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PUBLIC SATISFACTION WITH FOREST MANAGEMENT IN WESTERN MONTANA: AN

EVALUATION OF TRUST AND PUBLIC ENGAGEMENT

By

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Bachelor of Science, Resource Conservation, University of Montana, Missoula, Montana, 2018

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Public satisfaction with forest management in western Montana: an evaluation of trust and public

engagement

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Abstract

Trust is an integral component of the public engagement process involving land management agencies and local stakeholders. Traditional methods of public engagement, such as public meetings and comment periods, often result in low public satisfaction with the participation process and management outcomes. Two components of public engagement, process control and decision control, are critical for successful engagement processes and satisfaction with management decisions. Process control requires providing opportunities for public input, whereas decision control involves the public perceiving influence over management decisions. While recent studies have examined the relationships among process control, decision control, and public satisfaction, trust in a land management agency has not been examined. Data were obtained from a social monitoring survey that was administered to residents in the Swan Valley, Montana in 2018, which evaluated public perceptions with forest management. A path analysis was conducted to quantify the relationships among process control, decision control, trust, and satisfaction. Decision control and process control had a positive, direct effect on satisfaction; however, trust emerged as a significant predictor of satisfaction with management decisions. This finding suggests that simply providing the opportunity for input will not increase stakeholder satisfaction. Rather, stakeholders need perceived influence over the management decision and trust in the agency to be satisfied with management outcomes. Increasing trust between agencies and stakeholders will allow agencies to improve their relationship with the public, resulting in more public participation and comprehensive management decisions.

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Chapter 1

1.1 Introduction

Collaborative approaches to natural resource management are becoming more prevalent (Cheng & Mattor, 2006; Cheng & Sturtevant, 2012; Mattor, Cheng, Kittler, & Mcdonough, 2019). There has been an increase in collaboration over the last two decades to address the interconnected components of ecological (e.g. forest health) and socio-economic (e.g. community engagement) issues (Cheng & Sturtevant, 2012). There is also an increase in community involvement in collaborative groups, or collaboratives, as citizens express their own values for ecologically resilient forests and promoting restoration activities (Cheng & Sturtevant, 2012).

Local collaboratives can address ecological, economic, and social issues that go beyond the scope of traditional management practices. Land management agencies recognize the importance of collaboration and are partnering with local communities to incorporate local values, improve management decisions, and overcome political gridlock (Cheng, 2006). As such, there is a need for more inquiry to determine why these collaboratives are successful. In particular, research is needed to further explore the foundational elements that improve collaborations, such as trust and public engagement. These elements can be used to understand public satisfaction, a proxy to collaboration success. This thesis aims to answer the question: does public satisfaction with forest management decisions significantly explain variations in collaboration, public engagement, and stakeholder trust?

Trust is a key element of successful collaboration and a foundational component of natural resource planning processes that can determine the level of public support for management outcomes (Booth & Halseth, 2011; Leahy & Anderson, 2008; Orth, 2018; Smith, Leahy, Anderson, & Davenport, 2013; M. J. Stern & Coleman, 2015). Trust between

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communities and management agencies can also influence the degree of public engagement in planning processes (Booth & Halseth, 2011). National policies, such as the National Environmental Policy Act, National Forest Management Act, and Federal Landscape Restoration Act, mandate public engagement in management processes (Vosick, 2016; Wilson & Crawford, 2008). However, traditional methods of public engagement (e.g. public meetings and comment periods) feel consultative, and often only give the impression of interests in public viewpoints (Booth & Halseth, 2011; Vosick, 2016). This can result in decreased satisfaction with management outcomes, increased litigation and conflict with communities, and unwillingness among stakeholders to participate in future engagement opportunities (Booth & Halseth, 2011; Sheppard & Meitner, 2005; Tindall et al., 2010).

By incorporating trust and public engagement into decision-making processes, management agencies can increase public satisfaction with natural resource decisions (Irvin & Stansbury, 2004; Vosick, 2016). Increasing satisfaction with management decisions will likewise bolster trust and lead to stable, long-term relationships between communities and management agencies (Lachapelle & McCool, 2012; Vosick, 2016). It is pertinent for agencies to evaluate public satisfaction with the outcomes of management decisions. However, there is a lack of research that examines public satisfaction with forest management and factors that influence overall satisfaction (Secco et al., 2019; Sheppard, 2003; Tindall et al., 2010). This thesis will evaluate satisfaction with collaborative processes in natural resource decision making processes, while exploring how trust and public engagement can affect satisfaction with management outcomes.

1.2 Literature Review

Collaboration

Over the past decade, emphasis has been placed on collaborative approaches to natural resource management (Cheng & Mattor, 2006; Clement & Cheng, 2011; Mattor et al., 2019). Collaboration involves multiple stakeholders, often with conflicting interests, working together to solve a common problem or achieve a common goal (Vosick, 2016). This includes sharing information and perceptions to foster mutual learning and build innovative ideas (Cheng, 2006; Vosick, 2016). This approach has rapidly gained favor in natural resource management, and is reflected in land management policy. For example, the Collaborative Forest Landscape Restoration Program, the Healthy Forest Restoration Act, and the National Cohesive Wildland Fire Management Strategy mandate collaboration in the decision-making process (Vosick, 2016). Stakeholder involvement from citizens, public officials, interest groups, businesses, and agencies during planning and monitoring stages are also emphasized in these policies (Vosick, 2016).

The social and ecological benefits of collaboration have been identified in many previous research efforts. Collaboration can reduce conflict and decrease litigation by bringing diverse stakeholder groups together, developing relationships, and improving levels of trust across multiple interests (Mattor et al., 2019; Vosick, 2016). Stakeholders are able to pool and apply resources, such as information, staff, and funding, that might not have otherwise been available (Cheng, 2006; Mattor et al., 2019). Collaboration also allows for improved environmental outcomes by implementing goals identified by all stakeholders (Mattor et al., 2019). This process addresses more issues from different angles, resulting in better management decisions and improvement of the resource (Mattor et al., 2019; Vosick, 2016; Wilson & Crawford, 2008b).

Although there are numerous benefits to collaboration, significant challenges have also been identified (Leach, 2006; Vosick, 2016). One reoccurring challenge with collaboration is

representation. It is difficult to achieve equal representation among stakeholders in collaborative groups (Leach, 2006; Vosick, 2016). The intent of including "all stakeholders" can actually jeopardize equal representation if too many stakeholders from one interest are included, at the expense of stakeholders from other interests (Leach, 2006). Additionally, those participating might only be segments of a broader population (Clement & Cheng, 2011). For example, citizens who care deeply about the management decision can overshadow the silent majority (Clement & Cheng, 2011). This can lead to processes and decisions that are one sided or only represent select interest groups.

Power dynamics that exist in collaborative processes can be challenging to navigate. When power is not shared equally among stakeholders, it can prevent equitable relationships from forming (Orth, 2018). Instead, the collaborative process can increase already existing tension between stakeholders and agencies (Orth, 2018). Stakeholders' power over the process and final decisions are complicated further as agencies cannot legally relinquish decision-making authority to external parties for management of National Forest System lands (Butler, Monroe, & Mccaffrey, 2015; Orth, 2018; M. Stern & Coleman, 2015). This can degrade the collaborative process and result in increased conflict.

Additionally, collaborative processes can take years to decades (Leach, 2006; Vosick, 2016). It is expensive for agencies to spend time and money on a processes that might not result in a decision (Vosick, 2016). This long, slow process is a financial cost to stakeholders and individuals who are not paid to participate, and can decrease participation over time (Leach, 2006). Collaboration can be discouraging when the time commitment might not result in a management decision that can be implemented. Despite these challenges, stakeholder

engagement in management decisions is imperative (Clement & Cheng, 2011; Mattor et al., 2019; Vosick, 2016).

Measuring Collaborative Success

Success in natural resource collaboration is often described as whether or not goals were reached, and is evaluated based on process (inclusiveness, legitimacy, fairness), outputs (plans, agreements), and outcomes (changed ecological, social, or economic conditions) (Rudeen, Fernandez-Gimenez, Thompson, & Meiman, 2012). Meeting ecological objectives can be measured in terms of vegetation structure, species diversity and abundance, and ecological processes (Wortley, Hero, & Howes, 2013). There are several metrics to measure collaborative success, including biophysical outcomes, economic impacts, adaptive management, and diffusion of institutional innovation (Rundeen et al., 2012). One approach is to rely on a psychometric measure that focuses on individuals perceptions with collaborative processes and outcomes (Rudeen et al., 2012). This self-rating can reflect a perceived level of success, and at times may be more helpful in describing success with collaboration.

One measure that can be used as a proxy for collaborative success is public satisfaction with management outcomes (Rudeen et al., 2012). Satisfaction is a multi-dimensional concept that is used to measure the difference between expectations and outcomes (Tindall et al., 2010). This subjective concept can be shaped by personal and social values (Tindall, et al., 2010). Measuring satisfaction originated in service quality literature, which measured consumer satisfaction (Parasurman et al., 1986). MacKay and Crompton (1988, 1990) applied service quality and consumer satisfaction to the field of outdoor recreation and park management. It has since been integrated into recreation research to understand visitor experiences and expectations (Lee et al., 2004; Tindall et al., 2010; Williams 1989).

The United States Forest Service, along with other land management agencies, often utilize a uniform satisfaction measurement to gauge public perceptions of management practices. This warrants further analysis of public satisfaction with management practices and engagement processes (Tindall et al., 2010; Secco et al., 2019; Sheppard, 2003). An analysis of public satisfaction can identify management activities that need improvement and can lead to meaningful public involvement in management decisions (Secco et al., 2019; Tindall et al., 2010).

Public Engagement

For decades, there has been increasing public involvement with environmental and natural resource management (Beckley, Parkins, & Sheppard, 2006). Following World War II, public interest in natural resources began to increase as recreation opportunities became more accessible (Beckley et al., 2006; Booth & Halseth, 2011; Parkins & Mitchell, 2007). Policies that favored public engagement emerged from the environmental movement of the 1960's and 1970's, including the Wilderness Act, National Forest Management Act (NFMA), and the National Environmental Policy Act (NEPA) (Booth & Halseth, 2011).

These policies demonstrate that public engagement is an integral component in the decision-making process (Booth & Halseth, 2011; McGee, 2011; Saurí & Cerdan, 2003). Meaningful engagement can develop and strengthen relationships between residents and agencies, and enhance public support for government decisions (McGee, 2011). Agencies are attempting to integrate public views into forest management by increasing citizen participation, collaboration, and input in management processes (Booth & Halseth, 2011; Germain, Floyd, & Stehman, 2001). Federal agencies are mandated by policies (NEPA and NFMA) to allow for

public input during the decision-making process, but the agency has discretion over how the public involvement process is designed and implemented (Hoover & Stern, 2013).

