *(4 interviewees, 4 focus groups)*
- Difficulty with participation *(2 interviewees, 1 focus group)*
- Surprise components *(1 interviewee, 1 focus group)*
- Prioritizing encroached properties *(1 interviewee, 1 focus group)*
- Decreased funding over time *(1 interviewee, 1 focus group)*
- Lack of tax incentives *(1 interviewee)*

Program Modification

When asked how they would modify current assistance programs, the majority of interviewees mentioned that more funding and cost-sharing opportunities would be ideal. Others stated that increased technical assistance and mentorship could be valuable, along with enforcement or penalties for those not managing and incentives for those who do prioritize intact grasslands. The programs should also become more flexible for the diversity of landowners and operations that are present across the landscape.

- Increase funding/incentives *(7 interviewees, 5 focus groups)*
- More technical assistance/mentorship *(4 interviewees, 2 focus groups)*
- Enforcement/penalties for lack of management *(4 interviewees, 2 focus groups)*
- More flexibility *(2 interviewees, 4 focus groups)*
- Prioritize intact grasslands *(2 interviewees, 2 focus groups)*

- Funding for long-term maintenance *(3 interviewees)*
- Streamlined, simple contracts *(3 focus groups)*
- Agency follow-up *(2 interviewees, 1 focus group)*
- Contract components/clarity *(2 interviewees)*
- New invasive woody plant markets (e.g., cedar fibers for drilling) *(2 focus groups)*
- Mandatory burning component *(2 focus groups)*
- Faster timeline to accomplish work *(1 interviewee)*

Communications

The study participants also discussed various aspects of communication as it related to tree and shrub management.

Correct Terminology To Use

Many participants stated that when they were discussing trees and shrubs, they often referred to shrub treatment as brush management and used woody/tree encroachment when they were talking about trees. They tended to use the specific species name when discussing trees as well.

- Brush management (for shrubs) and woody/tree encroachment (for trees) *(5 interviewees, 3 focus groups)*
- Cedar trees or other species names *(4 interviewees, 2 focus groups)*
- Nuisance *(4 interviewees, 1 focus group)*
- Other: Grass management; evergreen; broad leaf; damn trees; trash trees; what a cow won't eat *(all mentioned once)*

Current And Trusted Information Sources

When asked about their ideal information sources for tree and shrub management, most participants mentioned relying on government agencies, other producers (including their local prescribed burn association and conservation district), or the internet for acquiring useful information. They also depend on neighboring producers, agencies, and universities for information on general grazing management. They tend to have the most trust in other producers as an information source, followed by local agency staff with whom they have long-standing relationships. Participants stated that electronic communications such as text messages, emails, apps, and the internet could be good information sources for tree and shrub management in the future, along with more in-person meetings and using various media outlets to get the word out.

- Tree and shrub management
    - Conservation agencies *(10 interviewees, 4 focus groups)*
    - Other producers (including prescribed burn association/conservation district) *(5 interviewees, 6 focus groups)*
    - Internet *(5 interviewees, 1 focus group)*
    - Universities *(3 interviewees)*
    - Chemical contractor *(1 interviewee)*
    - Agricultural publications *(1 focus group)*
    - In-person meetings *(1 focus group)*
- Grazing management

    - Other producers (including prescribed burn association/conservation district) *(6 interviewees)*
    - Agencies *(3 interviewees)*
    - Universities *(3 interviewees)*
- Trusted information sources
    - Other producers (including prescribed burn association/conservation district) *(6 interviewees, 5 focus groups)*
    - Agencies *(4 interviewees, 2 focus groups)*
    - Chemical contractor *(2 focus groups)*
    - Universities *(1 focus group)*
- New/ideal information sources
    - Text messages/emails/internet/phone apps *(5 interviewees, 3 focus groups)*
    - In-person meetings *(5 interviewees, 3 focus groups)*
    - Social and traditional media outlets *(2 interviewees, 3 focus groups)*
    - Direct mail *(2 focus groups)*
    - Celebrity champion *(1 interviewee, 1 focus group)*
    - Invasive woody plant management travel manuals (to keep in truck or car) *(1 focus group)*

Informational Needs

Several participants stated that they are still lacking information on how to manage specific species rather than trees and shrubs as a whole, while others would like more information on when and how to use chemical application as a treatment option.

