

Northern Minnesota Logger Conservation Action:
Social, Moral, and Business Norms and Profitability

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Abstract

This study explores the drivers of decision making and conservation action among northern Minnesota loggers, and in particular the relationship between perceived norms and profitability. Twenty interviews were conducted with loggers in northern Minnesota and analyzed using an adapted grounded theory approach. Study findings reveal that personal, business and social norms are powerful determinants of logger decision making. However, recent strains on profitability, as well as a perceived disconnect within the supply chain (i.e., wood suppliers, loggers and mills) constrain conservation action. This study adds to the growing body of research on conservation behaviors (e.g., recycling, energy consumption, and farming) of resources users through an inductive investigation of the conservation decisions of loggers, a relatively understudied social group. A better understanding of logger decision making will enable forest managers and policy makers to better evaluate and enhance conservation programming, timber sale policies, and forest management guidelines based on the experiences and perceptions of loggers.

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CHAPTER ONE

PROJECT BACKGROUND AND STUDY INTRODUCTION

Minnesota's timber industry is one of the largest industries in Minnesota, employing about 36,000 people (MFI Forest Facts Economy, 2008), predominantly in mills or wood products manufacturing companies. Even though loggers only represent 2,500 of these employees, they are the backbone of the industry (MFI Forest Facts Economy, 2008). All the wood harvested by loggers is used in wide variety of forest products worth over \$8.6 billion annually (MFI Forest Facts Economy, 2008). Logger decision making and actions are critical to the timber industry and its long term sustainability. In addition, loggers' actions through timber harvests are the main avenue to manage forests. Successful forest management not only promotes timber production and regeneration, but a variety of other objectives including wildlife habitat and recreation opportunities. Since the late 1970s, a few studies have gathered information about logging businesses (i.e. size, employees, education level, community demographics) or have focused on increasing understanding of loggers' occupational choice and perspectives on educational/training programs (e.g., Egan 2009; Milauskas and Wang 2006; Keefer 2003; Egan and Taggart 2004; Bihun and Jones 1993; Monteith and Taber 1979; Kilgore et al. 2007). However, no studies found to date have examined what drivers and constrains logger decision making and conservation actions out in the forest.

The programs and policies for public land timber sales can impact the type and amount of retained trees, both living (leave trees) and dead, which can then affect other post-harvest ecological conditions such as the future forest composition, structure, and

productivity. Along with utilization, timber sale programs and policies can impact public land management agency's revenue and administrative costs. The type of payment method, as well as the characteristics of a logging operation (i.e., equipment type, number of employees, chipping versus round wood, etc.) are likely to have a pronounced influence on logger decision making and conservation actions in the forest.

To harvest timber on public lands, a logger must first bid on and purchase the harvesting rights for a tract of forest in a public auction. Before signing a contract, the payment method must be agreed upon by the buyer and seller; this often happens prior to the bidding process. In Minnesota, there are two predominant payment methods for timber harvesting: consumer scale and sold-on-appraised-volume (SOAV). Under the consumer scale approach, a buyer pays for the timber based on the amount harvested and scaled at a mill. The buyer only pays for the actual volume removed from a site. Under SOAV, a buyer pays a fixed amount (i.e., lump sum) for the timber based on an appraisal estimate, regardless of how much actually is harvested. The buyer could end up taking more or less timber than was appraised for the same dollar amount. In Minnesota, the USDA Forest Service and Cass County Land Department are the only public agencies that exclusively sell timber under SOAV. The Minnesota DNR and most other county land departments sell timber under both methods.

Public land management agencies and policymakers need a better understanding of the ecological, economic, and social tradeoffs associated with each payment method to make informed management and policy decisions regarding timber sales. The University of Minnesota partnered with the Minnesota Department of Natural Resources, St. Louis County Land and Minerals Department, Cass County Land Department, and the Minnesota Logger Education Program to evaluate the timber

payment methods from an ecological, economical, and social perspective. This project sought to evaluate:

1. How the two timber payment methods impact post-harvest forest ecological conditions;
2. The cost-effectiveness of Minnesota's public timber sale programs; and
3. How natural resource managers and loggers perceive each of these payment methods.

The project goal was to provide Minnesota's public forest management agencies and policymakers with information that can help them identify economic and ecological tradeoffs associated with each payment method.

While it is easy to assume that the payment method is an institutional driver or constraint to decision making and conservation action, understanding *how* each method influences conservation action and *what* other factors exist that may independently or interactively influence conservation action is extremely important. For example, to what extent do social and moral norms influence decision making and conservation action? Loggers commonly interact and exchange knowledge with landowners, public agency personnel, foresters, and other loggers in their jobs. The remainder of this paper will focus more specifically on the social portion of this study: examining the drivers and constraints to decision making from the logger and public land management agency perspective.

The Timber Harvesting and Forest Management Guidelines developed by the Minnesota Forest Resource Council (2013) lay out the site-level forest management guidelines for loggers, landowners, and resource managers that are voluntary in

Minnesota. Guidelines focus on riparian zone management, wildlife habitat, historical/cultural resources, and forest soil productivity considerations. Although 'voluntary', nearly all of Minnesota's land management agencies require adherence to many of the guidelines as part of the timber harvesting contract. A contract might entail following guideline X, Y, and Z, for example. Violations of the timber harvesting contracts, and thus the guidelines listed within, by loggers on public lands can result in penalty fees or even prevention of bidding on future sales. However, the voluntary guidelines are not enforced on private land timber harvests. Loggers' perceptions and actions towards the guidelines are one way to evaluate their decision making and conservation action.

Study data were gathered using a qualitative approach. Researchers administered in-depth interviews and focus groups with key informants, and used qualitative analysis procedures to overarching themes, as well as diverging and converging ideas related to the research focus. Twenty in-depth interviews, plus four focus groups, were conducted with loggers. In addition, twelve in-depth interviews were conducted with natural resource managers.

The overriding goal of the study was to assess drivers and constraints to decision making and conservation action among loggers in northern Minnesota, in addition to evaluating perspectives about the timber payment methods. The following research questions are the focus of this paper:

1. What drives decision making and conservation action among loggers in Minnesota?

2. What constrains decision making and conservation action among loggers in Minnesota?
3. What role does timber payment method play in influencing decision making and action?
4. What role do norms play in influencing decision making and action?

The study goals are to enhance understanding of what influences logger decision making and how these drivers and constraints affect conservation action in the forest. The study offers a logger decision making framework that will assist Minnesota's public land management agencies and policymakers in developing and evaluating timber sales and forest management programs with loggers perspectives in mind. Specific recommendations are provided to better structure timber sale contracts and environmental guidelines to most achieve the desired results in the forest post-harvest.

This thesis is comprised of five chapters: (1) project background and study introduction, (2) a review of logger decision making research, (3) study methodology, (4) study findings from logger interviews, and (5) discussion.

Chapter Four is presented as a standalone manuscript intended for submission to a peer-reviewed journal article for publication. The manuscript examines the decision making and actions of loggers in northern Minnesota based on interviews with 20 loggers. A better understanding of decision making and conservation action is needed to ensure the long-term sustainability of Minnesota's timber industry and the successful management of its public forests. Key informant interviews and inductive data analysis reveal social, moral, and business norms as well as profitability as primary determinants of logger decision making. These dimensions and their subthemes are described by

participants as both drivers and constraints to decision making, and ultimately each dimension can significantly influence logger conservation action. In addition to describing the determinants of logger decision making, another important theme that will be discussed is the disconnect in the timber supply chain between natural resource agencies, loggers, and mills.

CHAPTER TWO

A REVIEW OF LOGGER DECISION MAKING RESEARCH

Past studies of loggers across the U.S. have focused on logger demographics, occupational choice and perceptions of educational/training programs. Few social science studies have investigated the factors that influence logger decision making or conservation action. A review of the literature found minimal studies addressing loggers concerns in the industry and business decisions. The literature presented here demonstrates a need and justification for further research about decision making among loggers and the timber harvest industry. The literature review will first focus on the theoretical body of knowledge surrounding conservation action and the role of norms. Next, the literature review will explore what has been studied about loggers and their role in the timber industry.

Norms and Conservation Action

Norms, both social and personal, can have an influence on societal groups and the conservation practices they use or pro-environmental choices they make (Cialdini, 2003; Cialdini, Reno, & Kallgren., 1990; Harland, Staats, & Wilke, 1999). The expectations, obligations, and sanctions held by a social group make up social norms (Schwartz 1977). There are two broad types of social norms that motivate human action: injunctive norms and descriptive norms. Injunctive norms are the “rules or beliefs as to what constitutes morally approved and disapproved conduct,” or what *ought* to be done (Cialdini et al., 1990). Perceived social sanctions are the main motivation behind injunctive norms (Reno, Cialdini, & Kallgren, 1993; Cialdini et al., 1990; Schwartz, 1977). Descriptive norms refer to what people *are* doing – “the perception of how most others

would or do behave” (Reno et al., 1993). Schwartz (1977) also recognizes personal norms as a possible influence on behavior. Personal norms are self-expectations based on internalized values – and they only influence behavior when activated, as described in norm-activation theory (Schwartz 1977).

Several sociological theoretical models that address human behavior recognize norms as a contributing factor of behavior. Ajzen’s (1991) theory of planned behavior (TPB) posits an individual’s intention to carry out a behavior is the chief factor of influence on behavior. An individual’s intention is motivated by three factors: attitude toward the behavior, perceived control of the behavior, and subjective norms. The perceived behavioral control is explained as “the perceived ease or difficulty of performing the behavior,” which is influenced to some degree by availability of resources such as time, money, and skills, along with past experiences and anticipated difficulties (Ajzen 1991, p. 188). An individual’s attitude toward the behavior refers to the assessment of favorability of the behavior. Finally, the subjective norm refers to the social pressure perceived to carry out, or not carry out, the behavior. Subjective norms differ from descriptive and injunctive norms in a key way: they are the expectations that *important or valued others* have about how an individual will behave (Fishbein & Ajzen, 1975). Individuals carry many beliefs about different behaviors and the three aforementioned motivational factors all have attached beliefs that influence intentions: behavior beliefs, control beliefs, and normative beliefs. TPB theorizes that behavior is dependent on the salient behavior, control, and normative beliefs of the behavior. Ajzen & Fishbein (1980) identify “the ultimate determinants of any behavior are the behavioral beliefs concerning its consequences and normative beliefs concerning the prescriptions of others (p. 239). Thus, TPB permits one to conclude that social norms do have a

strong impact on an individual's decision to perform a particular behavior. Examples of Ajzen's TPB as a theoretical framework for pro-environmental behavior include participation in waste management programs (Taylor & Todd, 1997) and water conservation programs in Taiwan (Lam, 1999).

Harland et al. (1999) hypothesizes that the inclusion of personal norms with TPB actually "increases our understanding of environmentally relevant behaviors" (p. 2507). Personal norms, frequently also referred to as moral norms in the literature, have expectations, sanctions, and obligations that are separate from social groups and social norms, but are instead tied to the self (Schwartz 1977). Harland et al.'s 1999 study of various pro-environmental behaviors (i.e. public transportation, using energy-saving lightbulbs, turning off faucet while brushing teeth) implies that "decision to behave proenvironmentally are based partly on moral considerations", whether for past behaviors or intents for future behavior (p. 2522).

