THE EFFICACY OF HABITAT CONSERVATION ASSISTANCE PROGRAMS FOR FAMILY FOREST OWNERS IN VERMONT

A Thesis Presented

by

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ABSTRACT

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The future of Vermont's 1.8 million hectares (4.5 million acres) of forest habitat will be largely determined by the decisions of family forest owners, who collectively own 60% of the state's forested land. To promote management for wildlife habitat, government agencies and non-governmental partnerships provide technical and financial support to family forest owners in the form of conservation assistance programs. In Chapter 1, I qualitatively compared the efficacy of two types of conservation assistance programs available in Vermont: traditional programs offered through the Natural Resources Conservation Service, and a simplified, accelerated program offered through a non-governmental partnership called Woods, Wildlife, and Warblers. By conducting interviews with 20 Vermont family forest owners, I identified common motivation and barrier themes and compared these themes across programs using the Transtheoretical Model's Stages of Change. Most motivations and barriers were described by landowners across all Stages of Change, but two motivations (professional recommendations and straightforward applications) and one barrier (independent forest management values) varied by either Stage of Change, program type, or both. I used the findings from the interviews to develop a mail survey, which was used to quantify patterns regarding

motivations and barriers towards three habitat conservation actions: 1) arranging for a forestry professional to walk the land, 2) applying for cost-share funds, and 3) making a patch cut. The results from this survey, which was sent to 2,122 randomly selected Vermont family forest owners and had a cooperation rate of 38%, are presented in Chapter 2. Using logistic regression models, I identified multiple significant motivations or barriers for each of the three actions. Additionally, I used contingency tables to compare respondents' levels of agreement for these motivations and barriers – as well as their level of trust for various information sources – with their Stage of Change. Overall, levels of agreement varied significantly across one or more Stages of Change for all motivations and barriers, and trustworthiness varied for 13 out of 14 information sources. Across both chapters, I provide recommendations to increase program efficacy with an emphasis on program attributes and tailored messaging.

Keywords: Barriers, cost share, family forest, habitat, motivations, technical assistance, Transtheoretical Model, Vermont, wildlife, Wildlife Value Orientation

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CHAPTER 1

A QUALITATIVE ASSESSMENT OF VERMONT FAMILY FOREST OWNERS' MOTIVATIONS AND BARRIERS TOWARDS PARTICIPATING IN COST-SHARE PROGRAMS TO ENHANCE WILDLIFE HABITAT

1.1 Abstract

Governmental groups have traditionally offered cost-share programs to family forest owners (FFOs) to promote conservation actions on private lands, including programs which improve or expand wildlife habitat. In 2017, a non-governmental partnership began to offer an alternative cost-share program in Vermont which simplified and accelerated the application process but lowered cost-share payments for habitat expansion and improvement projects. I qualitatively compared the efficacy of traditional versus alternative programs by conducting interviews with 20 Vermont FFOs. I identified common motivation and barrier themes and compared them across program types using the Transtheoretical Model's Stages of Change. The most common motivation themes related to aligned management interests, attractive funding, professional recommendations, and straightforward applications. The most common barrier themes included mismatched management interests, lack of clear information, the imbalance between the effort needed to apply and the benefits received from the program, strong independent forest management values, and low financial need. Most motivation and barrier themes did not vary by Stage or program type. However, the motivations regarding professional recommendations and straightforward applications, along with the barrier regarding independent control, varied by either Stage of Change, program type, or both. By assessing motivations and barriers by participants' Stage of Change and program type, this study provides a unique perspective into the experiences of Vermont

family forest owners as they progress through the decision-making process. I conclude by providing recommendations for forestry professionals and program administrators about tailored information based on the Stages of Change, potential improvements to program administration, and recognizing that cost-share programs address only a limited set of landowners' goals.

1.2 Introduction

Forests provide approximately thirty percent of terrestrial habitat worldwide (FAO 2020). As a major biome, forests provide wildlife with food, clean water, shelter, reproductive opportunities, and protection from predators (Brown 2020). New England is one of the most highly forested regions in the United States, but habitat availability is declining in this area for many species that depend on heterogeneous forest composition and age structure (Olofsson et al. 2016, Bakermans et al. 2012). This decline is due in part to historic land use patterns on privately-owned forestland, which typically involved intensive land clearing for agriculture followed by passive or active management practices that promoted homogenous forest age structures (Ducey et al. 2013). Today, large-scale environmental challenges such as climate change and invasive pests threaten to reduce forest complexity (Foster et al. 2017). Dramatic shifts in land ownership have also driven forest fragmentation, which has reduced habitat connectivity along with the size of interior forest habitat (Kittredge et al. 2008, Dietzman et al. 2011). In addition to these threats to the quality of forested habitat, the maturation of northeastern forests is compounding the decline of species dependent on early-successional habitat (Askins

2001). For some species in decline, the most effective measure to preserve populations is to protect and maintain their habitat (Mir and Dick 2012, Taylor et al. 2005).

Located in northern New England, the state of Vermont contains 1.8 million hectares (4.5 million acres) of forested land and is proportionally the fourth most-forested state in the country (Morin et al. 2020). The state's landscape includes the transition from the maple/beech/birch forests typical of the northeastern US to the spruce/fir forests of northern New England, resulting in relatively high compositional diversity (Morin et al. 2020). However, Vermont's overall forest structure is shifting towards older, larger trees, mainly due to its land use history. As of 2017, 69% of Vermont's timberland area was comprised of large-diameter stands (≥ 9" diameter at breast height [DBH] for softwoods and ≥11" DBH for hardwoods), while medium-diameter stands comprised 24% and small-diameter stands (<5" DBH) comprised only 7% (Morin et al. 2020). Since forest management strategies (or lack thereof) play a large role in shaping habitat quality, the future of Vermont's habitat quality rests predominantly in the hands of its collectively largest landowner group: family forest owners (FFOs). I define "forests" as land with at least 10% tree cover, which is at least one acre in size, no narrower than 120 feet, and is not currently developed for non-forest use (Butler et al. 2020). "Family forests" are forests which are owned by families, individuals, trusts, or estates (Butler et al. 2020). Currently, family forests represent 60% of Vermont's forested land, equating to approximately 1.1 million hectares (2.7 million acres) (Butler et al. 2020, Morin et al. 2020).

Because many of the environmental, cultural, and economic benefits of protecting wildlife habitat extend beyond the parcel level, some governmental and non-

governmental entities seek to support FFOs due to their large influence on Vermont's habitat quality. Within the USA, these entities occur at the national, state, and local level, and generally seek to help these landowners meet their needs while simultaneously promoting forest stewardship and habitat-enhancing management practices. Examples of this support include a range of programs, policies, and tools such as preferential property taxes, conservation easements, forest certification, cost-share programs, and technical assistance (i.e. professional advice, site visits, and information sessions/materials). I refer to cost-share programs and technical assistance collectively as "conservation assistance programs."

Despite the diverse types of conservation assistance available to FFOs, these programs generally have low utilization rates. According to the results from the 2018 National Woodland Owner Survey, only 4% of Vermont family forest ownerships with 10 or more acres have participated in a cost-share program (Butler et al. 2020). In contrast, Vermont FFO participation in some technical assistance programs is relatively high; 31% have received advice regarding their forest within the past five years. Compared with other forested states in the continental US, a high percentage of Vermont FFOs have received advice. However, utilization rates for cost-share programs closely reflect average rates nationwide.

Given the overall low rates of participation in conservation assistance programs across the country, many studies have attempted to better understand the motivations, barriers, and characteristics of FFOs who are eligible to participate in these programs (e.g. McGrath et al. 2020, Andrejczyk et al. 2016, Buffum et al. 2014, Song et al. 2014, Ma et al. 2012, Davis and Fly 2010, Kilgore et al. 2008). When considering how to

increase engagement, studies have explored landowner attitudes, values, beliefs, interests, objectives, reasons for owning and managing forestland, conceptualization of management, identity as a manager or non-manager, and demographic factors. For example, Kilgore et al. (2008) found that enrollment in a forest stewardship-type program was influenced by the amount of financial compensation, the landowner's intention to obtain a management plan, their opposition to the program's development restrictions, their prior awareness of the program, and their total acreage of forestland. Ma et al. (2012) and Song et al. (2014) also found that those with larger acreages were more likely to enroll in cost-share programs, while additionally concluding that participation varied by ownership objectives and geographical sub-region (Song et al. 2014) but not by age and income (Ma et al. 2012). Buffum et al. (2014) found that 47% of survey respondents would not have implemented early-successional habitat management without assistance from a cost-share program, although the sample was small and consisted of highly motivated landowners who had participated in an intensive forest habitat training program.

Additional studies have focused on a network of factors that suppress participation in assistance programs, such as a lack of targeted outreach (McGrath et al. 2020), the high level of effort needed to apply for programs (Jacobson et al. 2009), and distrust in the government (Rouleau et al. 2016). Other studies have focused on shortcomings in the way forest management is perceived and discussed, which may ultimately impact the efficacy of outreach regarding assistance programs. For example, Davis and Fly (2010) found that landowners often conceptualize the term "forest management" more broadly than forestry professionals, leading to a disparity between

these two groups in their respective understanding of whether "management" has occurred. Likewise, Andrejczyk et al. (2016) found a strong preference among family forest owners for the word "woodland" or "woods" over "forest" when describing their land, further demonstrating the disconnect in messaging between forestry professionals and those they serve. However, the greatest divergence may pertain to the relevancy of forest management; Kittredge (2004) stated that while forestry professionals typically think about management on a daily basis, family forests may be "running in the background" for many landowners.

Our study focused primarily on Vermont FFO's motivations and barriers for improving wildlife habitat via cost-share programs. Cost-share programs are part of a network of policies, programs, and tools that can be used for habitat conservation, which also includes programs such as Safe Harbor Agreements, incentive payments, tax breaks, technical assistance, and conservation easements. Specifically, cost-share payment programs support habitat conservation by using financial incentives to assist family forest owners in the adoption of specific land management techniques (Claassen et al. 2008). Generally, these programs require landowners to submit an application to the program administrator which outlines their proposed management action. If accepted, the administrator and the landowner sign a contract, where the administrator agrees to cover a certain percentage of the costs in exchange for a commitment from the landowner to perform the management actions to an approved standard and within a certain timeframe.

Traditionally, cost-share programs in Vermont have been established or funded through federal government agencies such as the USDA's Natural Resources Conservation Service (NRCS) or the Forest Service (USFS), and are administered at the

state level. Examples of current programs include the Environmental Quality Incentives Program (EQIP) and the Forest Stewardship Program (FSP). To assist landowners with wildlife habitat enhancement, some cost-share programs provide funds to help landowners create management plans. Others provide funding for implementing management activities such as invasive plant removal, the preservation of snags and other valuable roost sites, the creation or maintenance of early-successional habitat, and stand improvement to promote nesting or foraging. In general, the efficacy of cost-share programs is debated, with some studies reporting a significant conservation impact from these programs (Drummond and Loveland 2010, Kilgore and Blinn 2004, Mehmood and Zhang 2002) while others have found that landowners would have adopted the conservation practices to some extent regardless of their status in the program (Andrejczyk et al. 2016, Kilgore et al. 2015, Sun 2007).