- Knowledge on management of specific species and the ecological impacts of managing them *(3 interviewees, 2 focus groups)*
- Specific technical information on what chemicals to use and how to apply them *(3 interviewees, 1 focus group)*
- Timing of different management techniques for maximum effectiveness *(1 focus group)*
- Prevention methods for proactive management *(1 focus group)*

Barriers To Information Gathering

Participants struggled with the lack of an updated list of current available assistance programs, as well as a practical lack of time to gather new information or attend workshops. Ideally the agencies providing assistance programs would coordinate more effectively to share opportunities and streamline the information-gathering process.

- No updated list of current assistance programs *(1 interviewee, 2 focus groups)*
- Lack of time to gather information/attend workshops *(2 interviews)*
- Lack of interagency coordination/collaboration *(1 focus group)*
- County is in a communication desert (no radio coverage) *(1 focus group)*

Recreational Land Manager Interview

The research team interviewed a land manager with a business focused on managing hunting properties for non-residential landowners to understand their perspective on invasive trees and shrubs, and how those perspectives influence their management decision-making processes.

We were interested in how these perspectives were different or similar to those included in our main study population.

Operation

For the past 25 years this individual has owned and managed a land management development business, with an emphasis on deer, waterfowl, and upland bird hunting. As a secondary operation, they lease half of the land they own to producers, which they use for grazing. They understood that grazing as a form of land management can lead to additional deer hunting opportunities in the future.

Opinions About Trees And Shrubs

Overall, the interviewee felt that tree and shrub encroachment stems from a combination of eastern redcedars historically planted as windbreaks along with the current lack of large-scale management. They specifically emphasized that prescribed burning, grazing, or a combination of both practices are needed to combat encroachment across the landscape.

This individual stated that eastern redcedars can work well as a windbreak as long as they are managed correctly. They preferred to see cottonwood trees in pastures, which support species diversity while providing shade for livestock. However, this interviewee felt that invasive tree and shrub species are overall detrimental to the landscape due to the cost of managing after the encroachment has already occurred, along with a loss of grasslands for native wildlife habitat.

Tree And Shrub Management

The species the interviewee currently manages include eastern redcedar, honey locust, siberian elm, black locust, and russian olive. They typically use a combination of mechanical removal and chemical application to kill trees, which they then stacked into piles to burn. The tree removal takes place in the winter, with the burning beginning in March. When asked why they utilized these specific practices, the land manager shared that they've received funding from various entities to support the work, as well as harboring an understanding of the effectiveness of these practices.

Regarding their motivations to start managing trees and shrubs, this individual understood the ecological and financial costs of not managing grasslands. Specifically, they recognized the loss of grass, a lower water table, and less habitat for turkey populations as tangible environmental impacts. They shared a story of seeing quail and pheasant populations rebounding after a non-managed tract of land was cleared of invasive trees and shrubs. They also mentioned the need for a return on investment for owning the land, which can only occur if it is being managed properly. In regard to a parcel's recreational value, the interviewee challenged the common misconception that deer require a lot of woodland habitat, stating that they've seen some of the biggest whitetail in the country in proximity to intact grasslands. Another motivation to begin managing was access to the USDA NRCS Environmental Quality Incentives Program to financially assist with clearing trees and shrubs.

The land manager described how they base their management decision-making on the visual size of the trees on their range. On some parcels, the cedar trees are so large that clearing a

perimeter to form a fire break is required before a prescribed burn can be conducted so the fire can be controlled. After an initial clearing, this individual found success in conducting burns at regular intervals to remove any new saplings.

Hunting Misconceptions

The interviewee specifically mentioned how many deer hunters harbor the common misconception that eastern redcedar trees are essential for deer populations. This is often coupled with realtors who promote cedar forests as being valuable for outdoor recreation. When asked what type of support is needed to address this issue, the interviewee felt that education is the most important component to consider. They share multiple stories of educating their clients from the Eastern United States on the fact that trees aren't required to harvest large deer. Additionally, they showed their clients pictures of a treeless landscape from several decades ago when hunting became abundant in the region, strengthening his argument that large forests are not necessary for hunting opportunities. They believed that visually sharing before and after pictures is one of the most impactful ways to overcome this misconception. Now, the land manager is frequently contacted by Quail Forever employees requesting access to their properties to invite guests and educate them on the importance of proper management.