Traditional methods of public engagement (i.e. public meetings, public comment periods) result in low public satisfaction with the participation process and management outcomes (Booth & Halseth, 2011; Burton, Messier, & Smith, 2003; Petts, 2008). Although agencies solicit public comments, citizens believe the agency does not always use the input when making management decisions (Booth & Halseth, 2011; Shindler & Toman, 2003). Instead, the engagement process is a reactive approach where the agency states the management action and the public responds in support or opposition (Vosick, 2016). The public input period is viewed as a consultative model and only gives the impression of concern for public viewpoints, rather than meaningful engagement (Booth & Halseth, 2011; Germain et al., 2001).

To be successful, the engagement process needs to be meaningful and seen as having used people's contributions (Booth & Halseth, 2011). This can be achieved by incorporating two components of public engagement. One component is process control, which exists when procedures provide citizens with opportunities to voice their opinions (Colquitt & Rodell, 2015; Lauer, Metcalf, Metcalf, & Mohr, 2018). A second component is decision control, when participants exert influence over outcomes (Colquitt & Rodell, 2015; Lauer et al., 2018). While both are important components of the public engagement process, decision control has a direct, positive link to stakeholder satisfaction (Lauer et al., 2018). Providing opportunities to participate alone will not affect satisfaction; rather, satisfaction will increase when stakeholders believe their input was reflected in management decisions (Lauer et al., 2018). Other studies have identified the importance of using public contributions in the decision-making process (Booth & Halseth, 2011; Parkins & Mitchell, 2007). These findings have implications for the

public engagement process, as stakeholders not only need opportunities to participate, but stakeholders need to see how their input shaped decisions (Lauer et al., 2018).

Although local input is important for management decisions, implementing the public engagement process can be challenging for agencies (Booth & Halseth, 2011; Irvin & Stansbury, 2004; Parkins & Mitchell, 2007; Steelman, 1997, 1999). Eliciting active participation from citizens can be a serious challenge, especially in smaller communities (Booth & Halseth, 2011). Stakeholder's participation is often based on their perceptions of the agency as being fair and competent, with an open and inclusive participation process (Cheng & Mattor, 2006).

Stakeholder self-efficacy can also be a barrier to participation. Self-efficacy is the perception of individual capacity to participate and influence management decisions (Cheng & Mattor, 2006). Individuals with low self-efficacy believe their involvement will not influence the outcome and are less likely to participate (Cheng & Mattor, 2006). Participation also varies depending on if and how much an individual believes that (s)he has the skills needed to be an effective participant (Cheng & Mattor, 2006). A lack of understanding about technical issues and discomfort at public meetings can prevent individuals from participating. Personal constrains such as time, family structure, transportation, childcare, and economic status can also be barriers to participation (Cheng & Mattor, 2006; King et al., 1998).

Ensuring representation from all stakeholders and attempting to satisfy multiple interests and positions can also be difficult (Booth & Halseth, 2011; Webler & Tuler, 2006). This process is labor and time intensive, with no guarantee of a successful outcome (Steelman, 1997). The value choices that arise from public input and collaboration can be difficult for agencies to integrate into their technical-based decision making (Steelman, 1999).

Trust

Public trust in management agencies is a significant factor that determines successful engagement and management outcomes (Booth & Halseth, 2011; Davenport, Leahy, Anderson, & Jakes, 2007; Lachapelle & McCool, 2012; Leahy & Anderson, 2008; Winter, Vogt, & McCaffrey, 2004). Although it is conceptualized differently in the literature, generally trust is a psychological state in which a trustor accepts vulnerability based on their expectations of a trustee's intentions or behavior (Stern & Coleman, 2015). Trustworthiness is comprised of three elements: ability, integrity, and benevolence (Stern & Coleman, 2015). Ability is the trustor's confidence in the trustee's capabilities to successfully carry out an action (Stern & Coleman, 2015). Integrity is the trustor's perception that the trustee will consistently follow an acceptable set of principles (Stern & Coleman, 2015). Benevolence is the perception that the trustee feels positively toward the trustor and will act upon the positive orientation (Stern & Coleman, 2015). These three elements pertain to trustworthiness between individuals.

Additionally, there are four types of trust: dispositional, rational, affinitive, and procedural (Stern & Coleman, 2015). Dispositional trust is the predisposition of an individual to trust another entity, and can be based on personal history, cultural norms, or contextual cues (Stern & Coleman, 2015). Rational trust is based on the perceived utility of the expected outcome, and includes evaluations of prior performance of the trustee (Stern & Coleman, 2015). Affinitive trust is based on emotions and judgments of the trustee's qualities, such as shared values and feelings of social connectedness (Stern & Coleman, 2015). Lastly, procedural trust is perceptions of legitimacy, transparency, and binding procedures that decrease the vulnerability of the potential trustor (Stern & Coleman, 2015). Trust in procedures enables action if other forms of trust are absent (Stern & Coleman, 2015). High degrees of any form of trust may not

guarantee a specific behavior, but rather trust describes the psychological state and general willingness to accept a certain degree of risk (Davenport et al., 2007; Stern & Coleman, 2015).

Trust often determines the degree of political and social acceptability of management decisions and outcomes (Winter et al., 2004; Stern & Coleman, 2015). Several case studies have found increased public support for management outcomes when public trust in the agency is high (Lachapelle & McCool, 2012; Vaske et al., 2007; Vogt et al., 2005; Winter et al., 2004). Stakeholders' perceived success and acceptability of management decisions is correlated to the level of transparency, honesty, and trust that exists in the decision-making process (Booth & Halseth, 2011). Building a trusting relationship with the public can lead to socially acceptable management outcomes, and reduce the amount of time and money agencies spend on litigation and stalled planning efforts (Leahy & Anderson, 2008; Smith et al., 2013; Winter et al., 2004).

Several studies have identified the connection between trust and public engagement in decision-making processes (Davenport et al., 2007; Gray et al., 2012; Lachapelle & McCool, 2012; Mattor et al., 2019). The most common tool used by agencies to promote trust is including stakeholders in the decision-making process (Gray et al., 2012). A relationship between managers and the public has to exist in order for stakeholders to want to be involved and participate in the planning process (Sharp et al., 2012). A trusting relationship allows for information exchange and the development of shared goals, which is a central component of collaboration (Mattor et al., 2019). Citizens that have repeated, positive interactions with managers are more likely to trust managers and the agency (Davenport et al., 2007). In turn, citizens who trust in agencies are more likely to participate in future engagement opportunities and collaborative settings (Lachapelle & McCool, 2012; Gray et al., 2012).

Despite the importance of trust, there is often a lack of trust and support for management agencies and decisions (Booth & Halseth, 2011; Leahy & Anderson, 2008). A lack of trust in management agencies can result from the public belief that agencies discarded public opinions and did not value public viewpoints (Booth & Halseth, 2011). As distrust is a barrier to social acceptance of management decisions, it's imperative for agencies to adapt the standardized public involvement process to reflect local views and build a trusting relationship (Davenport et al., 2007; Service et al., 2002; Shindler & Toman, 2003; Vaske et al., 2007; Winter et al., 2004). Bolstering trust between agencies and stakeholders can positively influence public participation and result in higher satisfaction with forest management decisions.

Although research has been conducted on biological feasibility and economic efficiency of management actions, there has been little effort to understand social acceptability of management actions (Shindler & Brunson, 2002). Managers can benefit from social monitoring as it would fill a knowledge gap that currently exists regarding public views toward federal land management. This thesis evaluates satisfaction with collaborative approaches to forest management. Specifically, the relationships among trust, public engagement, and satisfaction is evaluated to determine which variables best predict satisfaction with management actions. This research provides managers with tangible solutions that can be implemented by agencies to improve public engagement processes, bolster trust, and increase overall public satisfaction.

1.3 Conceptual Framework

This work is guided by a conceptual framework that links the processes influencing overall satisfaction with management decisions and natural resource collaboration (Figure 1). Process control and decision control, two integral components of public engagement, are key components of this framework (Lauer et al., 2018). This framework illustrates the varying ways

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in which trust and public engagement are linked, as identified in the literature (Davenport et al., 2007; Sharp et al., 2012; Smith et al., 2012; Stern & Coleman, 2015). For example, agencies can increase trust by interacting with the public and involving citizens in management decisions (McGee, 2011). In turn, repeated positive interactions with agency personnel can increase trust in the agency and lead to future public participation (Vosick, 2016). These relationships contribute to overall satisfaction with management decisions, which can contribute to success in natural resource collaborations.

Figure 1. Conceptual framework of components contributing to collaborative success. Adapted from Davenport et al., 2007; Sharp et al., 2012; Smith et al., 2012; Stern & Coleman, 2015.
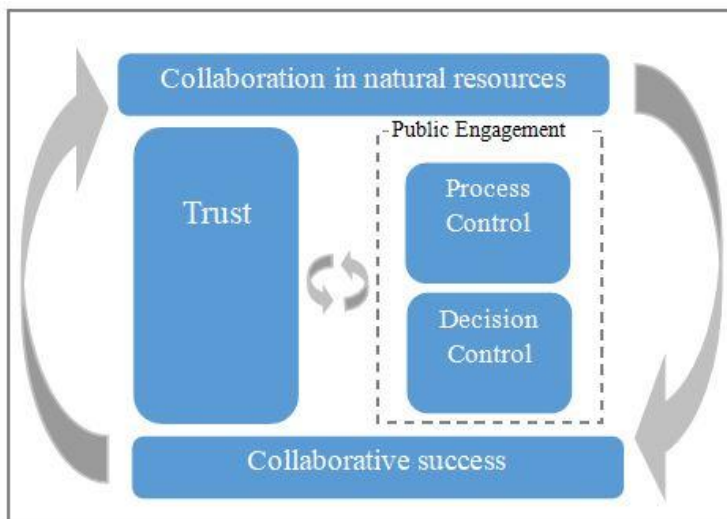
Chapter 2

In this chapter, I provide detailed methods used to determine what factors predict satisfaction with forest management. First, I present a description of the study region, including community and ecological overviews. Further detail is given on the Collaborative Forest Landscape Restoration Program to provide context for the Southwestern Crown Collaborative group (SWCC, 2017). Next, I outline survey methods and sampling procedures utilized in data collection. I end with describing the methods I utilized in secondary data analysis.

2.1 Study Region: Southwestern Crown of the Continent

Communities

The Southwestern Crown of the Continent encompasses the communities of Condon, Seeley Lake, Ovando and Lincoln (Figure 2). It contains portions of Lewis and Clark, Lake, and Missoula counties. Approximately 9,000 people live on this landscape, which is less than one person per square mile (Collaborative, 2010). The majority of the population is Caucasian (<89%), with 49% female and 51% male (Headwaters Economics, 2019). There is a bimodal age distribution with modes around 20-24 years and 55-59 years old, and a mean around 39 years old (Headwaters Economics, 2019). The area has experienced population growth over the last 20 years as the scenic beauty, rural character, and proximity to urban centers (e.g. Missoula, Kalispell, Helena) attract more people (Collaborative, 2010). The Southwestern Crown is made up of rural communities with dominant land uses consisting of timber harvesting and agriculture (Collaborative, 2010). Recreation is popular in this area given the close proximity to Glacier National Park and the Bob Marshall Wilderness.