1.2.1 Background

Between June 2017 and December 2018, a non-governmental partnership called Woods, Wildlife, and Warblers (WWW; http://www.woodsandwildlife.org) tested an alternative to traditional cost-share programs in southern Vermont. This partnership between the American Forest Foundation, the Vermont Woodlands Association, and Audubon Vermont hypothesized that offering lower cost-share payments, implemented through a non-governmental group with fewer bureaucratic hurdles, would have higher conservation impacts. WWW tested their hypothesis by dividing FFOs in southern Vermont into two groups. Landowners in “test” counties (Rutland and Windham) were offered accelerated financial assistance through WWW, while those in “control” counties

(Bennington and Windsor) were offered traditional financial assistance through NRCS programs. The assistance provided to both groups was tied to landowner actions that enhanced and/or expanded habitat for 40 high priority bird species, such as American Woodcock (*Scolopax minor)*, Canada Warbler (*Cardellina canadensis)*, and Wood Thrush (*Hylocichla mustelina)*. These 40 species were prioritized for protection by Audubon Vermont because their global populations are declining or are at risk of declining, and because these species rely on the Northern Forest (the mixture of hardwood and boreal forests extending from Maine through northern NH, VT, and NY) for breeding habitat (Hagenbuch et al. 2011). Outreach to landowners included images of birds and other wildlife in forested habitats, and described the role of birds as an indicator of overall forest health and habitat quality. The outreach materials also provided recipients with the option to request a free visit from a "woodland" professional to learn more about managing their woods with birds and other wildlife in mind.

Family forest owners who completed a professional visit received information about either the accelerated (WWW) financial assistance program or a traditional (NRCS) program depending on the county in which they owned land. While the exact percentage of cost-sharing assistance varied based on individual circumstances for both program types, those in the accelerated program generally received a 25% cost-share while those in the traditional programs received 75%. The application for the accelerated program was one page in length and landowners were notified of their application's approval status within two weeks. The application process for the traditional programs consisted of eligibility forms plus a multi-page program application form, and the

timeline for approval usually took a minimum of two months but could potentially take months longer.

In partnership with WWW, I interviewed FFOs to determine their motivations and barriers for and against both types of programs. Overall, my goal was to compare the efficacy of WWW's accelerated assistance model against traditional cost-share models. I spoke with a variety of landowners, including those who had completed, were considering, were unfamiliar with, or had decided against participating in each type of cost-share program. These different groups of landowners were chosen to represent the "Stages of Change," a construct of the Transtheoretical Model of Behavior Change (TTM) which I used as theoretical lens through which to analyze landowners' motivations and barriers.

1.2.2 Transtheoretical Model of Behavior Change

The Transtheoretical Model of Behavior Change is a psychological approach first used in the late 1970's to understand and predict behavior change (Prochaska and DiClemente 1983). The model arose from a study about cigarette smokers, which examined how individual smokers engaged in the process of stopping their addictive behavior. The model is comprised of four major constructs: (1) stages of readiness to engage in the new behavior (also known as "Stages of Change"), (2) processes of change, (3) decisional balance inventory, and (4) self-efficacy (Prochaska and DiClemente 1983). My study applied the first construct of TTM as a method for understanding the barriers and motivations applicable to Vermont FFOs as they enter and proceed through the behavior-change process. Specifically, the chosen behavior for my analysis - used to

determine whether a program was “successful” or not - was the action of applying to either a traditional or accelerated cost-share program.

The Stages of Change construct is based on the idea that there are five associated stages with any given change in behavior (Figure 1). Thus, an individual is in one stage at a time for any particular behavior. The stages are called pre-contemplation, contemplation, preparation, action, and maintenance (Prochaska and DiClemente 1983). Pre-contemplation occurs when a person is not ready to engage in a new behavior, either because they are unaware of, discouraged by, or resistant to the idea of trying the new behavior. The next step, contemplation, occurs when the person is considering engagement in the new behavior, often while comparing the pros and cons of taking action. After contemplation, a person enters the preparation stage once they have decided to take action and are actively preparing. Once the person begins engaging in a new behavior, they have entered the action stage. The maintenance stage is achieved once the new behavior has been maintained for over six months (Prochaska et al. 2008). Progress through these five stages is typically linear, but linear progress is not an underlying assumption of the model and a person may cycle through several stages more than once (Abrash Walton 2018). A sixth stage, called termination, is occasionally included in TTM applications and occurs when the individual has zero temptation to return to their pre-contemplation habits.

For the purposes of this study, the pre-contemplation phase was divided into two categories called Precontemplation: Unaware and Precontemplation: Resist. Individuals in the Precontemplation: Unaware category (henceforth called “Unaware”) were unaware of the behavior or had never considered changing behaviors, while those in the

Precontemplation: Resist stage (henceforth called “Resist”) had heard about the behavior but were discouraged by, or resistant to, the idea of trying this behavior. I chose not to apply the Maintenance or Termination stage to this study, as the specific action of applying to a cost-share program (as opposed to participating in a program) is treated as a single event. Thus, the application of Maintenance and Termination are less useful.

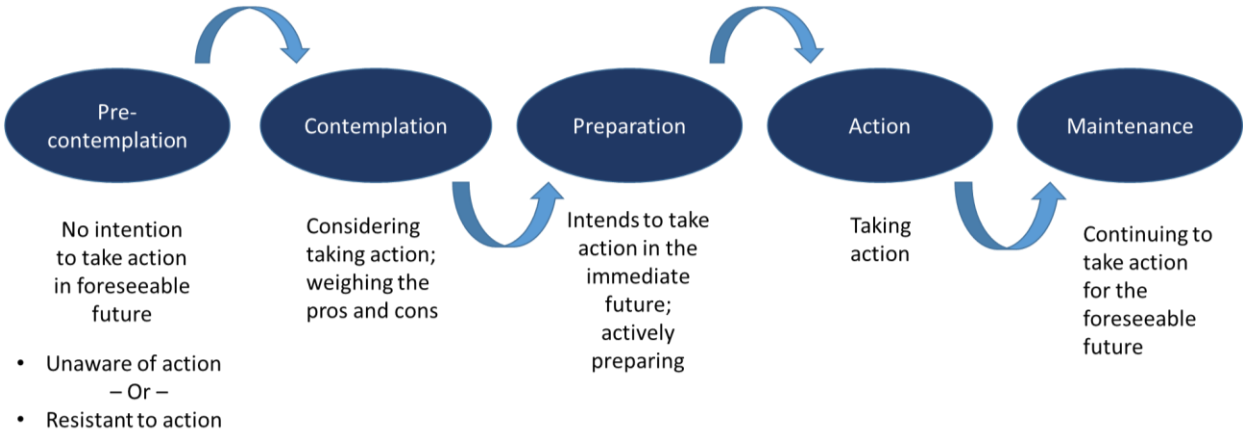

Figure 1. Conceptual model of the Transtheoretical Model of Behavior Change (adapted from Prochaska and DiClemente 1983).

Since its inception, the Transtheoretical Model has been used to examine a multitude of behaviors beyond smoking cessation. However, the vast majority of these studies have occurred within the physical and mental health fields. For example, Prochaska et al. (2008) wrote that TTM had been used to study dozens of health-related actions, such alcohol and substance abuse, anxiety and panic disorders, cancer screening, and radon testing. Within the environmental field, the use of TTM is very limited. It has been used to examine institutional fossil fuel divestment (Abrash Walton 2018), wildfire risk mitigation (Martin et al. 2007), conservation estate

planning (Markowski-Lindsay et al. 2017), sustainable energy use (He et al. 2010), and perceptions of climate change (Semenza et al. 2008).

While TTM is found infrequently in the environmental literature, alternative theories such as the Theory of Planned Behavior, Self-determination Theory, and the Value-Belief-Norm theory have been more commonly employed to study behavior change. In particular, the Theory of Planned Behavior (TPB) has widespread use, particularly in the human dimensions of wildlife field (Wilkins et al. 2019, Miller 2017, Shrestha and Burns 2016, Hrubes et al. 2001) and the forestry field (Rekola 2010, Karppinen 2005, Bieling 2004). TPB has relatively strong predictive power (Rossi and Armstrong 1999, Hrubes et al. 2001), and is useful when individuals are making conscious, reasoned considerations before deciding to take an action (Stern 2018). However, TPB does not account for unconscious influences on behavior, which is a major limitation to the theory (Sheeran et al. 2013, Stern 2018). TPB also fails to adequately address the problem of 'inclined abstainers', or individuals whose intention does not lead to action (Orbell and Sheeran 1998). Like TPB, Self-determination Theory is best used to study the intention to take action, and does not predict the degree to which intention will lead to action (Ryan and Deci 2000, Stern 2018). In contrast, Value-Belief-Norm theory can be used to explain and predict behavior, but its predictive power has been shown to be lower than that of TPB (Kaiser et al. 2005, Lopez-Mosquera and Sanchez 2012). Because forest management decision-making and action occur over a long timeframe, I wanted to explore a theory that was not based on the assumption that intention leads to action. Therefore, I chose to use TTM

as a theoretical lens because it has been rigorously tested as a behavior change model (Krebs et al. 2018), does not rely on an inconclusive assumption, and adds a new theoretical perspective to the family forest literature.

1.3 Methods

I conducted 20 interviews with Vermont FFOs who owned land in the counties of Bennington, Rutland, Windham, or Windsor. Because an objective of my study was to compare the efficacy of traditional versus accelerated programs, I emphasized these southern counties because both the NRCS and WWW administered cost-share programs in this area. While these interviews represented 20 different family forest ownerships, they included 29 interviewees because some parcels were owned by more than one person. In these situations, all co-owners or co-managers (such as a spouse or sibling) interested in participating in the study were invited to do so. For clarity, from here forward the term "participant" refers to the primary decision-maker for each family forest parcel, unless otherwise noted.

1.3.1 Sample Selection

Our sample for participants was drawn from mailing records provided by WWW. These mailing records categorized landowners by treatment (i.e., whether they owned land in an accelerated-funding [WWW] or traditional-funding [NRCS] county) and by their level of action regarding program participation. Therefore, I developed five categories into which I placed each participant based on treatment and level of action: those who applied for traditional funds or accelerated funds ("Applied Traditional" and

"Applied Accelerated"), those who had requested a professional visit in response to outreach but had not yet applied for funds ("Professional Visit Traditional" and "Professional Visit Accelerated"), and those who did not respond to outreach ("No Response") (Figure 2). Note that the initial outreach materials to both groups were not differentiated by treatment; landowners were informed of their specific cost-share offer only after they had completed the professional visit.

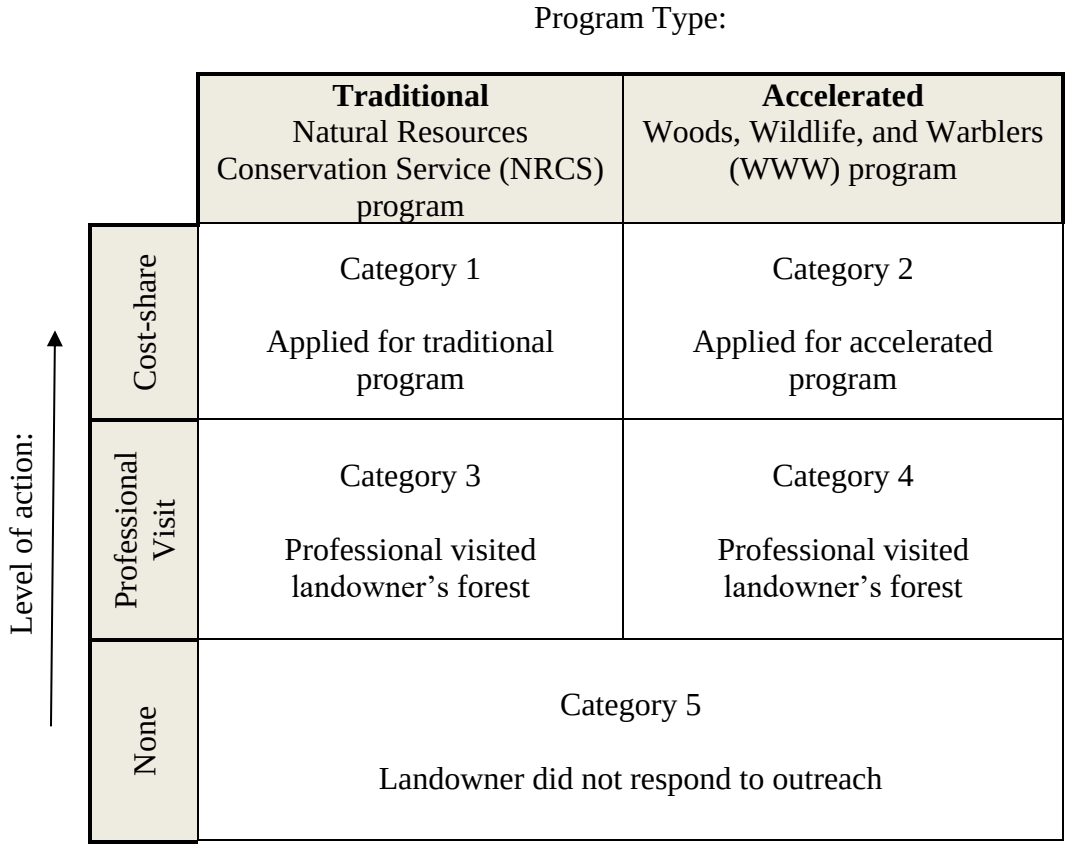

Figure 2. Conceptual model for sample selection.