The Theory of Normative Conduct (Cialdini, Kallgren, & Reno, 1991; Cialdini et al., 1990) also recognizes the saliency of injunctive and descriptive norms as core influences on behavior. Cialdini et al.'s (1990) studies of the social norm not to litter in public places provide an example of the influence of social norms on pro-environmental/conservation behavior. Subjects, when returning to their vehicle in a parking garage, found a handbill/flyer tucked under the windshield wipers. Researchers varied the environment – either clean (no handbills on the ground) or littered (scattered handbills and trash on ground). A confederate would walk past the subject, reading a handbill in their hands, which they would then litter in front of the subject. In a clean setting, subjects littered less after witnessing the littering act due to the increase in saliency of the descriptive norm: most others had not littered in the situation. When the

setting was scattered with high levels of litter, the subjects' sight of a confederate littering validated that the descriptive norm was to litter, thus increasing the number of subjects who littered. The study demonstrates that whichever norm type (i.e., injunctive or descriptive) is more salient at a particular time will have a direct influence on the behavior of an individual (Cialdini et al., 1990). The injunctive norm in both cases was "one should not litter." However, it was the descriptive norm that was more salient – either displaying that 'only one person littered, so that is not the norm' or 'many people have littered, so that is the norm'.

Loggers and the Logging Industry

Several studies have sought to identify the motivations for job choice among loggers (Carroll, 1989; Egan & Taggart, 2004; Keefer et al., 2004; Egan, 2009). The sense of independence, or being one's own boss, echoed through studies as a main motivation for becoming, and remaining, a logger (Egan & Taggart, 2004; Keefer et al., 2004; Carroll, 1989; Egan, 2009). For example, a study of Maine loggers reported 99% of loggers agree they log because of the sense of independence the job offers (Egan, 2009, p. 108). Studies also show that harvesting timber also offers loggers a sense of accomplishment in their job (Egan & Taggart, 2004; Keefer et al., 2004), and they feel proud of their industry (Keefer et al., 2004; Carroll, 1989).

However, research also revealed logger concerns around the future of the logging industry because of challenges in attracting new workers and especially the poor public image of logging (Egan & Taggart, 2004; Keefer et al., 2004; Carroll, 1989; Egan, 2009). As Egan and Taggart (2004) surmise, there is a perceived "disconnect between the public's negative perceptions of logging and the forest products that they consumed"

(p. 22). Egan's (2009) study of Maine loggers echo similar results: 92% of loggers agreed with the statement "the public generally doesn't understand logging" (p. 108). Egan and Taggart (2004) found that 71% of New Hampshire loggers thought "the public viewed loggers as unskilled" and in many cases were even taunted by people who opposed logging (p. 24). Carroll's (1989) study also revealed loggers believed the general public doesn't "appreciate the importance or difficulty of their work" (p. 100). Keefer et al. (2004) reported that 70% of loggers surveyed felt the most serious pressure they faced in the logging industry was a negative public image (p. 91).

Attracting new workers to the logging industry is also a concern because of low wages and few benefits for a labor that requires specific skills (Egan & Taggart, 2004; Milauskas & Wang, 2006; Egan, 2009). Only 26% of West Virginia logging business owners can afford to provide medical insurance for their workers – but more than 60% of owners said they would spend any added revenue on increased wages and benefits if logging rates were to increase (Milauskas & Wang, 2006, p. 22). Sixty-one percent of Maine logging business owners provided health insurance to their employees but did cite these costs (and other costs of running a business) as a "barrier to maintaining or expanding logging businesses" (Egan, 2009, p. 109).

Communication within the logging industry has also proved to be an issue. Although all timber harvests involve a logger, a landowner (either public agency or private landowner), and most of the time, a forester, Keefer et al. (2004) found many loggers felt foresters look down on them and their career, and do not understand logging operations or the needs of loggers. A great amount of occupational knowledge loggers obtain comes from hands-on experience – and loggers are critical of foresters who have no hands-on, field knowledge, but instead university-trained, textbook knowledge

(Carroll, 1989). Ninety-three percent of Pennsylvania logger survey respondents agree that “forest landowners, loggers, and foresters share equally the responsibility of taking care of the forest” and need improved cooperation and communication (Keefer et al., 2004, p. 99).

Loggers’ attitudes about education programs have also been documented in order to help improve communication with loggers (Keefer et al., 2004; Bihun & Jones, 1993; Egan, 2009). Many loggers felt the educational and professional training programs developed in response to poor public opinion about the industry, but that they did lead to positive changes for the environment and the industry, although sometimes affecting profitability (Keefer et al., 2004). Loggers participate in educational programs for many reasons including improving their public image, gaining recognition from landowners, becoming more knowledgeable, and improving their communications with foresters (Bihun & Jones, 1993). Seventy-one percent of Maine loggers felt certification helped improve the way they log, but only 32% felt certification improved the respect they receive from the general public (Egan, 2009, p. 108).

A few studies have begun to look at loggers’ concerns in Minnesota’s timber industry (Blinn et al., 2014; Brown et al., 2010). These studies of logging businesses and loggers are extremely valuable, yet there have not been any studies to shed light on what influences loggers’ decision making and conservation action. Studies of the determinants of conservation behavior have been very successful in theorizing the factors that affect decisions. However, these studies have not focused on conservation actions in timber harvesting or logger perspectives. This study will address both these gaps and expand the ever-growing body of literature about pro-environmental behavior, with a specific focus on timber harvesting and loggers.

CHAPTER THREE

STUDY METHODOLOGY

Introduction

Data supporting this thesis were gathered as part of a broader interdisciplinary study assessing the timber payment methods used in the state of Minnesota. The larger project was conducted in partnership with the Minnesota Department of Natural Resources, St. Louis County Land and Minerals Department, Cass County Land Department, and the Minnesota Logger Education Program. The project primarily sought to evaluate the payment methods from an ecological, economic, and social perspective. Interviews with loggers are reported in this thesis. Four focus groups with loggers and 12 interviews with natural resource managers were also conducted. At the time of this reporting, project results have not yet been made publically available.

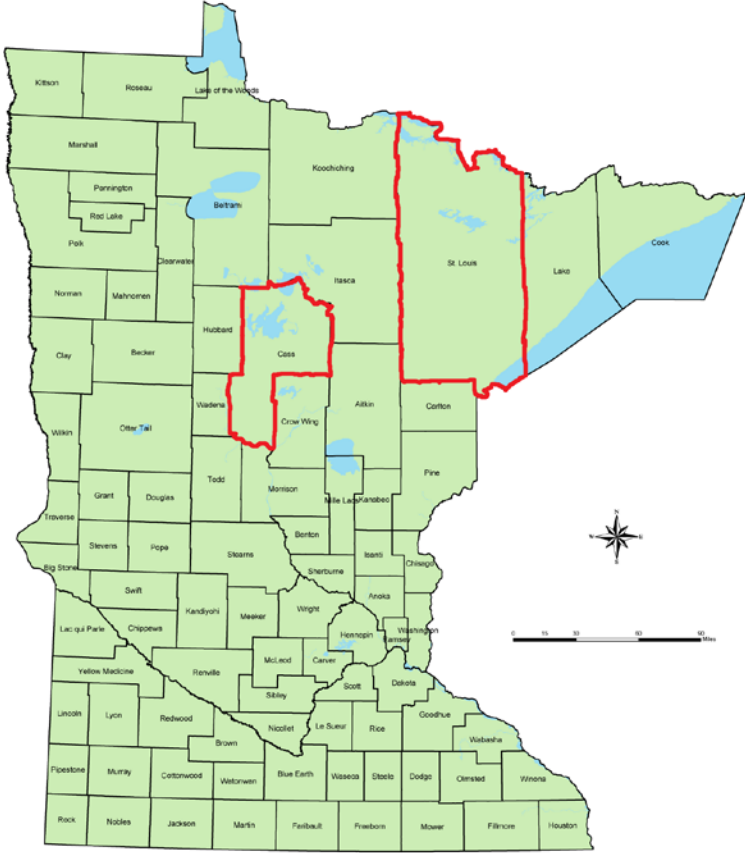
Researchers conducted in-depth interviews with key informants and then used qualitative analysis procedures to capture overarching themes, along with converging and diverging ideas relevant to the research focus.

This chapter provides a detailed reporting on the study area, study design, instrument development, participant recruitment, data analysis and management, and data validity.

Study Area

This research project will examine the perspectives of loggers who operate in Cass County and St. Louis County, Minnesota (Figure 1).

Figure 1. Study Area Map



Cass County is the only county-level land management agency in Minnesota that almost exclusively uses the sold-on-appraised-volume (SOAV) timber payment method for timber sales. St. Louis County offers sales under SOAV and the consumer scale approach. Details about St. Louis and Cass counties, along with the state of Minnesota and federal forest lands, are summarized below in Table 1.

St. Louis County, the largest county in Minnesota, covers 7,902 square miles in the northeastern portion of the state. The county population in 2013 was 200,540. The county land department manages 639,400 acres of commercial forest land – selling 187,224 cords of timber in 2014 alone (excluding tons of biomass).

Cass County is a smaller county, covering 2,414 square miles in the north-central portion of the state. The county population in 2013 was 28,555. The county land department manages 254,038 acres of forest land and sold 4,367 acres of timber stumpage (79,387 cords) in 2014 at their twelve (monthly) public auctions.

The state of Minnesota owns 3,781,850 acres of forest land – 3.1 million of those acres being state forests. In 2014, the Minnesota Department of Natural Resources (DNR) sold about 886,551 cords of timber.

The USDA Forest Service owns 1,999,569 acres of forest land in the state of Minnesota – predominantly in the Superior National Forest and the Chippewa National Forest. The Forest Service sold 176,674 cords of timber in 2014.

Table 1. Public Forestland Sizes and Timber Sold in 2014 (excluding biomass)

Agency	St. Louis County	Cass County	State of Minnesota (DNR)	USDA Forest Service
Public forest land (acres)	639,400	254,038	3,781,850	1,999,569
Timber sold (cords) in 2014	187,224	79,387	886,551	176,674

Note. Cords of timber sold in 2014. Adapted from “2014 Public Stumpage Price Review and Price Indices”, by D. Deckard, 2015, *Minnesota DNR Division of Forestry*, p. 14-27.

Study Design

This study is driven by four research questions: (1) What drives decision making and conservation action among loggers in Minnesota? (2) What constrains decision making and conservation action among loggers in Minnesota? (3) What role does timber payment method play in influencing decision making and action? and (4) What role do norms play in influencing decision making and action? To answer these questions, I

applied a qualitative research approach to document the perspectives of stakeholders in the logging industry. In-depth, semi-structured interviews were used in this qualitative approach because it “allows researchers to get at the inner experience of participants, to determine how meanings are formed through and in culture, and to discover rather than test variables” (Corbin & Strauss 2008, p.12). These interviews allow data to emerge, enabling researchers to build a framework bottom-up, rather than testing a hypothesis as one would do in a quantitative study.

An adapted grounded theory methodology was used for the entire study, including data collection, coding, and analysis. Strauss & Corbin (1990) describe the purpose of this approach as building “theory that is faithful to and illuminates the area under study.” The research questions guided the study under this methodology through an inductive approach – using detailed observations to notice patterns and develop theory from the bottom-up (Goddard & Melville, 2004). Data was gathered through in-depth personal interviews.