Figure 2. A map denoting the study area.
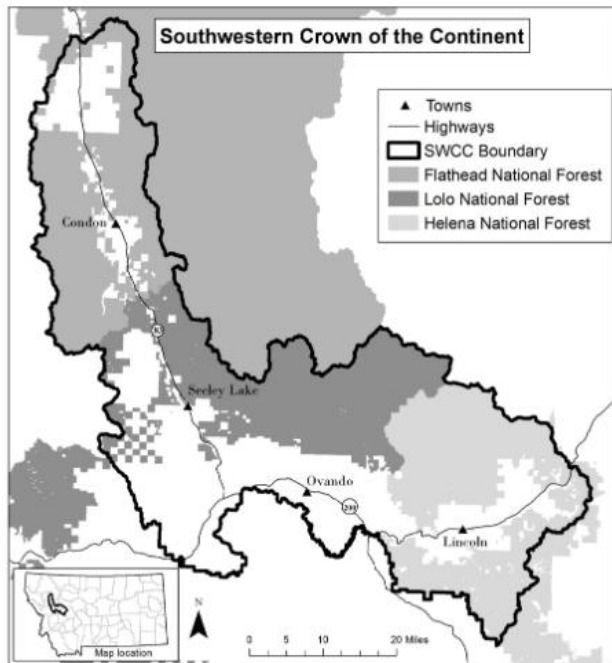
Communities in the Swan Valley were faced with significant challenges over the last 20 years. As across the western U.S., wildfire activity in the region has been increasing since the 1980's (Westerling, 2016). In 2007, the Jocko Lakes Fire burned over 36,000 acres and forced hundreds of residents to evacuation, and in 2017, the Rice Ridge Fire burned over 160,000 acres (Forest Service, 2018; Wall & Halvorson, 2011). The Rice Ridge Fire was one of the largest fires in Region 1 (encompasses northern Idaho, Montana, and portions of North Dakota) and was a national priority for firefighting resources and forced the evacuation of Swan Valley residents for weeks, with unhealthy air quality effects lasting even longer (Luth, 2018).

In addition to wildfires, these rural communities were negatively impacted by the declining timber market in the mid 2000's (SWCC, 2017). The Stimson Lumber Mill in Bonner closed in 2008, laying off over 100 employees, and in 2009, Smurfit-Stone closed its pulp mill in nearby Missoula (SWCC, 2017). The continuous decline in the timber market and low timber

prices pose a threat to the rural communities of the Southwestern Crown. A declining economy and an inherently flammable landscape leaves this area susceptible to social, ecological, and economic hardships.

Landscape context

The Southwestern Crown of the Continent is located in western Montana in the Blackfoot, Clearwater and Swan River valleys. It is part of the larger Crown of the Continent, which links the Canadian Rockies with the Greater Yellowstone Ecosystem and Selway-Bitterroot Wilderness areas to the south (Collaborative, 2010). The Southwestern Crown encompasses 1.5 million acres, 70% of which is publically owned. The Helena-Lewis and Clark, Flathead, and Lolo National Forests manage 59% of this area (Collaborative, 2010).

The Southwestern Crown of the Continent contains areas of high conservation value, providing important habitat for grizzly bears, lynx, gray wolves and wolverines (Collaborative, 2010). These areas also provide undeveloped tracts of lower-elevation habitat for winter ranges, as well as high quality breeding, nesting and migratory habitat for a diversity of bird species (Collaborative, 2010). Although the area has high conservation value, there is a history of intensive forest management and fire exclusion in the Southwestern Crown. The public and private forests in this region provide significant opportunities for ecological restoration.

Collaborative Forest Landscape Restoration Program

In 2009, Congress passed the Omnibus Public Lands Management Act, which established the Collaborative Forest Landscape Restoration Program (CFLRP) to encourage the US Forest Service to conduct landscape-scale ecosystem restoration on National Forest System lands (Butler et al., 2015). The CFLRP provides funding over ten years to complete restoration

projects. The goals of CFLRP's were to reduce wildfire management costs, enhance ecological health, and promote the use of small-diameter woody biomass (Butler et al., 2015).

Arguably, the unique aspect of the CFLRP is to promote collaboration at all stages of forest management decisions. If a national forest is awarded a CFLRP, the Forest Service must engage in collaboration with diverse stakeholders throughout the planning, implementation and monitoring processes (Butler et al., 2015). This collaboration increases stakeholder involvement in the forest management process while still adhering to preexisting legal requirements of National Forest land management (Butler et al., 2015). Stakeholder values, scientific information, and management experience inform the project planning and implementation, resulting in comprehensive management decisions.

The Southwestern Crown Collaborative (SWCC) was formed in July of 2009 after being approved for a Collaborative Forest Landscape Restoration project. The SWCC was among the first round of proposals to be awarded funding. The collaborative group consists of stakeholders across the Swan Valley, such as Swan Valley Connections, Blackfoot Challenge, and Lincoln Restoration Committee. Local chapters of conservation organizations are also involved, including Rocky Mountain Elk Foundation, Vital Ground, and The Wilderness Society. These stakeholders, along with citizens from Swan Valley communities, work together with Forest Service line officers from the Lolo, Flathead, and Helena-Lewis and Clark national forests.

Over the past ten years, the SWCC has been working to restore and promote social-ecological function by: enhancing ecological processes; protecting and improving terrestrial and aquatic habitat and connectivity; encouraging ecological, economic and social sustainability; and engaging communities and interested parties in restoration processes (Collaborative, 2010).

2.2 Methods

To understand SWCC member's attitudes toward forest management outcomes, semi-structured interviews were conducted with citizens, collaborative members, and agency managers. Interviewees were asked about their experience with the SWCC, participation in the collaborative group, how they perceived SWCC to have affected forest and fire management, and how the SWCC has impacted the relationship between the Forest Service and the community (Appendix 1).The University of Montana's Institutional Review Board approved the interview instrument on October 16, 2019.

To determine the relationship between public satisfaction with forest management, a quantitative social monitoring survey was distributed. The survey was administered from May 13, 2018 through July 24, 2018 by the University of Montana's Bureau of Business and Economic Research (BBER) on behalf of the Southwestern Crown Collaborative. The survey was mailed and responses were collected via a hardcopy questionnaire, or over the internet. The sample population received four mail contacts during the survey, with the first contact consisting of an introductory letter to participate in the survey via an online link. A follow-up thank you letter was mailed to respondents and a reminder was mailed to non-respondents encouraging them to participate via the internet link. After, a questionnaire packet was mailed to non-respondents, inviting participation via the internet link or by completing the hardcopy questionnaire and mailing it back in the stamped envelope provided. The last contact was made by mailing a second hardcopy questionnaire to non-respondents, inviting participation via the internet link or completing the hardcopy questionnaire and returning it in the stamped envelope provided.

Respondents were asked about forest management goals, prescribed fire and wildfire management, wildlife management, and manager efficacy. Questions also measured respondents environmental orientation (anthropocentric versus biocentric), overall satisfaction with forest management, and their involvement in forest decisions (e.g. attending public meetings, joining citizen advisory committees). Survey questions of interest included one satisfaction item, three process control items, four decision control items, and seven trust items.

The U.S. Office of Management and Budget (OMB) issued clearance for the survey on January 4, 2018, and the research was approved by the University of Montana's Institutional Review Board (IRB) on April 4, 2018. BBER formatted the hardcopy questionnaire and programmed and tested the internet survey using Qualtrics, Inc. software. Dr. Alex Metcalf of the University of Montana and Mr. Cory Davis of the SWCC approved the final questionnaire.

Survey Population Sampling

Random sampling was conducted by purchasing addressed-based residences from SSI Inc., Experian Inc., and GrowMail Inc. The study population consisted of 3,106 adults 18 years and older that lived in occupied dwellings listed on the U.S. Postal Service's Computerized Delivery Sequence file. These residents were then sampled from four U.S. Census Bureau block groups that overlapped with the study region. Institutionalized persons, homeless persons and those absent during the survey period were not sampled. In order to achieve within-household random sampling, the household member with the next birthday was asked to complete the survey. The next birthday method is a common technique in within-household random sampling (Battaglia et al., 2016; Link, Battaglia, Frankel, Osborn, & Mokdad, 2008).

To ensure that the survey is representative of the study population, survey weights were used to improve the accuracy of the estimates. Weighting data is supported in the literature as a

way to produce statistics that more accurately describe the survey population (Battaglia et al., 2016; Haziza & Beaumont, 2017; Rao, Hidiroglou, Yung, & Kovacevic, 2010). The survey was weighted in a three step process that is also widely accepted in survey research literature (e.g. Battaglia et al., 2016; Haziza & Beaumont, 2017; Haziza & Lesage, 2016). First, a base weight was calculated to account for the probability of selection of each individual in the sample. Next, the base weight was adjusted to account for non-response. Lastly, the nonresponse weight was calibrated to population control totals from the U.S. Census Bureau's American 2016 Community Survey five year estimates for the population of people 18 years and older. The Gest_Calibration module, developed by Statistics Canada, was used to obtain survey weight calibrations.

Data Analysis

An exploratory factor analysis was conducted utilizing the survey results representing trust, process control, decision control, and satisfaction. For trust, process control, and decision control, composite variables were constructed from the multiple survey questions linked to these elements. A full mediation model, adapted from Lauer et al. (2018), was used to test the relationship between process control, decision control and satisfaction. Finally, a path analysis was used to test: (1) the effect of process control on satisfaction; (2) the effect of process control on decision control; and (3) the combined effects of process control, decision control, and trust on satisfaction. Demographic variables, such as gender, age, and education were also included. An interaction term of decision control by trust was also included. A p-value of 0.05 was used to determine significance. All analysis was completed with Statistical Package for Social Scientists (SPSS).

Chapter 3 Draft Manuscript

This chapter is written for publication in Society and Natural Resources.

3.1 Introduction

Over the past two decades, there has been an increase in collaborative approaches to natural resource management (Cheng & Mattor, 2006; Cheng & Sturtevant, 2012; Mattor et al., 2019). Collaborative groups, known as collaboratives, are favored by local communities and agencies as a way to address the interconnected components of social-ecological issues (Cheng, 2006; Cheng & Sturtevant, 2012). As such, collaboration is reflected in natural resource policy, including the 2009 Collaborative Forest Landscape Restoration Program, the 2003 Healthy Forests Restoration Act, and the 2014 National Cohesive Wildland Fire Management Strategy (Vosick, 2016).

The congressionally established the Collaborative Forest Landscape Restoration Program (CFLRP) mandates the Forest Service to conduct landscape scale ecosystem restoration on national forests (Butler et al., 2015). This program allocated 10-year funding for restoration projects proposed by the Forest Service and a collaborative group representing that landscape (Schultz et al., 2017). There were 10 projects across the United States that were awarded CFLRP funding in 2010. As these projects near completion, we have a unique opportunity to evaluate how trust, between stakeholders and agencies, and public engagement in the forest management process, influences the overall success of a collaborative.