Assistance Programs

In addition to participating in the USDA NRCS Environmental Quality Incentives Program, the land manager mentioned having some land in the Farm Service Agency's Conservation Reserve Enhancement Program to help with farming practices that support bird conservation. They were generally pleased with these programs, but did mention there is often a lag time between when an individual applies for the Environmental Quality Incentives Program and when they can access the funds and begin managing.

Indigenous Land Manager Interview

The research team also interviewed an Indigenous land manager from the Cheyenne and Arapaho Tribes in Oklahoma who works with Indigenous producers on fire management in an effort to understand their perspectives on invasive trees and shrubs, and how those perspectives influence their management decision-making processes.

Operation

This individual was responsible for supporting the suppression of wildfires across tribal lands, but was also involved in hazardous fuels reduction through the use of prescribed burning to reduce the risk of wildfires. Various entities manage the diverse types of land ownership throughout the Tribes, yet the fire management program works across all these properties in order to make their efforts more effective. The interviewee has been a wildland firefighter for 25 years, but began their specific work with the Tribes in 2020. They stated that before they began, the lands were severely neglected and lacked any kind of fuels management. Since the burning program started, they have seen positive changes in eastern redcedar eradication and the total clearing of some pastures.

Opinions About Trees And Shrubs

The fire management representative described how beyond the fire risk from hazardous fuels, tree and shrub encroachment makes it difficult for both cattle and people to access certain parcels, reporting incidents where the thick vegetation had popped the tires of certain vehicles. They did state that eastern redcedars can give off a pleasant odor, and the Tribes have ceremonial uses for the tree. Still, this individual saw it as part of their job to educate their community that the current state of the landscape is not natural.

Tree And Shrub Management

The species this interviewee currently manages included eastern redcedar, honey locust, and osage orange. They often employ mechanical removal practices, which are maintained by rotations of prescribed burning. When asked why they use these specific practices, the representative referenced time and labor efficiencies, specifically related to the acquisition of a skid steer that allowed the fire program to manage more acres in less time than they had by hand removal with chainsaws.

This individual shared that hazardous fuels reduction for community protection along the wildland-urban interface was the primary motivation for the fire program to begin its prescribed burning efforts, yet several factors motivated the staff to continue burning. This included the benefits of management to both cattle and wildlife, the long-term efficiencies in cost savings from managing earlier on, and simply observing the visual results of effective management, such as flowers blooming from the seed bank and creeks running again that they hadn't seen in years.

When asked about visual cues they used to begin management, the representative described a modeling procedure which factors in variables such as fire load, types of fuels, whether it's a higher or lower fire year, and which fuels are located in close proximity to surrounding communities to determine the level of threat. By conducting assessments around human structures, such as homes or agricultural operations, the fire program is able to determine the most threatened areas to prioritize treatment. The interviewee stated that they changed their specific management practice based on tree density: for parcels with lower density, they were able to burn as long as the conditions were ideal. For densely packed stands, mechanical removal was first required to clear a fire break. The team then conducted a prescribed burn followed up with another mechanical treatment for whatever vegetation remained. Lastly, they cut and stacked the tree skeletons to remove them with pile burns.

The research team asked the interviewee how confident they were in the fire program's ability to manage the existing tree and shrub encroachment across the Tribal lands. They reported feeling confident that they could accomplish all of their current projects at scale given their capacity. They also mentioned that the longer an individual or entity is managing trees and shrubs, the easier and faster it becomes to maintain on those parcels, given that most of the vegetation is cleared in the initial treatments.

The fire program representative also shared several barriers to conducting this type of work. For any mechanical clearing that takes place around culturally significant sites, a survey is first

required to search for graves, artifacts, etc., often delaying management timelines. The interviewee was hesitant about wide-scale chemical applications followed by prescribed burns, expressing concerns overexposing their crew to toxins released in the air. They were also against spraying too closely to riparian areas or wildlife habitat.