1.3.2 Participant Recruitment

I attempted to recruit four or five participants for each category, with the expectation that four interviews per category would represent a diverse set of experiences. As I reached the final interview within each category, I monitored the responses to ensure that no substantial new information was being gained. Note that according to WWW records, only two landowners qualified for the Applied Traditional category and seven qualified for the Applied Accelerated category, so I combined these for recruitment purposes and attempted to speak to four people across both categories.

Expecting about a 10% response rate to recruitment efforts, I attempted to contact every landowner within the Applied Traditional, Applied Accelerated, Professional Visit Traditional, and Professional Visit Accelerated categories because the total number of people within each category was relatively small (ranging from 2 to 26 landowners per category) according to WWW records. For the No Response category, I randomly selected 50 landowners to contact and invite to interview. Participants were contacted by mail, as other contact methods were not available through the sampling frame. The recruitment letter contained information about the purpose and funders of the study, the format of the interview, the confidentially of all results, and offered $50 to each ownership for a completed interview. I received a high response rate to my recruitment letter, and each potential participant was asked a set of screener questions to ensure that they fit the scope of the study and to gather basic demographic data. I chose participants on a first-come first-serve basis while maintaining balanced demographics. Specifically, I strived to maintain a 50/50 split on the location of the participant's forest (accelerated vs.

traditional county), parcel size (under 50 acres vs. 50 or more acres), enrollment status in Vermont's Use Value Appraisal program (enrolled vs. unenrolled), gender, and age group (under 65 vs. 65 or older) (Table 1).

Table 1. Characteristics of the primary decision maker for each forest ownership interviewed (n=20).

Characteristic	**Number of Participants**
Location of forest	Accelerated county: 11 Traditional county: 9
Size of forest	<50 acres: 11 ≥50 acres: 9
Enrollment in Use Value Appraisal Program (UVA; a.k.a. Current Use)	Currently enrolled: 12 Not currently enrolled: 8
Level of action	No response: 4 Professional visit requested/completed: 11 Cost-share application completed: 5
Gender	Male: 12 Female: 8
Age	<65 years old: 8 65+ years old: 12

1.3.3 Data Collection

I used a semi-structured format for the interviews, where participants were asked open-ended questions with probes to elucidate detailed responses. Every interviewee was asked the same set of applicable questions and probes from an interview guide, by the same primary interviewer, to facilitate comparisons and analysis. A note-taker accompanied the primary interviewer according to safety protocols and to record clarifying descriptions of the interviews. Interviews were designed to take approximately

1 to 1.5 hours and were audio recorded. All interview procedures and materials were approved by the University of Massachusetts Amherst Institutional Review Board (Protocol ID: 2017-4379). Written and verbal consent was obtained from each primary decision-maker and any participating co-managers before each interview commenced. Interviews occurred between October 2018 and January 2019. Seventeen interviews took place in-person in Vermont on/near the landowners' forest, and three interviews were conducted via phone or video chat due to travel or schedule-related constraints. Each interview was transcribed to assist with analysis, and all participants were assigned pseudonyms to maintain their confidentiality.

1.3.4 Analysis

This study used a qualitative research design that organized interview data into categories formed through inductive, theory (TTM) based, and prior-research based development methods. First, I read through each transcribed interview to develop a general feel for the data. During this reading, I referenced notes taken during the interview to develop summaries that included a description of the interviewees' actions and attitudes regarding their forest, exploratory comments regarding their statements, and my perceptions of events and relationships. By the end of this step, I was able to develop a list of emergent themes and ideas which I arranged into topic and subtopic nodes using open and axial coding. Additional codes were developed based on prior FFO research and to reflect key elements of the Transtheoretical Model. Codes were compiled in a codebook and were applied to the interviews systematically using the NVivo software package (QSR International Party Ltd. 2018). The coding scheme was refined through an

iterative process until the coding categories aligned with my research questions and all data had been reviewed. I then applied selective coding to compare Stages of Change by cost-share treatment (accelerated versus traditional; Table 2) as well as by motivation and barrier. Note that two interview participants who had originally been classified via WWW records as "no response" were later determined to have applied to a traditional program prior to the inception of the WWW partnership, and were consequently coded in the Action stage.

Table 2. The number of participants interviewed within each Stage of Change regarding the action of applying for a traditional or accelerated cost-share program (n=20).

	Unaware	**Resist**	**Contemplation**	**Preparation**	**Action**
Traditional Program	1	3	1	0	4
Accelerated Program	5	1	2	0	3

1.4 Results

The results of this study are primarily organized into two sections to reflect the motivations and barriers described by the interview participants. Within each main section, I described the specific motivation or barrier categories developed through the analysis, the variability of the Stages of Change present within each motivation or barrier category, and any substantial differences in these motivations or barriers by cost-share treatment.

1.4.1 Motivations

I found that the motivations described by interviewees for applying to a cost-share program fell into four distinct categories. These categories related to management interests, attractive funding, professional recommendations, and the relatively straightforward application process. Two of these motivations – management interests and attractive funding – were consistently described by participants in the Action, Contemplation, and Resist Stages of Change and did not vary substantially between the traditional and accelerated treatments. As expected, these motivations were not described by anyone in the remaining two Stages of Change (Preparation and Unaware) because I had no participants in Preparation and because those in Unaware had not developed strong attitudes about a program with which they were unfamiliar. The remaining motivations – clear professional recommendations and the ease of the application process – were uniquely described by landowners in the Action stage. While the professional recommendations motivation was described by landowners in both the traditional and accelerated treatments, the ease of the application process was described only by those in the traditional treatment.

1.4.1.1 Aligned Management Interests

A number of landowners were interested in cost-share programs because these programs funded a management action they were interested in pursuing. These actions were predominantly related to improving wildlife habitat and included actions such as removing invasive plants, maintaining open meadow and edge habitat, and increasing vertical diversity through patch cuts, smaller regeneration cuts, or girdling. Landowners

mentioned that cost-share programs were appealing as a means to complete these actions, as they were otherwise “cost prohibitive” or “extremely time consuming.” However, one major difference between landowners in the Action stage, compared to those in the other stages, was that these individuals tended to already actively manage their land prior to learning about cost-share programs, and tended to have a strong intrinsic drive to modify some aspect of their forest.

1.4.1.2 Attractive Funding

For landowners who were motivated to apply for cost-share funds, their interest in conducting an eligible management activity was often paired with an interest in receiving financial support. Attractive funding was a motivation for landowners across stages, even if they eventually decided against applying to a program. While funding levels for traditional programs were described favorably by most participants, the relatively low funding levels for the accelerated program were viewed with mixed opinions. However, for those who already intended to take action regardless of their status in a program, the funding offered through the accelerated program was perceived as helpful and thus served as a motivation to apply. According to Kevin, who was in the Action stage for the accelerated program, “It wasn’t a lot, but every little bit helps.”

1.4.1.3 Professional Recommendations

Receiving a recommendation to apply for a cost-share program from a forestry professional also served as a motivating factor for several landowners in the Action stage. Note that while most participants in the study had received advice regarding planning or

implementing management actions, those in the Action stage uniquely received memorable, clear advice to apply to a cost-share program as well. These landowners recalled feeling supported in their efforts, and reported having a good working relationship with their forester/program administrator.

1.4.1.4 Straightforward Application

Several participants in the Action stage who felt well-supported by their forestry professional also felt motivated to apply for cost-sharing because the application process felt manageable. Often, the application process was described as easier than expected directly due to the support of a professional:

> *You can see I don't like the bureaucracy of the Use Value Program [UVA] but the NRCS programs are much worse. But they did most of the paperwork. So it was not a painful experience for me. Because they basically filled it out and the landowner was insulated from the pain of the bureaucratic necessities I guess in those programs.*
>
> -Karl, Action stage for a traditional program

1.4.2 Barriers

Interviewees described barriers towards applying for a cost-share program that could be grouped into five broad categories. These categories reflected mismatched management interests, lack of clear information, the imbalance between program effort versus benefit, strong independent forest management values, and low financial need. The barriers related to management interests and information occurred frequently amongst participants in all four Stages of Change present in the study (Unaware, Resist, Contemplation, and Action). Descriptions of the imbalance between effort versus benefit

were also common, although only amongst those in the Resist, Contemplation, and Action stages. I argue that the lack of this barrier amongst landowners in the Unaware stage is logical, as those who were unfamiliar with the programs did not have enough information to hold strong opinions about the program's relative effort versus reward. Therefore, I propose that mismatched management interests, lack of clear information, and the imbalance between effort and benefit are widespread barriers that can be found across FFOs in all applicable Stages of Change.

The remaining barrier categories - strong independent forest management values and low financial need – appeared to be more specific to certain Stages of Change. Multiple participants in this study described a desire to make decisions and manage their forest without interference from others, and those who strongly valued this independence were all in the Resist stage. Lastly, one participant in the Unaware stage described a lack of necessity for financial assistance, as he was content to allocate his own resources towards the management of his forest. While this barrier appeared only once in the study and was therefore associated with only one Stage of Change, I argue that other landowners with this barrier would also fall within the Resist stage if they decide against applying altogether. I will now present more detail about each of these five barrier categories.

1.4.2.1 Mismatched Management Interests

Many landowners across both treatments described having forest management interests that were not well matched by cost-share programs, and this served as a barrier towards learning about or applying for cost-share funds. Those in Unaware and Resist

were often content with the way their forest was currently managed, or lacked "inspiration" to take a management action. According to Kim, who was in the Unaware stage for a traditional program, "It [my forest] seems to be managing pretty well just by itself as far as I know." Others specifically preferred a passive management approach, while some felt that forest management was less salient than other, more pressing matters. These landowners were unlikely to seek out, receive, and/or remember clear information about cost-share programs because they did not perceive these programs to be applicable or necessary for their forest.

Other landowners with this barrier were interested in taking a specific management action, but the action was not eligible for cost-sharing. For example, several landowners expressed interest in removing invasive plants, but were uncomfortable with, or unwilling to apply for, cost-share funds because the programs would only cover chemical removal methods. Chemical control was perceived by some to be dangerous to human health, detrimental to bee populations, or likely to sterilize the soil, among other concerns. Other actions of interest that were not addressed by cost-share programs were "woods road" revitalization and invasive insect monitoring/control. In contrast, other landowners expressed interest in taking an action eligible for cost-sharing, but held concerns that this action was not well-suited for their land because it conflicted with other goals. For example, two participants were interested in making patch cuts to enhance wildlife habitat on their land, but were concerned about aesthetics, impacts on recreational activities, and trespassing by hunters.