Success is often described as whether or not goals were reached, and is evaluated based on process (inclusiveness, legitimacy, fairness), outputs (plans, agreements), and outcomes (changed ecological, social, or economic conditions) (Rudeen, Fernandez-Gimenez, Thompson,

& Meiman, 2012). Success in reaching ecological goals can be measured in terms of vegetation structure, species diversity and abundance, and ecological processes (Wortley, Hero, & Howes, 2013). Social and economic indicators are also frequently used to measure collaborative success. There are several metrics of successful collaboration, including biophysical outcomes, economic impacts, adaptive management, and diffusion of institutional innovation (Rundeen et al., 2012). One approach to measuring collaborative success is to rely on a psychometric measure that focuses on individuals perceptions with collaborative processes and outcomes (Rudeen et al., 2012). This self-rating can reflect a perceived level of success, and at times may be more helpful in describing success of collaboration.

We can determine success of collaborative efforts in part by measuring stakeholder satisfaction, a multi-dimensional concept used to measure the difference between expectations and outcomes (Rudeen et al., 2012; Tindall et al., 2010). Adapted from research and literature studying the service quality, outdoor recreation research has integrated visitor satisfaction when studying visitor experiences and expectations (Lee et al., 2004; Tindall et al., 2010; Williams 1989). The Forest Service, along with other land management agencies, often utilize a uniform satisfaction measurement to gauge public perceptions. An analysis of public satisfaction can identify key variables, such as public engagement and trust, that are needed for stakeholder satisfaction.

Public engagement is an integral component to natural resource decision-making (Booth & Halseth, 2011; McGee, 2011; Saurí & Cerdan, 2003). Although federal agencies are attempting to integrate public engagement into forest management, traditional methods (i.e. public meetings, public comment periods) often result in low public satisfaction with participation and management outcomes (Booth & Halseth, 2011; Burton et al., 2003; Petts,

2008). Meaningful engagement opportunities can develop and strengthen relationships between stakeholders and agencies, and enhance public support for management decisions (McGee, 2011).

Agencies can adapt their standard engagement process to incorporate two dimensions of procedural justice that stem from social justice literature, process control and decision control (Lauer et al., 2018; Parkins & Mitchell, 2007). Process control exists when procedures provide citizens with opportunities to voice their opinions (Colquitt & Rodell, 2015; Lauer et al., 2018). Similarly, decision control exists when citizens can exert influence over outcomes (Colquitt & Rodell, 2015; Lauer et al., 2018). Recent research has shown that only providing opportunities for participation will not affect stakeholder satisfaction (Lauer et al., 2018). Rather, stakeholder satisfaction will increase when stakeholders believe their input was reflected in management decisions (Lauer et al., 2018). Incorporating both process control and decision control into collaborative processes can improve management outcomes and bolster trust among agencies and stakeholders.

Public trust in management agencies has been identified as a significant factor that determines successful engagement and management outcomes (Booth & Halseth, 2011; Davenport et al., 2007; Lachapelle & McCool, 2012; Leahy & Anderson, 2008; Winter et al., 2004). Trust is comprised of multiple components, and elements of trustworthiness have also been identified (Davenport et al., 2007; Smith et al., 2012; Stern & Coleman, 2015). Several case studies have found increased public support for management outcomes when public trust in the agency exists (Lachapelle & McCool, 2012; Vaske et al., 2007; Vogt et al., 2005; Winter et al., 2004). Often, trust determines the degree of political and social acceptability of management decisions and outcomes (Winter et al., 2004; Stern & Coleman, 2015). Building a trusting

relationship with the public can reduce the amount of time and money agencies spend on litigation and stalled planning efforts (Leahy & Anderson, 2008; Smith et al., 2013; Winter et al., 2004).

Additionally, the level of public trust in an agency can influence the level of public engagement. A trusting relationship between managers and the public has to exist for stakeholders to want to participate in the planning process (Sharp et al., 2012). Citizens that have repeated, positive interactions with managers are more likely to trust managers and the agency (Davenport et al., 2007). As such, citizens who trust in agencies are more likely to participate in future engagement opportunities and collaborative settings (Lachapelle & McCool, 2012; Gray et al., 2012). By adapting the public engagement process to be more meaningful, agencies can also strengthen public trust and increase overall satisfaction with forest management decisions.

It can be difficult for agencies to implement meaningful public engagement processes and build trusting relationships (Booth & Halseth, 2011; Irvin & Stansbury, 2004; Parkins & Mitchell, 2007; Steelman, 1997, 1999). They often face time, personnel, and financial constraints that prevent them from taking the necessary steps to make the public engagement process meaningful and to build trusting relationships (Cheng & Mattor, 2006; Vosick, 2016). Additionally, equal representation of stakeholders can be difficult to achieve (Booth & Halseth, 2011; Webler & Tuler, 2006). Despite these challenges, incorporating local viewpoints can increase public support for management decisions, create a less divisive audience for future management decisions, and lead to a long term, trusting relationship between managers and the public (Irvin & Stansbury, 2004; Vosick, 2016).

This work is guided by a conceptual framework that links the process influencing overall satisfaction with management decisions and natural resource collaboration (Figure 1). Process

control and decision control, two integral components of public engagement, are key components of this framework (Lauer et al., 2018). This framework illustrates the varying ways in which trust and public engagement are linked, as identified in the literature (Davenport et al., 2007; Sharp et al., 2012; Smith et al., 2012; Stern & Coleman, 2015). For example, agencies can increase trust by interacting with the public and involving citizens in management decisions (McGee, 2011). In turn, repeated positive interactions with agency personnel can increase trust in the agency and lead to future public participation (Vosick, 2016). These relationships contribute to overall satisfaction with management decisions, which can contribute to success in natural resource collaborations.

Figure 3. Conceptual framework of components relating to collaborative success. Adapted from Davenport et al., 2007; Sharp et al., 2012; Smith et al., 2012; Stern & Coleman, 2015.
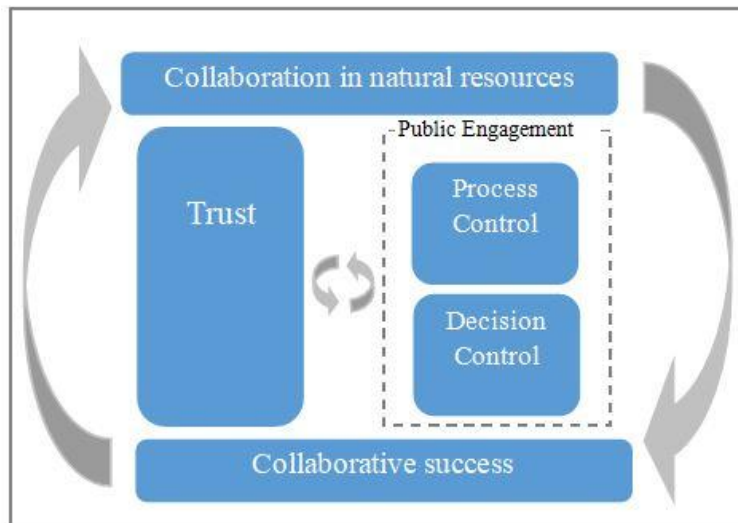
Here we evaluate satisfaction with collaborative approaches to forest management in western Montana. Specifically, we identify the relationship among trust, public engagement, and satisfaction to determine key predictors of satisfaction. We hypothesize that (1) decision control will partially mediate the relationship between process control and satisfaction, and (2) trust will

have a positive interaction with satisfaction. This research provides key predictors of satisfaction

and contribute to our understanding of how public satisfaction can contribute to success in

natural resource collaboration. These findings will provide managers with tangible solutions that

can be implemented by agencies to improve public engagement processes, bolster trust, and

increase overall public satisfaction.

3.2 Study Region

The Southwestern Crown of the Continent (Southwestern Crown, hereafter) is located in

western Montana in the Blackfoot, Clearwater and Swan river valleys. It is part of the larger

Crown of the Continent region, which links the Canadian Rockies with the Greater Yellowstone

Ecosystem and Selway-Bitterroot Wilderness areas to the south (Collaborative, 2010). The

Southwestern Crown encompasses 1.5 million acres, 70% of which is publically owned. The

Helena-Lewis and Clark, Flathead, and Lolo national forests manage 59% of the publically

owned area(Collaborative, 2010). This region contains areas of high conservation value,

including important habitat for grizzly bears, lynx, gray wolves and wolverines (Collaborative

2010). There is a history of intensive forest management and fire suppression in this area, which

provides for significant opportunities for ecological restoration on the public and private forests

in the Southwestern Crown.

The Southwestern Crown encompasses the rural communities of Condon, Seeley Lake,

Ovando and Lincoln, Montana. Approximately 9,000 people live in this landscape, which is less

than one person per square mile (Collaborative, 2010). The majority of the population is

Caucasian (<89%), with 49% female and 51% male (Headwaters Economics, 2019). These

communities have been faced with significant challenges over the last 20 years. As across the

western U.S., wildfire activity in the region has been increasing since the 1980's (Westerling,

2016). In 2007, the Jocko Lakes Fire burned over 36,000 acres and forced hundreds of residents to evacuation, and in 2017, the Rice Ridge Fire burned over 160,000 acres (Forest Service, 2018; Wall & Halvorson, 2011). The Rice Ridge Fire was one of the largest fires in Region 1 (encompasses northern Idaho, Montana, and portions of North Dakota) and was a national priority for firefighting resources and forced the evacuation of Swan Valley residents for weeks, with unhealthy air quality effects lasting even longer (Luth, 2018).

In addition to wildfires, these rural communities were negatively impacted by the declining timber market in the mid 2000's (SWCC, 2017). The Stimson Lumber Mill in Bonner closed in 2008, laying off over 100 employees, and in 2009, Smurfit-Stone closed its pulp mill in nearby Missoula (SWCC, 2017). The continuous decline in the timber market and low timber prices pose a threat to the rural communities of the Southwestern Crown. A declining economy and an inherently flammable landscape leaves this area susceptible to social, ecological, and economic hardships.

In response to the ecological and social challenges, the Southwestern Crown Collaborative (SWCC) was formed in July of 2009 after approval for a Collaborative Forest Landscape Restoration project. The SWCC was among the first round of proposals to be awarded funding. The collaborative group consists of local conservation groups, citizens, and Forest Service personnel from the Lolo, Flathead, and Helena-Lewis and Clark national forests. Over the past 10 years, the SWCC has been working to restore and promote social-ecological function. The success of this collaborative group can provide us with insight to the specific factors that contributed to its success and overall public satisfaction in this region.

3.3 Methods

We utilized survey results from a social monitoring survey administered from May 2018 through July 2018 in the Southwestern Crown. Random sampling was conducted by purchasing addressed-based residences from SSI Inc., Experian Inc., and GrowMail Inc. The study population consisted of 3,106 adults 18 years and older. These residents were then sampled from four U.S. Census Bureau block groups that overlapped with the study region. Institutionalized persons, homeless persons and those absent during the survey period were not sampled. Research methods and survey questions were approved by the U.S. Office of Management and Budget and the University of Montana Institutional Review Board before administering the survey.