Instrument Development

Interview instruments were developed for interviews with loggers in the study area. First, a contact script was created for recruiting prospective participants by telephone which described the study purpose, the process of participation, and how the data would be used (Appendix A). A consent form was also developed for participants to sign, giving permission for the interview to be audio recorded and for responses to be quoted anonymously (Appendix B). A background information questionnaire was also developed for participants to complete after an interview (Appendix C). The information from the background questionnaire was not publically linked with interview responses

but instead was used to aid in understanding the participating population and creating a participant profile for the results. Finally, an interview guide was developed to guide the discussion about the timber industry, the timber sale payment methods, and loggers' timber harvesting practices (Appendix D). The interview guide was exempt by the University of Minnesota's Institutional Review Board (IRB). All interview instruments were shared with the project partners for edits and feedback.

Participant Recruitment & Interview Administration

A list of loggers was compiled with the help of project partners. Loggers were placed on the list if they had bought sales in the study area (St. Louis or Cass County) in the past 3 years. St. Louis and Cass counties' land departments shared the public timber sale purchase records. Additional contact and business information was found on the public Minnesota Logger Education Program logger database. In total, the names, contact information, and operation description of 106 St. Louis County loggers and 44 Cass County loggers were gathered. Maximum variation purposive sampling was used when contacting individuals on the list. Maximum variation sampling includes participants with a wide range and variation of dimensions or characteristics in order to identify common patterns that are present across variations (Patton, 1990). This type of sampling ensured participants interviewed were from a variety of operation types, sizes, and experiences. The operation description (size and equipment type) was used to group loggers. Loggers of all groups - small, medium, and large operations size, conventional, cut-to-length, and hand fell operation types – were contacted. Random sampling was used within groups when contacting loggers.

Participants were contacted by phone using the contact script. Interview times were set up with interested and willing participants. Thirty four loggers were contacted and twenty agreed to be interviewed between the two county lists. Six individuals declined the interview. Eight interview were interested but were too busy to schedule an interview at that time. Participants were contacted until there was a verbal refusal to participate or two unreturned phone messages.

Interviews were conducted between April and August of 2014 at a location chosen by the interviewee, including the participants' residence, work shop, harvesting site, and local cafes. Prior to the start of the interview, each interviewee signed the consent form and the researcher answered any questions the interviewee had. The researcher also emphasized the voluntary nature of the study and assured the interviewee that every reasonable effort would be made to maintain confidentiality. The final interview guide was used to guide the discussion about the timber industry, timber sale payment methods, and timber harvesting practices. After working through the questions in the guide, participants were asked to complete the written background information questionnaire that was handed to them. Information collected included years lived in current city, years logging, number of employees, annual harvest (cords), agencies/entities that wood was purchased from in last year, natural resource organizations involved in, and highest level of formal education. All interviews were audio recorded, transcribed, and analyzed according to the methods described in the "data management and analysis" section below.

Participant Profile

The 20 interview participants were asked a series of socio-demographics questions, as well as questions about their logging operation and career. Interview participants represent diverse logging operation sizes, experiences. Interview participants' age ranged from 34 to 74. All 20 participants were male. There were no females on the list of possible participants that fit the desired qualifications. Most participants had lived in their community for most, if not all their lives, and had been logging for the majority of that time (Table 2). Operation sizes ranged from harvesting less than 1,000 cords per year to over 10,000 cords (Table 3).

Table 1. Interview Participant Profile

Socio-Demographic Characteristics		Cass County		St. Louis County	
		N	Percent	N	Percent
Gender	Male	10	100	10	100
	Female	0	0	0	0
Age	Mean	47	-	53	-
	Minimum	34	-	34	-
	Maximum	66	-	74	-
Years lived in community	Mean	37	-	50	-
	Minimum	13	-	34	-
	Maximum	55	-	68	-
Years logging	Mean	26	-	36	-
	Minimum	6	-	20	-
	Maximum	42	-	60	-
Employees	Mean	7.2	-	5.5	-
	Minimum	1	-	1	-
	Maximum	20	-	15	-
Formal education	Did not finish high school	2	20	0	0
	Completed high school	4	40	3	30
	Some college but no degree	1	10	1	10
	Associate or vocational degree	3	30	4	40
	College bachelor's degree	0	0	1	10
	Some college graduate work	0	0	1	10
	Completed graduate degree (MS or PhD)	0	0	0	0

Table 3. Participant Annual Harvest

Annual Harvest (cords)	Cass County		St. Louis County	
	N	Percent	N	Percent
Under 1,000	0	0	2	20
1,000 – 5,000	3	30	1	10
5,001 – 10,000	2	20	0	0
10,001 or more	5	50	7	70

Data Management and Analysis

Each interview was transcribed verbatim, proofread, and reread in order for me to become very familiar with the data. Interviews were transcribed using Olympus DSS

Player Standard Transcription Module Version 1.0.2.0. QSR NVivo 10 software was used to manage and analyze the data transcribed (QSR International Pty Ltd).

Analysis in the grounded theory approach is the inductive process of turning raw data into concepts and findings that reflect the “essence” of what participants are trying to convey but are also grounded in the properties and dimensions of the data (Corbin & Strauss 2008). The analysis process is dynamic and continuous. Coding is used to generate, develop, and verify concepts that are continuously being compared, expanded, and revised (Corbin & Strauss 2008; Rubin & Rubin 2012).

After the data are collected and transcribed, the next step in the data analysis process is data reduction. Data reduction includes the coding process. Open coding, or “breaking data apart and delineating concepts to stand for blocks of raw data”, will allow for flexibility and creativity in forming interpretive concepts and categories in the analysis process (Corbin & Strauss 2008). Each line of every interview transcription was fully transcribed and analyzed. The data from each transcript was first given codes, and then grouped into larger concepts, followed by categories.

Following data reduction is data organization, which includes refining, collapsing, and expanding categories. The goal is to find common themes, patterns, and relationships, along with divergent themes in order to create a conceptual framework. Data interpretation and verification is the next step in the analysis process. At this stage, the themes and meaning of the data are continuously questioned, compared, and corroborated. A theoretical framework is then built which is purposely challenged through negative case analysis – seeking out cases in the data that contradict the interpretations and frameworks built (Marshall & Rossman 1998). When new data and

cases yield no changes to the themes, the theory building is complete (Rubin & Rubin 2012).

All interview data, including background information, consent forms, audio files and transcriptions, were kept secured during the project time frame. Only fellow researchers involved with the project had access to the data. The study participant database was kept secured for three years following the study to ensure reporting and publication accuracy. Following the three years, the participant database was destroyed. Also, to ensure confidentiality of study participants, no identifying information from the interviews was included in any quotes or documents made public from the study.

Study Limitations and Validity

The perspectives of all northern Minnesota loggers were not captured because the goal of this study was not to statistically represent the opinions of the entire population of northern Minnesota loggers. The diverse backgrounds, experiences, opinions and values of study participants were captured; although, there are likely other opinions and perspectives not represented in this study. Study findings may not be generalizable to all logging communities, but the findings do provide important insights to the northern Minnesota logging community which is not typically studied in this capacity. The intent from this study was to gather rich information that is usually not possible through other techniques, such as surveys, to further understanding rather than draw generalizable conclusions.

The subject of “validity” in qualitative research is commonly debated. Various researchers have offered explanations and lists of criteria for achieving “validity” in qualitative research (Eisner, 1994; Lincoln & Guba, 1985; Miles & Huberman, 1994).

Charmaz (2006) suggests four categories for evaluating grounded theory validity: credibility, originality, resonance, and usefulness.

Creswell (1998) also offers strategies to achieve validity, many of which were used in this study and are described below. First, multiple triangulation methods should be used when possible. Different triangulation methods can include multiple investigators, multiple data sources, and use of multiple research methods. In this study, both interviews and focus groups were used to triangulate data. Multiple investigators discussed data, codes, concepts, and frameworks to also triangulate data.

Another validity strategy suggested by Creswell (1998) that was used in this study is negative case analysis. In the analysis process, the researcher actively searches for alternative points of view or data that does not fit into the theory or model, or disproves your theory or interpretations. As the decision making framework was developed, researchers sought out any examples or cases that were not in alignment with the framework to ensure it was the most accurate representation of the data.

The potential for bias as well as inconsistencies between interviews are possible limitations of the study inherent to qualitative research. Researcher bias can affect several aspects of a qualitative research study including participant selection, interviewing, or data analysis. It is essential that the researcher is open about his or her bias and clarifies it ahead of time in order to bracket it out during data collection and analysis, and remain as objective as possible (Creswell 1998). A standardized interview guide helped mitigate bias between interviews. Researcher triangulation, or having another researcher also look at the data and formulate codes and categories, and then comparing, also helped mitigate bias.

Inconsistencies during interviewing were mitigated through the use of standardized questions in a semi-structured guide. The researcher attempted to ensure all participants understood the question in the same way. All participants were taken through the same topics and questions through the standardized question list, but the semi-structured nature allowed the researcher to explore new ideas that came up, or follow a different order of questions that the interview naturally took on.

Maximum variation purposive sampling, or choosing a diverse range of participants, reduced the biases associated with other sampling methods such as convenience sampling or snowball sampling (Patton 1990). Convenience and snowball sampling might lead a researcher to select interview participants that are more readily available or they are more comfortable with.

Another possible limitation is how interviewees communicated to the researcher. All participants were male – the entire logging industry is predominantly male. As a female researcher, there is always the possibility that interviewees communicated differently to me than they would have with a male researcher. Building rapport with interview participants was one strategy used to compensate this limitation. Interviews started with introductory, warm-up questions designed to ease the participant into the interview and build rapport. Interviews also ended with closing questions, designed to be more general, wrap-up questions, to ease the participant out of the interviewing process. Interviewers also dressed in clothing congruent with interviewees to keep the interviewee feeling comfortable.

Through a careful research design and thorough analysis process, this study will provide important insights to natural resource managers and policymakers about the

northern Minnesota logging community. The timber industry is central to Minnesota's economy and culture. Loggers are needed to harvest the wood to ensure the continued future of the industry, so it is vital to understand these individuals and the decisions they make in the woods. This study will provide a greater understanding of these individuals and the influences on their decision making. In addition, this study will be a positive addition to the sociological theoretical literature on conservation behavior and the role norms play in these processes.

CHAPTER FOUR

PRIDE AND PROFITABILITY: THE INFLUENCE OF NORMS ON LOGGER DECISIONS AND CONSERVATION ACTION

Summary

This study explores the drivers of decision making and conservation action among northern Minnesota loggers, and in particular the relationship between perceived norms and profitability. Twenty interviews were conducted with loggers in northern Minnesota and analyzed using an adapted grounded theory approach. Study findings reveal that personal, business and social norms are powerful determinants of logger decision making. However, recent strains on profitability, as well as a perceived disconnect within the supply chain (i.e., wood suppliers, loggers and mills) constrain conservation action. This study adds to the growing body of research on pro-environmental behaviors (e.g., recycling, energy consumption, and farming) of resource users through an inductive investigation of the conservation decisions of loggers, a relatively understudied social group. A better understanding of logger decision making will enable forest managers and policy makers to better evaluate and enhance conservation programming, timber sale policies, and forest management guidelines based on the experiences and perceptions of loggers.

Introduction

Minnesota's logging workforce is responsible for harvesting the trees to support the wood products industry, while simultaneously carrying out the forest management goals of natural resource agencies. Successful forest management not only promotes sustainable timber production and regeneration, but also includes a variety of other

objectives including recreation opportunities and wildlife habitat (Nyland, 2002). The long term sustainability of the timber industry and forest management depends on these loggers; their conservation actions during timber harvests have direct impacts on Minnesota's forests. Yet the logging workforce has been in decline since the housing market crash of 2008, meaning there are fewer loggers to aid in forest management and fewer trees harvested. Tree growth is currently outpacing the harvesting rate in Minnesota, leading to higher amounts of dying wood that could have been utilized (VanderSchaaf 2014). In 2005, nearly 4 million cords of wood were harvested and utilized. By 2008, that number had decreased by almost 750,000 cords. Harvest levels in 2013 are even lower, estimated between 2.4 and 2.7 million cords (VanderSchaaf 2014).