1.4.2.2 Lack of Clear Information

The second widespread barrier, described by participants in both treatments, related to a lack of clear, concise information. This desired information varied in content and complexity based on management interests and Stage of Change. Those in Unaware did not recall ever hearing about cost-share programs from their forestry professionals, while some in Contemplation recalled the programs being mentioned but not well-explained. Specifically, one individual in the Contemplation stage recalled feeling too "overloaded" with information about management suggestions to discuss the details of cost-share programs with his forester, and others felt that they had received only vague advice to apply:

> *I've never had somebody say, hey, based on what you have here, you should be talking to A, B, C, D, E, because they have the following programs. And these programs do the following things, and your economic reason for doing it is this. And your [forest's] benefit from doing it is Y. I've not had anybody give me that in a very clear, specific way.*
>
> -Keith, Contemplation stage for a traditional program

Several landowners across accelerated and traditional programs echoed this sentiment, either feeling that they had received no clear recommendation to take a new management action, or that they had received no clear advice about whether to apply for a cost-share program. Two participants who had been offered the accelerated program either received incorrect information about the length of the program's application forms, or confounded this information with other information that they had previously heard regarding traditional programs. Another in Resist appeared to have confused the requirements for Vermont's Use Value Appraisal program (a property tax incentive program also known as "Current Use") with those for cost-share programs:

> *In all honesty if the NRCS could function without the requirement for Current Use, I would probably be tempted to move on it. It's the 10 year Current Use lien that probably bothers me most. That's a prerequisite as you know.*
>
> -Harry, Resist stage for a traditional program

Participants in the Action stage of both program types tended to desire specific and/or complex information. For example, one participant wanted a "map" of the different programs available and the varying actions they supported via cost-share. Another wanted clearer updates from her forester and cost-share administrator about her progress within the program. Several participants expressed confusion about whether, or how, to report work they had completed themselves. Lastly, at least one participant was unsure about whether there were restrictions on the future use of his land because he had accepted cost-share funds.

1.4.2.3 Imbalance between Effort and Benefit

Another barrier that was frequently described by landowners was related to the perceived imbalance between the effort required to apply to a program compared to the benefit derived from receiving cost-share funds. Specifically, some landowners described not having "quite enough" to do on their land to make any application worth the effort, regardless of the application's complexity. These landowners often felt that the recommended actions from their forester were easily manageable without outside help (e.g. hand-pulling a small patch of invasive plants) or were enjoyable for the landowner to accomplish on their own. Others felt fairly content with the state of their forest, so taking on the task of working with a program and its associated unknowns (e.g. time commitments, mental energy, risks from herbicide use, etc.) was unappealing.

Other landowners appeared to be more motivated to apply to a program, but felt that the application itself was too complicated, the payments were too low, or a combination of both. Interestingly, the sentiments regarding high application effort or low payments were described by landowners in both the traditional and accelerated program treatments, even though the accelerated program was designed to provide an easy application process and the traditional programs offered substantially higher financial support. Regarding the accelerated program, some landowners appeared to have confounded information – or were given incorrect information - about the application length (see Lack of Clear Information section above), while others were dissatisfied with the 25% cost-share offer. For those offered the traditional program, there were similar frustrations with the application length, but some landowners were also dissatisfied that the programs would not cover 100% of the costs:

> *If you hire it [the management activity] done, then you can get some financial support to help offset your costs. But you're still spending money on it.*
>
> -Karl; Action stage for a traditional program

Lastly, some landowners were concerned less about the effort to apply to a cost-share program, and were more concerned with the effort required to comply with the program's requirements. For example, one landowner expressed frustration that her management plan – which she obtained to qualify for Vermont's Use Value Appraisal Program – had to be re-written at her own expense if she wanted to conduct certain habitat enhancement activities. Other barriers regarding compliance effort will be discussed in the following section.

1.4.2.4 Strong Independent Forest Management Values

Some landowners within the Resist stage, who were all participants in the traditional treatment, described barriers related to their strong values regarding independent decision-making and independent forest management. A second barrier, regarding distrust in the government, appeared to contribute to this barrier in varying degrees. In general, landowners described a strong sense of pride and self-confidence in their own ability to keep their forest healthy and productive. Government run cost-share programs were acknowledged by some as financially appealing, but not worth the frustration of coordinating with forestry professionals or complying with government requirements. Landowners voiced concerns that cost-share programs would require them to cut too many trees, require pointless and time-consuming consultations with professionals, or dramatically restrict their ability to harvest:

> *Case in point, the bat hibernaculum [program], their timeframe is right when you want to be working. You can only technically cut trees in the wintertime for them, when you're on these programs. This doesn't take into consideration that the snow gets eight feet deep up there. You can't get to any of the stuff on a normal winter.*
>
> -Harry, Resist stage for a traditional program

Some landowners appeared to hold misconceptions about the program's requirements, such as a requirement to be enrolled simultaneously in the Use Value Appraisal Program. Overall, however, the sentiment was that the landowner was solely able to make the smartest decisions for their own land, and thus outside intervention in any form was undesirable. According to these landowners, in the worst case scenario a program would force them to take an action (or force them to stop taking an action) that was important for their land, and in the best case scenario the program would simply

create time-wasting and choice-restricting bureaucratic hurdles. According to Harry, “you have all the red tape to deal with, strings attached.”

1.4.2.5 Low Financial Need

Lastly, one participant in this study described a barrier for cost-sharing related to the low relevance of financial assistance. This landowner, Tony, clearly recalled receiving advice from a forestry professional to develop a management plan, but was fairly certain he had not received information about cost-sharing. He hypothesized the following regarding his recent visit with a forester:

> *Probably the reason [cost-share programs] didn't come up, [is] the funding is not an issue.... the use and the rationale and so forth is much more important and the aesthetic location and all that, than consideration of money. Cause the [management] plans aren't gonna cost that much and I, you know, would enjoy taking down the trees myself if I knew which ones it was gonna be.*
>
> -Tony; Unaware stage for an accelerated program

Interestingly, during our conversation Tony referenced his self-described “little pile” of written materials from his forester visit, and discovered a note regarding the availability of cost-sharing. It was apparent that he did not have a clear memory of receiving this information until reminded by the note, likely because of its lack of salience in his decision-making process.

1.5 Discussion

1.5.1 Motivations

Interest in a management activity eligible for cost-sharing was a common motivation across both program types. For those who had heard of cost-share programs, their motivations to apply centered on saving money and/or reducing the personal effort needed to implement habitat enhancement goals. These findings are consistent with those of Butler et al. (2020), which showed that wildlife habitat was rated as the top "very important" or "important" reason for owning forestland for Vermont FFOs with 10 or more acres. Interestingly, landowners who reached the Action stage had often developed forest management goals prior to consulting with a professional about cost-share programs, and many had already personally implemented forest management activities. This is consistent with the conclusions of Andrejczyk et al. (2016) that cost-share programs tend to help landowners do more management, and sometimes do higher-intensity management, but that the programs are not ideal for changing passive managers into active managers.

Similar to the motivation of aligned management interests, interest in funding opportunities motivated participants across both program types. An interest in funding for forest management among FFOs is well documented (e.g. Buffum et al. 2014, Kilgore et al. 2008), and the income of the landowner is often not a significant predictor of this interest (Ma et al. 2012, Sullivan et al. 2005, Kline et al. 2000). This finding supports the idea that landowners who are interested in managing may do so regardless of funding, although the amount of funding may impact the intensity or acreage of management

activities (Andrejczyk 2016). WWW's financial compensation of 25% appeared to further this pattern of use; interviewees with plans to manage anyway saw the program as "helpful," while those who did not necessarily plan to act saw the modest funds as a barrier to action.

A third motivating factor – receiving recommendations from professionals – was noted by landowners across many stages and both programs. However, those in the Action stage were the only landowners who strongly recalled receiving advice to specifically apply to a cost-share program. These landowners, especially those in traditional programs, also recalled feeling supported in their decision to apply by their forestry professional. My findings highlight the importance of clear recommendations from trustworthy information sources, accompanied by quality follow-up support from a forestry professional, in helping landowners reach the Action stage of the cost-share application process. Rouleau et al. (2016) supported my findings about the complexity of navigating these programs for many landowners (as well as for forestry professionals), indicating that the assistance of a trusted professional may be helpful for successful program completion. However, no other sources to my knowledge have recognized the importance of a forestry professional's clear, specific recommendation to apply for a program in addition to more traditional advice regarding management planning or implementation.

Regarding the fourth motivating factor – straightforward applications – one finding that was surprising was that landowners who had completed the accelerated program's application did not frequently discuss their experience applying. Therefore, I was unable to directly compare landowner attitudes regarding the ease/difficulty of the

application across program types. This is likely due to the semi-structured format of the interviews, where landowners were allowed to discuss their positive and negative experiences with the programs in an open-ended fashion. Therefore, the fact that landowners in the Action stage of the accelerated program did not discuss application paperwork revealed that the application was unmemorable. Since applications for traditional programs were sometimes perceived to be too complex, the fact that the accelerated program application was not associated with negative recollections may be considered a successful improvement.

1.5.2 Barriers

The mismatch between forest management actions eligible for cost-share, and those desired by landowners, was a commonly-discussed barrier across participants in both programs. Many in this group described their land as already well-managed, as better-off with no human interference, or as being of less importance than other more-pressing matters. Others found the actions eligible for cost-sharing to be inappropriate for their land, or found that there were no programs that addressed their concerns. This mismatch is supported by other FFO studies such as Davis and Fly (2010) and Kittredge (2004).

A second barrier, related to misunderstandings or a lack of knowledge, was widespread and recognized by participants in both program types. My findings indicated that simply providing more information about cost-share programs would be highly ineffective, however, because information overload was also cited as a concern. The numerous examples of this barrier provided throughout the interviews also supports the

idea that participants have highly variable needs regarding information, and that some need general information while others seek information specific to their unique situation. In particular, the types of information needed appeared to change as landowners progressed through the Stages of Change.

Like the barriers related to mismatched interests and lack of information, the barrier regarding the effort to apply or comply with a program's requirements was described by landowners in both program types. However, I was surprised to see application effort arise as a barrier for multiple landowners offered the accelerated program, since this program was designed to specifically address this barrier. Misinformation, confusion, and the lack of emphasis by professionals placed on the accelerated program's relative simplicity appeared to be the leading causes of this barrier. In addition, some landowners described not having "enough" to do on their land to make any application, regardless of its complexity, worth their time. Another barrier regarding effort across both program types included the frequently-studied problem of bureaucratic hassles (Rouleau et al. 2016, Kilgore 2008).

Strongly valuing independent control over forestland, along with the frequently associated barrier of government distrust, was the final barrier described by more than one landowner in this study. My findings support the conclusion by Rouleau et al. (2016) that some landowners feel this distrust, although it was not a predominant sentiment among the landowners in this study. However, my findings highlight an important nuance regarding this layered barrier. While the two landowners who expressed government distrust both owned land in traditional-treatment counties, their responses implied that they would be extremely hesitant to work with any outside organization, regardless of its

status as a governmental or non-governmental group. While sentiments regarding government distrust and valuing independent control appear to frequently be found together, the prior can be easily addressed through non-governmental programs while the latter is much more difficult to overcome. When this set of sentiments is combined with misinformation or confusion – such as that described by Harry regarding the necessity of enrollment in Current Use to participate in cost-share programs – addressing this barrier becomes extremely complicated.

1.5.3 Implications for Managers

The results of this qualitative study indicate several potential areas of improvement regarding the accessibility and design of information about cost-share programs. I also discuss the feedback I collected addressing issues with program administration, as well as the mismatch between landowners' forest management goals and the practices currently eligible for cost-sharing.

1.5.3.1 Increase the Accessibility of Tailored Information

Vermont FFOs may feel empowered to learn more about forest management options from a "roadmap" specific to their state that provides an overview of the purposes of, and relationships between, the different programs available to them. For example, this roadmap might take the form of a flowchart, interactive website, or quiz, which begins by asking landowners to consider their management values (e.g. ecological, aesthetic, economical, etc.), outlines potentially appropriate management actions to reflect these values, then lists specific programs the landowner may find helpful (e.g. cost-share

programs, conservation easements, Current Use program). The roadmap would also provide information on which professional to contact, as well as how to contact them, to learn more. Ideally the roadmap would be available in both a paper and digital form, with the ability for the landowner to request more information or click on a step to learn more about the topics that interest them. The tool should provide an optional method for the landowner to securely share their preferred contact method with woodland groups or experts of interest. The American Forest Foundation's online tool, called WoodsCamp, may be a model for this type of information system.