Respondents were asked about their trust in managers, public engagement, and overall satisfaction with national forest management. Trust was measured with four items, including ranking agreement with the following statements: "Forest Service managers in my area are knowledgeable about forest management techniques," and "Forest Service managers in my area are sensitive to the local impacts of their decisions." Process control and decision control were measured with seven items, including the following statements: "There were ample opportunities for public input on Forest Service decisions," and "Providing public comment felt meaningless." One item was used to measure overall satisfaction (Table 6).

The survey was mailed and responses were collected via a hardcopy questionnaire or online. The sample population received four mail contacts during the survey. First, an introductory letter was mailed inviting participation in the survey via an online link. Second, a follow-up thank you letter was mailed to respondents and a reminder was mailed to non-respondents encouraging them to participate via the internet link. Third, a questionnaire packet was mailed to non-respondents, inviting participation via the internet link or by completing a

hardcopy questionnaire. Last, a second hardcopy questionnaire was mailed to non-respondents

and inviting participation by completing the questionnaire or the internet link. In order to achieve

within-household random sampling, the household member with the next birthday was asked to

complete the survey. Survey responses were weighted according to U.S. Census estimates to

ensure the survey was representative of the study population.

An exploratory factor analysis was conducted utilizing the survey results representing

trust, process control, decision control, and satisfaction. For trust, process control, and decision

control, composite variables were constructed from the multiple survey questions linked to these

elements. A full mediation model, adapted from Lauer et al. (2018), was used to test the

relationship between process control, decision control and satisfaction. Finally, a path analysis

was used to test: (1) the effect of process control on satisfaction; (2) the effect of process control

on decision control; and (3) the combined effects of process control, decision control, and trust

on satisfaction. Demographic variables, such as gender, age, and education were also included.

An interaction term of decision control by trust was also included. A p-value of 0.05 was used to

determine significance. All analysis was completed with Statistical Package for Social Scientists

(SPSS).

3.4 Results

The survey yielded a response rate of 42.4%. Respondents included 49% male and 50%

female (mean= 1.51, SD= 0.506, where 1 is male and 2 is female). The majority of respondents

(41%) had completed high school, and some reported college experience (44%). The highest

proportion of respondents (29%) reported earning between $25,001 to $50,000 annually. The age

demographic was left skewed, with 70.8% of respondents being over the age of 51 years (Table

1).

Table 1. Demographic results of sample population.

Variable	N	Mean (1-5)	SD	Valid Percent
Education	2876	3.26	1.493	
Grade School				3.3
High School Graduate/ GED equivalent				41.5
Some College				20.0
Associate's degree				7.0
Bachelor's degree				17.2
Post Graduate (e.g. Master's degree or PhD)				11.1
Age	2817	1960	15.71	
18-30				6.7
31-40				10.8
41-50				11.8
51-60				26.0
61+				44.8
Gender	2897	1.51	0.506	
Male				49.3
Female				50.4
Other				0.3
Income	2494	2.62	1.322	
Less than $25,000				23.4
$25,001 to $50,000				29.6
$50,001 to $75,000				22.8
$75,001 to $100,000				10.2
$100,001 or more				14.0

Overall, residents were not satisfied with forest management. Satisfaction had a bi-modal distribution, with modes around very unsatisfied and somewhat satisfied. Over 59% of residents reported being dissatisfied with forest management (mean= 2.54, SD= 1.33). Respondents believed process control, or opportunities for public participation, existed in the community (Table 2) (mean= 3.07, SD= 1.076). Respondents agreed that there were opportunities for

participation through public comments, however 43% of respondents did not feel involved in the decision making process.

Table 2. Process Control items with sizes, means, standard deviations, and valid percents.

| | | | | Valid Percent | | | | |
Variable	N	Mean (1-5)	SD	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
I had opportunities to comment on management	3015	3.07	1.076	9.8	18.8	32.4	32.6	6.4
There were ample opportunities for public input	2993	2.88	1.084	12.1	24.5	31.4	27.4	4.7
Local community was involved in management decisions	2963	2.75	1.145	16.2	27.2	26.9	24.5	5.2

Similarly, decision control existed when participants could exert influence over management decisions, and was positively linked to stakeholder outcomes (Lauer et al., 2018). Despite the ample public comment opportunities, decision control was absent in this community (Table 3). Over 60% of respondents felt that public comments were meaningless and not seriously considered. Respondents believed decisions were already made before the public comment period and did not represent the community's concerns (mean= 2.53, SD= 1.027).

Table 3. Decision Control items with sizes, means, standard deviations, and valid percents.

Variable	N	Mean (1-5)	SD	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
					Valid Percent			
Public comments were seriously considered	2989	2.45	1.066	23.9	25.6	34	14.5	2
Decisions were already made before public comment	3005	3.71	1.017	2.7	8.7	27.9	36	24.7
Providing public comment felt meaningless	2937	3.69	1.062	3.4	10	26.4	34.8	25.5
Final decisions balanced the concerns of most people	2977	2.53	1.027	18.4	29.4	34.9	14.9	2.3

Overall trust in forest managers was lacking, as 50.3% of respondents reported not trusting managers to make proper decisions (Table 4). Respondents felt that managers were not sensitive to the local impacts of forest decisions (mean= 2.74, SD= 1.228). Although respondents did not believe managers have similar forest management goals as communities, 46% of respondents viewed managers as competent and knowledgeable about forest management techniques.

Table 4. Trust items with sizes, means, standard deviations, and valid percents.

Variable	N	Mean (1-5)	SD	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
					Valid Percent			
Managers have similar goals as I do	2986	2.58	1.158	23.5	23	28	22.5	2.9
Managers are knowledgeable about management techniques	2999	3.05	1.16	13.9	18.5	21.2	41.6	4.7
Managers are sensitive to local impacts of decisions	3004	2.74	1.228	21.3	22.5	22.4	28.5	5.4
I trust managers to make proper decisions	3010	2.54	1.203	25.8	24.5	22.6	23.5	3.5

Our results are consistent with the model presented by Lauer et al. (2018), given that we found decision control partially mediated the relationship between process control and satisfaction. We also expanded on the work of Lauer et al. (2018) by incorporating trust and demographic variables into the path analysis (Figure 4). When trust, process control and decision control were included in the model, decision control still partially mediated the relationship between process control and satisfaction; however, trust emerged as the strongest predictor of satisfaction (β=0.538, p<0.001). Demographic variables, including education, age, and gender were also included in the model (Table 5, 6). Education was the only significant demographic variable in the model (β=0.074, p<0.001), and the model yielded an R^2 value of 0.504. This R^2 value indicates that 50% of the variance in satisfaction can be explained by trust, process control, decision control, and education.

Figure 4. Path analysis model. An asterisk indicates a p-value less than 0.05.
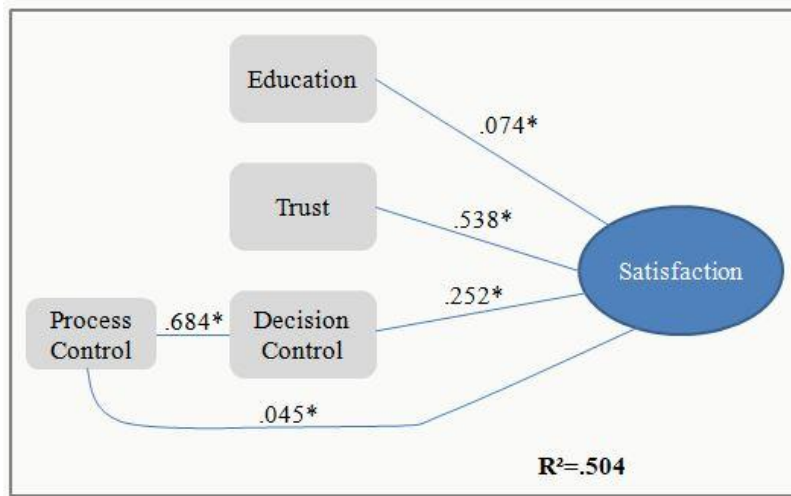
Table 5. Unstandardized coefficients, standardized coefficients, and p-values values for items included in the path analysis.

Items	Unstandardized Coefficients		Standardized Coefficients		
	B	Standard Error	Beta	t	*p*-value
Process Control	-0.072	0.03	-0.052	-2.387	0.017
Decision Control	0.416	0.038	0.253	10.961	0.000
Trust	0.674	0.028	0.533	24.219	0.000
Gender	-0.051	0.04	-0.019	-1.29	0.197
Age	0.025	0.019	0.019	1.313	0.189
Education	0.122	0.025	0.074	4.982	0.000

Table 6. Item means, standard deviations, factor loadings, and Cronback a for composite variables.

Composite Variables	Mean (1-5)	SD	Factor loading	Cronbach *a*
Trust	**2.73**	**1.05**		**0.912**
Managers have similar goals as I do	2.58	1.158	0.859	
Managers are knowledgeable about management techniques	3.05	1.16	0.891	
Managers are sensitive to local impacts of decisions	2.74	1.228	0.912	
I trust managers to make proper decisions	2.54	1.203	0.895	
Process Control	**2.89**	**0.991**		**0.88**
I had opportunities to comment on management	3.07	1.076	0.899	
There were ample opportunities for public input	2.88	1.084	0.925	
Local community was involved in management decisions	2.75	1.145	0.872	
Decision Control	**2.39**	**0.831**		**0.821**
Public comments were seriously considered	2.45	1.066	0.839	
Decisions were already made before public comment	3.71	1.017	0.808	
Providing public comment felt meaningless	3.69	1.062	0.833	
Final decisions balanced the concerns of most people	2.53	1.027	0.743	
Satisfaction				
Overall, how satisfied or unsatisfied are you with forest management?	**2.45**	**1.336**		
Education	**3.26**	**1.493**		

3.5 Discussion

Overall, public satisfaction with forest management was lacking in our study area. Our findings highlight that simply enhancing public engagement opportunities will not affect overall

satisfaction. Community members and stakeholders need to see how their feedback shaped the final decision. Our results and past research (Lauer et al., 2018) suggest that emphasizing how public input was used will bolster public satisfaction, opposed to only providing opportunities for input. Incorporating decision control can be challenging as agencies cannot legally relinquish decision-making authority to external stakeholders (Butler et al., 2014). However, the process of arriving at a decision can be as valuable as the decision itself (Schindler, 2004). It is imperative for managers to be transparent regarding their evaluation of public input, and how that input influenced the final decision. It is arguably more important for managers to communicate why and how decisions were made, especially if those decisions do not reflect local views (Lauer et al., 2018).

Trust was the strongest predictor of satisfaction in our path analysis. As such, trust between residents and agency managers has to exist in order for collaboration to be successful. In the population studied here, managers were not sensitive to local impacts of their decisions, and did not share similar forest management goals as residents. However, residents agreed that managers were competent and knowledgeable. This highlights the need of agency personnel demonstrating that they share similar management views as the public. For example, if the community values a timber economy, managers can highlight past and present timber sales that have stimulated local economies. Sharing information about current projects will allow citizens to see what measures agencies are taking to incorporate community values into national forest decisions. Agencies can also foster a relationship with the community by meeting with citizens in a formal setting, getting to know residents on a personal level, and establishing rapport with community leaders. These actions will bolster trust and improve public satisfaction with management actions.