With a smaller number of loggers attempting to fulfill the state's timber harvesting and forest management goals, understanding the decisions loggers make regarding conservation action in the woods becomes of utmost importance. Understanding what factors exist that may independently or interactively influence conservation action is also extremely vital. For example, to what extent do social norms influence decision making and conservation action? Loggers commonly interact and exchange knowledge with landowners, public agency personnel, and other loggers in their jobs and may be influenced by those societal interactions and norms.

The Timber Harvesting and Forest Management Guidelines developed by the Minnesota Forest Resource Council (2013) lay out voluntary site-level forest management guidelines for loggers, landowners, and resource managers in Minnesota. Guidelines focus on riparian zone management, wildlife habitat, historical/cultural resources, and forest soil productivity considerations. Nearly all of Minnesota's land management agencies require adherence to the guidelines as part of the timber

harvesting contract. Violations of the guidelines by loggers on public lands can result in penalty fees or even prevention of bidding on future sales. On private land timber harvests the guidelines are not typically required or enforced as part of a contract. Loggers' perceptions and actions related to the guidelines are one way to assess constraints to and opportunities for conservation actions.

The decision making and actions of loggers in northern Minnesota were examined in this study using a qualitative approach. Key informant interviews with 20 loggers and ensuing inductive data analysis revealed social norms, moral norms, business norms and profitability have predominant influence on loggers' decision making in northern Minnesota.

The purpose of this article is to establish a logger decision making framework based on the stories and experiences logger participants shared in the interviews. The framework will be grounded in loggers' reported values, beliefs, attitudes and behaviors. The framework will unveil important themes including convergent and divergent themes, as well as significant patterns and relationships to enrich current understanding of decision making drivers and constraints. The framework and supporting data will also provide Minnesota's public forest management agencies and policymakers with a social-science based decision tool for designing, evaluating, and adapting programming including timber sale contracts and environmental guidelines that make sense to loggers and protect forest ecosystems.

Literature

Past logging-related studies across the U.S. have focused on the public's perception of logging, communication within the industry, and logger perspectives on

educational/training programs. Few social science studies have investigated factors that influence logger decision making. A review of the literature, in fact, found no studies investigating the determinants logger decision making. Thus no theoretical model exists from which to build upon in this study. However, the body of literature on conservation action in general and various determinants is well developed.

Norms and Conservation Action

Norms, both social and personal, can have an influence on individuals and the conservation practices they use or pro-environmental choices they make (Cialdini, 2003; Cialdini, Reno, & Kallgren., 1990; Harland, Staats, & Wilke, 1999). The “expectations, obligations, and sanctions” held by a social group make up social norms (Schwartz, 1977, p. 223). There are two broad types of social norms that motivate human action: injunctive norms and descriptive norms. Injunctive norms are the “rules or beliefs as to what constitutes morally approved and disapproved conduct,” or what *ought* to be done (Cialdini et al., 1990, p. 1015). Perceived social sanctions are the main motivation behind injunctive norms (Reno, Cialdini, & Kallgren, 1993; Cialdini et al., 1990; Schwartz, 1977). Descriptive norms refer to what people *are* doing – “the perception of how most others would or do behave” (Reno et al., 1993, p.104). Schwartz (1977) also recognizes personal norms, also referred to as moral norms, as an influence on behavior. Personal norms are self-expectations based on internalized values, and they only influence behavior when activated, as described in norm-activation theory (Schwartz 1977).

Several theoretical models that address human behavior recognize norms as a contributing factor of behavior. Ajzen’s (1991) theory of planned behavior (TPB) posits

an individual's intention to carry out a behavior is the chief factor of influence on behavior. An individual's intention is motivated by three factors: attitude toward the behavior, perceived control of the behavior, and subjective norms. The subjective norm refers to the social pressure perceived to carry out, or not carry out, the behavior. Subjective norms differ from descriptive and injunctive norms in a key way: they are the expectations that *important or valued others* have about how an individual will behave (Fishbein & Ajzen, 1975). Individuals carry many beliefs about different behaviors and the three aforementioned motivational factors all have attached beliefs that influence intentions: behavior beliefs, control beliefs, and normative beliefs. TPB theorizes that behavior is dependent on the salient behavior, control, and normative beliefs of the behavior. Ajzen & Fishbein (1980) identify "the ultimate determinants of any behavior are the behavioral beliefs concerning its consequences and normative beliefs concerning the prescriptions of others (p. 239). TPB research suggests that social norms have a strong impact on an individual's decision to perform a particular behavior. Examples of Ajzen's TPB as a theoretical framework for pro-environmental behavior that recognize the driving influence of social norms include participation in waste management programs (Taylor & Todd, 1997) and water conservation programs in Taiwan (Lam, 1999).

Harland et al. (1999) hypothesizes that the inclusion of personal norms with TPB actually "increases our understanding of environmentally relevant behaviors" (p. 2507). Personal norms, or moral norms, are based on "expectations, sanctions, and obligations" that are separate from social groups and social norms, but are instead tied to the self (Schwartz, 1977, p. 223). Harland et al.'s 1999 study of various pro-environmental behaviors (i.e. public transportation, using energy-saving lightbulbs, turning off faucet while brushing teeth) revealed that pro-environmental decisions and

behaviors have a strong foundation in moral considerations whether for past behaviors or intents for future behavior.

Loggers and the Logging Industry

Several studies have revealed logger concerns around the future of the logging industry because of challenges in attracting new workers and especially the poor public image of logging (Egan & Taggart, 2004; Keefer et al., 2004; Carroll, 1989; Egan, 2009). Egan and Taggart (2004) identified a “disconnect between the public’s negative perceptions of logging and the forest products that they consumed” (p. 22). Egan’s (2009) study of Maine loggers echo similar results: 92% of loggers agreed with the statement “the public generally doesn’t understand logging” (p. 108). Egan and Taggart (2004) found that 71% of New Hampshire loggers thought “the public viewed loggers as unskilled” and in many cases were even taunted by people who opposed logging (p. 24). Carroll’s (1989) study also revealed loggers believed the general public doesn’t “appreciate the importance or difficulty of their work” (p. 100). Keefer et al. (2004) reported that 70% of loggers surveyed felt the most serious pressure they faced in the logging industry was a negative public image (p. 91).

Attracting new workers to the logging industry is also a concern because of low wages and few benefits for a labor that requires specific skills (Egan & Taggart, 2004; Milauskas & Wang, 2006; Egan, 2009). According to Milauskas and Wang (2006), only 26% of West Virginia logging business owners can afford to provide medical insurance for their workers – but more than 60% of owners said they would spend any added revenue on increased wages and benefits if logging rates were to increase. Sixty-one percent of Maine logging business owners provided health insurance to their employees

but did cite these costs (and other costs of running a business) as a “barrier to maintaining or expanding logging businesses” (Egan, 2009, p. 109).

Communication and interpersonal interactions within the logging industry has been a promising topic of study. Although all timber harvests involve a logger, a landowner (either public agency or private landowner), and most of the time, a forester, Keefer et al. (2004) found many loggers felt foresters look down on them and their career, and do not understand logging operations or the needs of loggers. A great amount of occupational knowledge loggers obtain comes from hands-on experience – and loggers are critical of foresters who have no hands-on, field knowledge, but instead university-trained, textbook knowledge (Carroll, 1989). Ninety-three percent of Pennsylvania logger survey respondents agree that “forest landowners, loggers, and foresters share equally the responsibility of taking care of the forest” and need improved cooperation and communication (Keefer et al., 2004, p. 99).

Loggers’ attitudes about education programs also have been documented in order to help improve communication with loggers (Keefer et al., 2004; Bihun & Jones, 1993; Egan, 2009). Many loggers attributed the development of educational and professional training programs to the poor public opinion about the industry. While these training programs did lead to positive changes for the environment and the industry, loggers did stated they sometimes affect profitability (Keefer et al., 2004). Loggers participate in educational programs for many reasons including improving their public image, gaining recognition from landowners, becoming more knowledgeable, and improving their communications with foresters (Bihun & Jones, 1993). Seventy-one percent of Maine loggers felt certification helped improve the way they log, but only 32%

felt certification improved the respect they receive from the general public (Egan, 2009, p. 108).

While these studies lay important groundwork for identifying logger concerns and attitudes, they are limited in contributing to an understanding of logger decision making and conservation action. To fill this need, we examine what influences loggers' decision making and conservation action and establish a decision making framework grounded in northern Minnesota loggers' stories and experiences.

Methods

An adapted grounded theory methodology was used for the study, including qualitative data collection, coding, and analysis. Strauss & Corbin (1990) describe a primary goal of the grounded theory approach as developing "theory that is faithful to and illuminates the area under study." The research questions guided the study design and data collection and analysis procedures were consistent with inductive research, or using detailed observations to notice patterns and develop theory from the bottom-up (Goddard & Melville, 2004).

In-depth, semi-structured interviews were conducted with 20 loggers in northern Minnesota in 2014. Loggers who had purchased a timber sale within our study area (Cass and St. Louis counties) in the last 3 years were identified. From this list of 150 individuals, the sample pool was selected using maximum variation purposive sampling (Patton, 1990), with a goal of representing loggers with diverse operation types, sizes, and experiences.

Interview participants ranged from age 34 to 74 and had been logging from 6 to 60 years. Participants' logging operations also varied from conventional to cut-to-length,

plus those with biomass harvesting capabilities like a chipper or grinder. Annual harvests ranged from less than 1,000 cords to over 10,000 cords. While participants were diverse in age and logging business characteristics, they were quite homogeneous in race and gender: all participants were white males.

Interviews were audio-recorded and transcribed verbatim. Analysis began with open coding: labeling every meaning unit within individual transcripts with a progressive coding system (Corbin & Strauss 2008). Like codes were then linked and grouped into broader concepts, and concepts were grouped into even broader categories. Categories were refined, collapsed or expanded to reveal convergent and divergent themes and patterns and relationships within and among themes. In order to ensure validity of the analysis, intercoder reliability was assessed through coding cross-checks. After intensive iterative analysis and multiple iterations of concept maps and theme tables, a theoretical framework was developed and tested through a process of negative case analysis, or seeking out cases in the data that counter or challenge the framework (Marshall & Rossman 1998). When new data and cases resulted in no substantive changes to the coding system or theoretical framework, the theory building was complete (Rubin & Rubin 2012).