One of the many benefits of a "roadmap" tool is that it could provide targeted information based on the landowner's management values and Stage of Change. For example, if a landowner were to visit the roadmap website and click on the "EQIP" program, they could be presented with basic information about what the program does and who administers it (addressing those in the Unaware stage). The landowner could then have the ability to follow links to other sections of the website based on Stage of Change, with titles such as "Deciding if a cost-share program is right for you" (addressing those in Contemplation) or "How to apply for a cost-share program" (for those in Preparation). Ideally, the tool would allow for comparisons of the pros and cons of different management actions selected by the participant – including the "action" of passive management – as well as a comparison of the different programs. Each page could contain testimonials from other Vermont FFOs and forestry professionals, as well as an FAQ section. It is important that the tool clearly states from which agency or organization (ideally a partnership between both) the information comes, as well as how recently the information was updated to establish trustworthiness. Lastly, the roadmap

tool should be easily searchable on the internet, and should also exist in paper form for wide distribution across agencies, NGOs, and landowner groups through which FFOs commonly seek information.

Outside of a "roadmap," there are other actions that forestry professionals can take to improve the accessibility of information. Specifically, foresters may benefit from utilizing the Stages of Changes when considering which type of information would be most beneficial to the landowner. For example, a landowner in the Contemplation stage of applying to EQIP for a patch cut may benefit most by being connected with another landowner who has already made a patch cut; perhaps a visit to see this patch cut for themselves or the ability to speak to someone about their experience would be most effective in helping the landowner move to the Preparation stage. Conversely, a landowner in the Unaware stage who is considering "active" management for the first time might benefit most from clear, concise written material that describes the recommended management action, mentions that funding may available to help cover the costs of the action, and provides instructions on how to find more information. Setting up a follow-up phone call with the landowner specifically to discuss the landowner's decision on whether to act or not may help move the landowner into the Contemplation stage of applying without overloading them with too much information at once.

The findings from this study also indicate that there are common points of confusion regarding cost-share programs that foresters and program administrators should work to clarify. These points of confusion include the requirements necessary to complete the program (which were often confused with those of the Current Use program), the types of management actions that are currently eligible for cost-sharing,

and whether/how the landowner could receive funding for work they completed themselves. Since this information is commonly relayed to landowners through foresters, other forestry professionals, and peers, it is important that outreach to these groups occurs regularly to provide feedback about common points of confusion as well as to update them regarding policy/program changes.

1.5.3.2 Improve Specific Aspects of Program Administration

Overall, participants in the Action stage reported relatively positive experiences while participating in their cost-share program. However, two areas of improvement were identified by participants. First, several landowners felt that communication with program administrators was inadequate, describing it as "very casual" and leaving them confused about their progress within the program and/or whether they had completed all the necessary steps. Establishing an account that is accessible to the landowner may help alleviate this confusion, allowing landowners to check whether certain requirements have been fulfilled, whether they or their forestry professional have received funds and for which actions, etc. Secondly, participants who were removing invasives in their forest were disappointed that forestry professionals did not/were not allowed to recommend specific herbicide applicators. Because herbicide application was considered risky by many study participants, landowners were especially frustrated that their professional could not recommend a trustworthy applicator. I suggest establishing a peer-to-peer recommendation system specific to Vermont, similar to Yelp or Angie's List, where landowners can read testimonials from fellow landowners in their state and judge for

themselves the trustworthiness of herbicide applicators, loggers, and other forestry professionals.

1.5.3.3 Recognize that Cost-share Programs Do Not Address the Goals of Many Vermont FFOs

The three most "important" or "very important" reasons for Vermont FFOs to own their land is to protect or improve wildlife habitat, to enjoy beauty or scenery, and for privacy (Butler et al. 2020). It is important to recognize that "active" management (i.e. having a management plan, receiving advice from a forestry professional, harvesting trees for sale or to improve forest health) may be undesirable or unnecessary for many landowners to achieve these goals. In their current form, cost-share programs appear to be most attractive to FFOs with strong stewardship goals or pre-determined management objectives, and are thus unlikely to be an effective tool for engaging the majority of family forest owners. Instead, I propose that cost-share programs are providing a niche service that help active managers do more, or higher intensity, management activities than they might otherwise accomplish. If the goal of managers and policy makers is to convert more active managers into cost-share participants, actions such as the roadmap and targeted messaging may be the most helpful. However, if programs are to have a wider appeal to a typical Vermont FFO, they must change to match the landowners' goals for a more passive approach, perhaps by providing an incentive for landowners to keep their forest unfragmented or to passively manage for carbon storage. Otherwise, these programs must include more effective outreach about the benefits of active management approaches through trustworthy information sources. Like Andrejczyk et al. (2016), my findings support the idea that different forms of landowner assistance, such as education

and personalized-advice programs (e.g. site visits), are currently more effective than cost-share programs for engaging higher percentages of landowners.

For active managers, the results from the interviews indicate that many actions eligible for cost-sharing are of interest to Vermont FFOs. However, among landowners who wish to control invasive plants, concerns regarding the harmful impacts of herbicides on the health of the forest ecosystem, the health of the herbicide applicator, and their own health, is a major barrier towards meaningful action (Ma et al. 2018, Howle and Straka 2010). In fact, multiple landowners I spoke with compared modern herbicides to "agent orange." Detailed, nuanced information about herbicide application from trustworthy sources, including knowledgeable peers, may be the best way to address the concerns of those willing to listen; Howle and Straka (2010) found that field focus groups were perceived by FFOs as a highly effective demonstration method. For landowners who are entirely opposed to chemical control methods, options such as mechanical suppression or biological control may be the only way to encourage landowners with invasive plants to take action, although these methods are often costlier and are thus less feasible to fund through cost-sharing (Ward et al. 2013, Clout and Williams 2009). I also found that Vermont FFOs perceive a lack of support within cost-share programs regarding invasive forest insects/tree diseases. Perhaps a program that provides funds for a forester to specifically search for evidence of damaging insects/tree disease on an FFO's land, or that clearly advertises that funds can be used for mitigating the spread of pests/diseases, would be helpful to address these concerns.

Lastly, it is important to recognize that cost-share programs are currently designed to help only those with the interest and financial privilege to actively manage their land. As Ken stated:

> *People can't pass this [woodland] on to their family, because you can't make a living at it. Maybe if you have 2,000 or 10,000 acres or something, yeah, you can make a living at it. But with this size, no. I would say that probably to date, I have spent more on the forest than I've received by quite a bit. And so, all this …help and all this other stuff [cost-share programs] is meaningless if you don't have something useful there.*

Unless an effort is made to fully fund management practices on family forest land, or a market system is developed to strongly incentivize active, sustainable forest management for small-scale forest owners, Vermont FFOs will have inequitable access to the benefits of cost-share programs.

1.5.4 Study Limitations

I was successful in my attempt to develop themes regarding Vermont FFO motivations and barriers towards cost-share participation, but the study was limited in several areas. One limitation centered on the participants' ability to recall the details of when and with whom they had worked with regarding their forest management goals. Many of the study participants had worked extensively with several forestry professionals both within and outside the timeframe of WWW's accelerated funds study, making it difficult to match memories or sentiments with a specific program, agency, or organization. In addition, several landowners in accelerated-funded counties had participated in a traditional NRCS program prior to or during the accelerated funds study, and some professionals serviced multiple counties, adding to the confusion about which program or timeframe a memory referred to. For participants who did not find forest

management to be a highly salient topic, remembering which organization or person had contacted them and why was not easily recalled. In my analysis, I prioritized the assessment of participants' statements in the context of their entire interview, and matched recollections against WWW records, to ensure accurate characterization of programs. When statements were ambiguous, I did not use the statement for analysis.

Another limitation involved my application of the Transtheoretical Model to a semi-structured interview method. I did not ask participants about their Stage of Change directly; rather I assigned each ownership to a stage after analyzing the transcript of their interview. In certain circumstances, I found it difficult to classify participants because of their emphasis on a certain barrier or motivation, rather than their overall decision regarding the cost-share application. In addition, I was unable to include an analysis of participants in the Preparation stage because none of the individuals I recruited qualified for this stage. While I emphasized individuals in the recruitment process who appeared likely to be in Preparation (i.e. had spoken to a forester about a program, but had not yet applied), I determined from the interviews that all were in either Contemplation or Resist. Because the interviews occurred over a year after WWW's campaign, the timing of the interviews likely impacted my ability to speak to those in Preparation because this stage had a relatively narrow timeline. Those who had decided to apply had already completed the process, especially in the accelerated programs because the application process was relatively quick.

Qualitative methods are excellent for exploring questions regarding why a participant did or did not take an action, but it was still sometimes difficult to discern the relative importance of certain motivators or barriers in the decision making process. For

example, Tim spent much more time during his interview discussing his hesitations about his program's requirement to use herbicide for invasive plant treatment, but when asked directly about why he did not participate in a program he concisely stated that "it was the [lack of] money." Other participants did not appear to have considered which negative aspect of the program was the most influential in their decision, did not clearly articulate these differences, or found them all to be equally important. For this reason, it is important for program administrators to understand that not all negative sentiments expressed in this chapter may be serving as barriers individually, but that the combination of barriers may need to be addressed before individuals are willing to participate in a program.

One frequently-cited limitation of qualitative methods is that information is gathered from a very small, non-random sample, and therefore the findings likely do not reflect the population (Krueger 2014, Racevskis and Lupi 2006). I used the results from Chapter 1, including findings regarding word choice, motivations, and barriers to develop a mail survey sent to over 2000 Vermont FFOs. These results, which will help quantify patterns across the state, are reported in Chapter 2.

1.6 Conclusions

By categorizing study participants by their Stage of Change regarding the action of applying to a cost-share program, this study was able to provide a unique perspective into the motivations and barriers Vermont family forest owners experience as they progress through the decision-making process. In general, motivations and barriers for cost-share programs addressed two key areas: the program itself (e.g. the program

required too much effort to apply), and the management action eligible for cost-sharing (e.g. patch cuts are aesthetically displeasing). Most motivations and barriers were described by landowners across all Stages of Change, but a few appeared to be specific to certain stages. Professional recommendations and the ease of the application process were motivating factors described uniquely by those in the Action stage and were always paired with the motivation of interest in an eligible management activity. The other factor found to be unique to a certain stage was the barrier related to independent management values, which was specific to landowners in the Resist stage.

This study also provided many specific examples of why landowners chose to participate in an accelerated or traditional program, why they did not, or why they were still deciding. WWW's accelerated funding program addressed a set of barriers regarding application effort and distrust for the government, but these attributes were sometimes misremembered, not highly valued, or possibly never explained to some individuals in pre-action stages. In addition, the lower funding levels appeared to have mainly motivated those who already intended to take a management action on their land. Those who were more hesitant tended to see the funding as inadequate and therefore a barrier to action. In addition, I found no evidence of a landowner in the Action stage who partook in WWW's program who would not have participated in an NRCS program, although the number of participants who had applied for WWW's program was very small. Specifically, two out of the three landowners I interviewed who had applied for WWW's accelerated funding had already participated, or were concurrently participating, in an NRCS program. The other landowner was not aware of NRCS cost-share programs,

although this landowner had previously participated in a USDA Farm Service Agency program for land owned in another state.