Although trust was the strongest determinant of satisfaction in our study, trust and decision control could be strongly intertwined. For example, stakeholders that trust an agency are more likely to participate in the decision-making process (Sharp et al., 2012). If managers are transparent in their decisions by communicating how public input is reflected in the final decision, citizens are more likely to trust managers. In turn, citizens that trust managers and have perceived influence over final decisions are more likely to be satisfied with the management outcome. This demonstrates that a feedback loop could exist between decision control and trust. By focusing on these two components, agencies can boost overall satisfaction while simultaneously increasing trust and decision control.

Numerous studies have established trust as a significant factor in successful engagement processes and management outcomes (Booth & Halseth, 2011; Davenport, Leahy, Anderson, & Jakes, 2007; Lachapelle & McCool, 2012; Leahy & Anderson, 2008; Winter, Vogt, & McCaffrey, 2004). This study tested this assumption in rural communities in southwest Montana. Trust was measured quantitatively, where as other trust metrics are qualitative, hypothetical, or theoretical (Coleman, Stern, & Widmer, 2017; Stern & Baird, 2015; Stern & Coleman, 2018).

The results confirmed that trust in the agency has a positive, direct effect on public satisfaction. This finding furthers our understanding of the role trust plays in management processes, and demonstrates how trust and public satisfaction are linked. Our results suggest that trust influences satisfaction, however this relationship could be reversed with satisfaction influencing trust. Further research is needed to explore the directionality of this relationship as no significant findings were identified in the literature.

Data for this survey were obtained from a social monitoring survey conducted in 2018 to understand how the public perceived a suite of forest management factors, such as prescribed

burns, wildfire management, ecosystem management, removal of noxious weeks, and decommissioning forest roads. Although this survey contained a collaborative component, the survey was not explicitly designed for an in-depth evaluation of trust, public engagement, and satisfaction; instead the survey was adapted to gain insights into the research questions posed here.

Additionally, the survey does not contain a robust measure of trust. The primary researchers were constrained by the types of questions they could ask as the Office of Management and Budget (OMB) and Forest Service managers were intimately involved with the survey design. Items were included on the survey that were not a complete measure of trust. Only four out of seven trust items measured trust as presented by Stern and Coleman (2015). For example, items including "Forest Service managers in my area do a good job communicating with the public," and "My interactions with Forest Service managers in my area have been generally positive," were items that managers requested on the survey, but did not directly measure components of trust (Stern & Coleman, 2015). A more complete measurement of trust should exist in order to properly analyze its effect on satisfaction.

This study utilized path analyses with linear regressions for data analysis. Process control, decision control, and trust had linear relationships with satisfaction. Collinearity did not exist as our VIF scores ranged from 2.2 to 2.5, and tolerance scores ranged from 0.39 to 0.45. Individual cases were not unduly influencing the model, as indicated by a Cook's Distance value less than 1. However, satisfaction was not normally distributed; rather, there was a bimodal distribution with modes around very unsatisfied and somewhat satisfied. We can infer correlation among process control, decision control, and trust with satisfaction. While we cannot infer causation, our model suggests strong correlation between trust and satisfaction.

Our research identified factors that contributed to satisfaction in rural communities in western Montana. Successful collaborative management requires public participation, clear understanding of how public input influenced final decisions, and trust in agencies. These factors will not only contribute to collaborative processes, but increase public satisfaction with national forest management. Increasing public satisfaction is imperative for management agencies as it can increase support for the management decision, increase future public participation, and decrease the likelihood of litigation (Lachapelle & McCool, 2012; Smith et al., 2012; Vosick, 2016). Further research is needed to understand if and how these factors change according to different national forests and communities. These findings can provide stakeholders, collaborative groups, and agencies with insight into better natural resource decisions and forest management.

Chapter 4

4.1 Discussion

Theoretical Implications

Collaborative success correlate to public satisfaction with management actions. This study suggests that process control and decision control are two important factors that contribute to satisfaction, while trust is the strongest predictor of satisfaction. These findings contribute to a limited field of understanding of satisfaction in natural resource management (Secco et al., 2019; Sheppard, 2003; Tindall et al., 2010). This study also provides researchers with key predictors (i.e. trust and public engagement) to evaluate collaborative success. Several metrics of successful collaboration have been identified through past research (e.g. biophysical outcomes and economic impacts), and this study provides three additional metrics to analyze in different collaborative settings.

It is well established that trust is a significant factor in successful engagement processes and management outcomes (Booth & Halseth, 2011; Davenport, Leahy, Anderson, & Jakes, 2007; Lachapelle & McCool, 2012; Leahy & Anderson, 2008; Winter, Vogt, & McCaffrey, 2004). Trust is also a key factor in successful planning processes (Booth & Halseth, 2011). Often, the perception of process fairness is based upon the degree of trust that stakeholders have in an agency (Cheng & Mattor, 2006; Winter et al., 2004). This study tested these assumptions in rural communities in southwest Montana. Trust was measured quantitatively, where as other trust metrics are qualitative, hypothetical, or theoretical (Coleman, Stern, & Widmer, 2017; Stern & Baird, 2015; Stern & Coleman, 2018).

The results confirmed that trust in the agency has a positive, direct effect on public satisfaction. This finding furthers our understanding of the role trust plays in management

processes, and demonstrates how trust and public satisfaction are linked. This finding can be tested in different collaborative and management contexts to understand how trust affects management processes and collaborative success. Our results suggest that trust influences satisfaction, however this relationship could be reversed with satisfaction influencing trust. Further research is needed to explore the directionality of this relationship as no significant findings were identified in the literature.

This study confirmed that decision control has a positive, significant relationship on public satisfaction. As there have been recent efforts to understand how specific components of public engagement (process control, decision control) will influence public satisfaction with management outcomes, this finding deepens our knowledge regarding the interaction of public engagement and stakeholder satisfaction (Lauer et al. 2018). It also provides researchers with a thorough understanding of what successful public engagement entails. These procedural justice constructs can be applied to collaborative research to strengthen engagement processes and lead to better outcomes for those involved.

Managerial Implications

Trust was identified as the most important factor when predicting satisfaction with management outcomes. The sampled population did not feel that managers were sensitive to the local impacts of their decisions and did not share similar goals as residents. Yet, residents agree that managers are competent and knowledgeable about forest management techniques. To bridge this perceived gap, agencies should highlight current and past management actions that align with public values toward national forests. For example, if the community values a timber economy and wants to see more timber harvested, the Forest Service can provide details on harvested acreage. Sharing information about current projects will allow citizens to see what

measures agencies are taking to incorporate community values into national forest decisions. Agencies can communicate this information and foster a relationship with the community by meeting with citizens in an informal setting, publishing correspondence in a local newspaper, and establishing rapport with community leaders. These actions will bolster trust between the public and the agency, as well as improve public satisfaction with management decisions.

Investing in social relationships will improve public trust in agencies and increase public participation. In addition to traditional engagement opportunities (e.g. public meetings and comment periods), agencies should implement a more robust engagement process. Providing alternative ways for public engagement can foster a relationship between managers and the public, such as connecting with community leaders and visiting with citizens at monthly breakfast meetings. These opportunities will create a rapport between managers and the community, and increase future public participation.

However, only providing opportunities for input will not increase public satisfaction. The results of this study and past research (Lauer et al., 2018) suggest that emphasizing how public input was used will increase public satisfaction. It will not be enough to simply increase interactions between managers and the public. Citizens need to be involved and have a perceived influence over the final management decision in order to be satisfied with the outcome. It is imperative for managers to be transparent when evaluating public input, and communicate how and why decisions were made, especially if those decisions do not reflect local views (Lauer et al., 2018).

Agencies should focus on strengthening public trust and incorporating decision control into management decisions, as results of this study indicate that trust and decision control could be strongly intertwined. For example, public trust in an agency results in more public

participation in the decision-making process (Sharp et al., 2012). When managers are transparent in their decisions and communicate how public input is reflected in the final decision, citizens are more likely to trust managers. As such, citizens that trust managers have a perceived influence over final decisions and are more likely to be satisfied with the management outcome. This demonstrates that a feedback loop could exist between decision control and trust. Therefore, agencies can boost overall satisfaction while simultaneously increasing trust and decision control.

Successful collaborative processes require trust in agencies, public participation, and a clear understanding of how public input influences final decisions. As collaborative approaches grow in natural resource decision making, it is imperative that agencies understand and incorporate these factors to make collaboration meaningful. Trust and public engagement will not only contribute to collaborative success, but increase future public participation and decrease the likelihood of litigation (Lachapelle & McCool, 2012; Smith et al., 2012; Vosick, 2016).

Study Limitations

This study utilized secondary data analysis from a quantitative social monitoring survey. Data were collected to understand how the public perceived a suite of forest management factors, such as prescribed burns, wildfire management, ecosystem management, removal of noxious weeds, and decommissioning of forest roads. The survey had already been administered, which did not allow for my participation in the development of the survey. Although there was a collaborative component, the survey was not explicitly designed to address the research questions of this thesis, but instead were adapted to gain insights into the research questions posed here. Another disadvantage of secondary data analysis is the researcher doesn't participate in the data collection. This can limit the researchers understanding of the data collection process.

This issue was alleviated by obtaining data collection methods from technical reports and consulting with the primary researchers.

Additionally, there was not a robust measure of trust on the survey. The primary researchers were constrained by the types of questions they could ask. The Office of Management and Budget (OMB) and Forest Service managers were intimately involved with the survey design and required some questions that were not an accurate measure of trust. Only four out of seven trust items measured trust in a consistent way with the literature (Stern & Coleman, 2015). For example, items including "Forest Service managers in my area do a good job communicating with the public," and "My interactions with Forest Service managers in my area have been generally positive," were items that managers requested on the survey, but did not directly measure components of trust (Stern & Coleman, 2015). A more complete measurement of trust should exist in order to properly analyze its effect on satisfaction.

Similarly, there was only one measure of satisfaction on the survey. Respondents were explicitly asked if they were satisfied with forest management. This measure allows us to gauge how the public is satisfied or dissatisfied with forest management. However, satisfaction was being used as a proxy for success. Success is often measured with multiple items in order to establish an accurate measurement (Rudeen et al., 2012). Including additional satisfaction items could have yielded a better representation of satisfaction among respondents.

This study utilized path analyses with linear regressions for data analysis. Process control, decision control, and trust had linear relationships with satisfaction. Collinearity did not exist as the VIF scores ranged from 2.2 to 2.5, and tolerance scores ranged from 0.39 to 0.45. Individual cases were not unduly influencing the model, as indicated by a Cook's Distance value less than 1. However, satisfaction was not normally distributed; rather, there was a bimodal

distribution with modes around very unsatisfied and somewhat satisfied. As such, the results infer correlation among process control, decision control, and trust with satisfaction. While the results do not infer causation, the model suggests strong correlation between trust and satisfaction.