Results

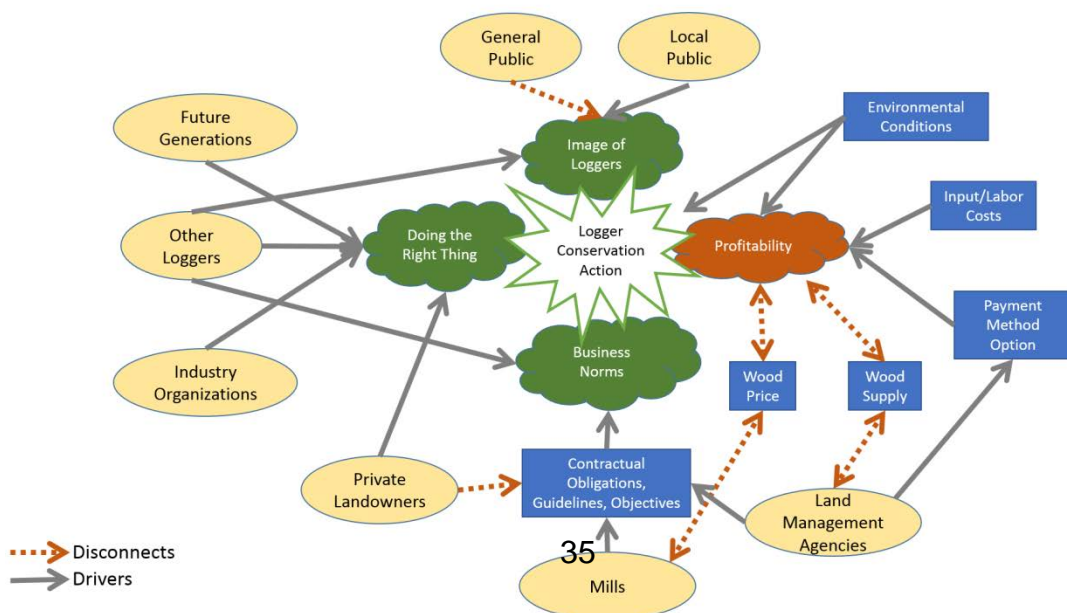
To explore the factors that influence loggers when making decisions, interviewees were asked to describe who or what influences their harvesting practices and what were the most important considerations when making decisions about their businesses. In addition, interviewees were asked about their perspectives on the Timber Harvesting and Forest Management Guidelines, along with the factors that affect their

ability to implement the guidelines. Four determinants of decision making emerged out of these interview questions: personal norms, social inductive norms, business norms, and perceived profitability. Each of these determinants will be discussed below. In addition to the determinants of decision making, data revealed a perceived disconnect in the timber supply chain between natural resource management agencies, loggers, and mills. The discussion will conclude with a discussion about this supply chain disconnect.

Four dimensions of decision making

Themes, patterns and relationships identified through inductive analysis revealed four determinants of logger decision making consistent with the constructs of personal norms, social inductive norms, business norms, and perceived profitability. Doing the right thing (i.e., personal norms); the public image of loggers (i.e., social inductive norms); and business norms (e.g., contractual obligations, guidelines, and landowner objectives), and perceived profitability emerged as the predominant dimensions influencing decision making and conservation action (Figure 2).

Figure 2. Logger Conservation Action



Public image of loggers

Public perception or image of loggers emerged as one of four primary determinants of logger decision making. Within the dimension of public image, participants focused on two specific public interest groups: local public and the general public. Perceptions of both of the groups appear to have an impact on how loggers carry out their business. According to one participant, local public perception is powerful: “Yeah, I think we have to do our very best, because the public’s perception has an awful lot of power against our industry. A lot of power. A brand new timber harvest – even at its best – looks bad. And when the public sees that, its shock...we have to try to do a good job and try to hopefully give them a little better opinion of us.” Similarly, another participant acknowledged that logging site conditions can irritate the local public.

I mean that’s part of the public perception too. A lot of that is just educating them. And they may come to a harvest site, and you know, “oh boy, that looks terrible and messy.” But they don’t realize if that harvest on this aspen site isn’t done, what it’s going to look like in 20, 30 years or so when it’s all on the ground and a mess. A lot of that is just educating the public on what’s happening on the ground, and why it’s happening on the ground.

One participant expressed his frustration when asked if he was influenced by the public’s perception of logging:

I kind of gave up on that...I’ve come to the conclusion that we could do the nicest job you want, there’s always going to be somebody that’s going to complain about it. So I don’t really look at that. I look at doing the best job that I know that’s going to be done. And I don’t worry about what somebody else is going to think of it.

In contrast, another participant was motivated to consider site aesthetics because of local public perception: “I want the job to look decent, so it’s not looking like a mess, so the person driving by ain’t calling and saying ‘they made a big mess because

they logged it' or something. So I guess the public eye driving by... I'd rather do a decent job just because of that."

A need to "educate the public" about timber harvesting was a common topic of discussion among participants. A participant explained, "Most of the public don't know nothing about logging. Even though they drive right by it, live right by it...it's like they don't even know what's going on...everybody's kind of getting out of touch with it all."

One participant suggested that the public has misconceptions about loggers and that he personally is stereotyped: "Educate the public that we're not as bad as they think we are. I live with this stigma that all loggers are drunks and all this." Similarly, another participant believes loggers are misunderstood:

If the public thinks loggers are a bunch of idiots and destroy the forest and stuff like that, I think they need to be educated better because ultimately, I think most loggers care more about the woods than a lot of other people do.

Similarly, another interviewee explained that loggers' reputation is important to them: "I think the public plays a huge role in how loggers get portrayed in this day and age. And I think most loggers want a good reputation."

Doing the right thing

A second primary determinant of logger decision making is "doing the right thing" or a sense of personal responsibility and accountability in logging. It reflects a basic moral ethic that fuels pride in a job well done and stewardship of natural resources. Major themes that emerged around doing the right thing include protecting the forest for future generations, personal pride, and industry organizations starting a better line of thinking.

Many participants voiced concern that large operators are over prioritizing harvesting large volumes and not taking the time to harvest it appropriately or cleanly. One participant described this phenomenon,

Honestly I think there's too much getting wasted by some. Some of the bigger loggers...they don't want to take the time to harvest it. They'll take the good and leave the crumbs...It's about volume, volume versus quality to some of them. The big company loggers, the men with the money, it's about the volume. It ain't about the pride of cleaning up behind yourself.

The theme of personal pride was very prevalent with participants. When asked if he was influenced by other loggers, one participant responded: "Oh yeah. You look at their jobs and see how they're doing...It's a pride. If you're in this business you have to have some pride in what you are doing." Similarly, another participant described what inspires him about his job: "Most of the people who are in this field want to be able to drive down the road and say, 'hey I cut this piece.' You take pride in what you do." Loggers also felt a pride in their business that influenced their actions in the woods. They want to do a better job than other loggers because that reputation will help their business. One participant stated, "We always try [to do a good job], even if we don't have to do it...I don't want somebody coming behind me and [saying], 'Boy, that guy left a big mess'...We got a little pride in our work."

Participants were asked what they believed their role was in maintaining or improving forest health. Many participants acknowledged a responsibility to protect the forest for future generations and for reasons other than timber, like wildlife. For example, one logger stressed, "You got to take care of it. You have to. Not only for the timber, it's the natural resource too. It's the animals here too. You have to. You have to take care of the natural resources." Another participant echoed his opinion on what forest health means, "That means to me that there will be timber available for my grandkids...forest

health [is] huge. I'm a hunter, I'm a fisherman, and I love the woods. So, in my opinion, forest health is just doing things the right way to ensure nice forests for the future." On the topic of forest health, another interviewee stated, "Forest health is a huge thing to me and it goes hand in hand with good logging practices."

Most interviewees believed they had a clear role in maintaining or improving forest health: to do the right thing when harvesting. Participants even voiced that "we know when it ain't right," when loggers are harvesting in an unsustainable way. "You just have to know better and do better. That's what I feel my role is," said one participant. He continued on to say, "most of us are trying to do the right thing and I believe that. I really do." Another interviewee was inspired by the forest industry having this shared goal of forest health:

I think everybody's pretty active [in the industry]. That's a big inspiration. Everybody's kind of working towards the same goal, to keep a healthy forest. Keep it productive. Working with the wildlife people. I mean, we live here, we hunt and fish. I've got kids, we've got a grandkid...you want them to have the same experience we did. So I think that's the ultimate goal is to keep it productive and healthy. It provides jobs, it's a huge impact, you know? So I think that's my main goal is to try to keep the industry viable. Do our part.

Business norms

A third determinant of logger decision making is business norms. Participants identified contractual obligations, conservation guidelines (Timber Harvesting & Forest Management Guidelines), and landowner objectives as external factors that influence logger decision making and ultimately, conservation action.

When harvesting on a timber sale purchased from a public land management agency, loggers are required to follow the timber sale contract they signed, or risk large

fines and/or being blocked from purchasing future sales. Although the contractual obligations can vary from agency to agency, all include some form of conservation guidelines. However, the guidelines are not mandatory on private forest land, so it is up to the logger to implement the guidelines, while also following the landowners' objectives for the timber harvest.

Several participants who harvest on private lands expressed concern these landowners are driven solely by profit and don't understand or care about sustainable timber harvesting practices. For example, one interviewee said, "When [private landowners] are motivated to sell timber, the bigger motivator in the whole package is money." Another participant said private landowners are "probably in it only for the money. Where you've got the DNR and the counties...you've got recreation and all that stuff they have to look at too." Another interviewee shared "the only time [the public] knows about [logging] is when you are on their land logging their trees. And all they care about then is how much you made. That's their primary driver."

One interviewee shared his perspective on private landowners and why he prefers to work with public land management agencies:

I'm sure [private landowners] would be asking us to do a lot of things that ain't right or ain't legal even. I'm sure they'd have all kinds of ideas...I prefer working with the county or the state I guess personally. They understand logging. It makes sense to them. They're looking for a forest, they're not looking for a park. ...Private landowners are looking for a park. Then wondering why there's no deer in it. Because, deer don't hang out in a park. They go in the woods. It's always tough to deal with them...

Similarly, one interviewee said, "Leave trees are another [guideline] that landowners, sometimes, they don't want to leave anything. They want every penny they can get off." Yet, this participant felt strongly that guidelines should still be implemented

even on private forests. He continued: “But you say [to the landowner], ‘I really need to do this’. So you kind of negotiate with them and try to come to some conclusions that may not be right as the guidelines are written but it may work and at least there was some attempt made in the end to do that.”

Above all, participants expressed that loggers want to stay in business. Several participants recognized the need to follow the guidelines if they want to stay in business. For example, one interviewee spoke about implementing the guidelines and said simply, “Well if I don’t, I get shut down. I’ve got to adhere to them guidelines. I can’t just do what I want.”

Profitability

The fourth determinant of logger decision making is profitability. Prominent factors affecting profitability that emerged in these data include input and labor costs, environmental conditions, the option of timber payment method, and the wood supply and price. Having a profitable business allows loggers to put more money and time into guideline implementation, or conservation actions. In these interviews, however, profitability was viewed as a constraint to decision making.

Participants commonly voiced concerns about the financial challenges of being a logger in today’s industry. Interviewees recalled the number of loggers that have gone out of business since the housing market crash of 2008 and how difficult it is for many to maintain their business. One interviewee explained, “The obstacles are the cost of survival. The stumpage prices. The fuel prices. The parts...anything you look at is astronomically unfeasible.” Similarly, another interviewee said, “Profitability, definitely a major concern. Things have been pretty poor for about 8 years...That’s a pretty major

concern that tells you 'are you staying in?'" He continued, "Other significant costs are insurance, labor, and fuel...everything has gone up. But we're still cutting for the same price. So that means you either have to become more efficient or work harder."

Participants acknowledged that "you've got to have a profit there in order to run a business," yet many feel there is little they can change to make a profit. The input costs are out of their control. High input and labor costs have led to concern over loggers going out of business, as described by one interviewee:

We're losing loggers right and left. There's no money in it anymore. The people that are trying to hang on are people like myself and bigger operators...there can be small operators out there too, but it's a struggle. And then people are finding that there's nobody coming in their shoes. Their kids are not taking over their businesses and it's a dying thing. You keep losing a couple more every year, going out of business. And the people that are out there can't find no help. And this isn't just here, it's all over. It isn't just this state.