I conclude that the WWW program was excellent at addressing certain barriers, but because of lower overall awareness about the program and the tradeoff of less cost-sharing, the program was not able to move many participants through all the Stages of Change to Action. However, it is important to note that WWW's programs had more people in the Contemplation stage, and fewer people in the Resist stage, than traditional programs. This indicates that WWW's approach may have been more motivating for certain landowners than the traditional approach, and while WWW's approach did not result in many applications, it did influence more landowners to consider or plan forest management activities (i.e. progress from one Stage of Change to another). WWW's program also increased awareness about cost-share programs in general and reached landowners who had never consulted with a forestry professional before, which may lead more family forest owners to apply to programs in the future.

CHAPTER 2

A QUANTITATIVE ASSESSMENT OF THE EFFICACY OF HABITAT CONSERVATION ASSISTANCE PROGRAMS FOR FAMILY FOREST OWNERS IN VERMONT

2.1 Abstract

The decisions of Vermont family forest owners, who collectively own 60% of Vermont's wooded land, have a large impact on the quality of the state's 1.8 million hectares (4.5 million acres) of forest habitat. To promote management for wildlife habitat, government agencies and non-governmental partnerships provide technical and financial support to family forest owners in the form of conservation assistance programs. To assess the efficacy of these programs, I sent a mail survey to 2,122 Vermont family forest owners to quantify the degree to which they agreed or disagreed with motivations and barriers for the following conservation actions: 1) arranging for a forestry professional to walk their land, 2) applying for cost-share funds, and 3) making a patch cut. Using logistic regression models, I identified multiple significant motivations or barriers for each of the three actions. For both the cost-share and patch cut actions, an expert's personalized recommendation to act was significant as a motivating factor, while a lack of knowledge about how to complete an action was a significant barrier for the cost-share and professional visit actions. Additionally, I used contingency tables to compare respondents' levels of agreement for these motivation and barrier statements – as well as their level of trust for various information sources – with their Stage of Change according to the Transtheoretical Model. Overall, levels of agreement for the motivation and barrier statements varied significantly across one or more Stages of Change for all 29 statements tested, and trustworthiness varied for 13 out of 14 information sources. For 13

motivation or barrier variables, levels of agreement increased or decreased progressively as respondents advanced through the Stages of Change. I used the results of the study to provide specific recommendations for increasing family forest owners' interest and participation in the three conservation actions, with an emphasis on how messaging can be tailored based on the audience's Stage of Change.

2.2 Introduction

Forests cover over thirty percent of terrestrial habitat across the globe and provide crucial habitat functions for wildlife such as clean water, food, shelter, protection from predators, and reproductive opportunities (FAO 2020, Brown 2020). New England is one of the most heavily forested areas of the United States, but habitat quality and availability is declining in this region for many species that require heterogeneous forest age structure and composition (Olofsson et al. 2016, Bakermans et al. 2012). Land use patterns are a main source of this decline, as forested land was historically cleared for agricultural purposes and the subsequent regrowth was passively or actively managed in a manner that typically promoted homogenous forest age structure (Ducey et al. 2013). In addition to this inherited challenge, modern threats to forest complexity include invasive pests, climate change, and forest fragmentation; the latter of which results in shrinking interior forest habitats and reduced habitat connectivity (Foster et al. 2017, Kittredge et al. 2008, Dietzman et al. 2011). For species dependent on early-successional forest habitat, the overall maturation of northeastern forests is compounding these threats to habitat quality and causing some populations to decline (Askins 2001). For some declining populations,

the most effective mitigation measure is to protect and maintain habitat (Mir and Dick 2012, Taylor et al. 2005).

The state of Vermont, in northern New England, is proportionally the fourth most-forested state in the country and contains 1.8 million hectares (4.5 million acres) of forested land (Morin et al. 2020). Vermont's landscape includes the transition from maple/beech/birch forests, which are typical of the northeastern region of the United States, to the spruce/fir forests of northern New England. This transition results in diverse forest species composition, but the overall age structure is shifting towards larger, older trees as a result of the state's land use history. As of 2017, only 7% of Vermont's timberland area was comprised of small-diameter stands (<5" in diameter at breast height), while medium and large-diameter stands comprised 24% and 69% respectively (Morin et al. 2020). However, stands of very large, old trees are rare (Davis 1996).

Since both active and passive management strategies play a substantial role in shaping the structure of forests, the future of the state's habitat lies largely in the hands of its landowners. In Vermont, family forest owners (FFOs) are collectively the largest group of landowners and represent 60% of the forested land in the state (Butler et al. 2020). I define "forests" as land with at least 10% forest cover that is at least one acre in size, at least 120 feet wide, and not currently developed for non-forest use (Butler et al. 2020). Family forests are those forests owned by individuals, families, estates, or trusts (Butler et al. 2020).

Due to the large influence of FFOs on Vermont's habitat quality, some governmental and non-governmental entities work to support these landowners with habitat protection because many of the cultural, environmental, and economic benefits of

doing so extend beyond the level of an individual parcel. Occurring at the local, state, and national levels within the United States, these entities generally strive to help landowners meet their needs while simultaneously promoting forest stewardship practices that enhance habitat quality. These groups provide support for forest conservation through policies, programs, and tools such as preferential property tax programs, conservation easements, and assistance programs (i.e. cost-share and technical assistance, including site visits, professional advice, and information sessions/materials).

Despite efforts to increase participation in conservation assistance programs, many programs are not highly utilized by family forest owners. In Vermont, only 4% of family forest ownerships with 10+ acres have participated in a cost-share program according to the 2018 National Woodland Owner Survey (Butler et al. 2020). This utilization rate closely reflects the nationwide average. Vermont FFO participation in other conservation assistance or preferential property tax programs, however, is relatively high; 31% of those with 10+ acres have received advice about their forest within the past five years and 38% are enrolled in the state's preferential property tax program. In contrast, only 18% of FFOs nationwide have received advice in the past five years and 17% are enrolled in a preferential property tax program.

Due to the overall low levels of participation in conservation assistance programs nationally, many studies have focused on ways to increase engagement and better understand the characteristics of FFOs who choose, or do not choose, to utilize these programs (e.g. McGrath et al. 2020, Andrejczyk et al. 2016, Buffum et al. 2014). These studies have explored landowner values, beliefs, attitudes, objectives, interests, conceptualizations of management, identity, and demographics, among other factors. For

example, Kilgore et al. (2008), Song et al. (2014), and Ma et al. (2012) all found that FFOs with larger acreages were more likely to participate in certain financial incentive programs. Additionally, Kilgore et al. (2008) found that enrollment could be predicted by the amount of financial compensation, the landowner's prior awareness of the program, their intention to obtain a management plan, and their opposition to the program's development restrictions. Song et al. (2014) concluded that participation varied by geographical sub-region and ownership objective, while Ma et al. (2012) determined that age and income did not affect participation levels. Some studies have concluded that cost-sharing assistance was an important motivation for accomplishing forest management activities (Buffum et al. 2014, Drummond and Loveland 2010, Kilgore and Blinn 2004), while others found that landowners would have completed the management practices to some extend regardless of participation in the program (Andrejczyk et al. 2016, Kilgore et al. 2015, Sun 2007).

Other studies have focused specifically on factors that serve as barriers to participation in assistance programs, such as distrust in the government (Rouleau et al. 2016), complicated application processes (Jacobson et al. 2009), and lack of effective, targeted outreach (McGrath et al. 2020). Other studies have analyzed the shortcomings in the ways forest activities are defined and perceived, with Davis and Fly (2010) finding a disparity between the way landowners and forestry professionals define the term "forest management" that may ultimately lead to misunderstandings regarding whether "management" has occurred. Similarly, Andrejczyk et al. (2016) found a further disconnect between FFOs and forestry professionals, as represented by differences in the use of the term "forest" versus "woodland." Yet the most substantial divergence between

the two groups may pertain more to the relevancy of forest management in its entirety; Kittredge (2004) pointed out that while forestry professionals usually think about management strategies on a daily basis, the state of the forest may be "running in the background" for many family forest owners.

While there are a number of barriers to participation in conservation assistance programs, FFOs are also motivated by certain factors to keep their forests intact and healthy. Motivations and values for owning and managing family forestland include environmental stewardship, recreation, income from forest resources, aesthetics, inclusion of forestland as part of the home, family legacy, privacy, and religion/spirituality (Bengston et al. 2011). Within the environmental stewardship value, one specific motivator for maintaining or improving forest health is for wildlife habitat (Bengston et al. 2011). According to the results of the 2018 National Woodland Owner Survey, 77% of family forest ownerships across the USA with 10 or more acres say that wildlife habitat is a "very important" or "important" reason for owning their land. In addition, 23% of ownerships have improved wildlife habitat in the past five years, and 30% intend to do so in the next five years. Wildlife is also a preferred assistance topic for 36% of participants, second only to the topic of timber management. In Vermont, wildlife habitat stewardship ethics are even more important as a forest management motivation. In this state, 84% of family forest ownerships with 10 or more acres say that wildlife habitat is a "very important" or "important" reason for owning their land, 33% of ownerships have improved wildlife habitat in the past five years, 31% intend to improve habitat in the next five years, and 47% are interested in wildlife as an assistance topic (Butler et al. 2020).

Wildlife values are important to consider in the context of conservation assistance programs because landowners who hold positive attitudes and values towards wildlife are more likely to participate in conservation programs and forest management practices (Dayer et al. 2015, Mehmood and Zhang 2005, Sorice and Conner 2010, Sorice et al. 2014). In Vermont, the significance of wildlife as a motivator for forest conservation is recognized by both governmental and non-governmental groups, which provide technical assistance and cost-share funds for forest habitat improvement. Examples of groups currently offering conservation assistance programs in Vermont include the Natural Resources Conservation Service (NRCS), which is a government agency, and Woods, Wildlife, and Warblers, which is a partnership between the non-governmental organizations American Forest Foundation, Vermont Woodlands Association, and Audubon Vermont. These groups provide expertise and funds for habitat enhancement activities such as patch cuts, apple tree release, invasive plant removal, and roost tree protection.

While positive wildlife attitudes and values are associated with participation in conservation assistance programs, there are differences in the ways in which wildlife is valued that may have an impact on forest management attitudes and behaviors. One method for categorizing and measuring these different value systems is through wildlife value orientations. Wildlife value orientations are general patterns of beliefs that provide meaning and direction to fundamental values in the context of wildlife (Fulton et al. 1996). By scoring responses to survey items representing utilitarian and mutualist dimensions (representing the broad views that wildlife should be managed for human benefit versus live in harmony with humans, respectively), people can be classified as

one of the following four orientation types: mutualists, traditionalists, pluralists, or distanced (Teel and Manfredo 2010). According to Teel et al. (2005), mutualists support the idea that wildlife are deserving of rights and care; they believe that humans and wildlife are meant to co-exist. Traditionalists hold an ideological view of human dominion over wildlife, which is associated with the prioritization of human well-being over wildlife and a more utilitarian treatment of wildlife. Pluralists hold a combination of both mutualist and traditionalist viewpoints, prioritizing values differently depending on the situation. For example, a pluralist may respect the practice of hunting because it provides food, but experience great distress at the idea of personally killing an animal. Distanced individuals lack a well-formed wildlife value orientation, suggesting either a lack of connection with wildlife or a lack of interest in wildlife issues.

Wildlife value orientations have been used in a variety of contexts, but are primarily used for studies predicting wildlife-related behaviors and attitudes. For example, wildlife value orientations have commonly been used to explain variation in public opinions regarding habitat management practices and to predict participation in wildlife-related recreation (Vaske and Needham 2007, Zinn et al. 2002). Wildlife value orientations were recently studied in the context of USDA Farm Bill grassland conservation programs, and were found to have no relation to program participation (Gigliotti and Sweikert 2019). However, no similar effort has been made to determine the orientations of family forest owners in the United States or to understand the influence of wildlife value orientation on forest conservation program participation.