The social monitoring survey was conducted to inform Forest Service managers and members of the Southwestern Crown Collaborative. However, this survey only provides a cross sectional glimpse of how people feel about forest management. Part of monitoring is repeated inquiry. One survey is not monitoring; this survey establishes a baseline of social perceptions toward forest management. Additional surveys should be conducted to understand how the concepts (e.g. trust and satisfaction) evolve over time.

Future Direction

Future research should evaluate the relationship between public engagement, trust, and satisfaction across other collaboratives associated with CFLR programs. Ten projects across the United States were awarded CFLRP funding in 2010. Thirteen additional projects received funding that will expire in 2022. Researchers have the opportunity to evaluate collaborative processes between local stakeholders and agencies over 10 years. The social monitoring survey utilized by the Southwestern Crown Collaborative was approved by OMB for use across any national forest. This approval provides managers with a unique opportunity to gather social data on how collaborative management impacted their national forest and surrounding communities.

Additional research in the Southwestern Crown study region should build upon the social baseline established by the 2018 survey. An additional survey in 2021 could evaluate how public satisfaction has evolved with forest management after large fire events and salvage logging sales in the area in 2017 and 2018. The survey could also track the progress of the Southwestern

Crown Collaborative after completion of the CFLRP funding. The data acquired would

contribute to agency and researcher understandings of how key factors influence satisfaction.

Appendix 1. Key Informant Interview Instrument.

SWCC Key Informant Phone Interviews

Tell me your experience with the Collaborative

      [Probe] What was the community response to the Collaborative?

      [Probe] Is there equal participation among community members?

Tell me your experience with forest management in the area

      [Probe] Has the Collaborative been beneficial to forest management?

      [Probe] What forest management techniques do you see happening on the landscape?

Tell me your experience with wildfire in the area

      [Probe] Has the Collaborative been beneficial to wildfire?

      [Probe] Has prescribed burning, thinning, etc. been effective in reducing fire severity?

Prior to the Collaborative, what was the relationship between land management agencies and the community?

How has the relationship between the land management agencies and the community changed since the Collaborative formed?
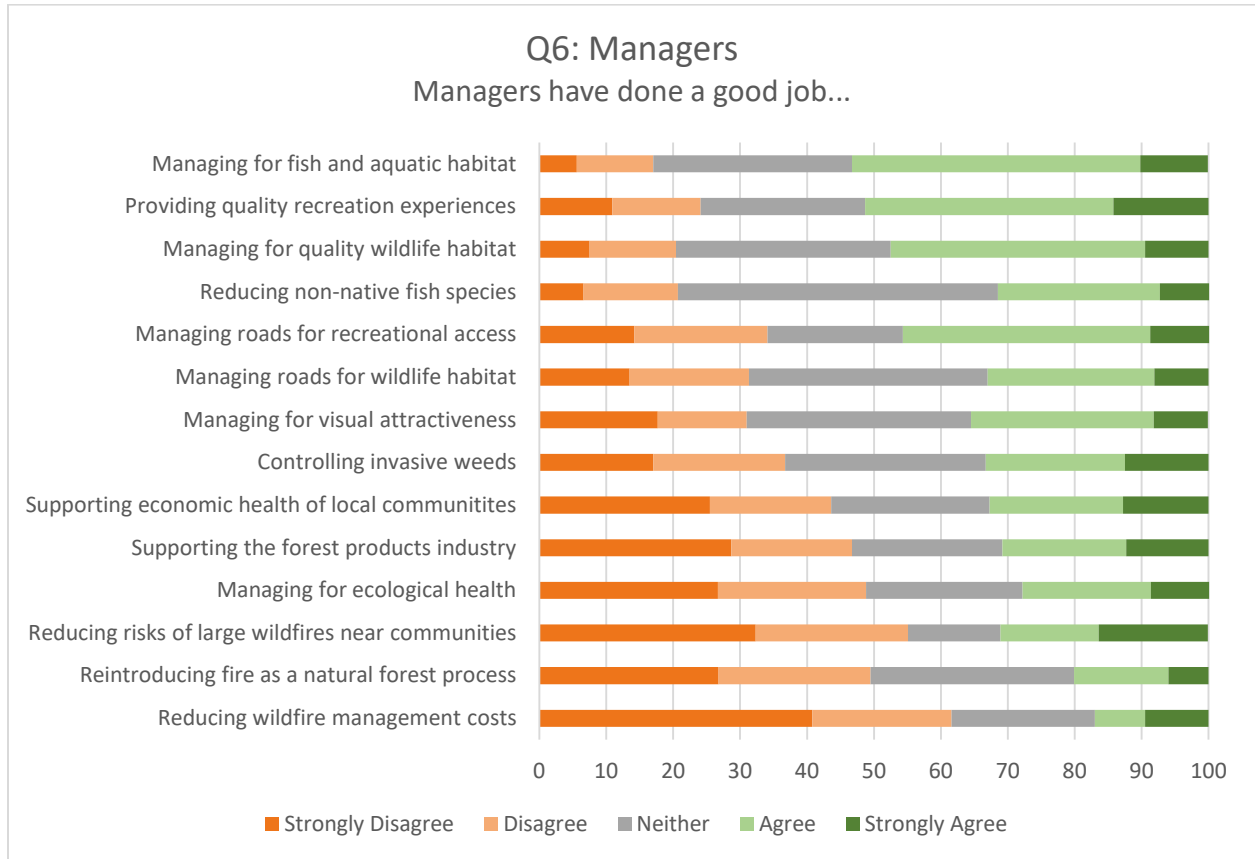
      [Probe] What is the future of the Collaborative?

Appendix 2. Importance scores for various forest management goals.
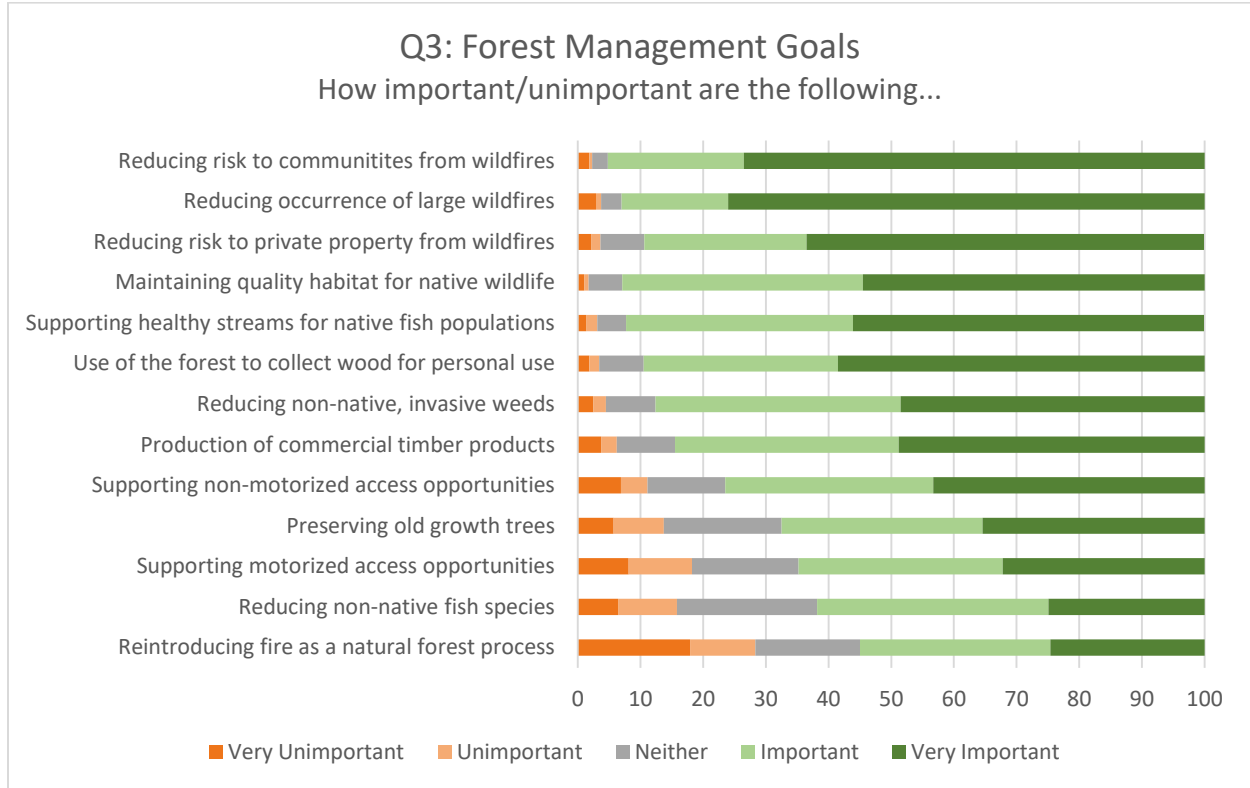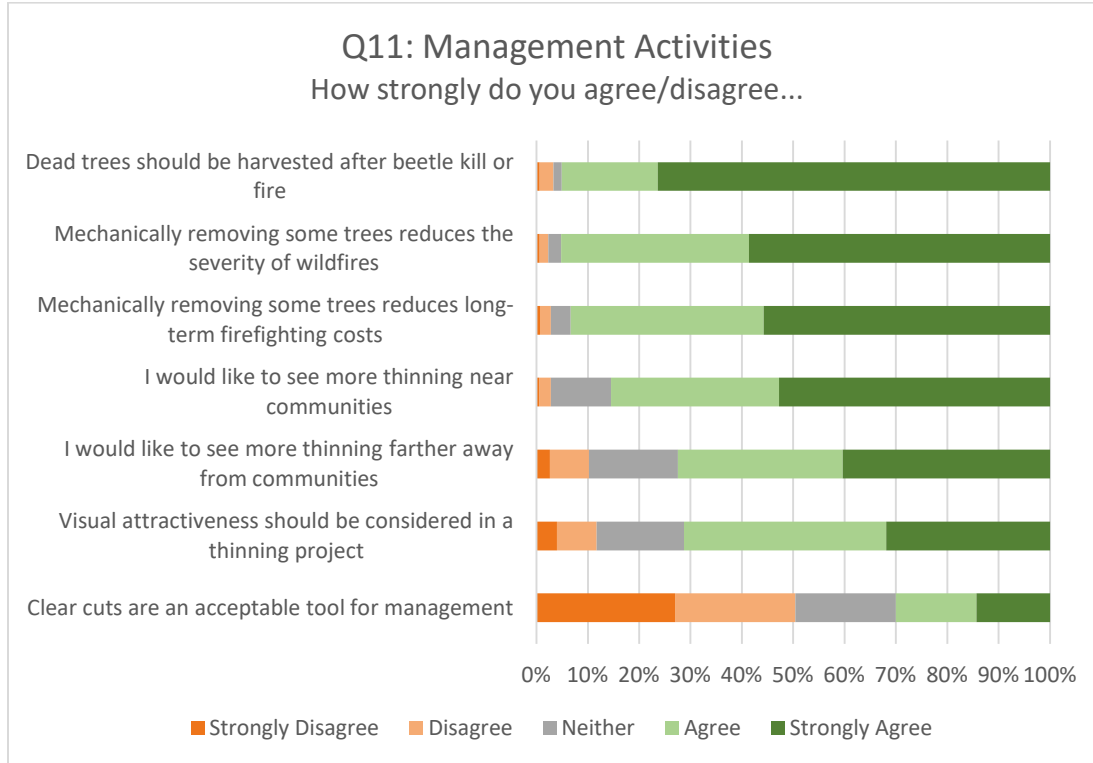

Responses were based on a five-point Likert scale with 1= Very Unimportant, 2= Unimportant, 3= Neither, 4= Important, 5= Very Important.