Environmental conditions also emerged as an influence affecting loggers' profitability, even though these are out of their control. Weather was frequently cited as a constraint to profitability. Wet conditions can make it impossible to log without violating the guidelines. The topography and soil conditions of a tract can also mean extra time and money spent to harvest the trees correctly and safely. Again, these input costs and environmental conditions can make it hard to stay in the logging business and make a profit.

Profitability, or lack thereof, can have a direct negative link to decision making and conservation action. A common sentiment from participants is there are loggers out there who will not follow all the guidelines if they are short on money because the guidelines do have a cost to implement. One interviewee described this occurrence:

...The financial state of the operator has a lot to do with what goes on. They're going to hit it as hard and fast as they can when they're really strapped financially. I think it translates to just a little poorer quality as far as finishing the job and finishing it right. Following the guidelines, taking a shortcut here and there...I say that because I've stood in most of those many times. The financial commitment is a pretty major motivator in making you got to work and get it done as quick as you can and not necessarily in the best manner.

Similarly, another interviewee noted how he wants to do a good job, but that doesn't mean it doesn't affect him financially: "I still want to see us do as good of a job as we possibly can. But I will say this...the quality of my work I think is as good as any, but that doesn't make you any more money. Because you have to go a little further to do it right." The input costs, including the extra time and money it takes to follow the guidelines, was seen as a major factor affecting profitability that loggers' had little to no control over.

The payment method used during a timber sale was also a focus of interview discussion. Participants shared their perspectives on consumer scaled versus sold as appraised volume (SOAV) and what they see as advantages or disadvantages of each. Although payment method preferences varied, the reasons for preferring that payment method were almost entirely focused on profitability. Those who oppose SOAV frequently cited the financial risk of an underrun – when there is less wood in actuality than what was appraised or estimated. For example, one participant said the disadvantage of SOAV was "if they sell you 1000 cords and there's only 900 cords there, then you're off by 10% [so] your cost of timber went up 10% and your profit went down 10%. So that's pretty significant...it all adds up pretty fast. It's an expensive game to be in and when you lose money like that, it's pretty devastating." Many participants shared examples of their own sales, or others they knew of, underrunning and the financial repercussions of that loss. Even those who prefer SOAV over consumer scaled

recognize this disadvantage. For instance, one interviewee said, “the biggest [disadvantage] is when they do run short, and they do. I mean that’s a huge deal. That’s about the only one though...the one and only. And it’s a big one too. Because it can make a huge difference.”

Additional time spent preparing for a timber sale, or cutting a timber sale, adds additional costs to the operators. Participants noted that if you check cruise an SOAV sale before you buy it, you will know if the foresters’ estimate is accurate. However, additional time spent check cruising in the woods is less time spent cutting, so there is an additional cost associated with it. Consumer scaled sales remove that risk for those who don’t want to spend the time check cruising.

On the other hand, consumer scaled sales have the added time factor of dealing with tickets for loads of wood and having foresters come to your site and scale. One interviewee said, “The advantages [of SOAV] are you don’t have to have a forester come out and scale every time you want to bring a load of wood to a non-compliant consumer scale...you’re always going ‘we need a scale, we need a scale, we need a scale.’ So it’s nice for that. Another big issue that it’s nice for is you don’t have them tickets you’re always tracking down.” Another interviewee also disliked the consumer scaled tickets and thought they were a hassle to deal with: “I avoid as many consumer scaled permits as possible. It’s a pain in the ass. When you start dealing with these stupid consumer scale tickets and you start relying on several people down the line in your business to take care of all this stuff, it’s a nightmare. It’s just literally a nightmare.” Cutting a consumer scaled sale also means loggers frequently have to wait for foresters to come and scale a load before it can be trucked to a mill. This process might also require

separate landings and additional wood sorting, which all adds costs, which one

interviewee describes:

It's a pain, you know. For instance, we're doing a job that's got oak, birch and aspen. It's all got to be scaled. We're running the aspen into Sappi. Consumer scale, fair enough. The hardwood, some of it, will be taken to a sawmill that's set up for consumer scaled. The low grade hardwood, we'll have to haul all this stuff off this job because we're limited on our landing size. So we can't have a whole pile, 3 separate piles. So we've got to haul it out. So what do we do? We make an alternate landing. Well then the forester has to go down there and scale a pile of wood. And in some cases, we'll bring it back to our yard. Well you have to unload it, state guy will come and scale it. Then you have to load it back up and haul it to the mill. So I mean, what it does in some cases, for your hardwood permits especially, it generates a lot of extra handling of wood. Which all costs money every time you grab that stick of wood – its more dollars.

Another interviewee described a similar situation when cutting firewood on a consumer scaled sale: "If you are going to do firewood [on a consumer scaled sale] you have to get the forester out there. You can't just slash it onto the truck and go. You have to wait til you get the forester out there to scale it. You have to put it on the ground and then pick it up again which that adds an expense to it. We like to slash right on the trailer. That's one less handling of the wood. So there is a little added expense to it, to consumer scaling, when it comes to things that have to be ground scaled."

Similarly, many participants who also have biomass harvesting equipment, such as a chipper or grinder, felt SOAV was more conducive to their operations. SOAV sales with a chipper (or grinder) allows loggers the freedom to put whatever species they want in the chipper, without worrying about sorting every stick. For example, one interviewee said about SOAV sales, "And that goes pretty good with our chipping. Because if you had a bunch of basswood or something that's low quality, might take some bolts out and you can just chip the rest and nobody cares. You don't have to worry about if there's a foreign stick in there."

Kinks in the Supply Chain

Apart from the four primary determinants of logger decision making, a predominating theme was a perceived disconnect in the timber supply chain between public land management agencies, loggers and mills. Participants expressed concern that the mills did not understand their hardships and weren't paying a fair price in exchange for harvested wood. Several participants even discussed how "one or two of the mills [are] paying more money to certain loggers". Participants also suggested agencies weren't putting up enough wood, even though they have plenty that could be cut, and were instead driving up the stumpage prices by keeping the supply low.

A common theme among participants with smaller operations was the portrayal of the timber industry as being a "rich man's game" now and of smaller operators being outcompeted by large operators. One participant spoke about his displeasure with how timber sales are structure,

I don't think that's fair. How can the small guy compete with the big guy? That's not fair! My pockets ain't that deep...and the markets like LP or Sappi or NewPage or any of them, they'll talk to the big loggers before they'll talk to us. And they'll give the big loggers the contracts before they'll give them to us. They won't even look at a small logger twice.

He continues to stress the perspective many participants shared about "big business" in the industry:

It's big business. And they're not realizing that they're impacting a lot of other lives with the little loggers. Little loggers are going out of business. And I'm going to try to keep doing it as long as I can because I like it, but it's getting harder and harder and harder. Because it is such a big business. And it doesn't seem like the foresters on one end and the county, state, or federal hub-bubs in the offices don't realize that.

Similarly, participants felt agencies generally did not understand loggers' struggles and were not putting up near enough wood for sale. For instance, one participant was describing changes he'd like to see in the timber industry: "I think we need to have more [communication] between the foresters and the loggers. The foresters...really need to look at the other side and we need to look at their side of the thing to get a better understanding how they're doing their job and what we're facing over on this side. They need to know what actually you can do and how they can set up sales that are better for us to cut it the way they want it cut."

Again, the amount of wood agencies are putting up for sale was frequently lamented by participants. One participant described, "There's not enough [wood] on the auction for everybody that's competing for it. If there was enough wood, if there was enough volume set up....everybody would get enough wood to keep working and then you could offset the cost of the fuel, your operation...the industry has just been slowly getting starved out." Another interviewee said, "But what I don't understand about our agencies...we're not anywhere near keeping up with the harvest as far as the mortality rate going up. It's way off balance. The part that puzzles me is that our agencies are never in tune with what our industry demands are." He later continues on this topic, describing how this disconnect in the supply chain has a direct impact on loggers' profitability:

Why don't we, for instance...sell twice as much aspen per year for half of the amount of money per cords? Instead of selling the amount that they're doing now for an inflated price. Sell more wood for a little less money. In the end, you're going to have the same amount of money coming in but you're going to make available the resources for industry to flourish. And that translates into money. That translates into jobs. That translates into a lot of economic impact that we don't get when we're pacing limited stumps availability, [translating] to high prices, [translating] to low profits for the operators....It's a struggle. And the answer is right there

because we have the resources to do it. We have the stumpage to do it. But it just doesn't seem to translate to St. Paul.

Another interviewee commented on this supply chain disconnect and agencies not being in tune with the industry: "That's kind of what bothers me sometimes...their inability to adjust, to accommodate, to what industry needs...I've always thought they need to be more in tune with what do we have out here for industry and what are their real needs so we can keep [these companies viable]...provide some jobs and utilize our resource." He continued with that line of thought, "I think sometimes our [agencies are] just so far out of touch with what the reality is financially anyway, and what our real needs are...I mean there has to be a balance somewhere where we can utilize all our resources, we don't need to let them go bad, and yet still keep some good industry going." Another interviewee expressed concern for the future of the industry due to wood availability saying:

I guess I don't have a lot of hope for future expansion of the industry to utilize our resource. And one of the reasons, it's obvious right now...we're down two to two and a half million cords per wood a year on our harvest than we were [8 years ago]. And yet, all of that wood not being harvested, we can go to a timber sale...35 guys at this timber sale and they'll have 13 tracts of timber to sell that are no bigger than they were 8 year ago...And the part that troubles me about this is the industry isn't paying any more for this wood...As far as looking down the road into the future, I just really am not that encouraged by it.

Not only was there a perceived supply chain disconnect between agencies and loggers, but also between agencies and the mills. All three players (agencies, loggers, and mills) depend on each other in order for the timber industry to exist. However, participants sensed the lack of communication between those that supply the wood and those that purchase the wood:

I mean, so many mills have already went out of business and it's like [agencies] are trying to get as much money as they possibly can for their

wood...They've got to supply the mills so they don't go out of business too because if there isn't any mills left, their wood is absolutely useless...so the mills need the state. But the state also needs the mills. So I think they need to listen a little bit better to us and the mills on this stuff because they both need each other.

Agencies and mills also depend on the loggers to harvest the timber, yet several participants expressed feeling without a voice in the industry, compared to the big loggers especially. "Who's going to listen to one person? I just keep doing what I'm doing and keep plodding along with things...They're going to outbid me anyway because they've got deeper pockets than I do. So, I just kick back and usually try to buy private timber because I can't compete with it," said one participant when asked about adapting to challenges in the industry. Similarly, when asked about inspirations in the timber industry, another interviewee stated, "There's nothing really inspiring. I just wish I could do more to impact it. But I'm always just the one man band, I can't. I'm just trying to make a living and keeping enough food on the table to keep myself fed. And keep enough fuel in my tank of my equipment to keep it running. You know that's basically all I'm doing is making a job for myself. I wish there was something more that I could do."

Participant stressed the need for change in the industry in order for it to survive in the future. "I'd like to see some changes done there to make it a little bit more profitable...I would like to see whatever could be done to supply more timber so there's more available to cut at the time to better markets. It's not really a supported industry," said one interviewee. The most common change desired by interviewees was increasing the available supply of wood. One participant said, "I think just getting more wood up on the market would help everything else so there's enough wood there and there's not just 25 people fighting over 10 sales." Another participant described the same thing: "You go

to the timber sale and there's 20 guys there that want 3 nice sales...[you] sit there and bid against each other."