Based on interviews with family forest owners in Vermont (see Chapter 1) and consultations with project partners, I identified five conservation topics of interest: 1)

Vermont's Use Value Appraisal program (UVA; also called "Current Use") 2) technical assistance (i.e. walking the land with a forestry professional) 3) patch cuts 4) conservation easements and 5) cost-share programs. In particular, I found that the topics of technical assistance, cost-share programs, and patch cuts were highly interrelated. For example, many participants learned about the potential benefits of patch cuts for the first time during a technical assistance visit, and contemplated applying for cost-sharing funds if both the cut and the cost-share program were recommended by this professional. I will therefore present my findings regarding technical assistance, cost-share programs, and patch cuts together. Select results for the remaining two topics – Use Value Appraisal and conservation easements – are available in the supplemental materials.

2.2.1 Transtheoretical Model of Behavior Change

Our findings from the interviews indicated that some motivations and barriers towards taking a conservation action appeared to be associated with the participant's readiness to take that action. To better understand these associations, I used the Transtheoretical Model of Behavior Change (TTM) as a theoretical lens. TTM is a psychological approach used to understand and predict behavior change (Prochaska and DiClemente 1983). The model arose from a study about cigarette smokers and examined how individual smokers engaged in the process of stopping this addictive behavior. The model contains four major constructs: (1) Stages of Change (i.e. stage of readiness to engage in the new behavior), (2) processes of change, (3) decisional balance inventory, and (4) self-efficacy (Prochaska and DiClemente 1983).

Our study applied the first construct of TTM as a method for analyzing the barriers and motivations applicable to Vermont FFOs in different stages of the behavior change process. The other constructs help explain factors related to the Stages of Change and are promising fodder for future research. The behaviors of interest in this study were the three conservation topics: arranging for a visit with a forestry professional, applying to a cost-share program, and making a patch cut. This first TTM construct, Stages of Change, is based on the idea that there are five associated stages with any given change in behavior (Figure 1).

According to TTM, an individual is in one stage at a time for any particular behavior. Progress through these five stages is typically linear, although linear progress is not an underlying assumption of the model because a person may circle though several stages more than once (Abrash Walton 2018). The stages are called pre-contemplation, contemplation, preparation, action, and maintenance (Prochaska and DiClemente 1983). Pre-contemplation occurs when a person is not ready to engage in a new behavior, either because they are unaware of, resistant to, or discouraged by the idea of trying the new behavior. The next step, contemplation, occurs when the person is considering engaging in the new behavior by thinking about the pros and cons of taking action. An individual enters the next stage, preparation, once they have made the decision to make a behavior change and are actively preparing to make the change. Once the individual begins the new behavior they have entered the action stage, and if they sustain the new behavior they enter the maintenance stage (Prochaska et al. 2008). A sixth stage, called termination, is sometimes included in the model and is achieved once an individual has zero temptation to return to their pre-contemplation behavior.

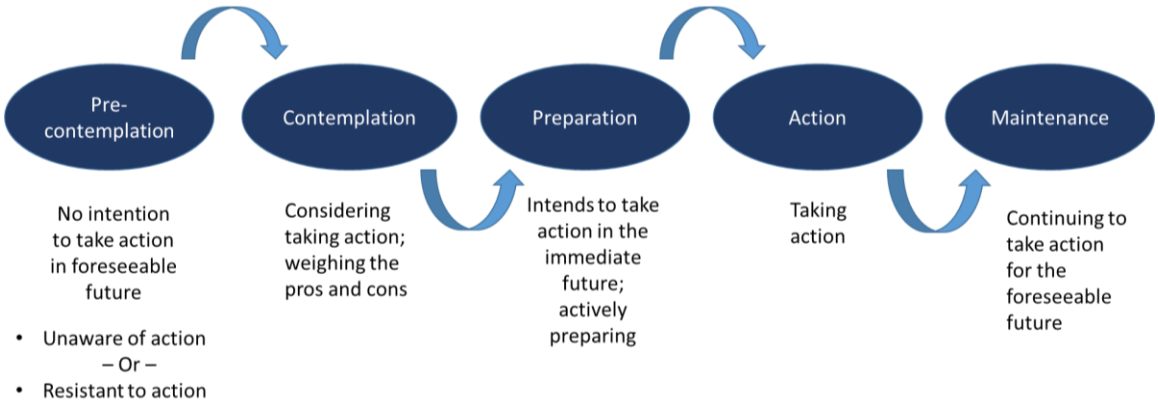

Figure 3. Conceptual model of the Transtheoretical Model of Behavior Change (adapted from Prochaska and DiClemente 1983).

For the purposes of this study, I divided the pre-contemplation phase into two categories: Pre-contemplation: Unaware and Pre-contemplation: Resist. Individuals categorized as Pre-contemplation: Unaware (henceforth "Unaware") had never considered taking the specified conservation action, while those in the Pre-contemplation: Resist (henceforth "Resist") stage were resistant to, or discouraged by, the idea of taking the action. I also chose not to apply the maintenance or termination stage to this study, as some of the behaviors I analyzed were treated as a single event (e.g. one does not "maintain" the behavior of applying to a cost-share program by applying every day for six months, and thus it is illogical to apply the subsequent termination stage to the analysis).

The Transtheoretical Model has been used to analyze a multitude of behaviors beyond that of smoking cessation, although the vast majority of these studies have occurred within the physical and mental health fields. For example, TTM has been used

to study substance abuse, eating disorders, medication compliance, and unplanned pregnancy prevention among many other behaviors (Prochaska et al. 2008). However, the use of TTM is very limited within the environmental field. The model's use has been described in studies regarding fossil fuel divestment (Abrash Walton 2018), conservation estate planning (Markowski-Lindsay et al. 2017), energy reduction behaviors (He et al. 2010), wildfire risk mitigation (Martin et al. 2007), and perceptions of climate change (Semenza et al. 2008).

In contrast, alternative theories such as the Theory of Planned Behavior (TPB), Self-determination Theory, and the Value-Belief-Norm (VBN) Theory are found much more frequently in the environmental literature. In particular, the Theory of Planned Behavior is heavily utilized in the field of Forestry (Rekola 2010, Karppinen 2005, Bieling 2004) and in the Human Dimensions of Conservation field (Miller 2017, Wilkins et al. 2019, Hrubes et al. 2001, Rossi and Armstrong 1999, Shrestha and Burns 2016). TPB has relatively strong predictive power (Rossi and Armstrong 1999, Hrubes et al. 2001, Shrestha et al. 2012), however it is best used when individuals are making reasoned, conscious considerations before deciding to take an action (Stern 2018). A major limitation of the theory is that it does not account for unconscious influences on behavior (Sheeran et al. 2013, Stern 2018). TPB also fails to adequately address situations where individuals intend to take action but never do so (Orbell and Sheeran 1998). Similar to TPB, Self-determination Theory fails to adequately predict the degree to which intention will lead to action (Ryan and Deci 2000, Stern 2018). Value-Belief-Norm Theory, in contrast, can be used to predict behavior instead of intention, but its overall predictive power is generally lower than that of TPB (Kaiser et al. 2005, Lopez-

Mosquera and Sanchez 2012). Because the three conservation actions analyzed in this study take long periods of time to consider, arrange, and enact, I wanted to explore a theory that was not based on the assumption that intention leads to action. Therefore, I chose to use TTM as a theoretical lens because it does not rely on this intention assumption, because it has been rigorously tested as a behavior change model (Krebs et al. 2018), and because it added a new theoretical view to the family forest literature.

2.3 Methods

2.3.1 Sample Selection

I conducted a mail survey which targeted a random sample of 2,122 family forest ownerships across the state of Vermont, USA. All family forest owners in the sample owned at least ten acres of wooded land within one property in Vermont. This ten acre minimum was selected because parcels smaller than ten acres are generally considered to be poorly suited for forest management or other forestry-based programs (Butler et al. 2016). The sample size was determined through the combination of a power analysis and cooperation rate projections based on a 95% confidence level and a +/- 3% margin of error (Dillman et al. 2014).

I used the 2017 Vermont Grand List (administered by the Vermont Department of Taxes) as the sample frame, which provided the most up-to-date information on owner name(s), owner's primary address, and parcel size available when the project began in 2018. This sample frame did not provide information on the number of forested acres per parcel. To select the random sample of Vermont FFOs with 10+ acres, I used a

probability-based sampling design where the probability of selecting a parcel was proportional to the size of the parcel (Lohr 1999). I chose to use this probability-based design because the distribution of parcel sizes in the sample frame was non-normal with a long right-side tail, and therefore using a completely random sample design might have resulted in a very low representation of larger-acreage parcels. The probability-based strategy provided a range of acreage sizes on a continuous scale, and eliminated the need to stratify based on artificial acreage size categories. After selecting 3000 parcels, I manually categorized each parcel in the sample by its ownership type (FFO vs. non-FFO) based on the name of the parcel owner. Non-FFO parcels were then removed from the sample. If the same landowner(s) owned more than one parcel, one parcel was randomly selected to represent that owner to ensure that no landowner received multiple surveys. The final sample consisted of 2,122 unique ownerships. With a target sample size of 2000 FFOs, a sample size of 2,122 was appropriate to account for an estimated number of surveys that would be undeliverable or would be returned by landowners who stated that they owned less than 10 acres of forest.

2.3.2 Instrument Development

I developed the survey instrument in consultation with project partners using the preliminary findings from the interviews and from prior research on FFOs (see Chapter 1). The core set of questions focused on the landowner's familiarity, level of action, motivations, and barriers towards conducting the three conservation actions on their land: arranging for a forestry professional to visit their land, applying to a cost-share program, and making a patch cut. Whenever possible, the vocabulary used within the instrument

was chosen to reflect the wording used by family forest owners during the interviews. For example, I used the term “woodland” instead of “forest”, and represented the diverse group of forestry professionals and peer landowners who provide technical assistance with the term “woodland expert.” The following definitions were developed for each of the three actions based on the findings from the interviews, along with prior FFO research, and were presented in the survey instrument:

Table 3. The definition provided to survey participants for each of the conservation actions used in the analysis.

Action:	Definition:
Expert Visits	To learn more about their woodland, Vermont landowners can arrange a visit with a woodland expert to walk their land and answer questions/provide personalized advice. Experts include foresters, biologists, and fellow landowners who represent both government agencies and non-governmental groups. Depending on the type of expert, landowners may pay for the visit or receive the visit free of charge.
Patch Cuts	A "patch cut" describes an area of woodland, between 1/2 acre and 5 acres in size, in which all or most of the trees have been cut to open the canopy and allow plants/trees to grow back naturally.
Cost-share Programs	Cost-share programs provide financial assistance to qualified woodland owners to conduct specific conservation activities on their land, such as removing invasive plants, creating a forest management plan, or enhancing wildlife habitat. Funding for cost share programs can come from federal, state, or non-governmental groups, such as the Natural Resources Conservation Service (NRCS) or the Woods, Wildlife and Warblers program.

Additional sets of questions were based off of the USDA Forest Service’s National Woodland Owner Survey (Butler et al. 2020) as well as wildlife value orientation surveys (Fulton et al. 1996, Teel and Manfredo 2010, Chase 2016). The total length of the survey was set so that it did not exceed 25 minutes, on average, to complete.

To help ensure the questions were reliably interpreted by Vermont family forest owners, I pre-tested the instrument by conducting cognitive interviews. Based on the results of the cognitive interviews, the majority of survey items were found to be clearly comprehended. A few minor changes were made to the organization and instructions of the TTM question to reduce measurement errors. All interview and survey materials were approved by the University of Massachusetts Amherst Institutional Review Board (Protocol ID: 2017-4379).

2.3.2.1 Instrument Design

Survey questions regarding each of the three conservation actions – expert visits, patch cuts, and cost-share programs – were organized by topic into separate sections of the survey instrument. Each section was further subdivided into three parts (A, B, and C). In part A, respondents were asked about their familiarity with the topic of that section. For the cost-share and patch cuts sections, those who indicated that they were unfamiliar were instructed to skip sections B and C for that section. I chose to implement this skip pattern based on the assumption that participants who were unfamiliar with a topic would find questions about their Stage of Change, motivations, and barriers to be not applicable and confusing. The term "woodland expert" however, was found to be generally recognizable during the interviews and I determined the skip pattern to be unnecessary for this topic.