The interviewee listed the greatest number of barriers around prescribed burning, the largest being their current access to funding and personnel or contractors which prevented them from scaling up the burn program at the level they desired. Stringent burn requirements had also tended to delay planned burning, along with weather and time constraints. Considering the impacts to the surrounding wildlife and ecosystem was also found to cause delays, and this individual was clear that public perception around burned acres, skeleton piles, and other impacts from burning can have a strong impact on the fire program's ability to manage in the long run.

Regarding support for prescribed burning, the representative discussed the importance of establishing a multi-entity partnership in the future, consisting of private, non-profit, and municipal actors cooperating and pooling resources to plan large-scale burning efforts across multiple acres, based on a mutual understanding of their shared goals. The interviewee envisioned this collaborative crossing jurisdictional lines and maintaining constant communication so that they could quickly initiate a burn when the conditions allowed for it. They mentioned that hiring liaisons trusted by local communities would also be important to communicate on the collaborative's progress and reported success.

Others Entities

Regarding the fire program's current efforts to collaborate, the interviewee mentioned that they worked closely with local fire departments to assist with one another's work. The fire program also works outside of the Cheyenne and Arapaho Tribes' jurisdiction, assisting other tribes in the surrounding region as needed. The representative also shared a detailed process they used for planning and communicating about an intended burn. They must first acquire a permit through the burn permit system, which outlines burning regulations through Oklahoma state prescribed burn laws. Once the permit is acquired, they email Tribal compliance, the Tribal administration, the Fire Chief, and emergency management to inform them that a burn will be taking place. The day of the burn, the representative submits a spot weather forecast to the National Weather Service before calling the Concho County central dispatch office to notify them of the intended burn. In order to ensure transparency, they also call the county after the burn is done to confirm that everything was extinguished. Lastly, the fire program staff go to every home in the surrounding area to make residents aware that the burn will take place. The interviewee expressed confidence that this established process in place works well to accomplish their goals.

When asked how they would share the importance of proactively managing trees and shrubs with an individual who owns or manages intact grasslands, the interviewee said that they would share the importance of hazardous fuels reduction, making the case that they can either manage trees and shrubs now or when a wildfire is approaching their home or other vital infrastructure. They would also point out the money and time efficiencies saved while proactively

managing grasslands, stressing how aesthetically pleasing and healthy intact grasslands can be when they are managed properly.

Issues With Non-Managing Landowners

The interviewee expressed the frustration of managing a parcel of land that borders properties whose owners are not conducting any sort of management. They described how trees and shrubs from a neighboring property will continue to encroach on cleared lands under a patchwork management scenario, and again highlighted the need for regional coordination and cooperation. To resolve this issue with non-managing landowners, the representative stated that they would match them with a mentor or technical expert in the field who could give them honest information about the importance of proper management.

Assistance Programs

When asked about assistance programs the fire program had previously utilized, the representative stated that the Bureau of Indian Affairs Southern Plains Region was their main source of funding for work conducted on allotment lands. They had also taken advantage of preparedness funds and were starting to look into acquiring Oklahoma state funds. The primary assistance they had received to-date included funding to do the work and to purchase new equipment, such as sonars to conduct surveys. For additional surveys, the programs had also assisted their efforts by bringing in technical experts to conduct NEPA assessments. The major aspect of the assistance programs this individual disliked was related to the timeline of applying for enrollment to actually doing the work on the ground, which could be very time consuming. If they could improve upon the assistance programs as they are currently structured, the interviewee would have them provide a larger amount of funding that is easily accessible for purchases such as equipment, along with making it feasible to establish new local prescribed burn associations to scale up the number of prescribed burning efforts taking place across the landscape.

Communications

Given that this individual is a member of the fire program, they referred to tree and shrub management simply as fuels management. They stated that any individual interested in learning more about this type of management typically turned to the fire program as their primary information source. Members of the Tribes preferred print material to find additional information, such as pamphlets and booklets. For an individual just getting started with their tree and shrub management, the interviewee would particularly point them toward sources where they can acquire funding and receive whatever technical information was needed.

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