Other participants were frustrated by the same idea that agencies aren't setting up as much wood as they could be. For example, one interviewee said, "The state and the federal could set up a lot more wood than what they do. And they just don't...the answer is to get out and set the damn wood up and sell it." Many participants also felt agencies were wasting wood that they could be setting up – that there are so many mature trees dying of old age that could've been cut and utilized. When asked to define what forest health means to them, nearly every interviewee described a "young stand and not falling down" or "trying to cut the old mature stuff that's falling over so it can regenerate". Another interviewee stated, "I still feel like we are under harvesting...as it dies with old age, the forest dies." One interviewee felt his role in improving forest health was to get "rid of the old rotten stuff. Having fresh growth come up...on a little quicker cycle so it's better quality for the future," because he felt it is "way too old" and not of good quality currently. Similarly one participant felt "we waste a lot of our timber" because "[the government] put so many regulations on you that you don't need."

Discussion

The image of loggers, one important determinant of logger decision making, is an injunctive social norm. The public perception of logging carries with it a social norm of what loggers *ought* to be doing or what is morally right (e.g., leaving a clean site). The second determinant, doing the right thing, is a moral norm influencing loggers' conservation action. The moral norm is an internalized injunctive norm about what loggers believe to be moral or ethical behavior when working in the woods.

Interview data demonstrate that logger practices are driven by social and personal norms. They are further influenced by business norms or standards of conservation action. While these three determinants might suggest loggers would automatically engage in conservation actions, loggers interviewed identified profitability as a primary constraint to decision making. The literature demonstrates the importance of both social and moral norms in pro-environmental or conservation behavior (Ajzen & Fishbein, 1980; Harland, 1999). Strong social and moral norms about environmental stewardship and conservation would understandably be associated with decision making and conservation action. Participants expressed through moral norms the desire to do the right thing in the woods with regards to timber harvesting. Many loggers were 2nd, 3rd, or 4th generation loggers and felt strongly about healthy forests so that future generations could enjoy the same benefits. Loggers felt they had a job to do in maintaining or improving forest health through their role of timber harvesting, and the responsibility to do the best job they can. Even on private timber sales where the Timber Harvesting and Forest Management guidelines are voluntary, loggers interviewed still wanted to do the right thing, frequently citing their sense of pride in their business. Parallel with their sense of pride was wanting to do a better job in the woods than other loggers, earning a good reputation for their business.

Social norms also had a pronounced influence on decision making among loggers. However social norms also can perpetuate misconceptions, according to study participants, that loggers are carrying on improper behaviors or that they do not care about the environment. According to interviewees, there still exists a poor public opinion about loggers and the timber industry, and participants desired to rectify it. Many attributed the poor public opinion to a disconnect between the public and actual forest

management. According to participants, the local public doesn't understand the role of timber harvesting in forest health and regeneration, and instead only cares about aesthetics. For example, a common guideline for timber harvests is to distribute logging slash throughout the site. This guide has many ecological benefits including preventing erosion and providing wildlife habitat. However, the general public thinks it makes a site look very messy and unappealing. Participants frequently discussed the need to educate the public about proper timber harvests to help better their opinion of loggers and the industry. Loggers want a good reputation and that social norm drives their decision making. However, the social norm of leaving a clean site may not be consistent with conservation action, from the perspective of forest management.

However, social, moral, and business norms are not the only influences loggers feel when making decisions in the woods. Profitability is essential to any business for continued existence. This study suggests that profitability may constrain decision making and conservation action regardless of any social, moral, or business norm influences. Implementing guidelines and taking the time to harvest sustainably costs money, and loggers who may be on the margins of profit or loss might be tempted to push the limits of the harvesting guidelines.

Conclusion

This research suggests loggers perceive strong moral, social, and business norms that drive their decision making and in many instances, their conservation action, yet profitability, or lack thereof, can have a major influence as well. Participants in this study cited profitability as one of the top, if not *the* top, concern in the logging industry today. Loggers may feel powerful influences from moral, social, and business norms that

are driving them to engage in conservation action out in the woods – but in some cases, profitability can constrain that action out of mere feasibility and the need to make a profit.

Although possible, it is extremely difficult to change attitudes. It will be difficult to change the public's perception of logging, but efforts moving towards this cause would be very beneficial. In addition, there is not a lot that can be done to change factors directly affecting profitability, such as environmental conditions and input costs.

Therefore, the factors influencing business norms, contractual obligations, guidelines, and landowner objectives, seems to be the best place for intervention and change. The guidelines and timber sale contracts are all within the control of policymakers and natural resource professionals. The goal should be to increase flexibility in contracts and guidelines. More specifically, policymakers and agencies should be investigating the opportunities for change that would make little if any difference ecologically, but would make a large economic difference for the loggers. The goal should be to increase flexibility in guideline implementation in ways that alleviate the constraining profitability. Possible examples include increased flexibility with season of operations, fewer visual quality mandates, and increased financial and resource aid.

Several interviewees described their concerns that agencies were going overboard with 'frozen ground only' designations and there wasn't enough summer wood. Considering the data shows that loggers are strongly influenced by the sense of responsibility to do the right thing (moral norms), there may be opportunities to allow some sales for summer harvesting, and putting the responsibility on the logger to know when it is acceptable to be running equipment, weather-dependent, without rutting. Loggers have a strong desire to stay in business. Agencies might consider revoking a

logging business' privileges to bid on future sales, rather than fines, if a logger repeatedly operates during wet conditions and causes ruts.

Aesthetic guidelines may be another option for intervention. Many of these visual quality guidelines may not make any difference ecologically for forest regeneration and health but could make an important difference for a logger trying to maintain his business. Leave trees are one example. Loggers described the reasoning for leaving reserve trees along roadsides for aesthetic purposes, such as when the public is driving by. However, if these leave trees were instead at the farthest back area of a sale, it would save businesses money in road building, fuel costs, and equipment maintenance. While this visual quality guideline may be very important on some timber sales, agencies and mills should consider its actual importance on every sale, knowing the extra costs it incurs to loggers.

Finally, natural resource management agencies and mills should consider providing additional resources or financial help to loggers for implementing the guidelines. Although many interview participants recognized that the cost of guideline implementation should be taken into consideration when purchasing a timber sale, agencies should recognize the financial state of the timber industry and offer financial or resource help to aid in its sustainability. Many agencies already underwrite logger trainings and certifications. However, there are other opportunities where agencies could aid loggers in guideline implementation. For example, agencies could provide water bars when they want them installed post-harvest, or provide mats for stream crossings. These examples would alleviate costs for loggers who are already on the margins of a profit. Profitability was cited as loggers' greatest concern in the timber industry, as well as the greatest constraint to conservation action. Policymakers, agencies, and mills should

keep this in the forefront of their minds, recognizing that incentivizing conservation practices through policies or programs would be a valuable goal for the entire industry.

Finding ways to alleviate these disconnects has the potential to improve all four determinants of conservation action: social norms, moral norms, business norms, and even profitability. If profitability is no longer a constraint, and social, moral, and business norms are the predominant influences, loggers will be more likely to engage in conservation action in the woods, leading to the sustainability of the timber industry and the forests of Minnesota.

CHAPTER FIVE

MANAGEMENT IMPLICATIONS AND FUTURE RESEARCH

Loggers are the backbone of timber industry which plays a major role in the vitality of northern Minnesota towns, as well as the state economy as a whole. Their timber harvesting practices are also critical to the management of Minnesota's forests. Yet, little is known about what influences logger decision making and action. The decisions loggers make in the forests about timber harvesting and conservation practices can have long-term effects on Minnesota's forests that can directly affect the future of the industry. It is imperative for natural resource managers and policymakers to understand the influences on the decision making of Minnesota loggers so they may better understand the direction the forest industry and forest health is heading, and how they might change it.

Study findings suggest loggers are influenced by social, moral and business norms of decision making and conservation action, but are constrained by limits to profitability of today's timber industry. Although possible, it is extremely difficult to change attitudes. It will be difficult to change the public's perception of logging, but efforts moving towards this cause would be very beneficial. Agencies are in a position to aid in improving the public's perception of loggers and the industry. Public land management agencies who deal with the public on a regular basis should continue and increase educational efforts and programming aimed at improving the public's perception of the industry. The public needs to understand the purpose of timber harvesting and its role in forest health and sustainability.

In addition, there is not a lot that can be done to change factors directly affecting profitability, such as environmental conditions and input costs. Therefore, the factors influencing business norms, contractual obligations, guidelines, and landowner objectives, seems to be the best place for intervention and change. The guidelines and timber sale contracts are all within the control of policymakers and natural resource professionals. The goal should be to increase flexibility in contracts and guidelines. More specifically, policymakers and agencies should be investigating the opportunities for change that would make little if any difference ecologically, but would make a large economic difference for the loggers. The goal should be to increase flexibility in guideline implementation in ways that alleviate the constraining profitability. Possible examples include increased flexibility with season of operations, fewer visual quality mandates, and increased financial and resource aid.

Interview participants frequently expressed frustration over the season of operation of sales, explaining there was “not enough summer wood”. Loggers did recognize that there are environments that are just not optimal for summer harvests, and need to be kept as winter only. However, many interviewees described their concerns that agencies were going overboard with ‘frozen ground only’ designations. Considering the data shows that loggers are strongly influenced by the sense of responsibility to do the right thing (moral norms), there may be opportunities to allow some sales for summer harvesting, and putting the responsibility on the logger to know when it is acceptable to be running equipment, weather-dependent, without rutting. Loggers have a strong desire to stay in business. Agencies might consider revoking a logging business’ privileges to bid on future sales, rather than fines, if a logger repeatedly operates during wet conditions and causes ruts.

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Future Research

One important theme that emerged in this study but was not thoroughly discussed is the disconnect between loggers and the general public, and the opportunities to fix it. Interviewees felt the general public doesn't understand how forest management works and are overly focused on aesthetics. Some participants described specific techniques used to mend the disconnect between loggers and the public, such as buffer strips along the roads or highways. Another participant mentioned "trying to keep the trucks quiet going through neighborhoods" as another strategy. One participant said, "Most of the sales we get into are back off the beaten path so it's not something the public can see a lot of. But I'm a huge advocate of leaving trees, stuff like that, looking pretty nice so people see." One interviewee discussed his desire to get more people into the woods to ease the disconnect and begin to understand how forest management actually works. There seems to be many opportunities to increase communication and mend this disconnect between the public and the loggers which could be further studied.

A theme that emerged from the data but was not fully explored for this thesis was the declining logging workforce. Participants frequently mentioned how difficult it is to maintain workers, the number of loggers that have gone out of business, and the perception that no new loggers are entering the industry. Many of these ideas are directly related to profitability. Business owners are having trouble maintaining workers due to low profits and the high costs of insurance, workers compensation, plus having to compete for labor with the mining industry. Loggers have gone out of business due to the market crash in 2008 and low profitability. Few new loggers are entering the business because initial input costs (purchasing equipment and stumpage) are

extremely high. Further research is needed to assess the potential implications of this declining workforce on forest health and Minnesota's economy.

In addition, future research should examine the future of northern Minnesota's forests in the face of climate change and how the forest product markets will change. Participants already mentioned the need for markets to adapt to current forest conditions. This need will be even greater as forest species composition shifts with changing climates. It will be imperative for industries, and natural resource management agencies, to adapt if they want to be sustainable.