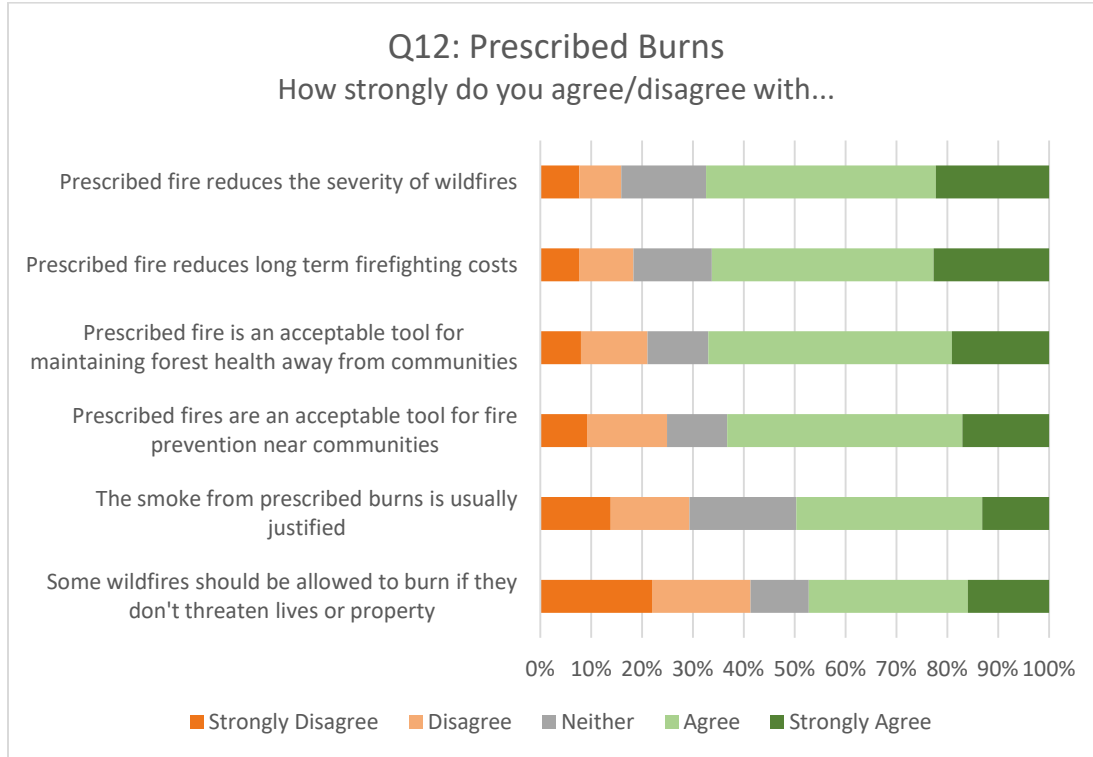**Appendix 3.** Approval scores for manager performance.

Responses were based on a five-point Likert scale with 1= Strongly Disagree, 2= Disagree, 3= Neither, 4= Agree, 5= Strongly Agree.

Appendix 4. Approval scores for mechanical thinning measures.

Q11: Management Activities
### How strongly do you agree/disagree...

Responses were based on a five-point Likert scale with 1= Strongly Disagree, 2= Disagree, 3= Neither, 4= Agree, 5= Strongly Agree.

Appendix 5. Approval scores for prescribed fire measures.

Responses were based on a five-point Likert scale with 1= Strongly Disagree, 2= Disagree, 3= Neither, 4= Agree, 5= Strongly Agree.

**Appendix 6.** Public involvement methods utilized by respondents.

Q13: Public Involvement
Have you been involved in NF decision making process by...
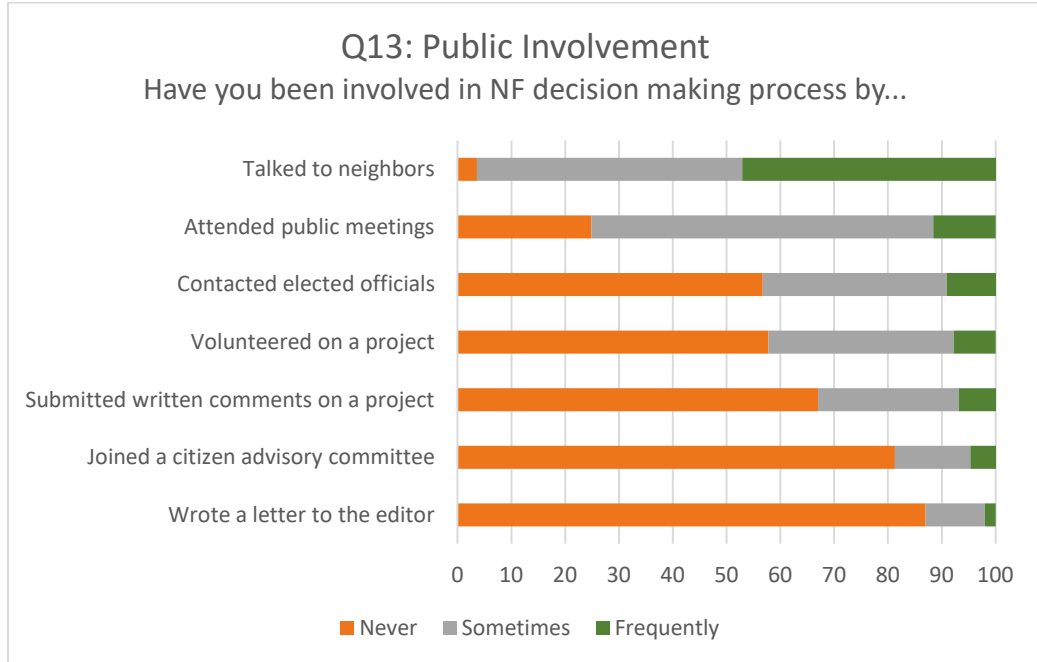
Appendix 7. Component matrix of trust measures from survey.

Trust Component Matrix

	Component
	1
Managers have similar goals for the forests as I do	0.818
Managers are knowledgeable about forest management techniques	0.871
Managers are sensitive to local impacts	0.898
Managers do a good job communicating with the public	0.857
My interactions with managers have been generally positive	0.853
I trust local Forest Service managers to make proper decisions	0.857
I personally know and interact with local Forest Service employees	0.368

Appendix 8. Diagram illustrating decision control's partial mediation on process control and satisfaction. *An asterisk indicates a p-value less than 0.05.*
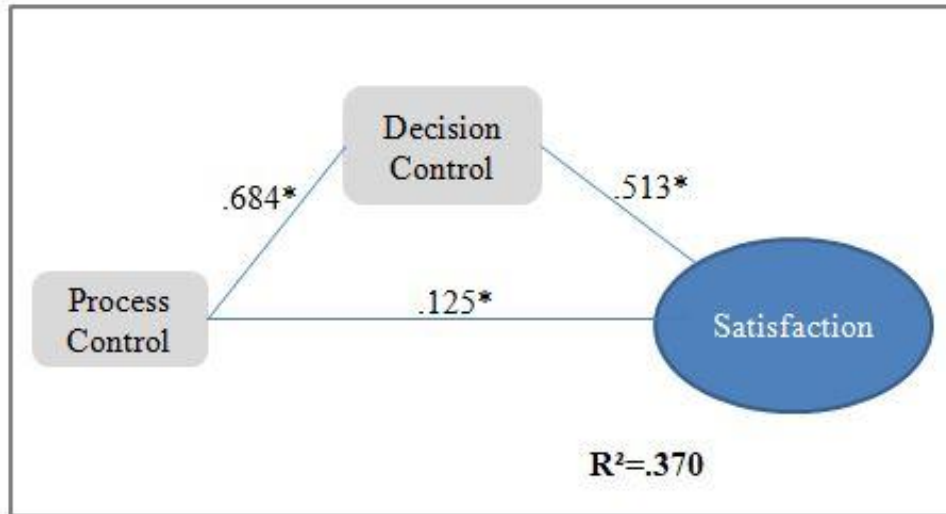
Appendix 9. Path analysis with interaction term. An asterisk indicates a p-value less than 0.05.
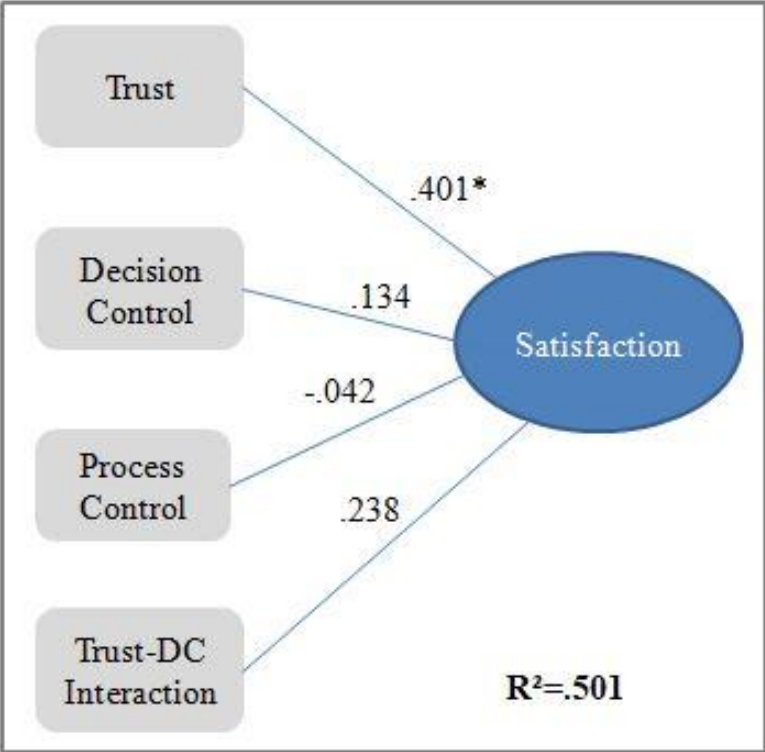
Appendix 10. *Unstandardized coefficients, standardized coefficients, and significance values for*

items included in the path analysis with interaction term.

Item	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Significance
Process Control	-0.058	0.03	-0.042	-1.93	0.054
Decision Control	0.22	0.072	0.134	3.054	0.002
Trust	0.507	0.061	0.401	8.293	0
Interaction	0.073	0.023	0.238	3.17	0.002

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