Another theme that emerged from interview data was the frustration over inconsistent and varying interpretations of the guidelines by foresters or timber sale administrators. Although there is a standard Timber Harvesting and Forest Management Guideline book, participants felt frustrated that foresters interpretation of rules varied among area, agency, and foresters. Participants did share their desire for foresters to be flexible with the guidelines. However, successful forest management and conservation behavior among loggers might be more effective if guideline interpretations were consistent across the state. Natural resource managers and policymakers should focus on creating standard definitions and interpretations.

Conclusion

This study suggests the success of loggers' decision making and conservation actions in northern Minnesota forests depends on the predominance of profitability influences. Current theories on decision making and conservation behavior describe the importance of social and moral norms as influences to behavior, which is also demonstrated in this study. However, the profitability of the logging industry can

constrain conservation action in the woods. Many loggers are influenced by the social and moral norms surrounding conservation behavior, but can feel they must make decisions that are not in line with conservation behavior in order to make a profit and stay in business. Loggers will be more likely to make pro-environmental decisions if they do not feel constrained by profitability. It is understandable that the desire to maintain a career and continue a logging business might take precedence over implementing a guideline that poses extra time and money. However, it is important to recognize that the future of the logging industry depends on a sustainable, healthy forest.

The extremely high input costs of running a logging operation, combined with the perceived disconnects between the agencies' wood supply and the mills' price for wood, has made loggers feel like there is nothing they can change or do – and in many cases has led to individuals quitting or going out of business. Yet, this logging workforce is a vital component to forest management: trees must be harvested to promote regeneration. In order to maintain sustainable forests and a sustainable forest products industry, constraints to loggers' conservation actions must be addressed. Natural resource managers and policymakers need to consider social norms, moral norms, and profitability when making decision about the industry and structuring timber sales. An increased understanding of these influences and their roles will lead to more effective conservation efforts and improved communication, protecting our forests and forest industries in the long term.

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APPENDICES

APPENDIX A: CONTACT SCRIPT

“Hello, my name is _____. I am a graduate student conducting research on logger decision making and timber sale and harvesting practices for Mae Davenport, Associate Professor in the Department of Forest Resources at the University of Minnesota. This study involved loggers who operate in Cass County and St. Louis County. I have been interviewing loggers to gather their insights about timber payment methods and the decisions loggers make about their harvesting practices. I was hoping you would be able to assist me by participating in the study and sharing your perspectives with me. The interview takes about one and a half hours. Would you be willing to participate?”

If yes: “Thank you. I am available on _____ (days of week, times, have alternates ready) is there a time that would work best for you? [Set date, time, location (get directions)]. I would like to send you a confirmation email with date, time and location information. The email will include all of my contact information, in case you have any questions or concerns. Do you have an email address I can send the confirmation to?”

- a. **If yes**, take it down or confirm we have the correct email address for them.

“Thank you. I look forward to meeting with you on _____(agreed upon date)_____.”

- b. **If no**, “Is _____(phone # you contact them with)_____ the best way for me to get a hold of you? In case you need to get a hold of me with questions or concerns, my phone number is _____. I look forward to meeting with you on _____(agreed upon date)_____.”

If no: “Ok, thank you for your time. Good bye.”

If they seem unsure: “Just to be clear, participation is completely voluntary and if you decide to participate you can withdraw at any time. Your identity will remain confidential and we won’t include any information that would make it possible to identify you in the final report. We’re only talking to a limited number of key representatives, so capturing your perspective is important. Can I ask what your concerns about participating are?”

[Try to address their concerns]

If they want to know why they are being asked to participate: “We’re interviewing a variety of loggers to try to get diverse perspectives, a range of experiences, and a range of operation types and sizes. Since we are only able to conduct a limited number of interviews, capturing your perspective is important.”

If they want to know how the information will be used: “We are trying to better understand loggers’ perspectives on the timber payment methods, challenges they face, and decisions associated with harvesting practices. We’ll be putting together a final report that describes how loggers view these issues to share with educators and resource professionals. Your information will be kept confidential and there will not be any identifying information in the report.”

If they want to know what the study is for: “This project is aimed at assessing the two timber payment methods and the issues encountered with each. This will lead to an improved understanding of the opportunities and concerns associated with each timber payment method so recommendations can be provided for dealing with the identified concerns.”

If they want to know who is supervising the research: “Mae Davenport is the supervisor for this study. She is an associate professor in the Department of Forest Resources at the University of Minnesota. If you would like to contact her directly I can give you her phone number [612-624-2721] or email address [mdaven@umn.edu].”

If they ask about IRB: The research project has been approved by the IRB/Human Subjects Committee.

APPENDIX B: CONSENT FORM

You are invited to participate in a study of logger decision making in timber sale payment methods and harvesting in Minnesota. You were selected as a possible participant for an interview because you are a logger in Minnesota who operates in either Cass or St. Louis County. We ask that you read this form and ask any questions you may have before agreeing to be in the study. This study is being conducted by: Mae Davenport, Associate Professor at Department of Forest Resources, University of Minnesota.

Background Information

The purpose of this study is to better understand what influences loggers' decisions about timber sales and harvesting.

Procedures:

If you agree to be in this study, we would ask you to participate in an interview lasting approximately 90 minutes. The interview will be audio-recorded and transcribed.

Risks and Benefits of being in the Study

Risks associated with this study are minimal; responses are confidential and participants' names will not be linked to any information in any publications. Indirect benefits of participation include increased awareness of logger decision making with regards to timber sales and harvesting for the agencies involved in timber sales and forest management. Study results will be made available to the public and all participants will have access to them.

Confidentiality:

The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify a subject. Research records will be stored securely and only researchers will have access to the records. Your responses to the interview questions will be audio-recorded, transcribed and kept for three years in a locked office. Afterward, these recordings will be destroyed. Only those directly involved with the project will have access to the audio recording or the interview notes.

Voluntary Nature of the Study:

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of Minnesota. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

Contacts and Questions:

The researcher conducting this study is: Mae Davenport. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at address: 115 Green Hall 1530 Cleveland Ave. North, St. Paul, MN 55108-6112, phone: 612-624-2721, email: mdaven@umn.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Research Subjects' Advocate Line, D528 Mayo, 420 Delaware St. Southeast, Minneapolis, Minnesota 55455; (612) 625-1650.

You will be given a copy of this information to keep for your records.

Statement of Consent:

I have read the above information. I have asked questions and have received answers. I consent to participate in the study.

"I agree_____ I disagree_____ to have my responses audio-recorded"

"I agree_____ I disagree_____ that Mae Davenport may quote me anonymously in her papers"

Signature:_____ Date: _____

Signature of Investigator:_____ Date: _____

APPENDIX C: BACKGROUND INFORMATION QUESTIONNAIRE

To better document the types and range of loggers we talk to, we are asking participants to complete a short background information worksheet. This information will only be presented as a summary of study participant characteristics. All efforts will be made to maintain confidentiality and any information provided that may reveal your identity will be excluded from published documents. Your name will not be associated with the data collected and will not be referenced in any future publications.

1. In what city do you live in and how long have you lived there?

_____.

2. How many years have you been logging? _____.

3. How many years have you logged with your current operation/employer?

4. Approximately how many employees does your operation currently have?

_____.

5. Approximately how many cords does your operation harvest annually?

_____.

6. What agencies/entities have you bought wood from in the past year? (circle all that apply)

a. USDA Forest Service

e. Other County

b. Minnesota DNR

f. Private Landowner

c. St. Louis County

g. Other

d. Cass County

7. Are you involved in any natural resource or community organizations (e.g., SAF, MLEP)?
Please specify:

8. What is your gender? Male Female

9. How would you describe your race and ethnicity?

_____.

10. What is your age? _____.

11. What is the highest level of formal education you have completed?
- a. Did not finish high school
 - b. Completed high school
 - c. Some college but no degree
 - d. Associate or vocational degree
 - e. College bachelor's degree
 - f. Some graduate work
 - g. Completed graduate degree (MS or PhD)

APPENDIX D: INTERVIEW GUIDE

First, I'd like to start with a few questions about your logging business in general.

1. Let's start by you telling me a little bit about your logging operation. How would you describe your operation/business to a friend?
 - a. What equipment does your operation/business regularly use?
 - b. What products does your operation/business typically produce?
2. What do you like most about being a logger?
3. What worries or concerns you the most about logging today?
 - a. Are there ways in which you've addressed these concerns? Would you share an example?
4. What does your logging operation/business mean to you?

Next, I would like to learn more about your decision making process for your logging operation.

5. What are some of the most important considerations when making decisions about your business?
6. What are some of the biggest obstacles you face in day-to-day decision making?
 - a. How do you address these obstacles?
7. Who do you consult with before making decisions?
 - a. Please describe these interactions.
8. How often do you interact with others out in the woods like foresters, agency personnel, or other loggers?
 - a. How would you describe those interactions?
 - b. Would you change anything about those interactions?
9. Have you changed the way you log in the past 5 years in an attempt to make your operation more successful? Please explain.

Now, I would like to learn more about your perspectives on timber sales payment methods.

One primary objective of our study is to better understand opportunities and challenges associated with the two timber sale payment methods: consumer scaled sales and timber sales that are sold on appraised volume (SOAV). The next set of questions relates to these two methods.

10. Approximately what proportion of your sale purchases each year are consumer scaled versus SOAV?
 - a. Has this proportion changed over the past 5 years? Please explain.
 - b. Do you see this proportion changing in the future? Please explain.
11. When you have the choice, which payment method do you choose? Please explain.
 - a. What factors are important to you when purchasing a tract as consumer scaled? Please explain.
 - b. What factors are important to you when purchasing a tract as SOAV? Please explain.
12. What do you see as the primary advantages of SOAV?
13. What do you see as the primary disadvantages of SOAV?
14. What do you see as the primary advantages of consumer scaled?
15. What do you see as the primary disadvantages of consumer scaled?
 - a. Is documenting tickets and working with sale administrators difficult?
16. Do you think the type of payment method has an impact on the timber industry? Please explain.
17. Do natural resource management agencies influence payment method decisions? Please explain.
18. Are there ways in which agencies could better support loggers in timber sales under each payment method? Please explain.

Next, I have some questions for you about timber harvesting practices and specifically, the *Timber Harvesting & Forest Management Guidelines* developed by the Minnesota Forest Resource Council.

19. First, a broad question: What do the words “forest health” mean to you?
20. Are you concerned about the health of forests in northern Minnesota? Please explain.
 - a. What do you see is your role in improving or maintaining forest health?
21. Who or what most influences your timber harvesting practices? Please explain.
 - a. Are you influenced by other loggers? Please explain.
 - b. Are you influenced by the public’s perception of logging? Please explain.
 - c. Are you influenced by the market? Please explain.
 - d. Are you influenced by natural resource management agencies? Please explain.
22. Are you influenced by industry trade organizations (e.g., TPA, ACLT, MLEP, MFI, MML)? Would you share an example?

23. What is your general impression of the Timber Harvesting & Forest Management Guidelines?
 - a. What do you like or dislike about the guidelines?
 - b. If you could change anything about the guidelines, what would you change?
24. What support do you think you need in guideline implementation?
 - a. If you have questions about the guidelines, who do you go to or what resources do you use?
 - b. Do you get the support you need from natural resource management agencies to successfully implement the guidelines? Would you share an example?
25. What factors most affect your ability to implement the guidelines?

Finally, I have a few last questions for you.

26. What inspires you the most about Minnesota's timber industry today?
27. If you could change anything about Minnesota's timber industry, what would you change?
28. Is there anything else I should know about your perspective? Anything we didn't discuss that you wanted to make sure is mentioned?