In part B, I asked respondents about their level of action and provided answer choices based on the Stages of Change. An example of these answer choices for the survey section about patch cuts can be found in Figure 4.

In part C, respondents were asked to indicate their level of agreement with a set of motivation and barrier statements specific to each action which had been derived from the interview analysis (see Chapter 1). Respondents were presented with a five-point Likert scale (strongly disagree to strongly agree), plus a "do not know" option for each motivation and barrier statement.

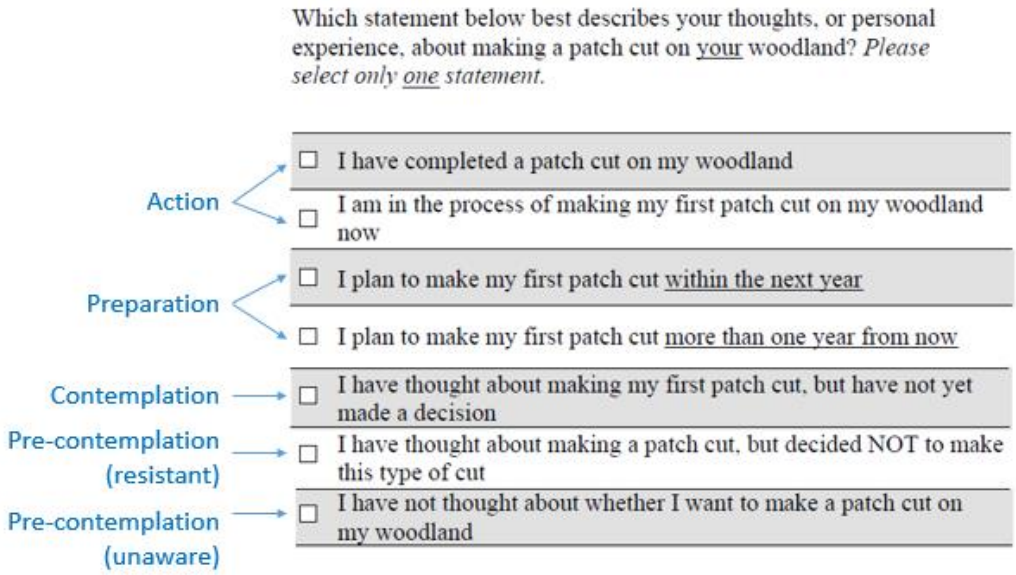

Figure 4. Example item from the survey instrument with related Stage of Change superimposed.

2.3.3 Data Collection and Processing

I used the Dillman et al. (2014) Tailored Design Method to implement the surveys. Implementation consisted of four waves of mailing, followed by a telephone follow-up for a selection of those who did not respond. Directly prior to the first mailing, the addresses in the mailing list were compared with the United States Postal Service's National Change of Address (NCOA) database, and addresses were updated based on

NCOA records. The first mailing consisted of a pre-notice postcard, which was sent to alert the sample FFOs that a questionnaire would be arriving soon. About one week later, the FFOs received a questionnaire with a cover letter that described the purpose and importance of the survey as well as a pre-paid, pre-addressed return envelope. Two weeks after the survey was mailed, a reminder/thank you postcard was sent to thank those who responded and to encourage non-respondents to respond. Three to four weeks after the reminder/thank you postcard, a second questionnaire and cover letter with a pre-paid and pre-addressed return envelope was sent to the sample FFOs who had not yet responded. All mailings occurred between January 27th, 2020 and March 17th, 2020.

I processed completed questionnaires using an automated routine that relied on optical character recognition (OCR) and optical mark recognition (OMR) technology (TeleForm 2010). Each response was reviewed to discern the respondent's intent, to ensure the software's accuracy, and to eliminate illogical responses. I removed any surveys returned by individuals outside the scope of the project or less than 75% complete from further analysis. Missing values were imputed using the MICE package (Van Buuren and Groothuis-Oudshoorn, 2011) in the statistical software R (version 4.0.2).

2.3.4 Nonresponse Assessment

For those FFOs who did not respond to the mail inquiries, I purchased telephone numbers to conduct a nonresponse assessment. Using Cohen's power analysis with a desired effect size of 0.6, a significance level of 0.05, and a power of 0.9, I determined that 31 nonresponders would need to be contacted. Thirty-three qualified nonresponders

were successfully contacted, although three were later removed from the analysis because they returned completed surveys. I asked each nonresponder to answer the same six questions, which had been drawn from the survey because they represented key variables or because I predicted that the responses to these questions would vary the most between survey responders and nonresponders. Using Pearson's chi-squared test, I measured the difference between respondents and non-respondents for six variables. Five variables (representing acres of forest owned, whether trees had been cut for sale, whether a forestry professional had ever visited, whether a cost-share program had been completed, and age) showed no significant difference between respondents and non-respondents ($p=0.05$). However, respondents were significantly more likely to identify as male than non-respondents.

2.4 Analysis

2.4.1 Logistic Regression

I began the analysis by running descriptive statistics on each item in the survey instrument. I then used logistic regression models to estimate the influence of multiple explanatory variables on whether a respondent had completed each of the three conservation actions. For each conservation action, I merged the Stage of Change responses to create a binary explanatory variable representing (1) action taken or (0) action not taken. "Action taken" merged the responses "I have completed *Action X*" and "I am in the process of taking *Action X*". I decided to merge these responses in recognition of the fact that forest management actions often take several months or years

to complete. “Action not taken” combined the responses “I plan to take *Action X* within the next year”, “I plan to take *Action X* more than one year from now”, “I have thought about *Action X* but not yet made a decision”, “I have thought about *Action X* but decided NOT to”, and “I have not thought about whether I want to take *Action X*.”

The explanatory variables, listed in Tables 4, 7, and 9, consisted mainly of the responses to the barrier and motivation statements. I merged the responses “strongly agree” and “slightly agree” together and “strongly disagree”, “slightly disagree”, “neither agree nor disagree” and “do not know” together to create a binary variable for each statement indicating whether a respondent agreed (1) or not (0) with each barrier or motivation. I included the size of the respondent’s forest (measured as the log of the acreage of forest on their largest property) as another explanatory variable because of its frequent significance in other studies of family forest owner behavior (Song et al. 2014, Ma et al. 2012, Kilgore et al. 2008), as well as the respondent’s wildlife value orientation (WVO). Wildlife value orientation was calculated heuristically using the responses to 14 statements in the survey instrument, which closely reflected those developed for another recent WVO study (Chase 2016). I used “mutualism” as the reference level in the logistic regression to increase interpretability. Using a Variable Inflation Factor, I checked for multicollinearity in the explanatory variables and found no inflation factors over five, suggesting no multicollinearity (Sheather 2009). To assess goodness-of-fit, I ran a Hosmer-Lemeshow test. The p value of each model was over 0.05, indicating the models were not a poor fit.

2.4.2 Contingency Tables

To understand whether respondents' barriers and motivations towards each of the three conservation actions varied by their Stage of Change, I created contingency tables and graphed the results. Compared to the logistic regressions described above, these contingency tables differed because they included all the Stages of Change as explanatory variables. Each table compared the results of a barrier or motivation statement against the Stages of Change results for that action. To adequately populate the tables, I merged certain response categories for both the explanatory variables (barrier and motivation statements) and response variables (Stages of Change). The explanatory variables were collapsed as follows: Disagree ("strongly disagree" and "slightly disagree"), Neutral ("neither agree nor disagree" and "do not know") and Agree ("strongly agree" and "slightly agree"). The response variables were collapsed or recoded as: Action ("I have completed *Action X"* and "I am in the process of taking *Action X*"), Preparation ("I plan to take *Action X* within the next year" and "I plan to take *Action X* more than one year from now"), Contemplation ("I have thought about *Action X* but not yet made a decision"), Unaware ("I have not thought about whether I want to take *Action X*") and Resist ("I have thought about *Action X* but decided NOT to"). I then ran chi-squared tests to determine if there was a significant relationship between the respondents' motivations and barriers and their Stage of Change per action (alpha =0.05).

2.5 Results

Between February 2, 2020 and June 4, 2020, 712 people completed surveys that were usable for analysis. The overall survey cooperation rate was 38%. The following

sections describe the results of the familiarity analysis, logistic regressions, and contingency tables for each of the three conservation actions.

2.5.1 Expert Visits

For the Expert Visits section, I asked respondents to indicate whether or not each type of expert (professionals or knowledgeable peers) had visited their land. I also provided a "do not know" option for each expert type, as results from the interviews indicated that landowners often could not remember the name of their expert's position (forester, biologist, etc.) and/or the agency/group the expert represented. I found that consulting foresters/private foresters were the most common type of expert to have visited a respondent's land, with 66% of respondents indicating that this expert had visited their land at some point since they have owned it. The second most common expert type was a Vermont county forester, with 60% of respondents indicating that this expert had visited their land (Figure 5). Forty-eight percent (n=342) of respondents stated that both of these expert types had visited their land.

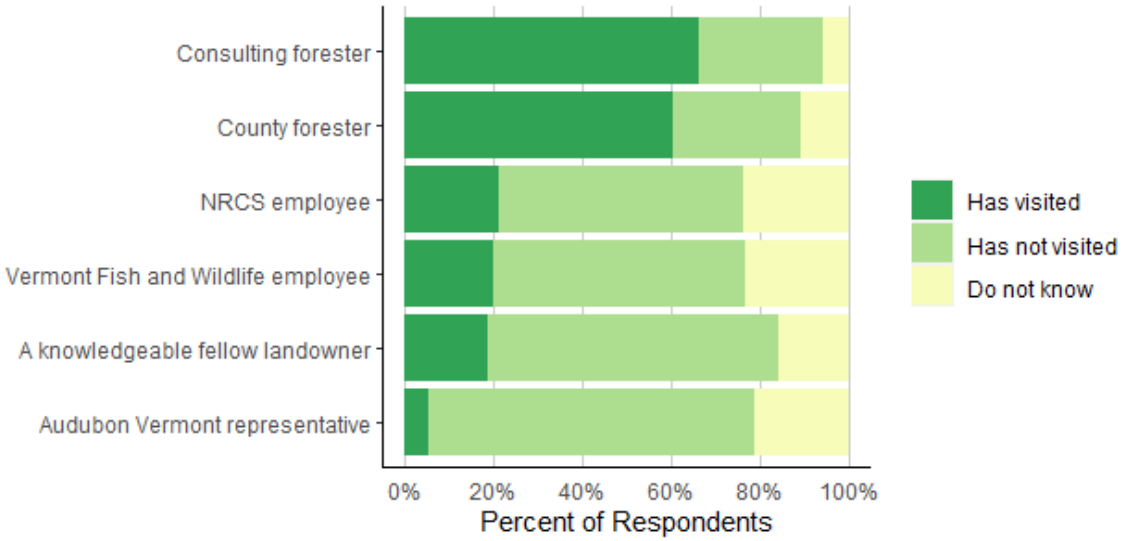

Figure 5. The percentage of respondents who have had a visit from each of the above woodland experts, have not had a visit, or did not know.

Since no respondents were instructed to skip any part of the Expert Visits section, I used the responses from all 712 participants in a logistic regression model to estimate the influence of the barrier and motivation statements, as well as wildlife value orientation, on whether the respondent had ever arranged for an expert to visit their forest (Tables 4 and 5). Of the explanatory variables included in the model, the variable with the greatest positive influence on the action of arranging an expert visit was Learn. I found that the odds of a respondent having already arranged a visit with a woodland expert were 4.8 times greater when they agreed with the statement "a visit from an expert helps me learn something new about my land" than those who did not agree. Other variables with significant positive influences were Reassurance (those who agreed that "a visit from an expert gives me reassurance that I am taking good care of my woodland" had 2.5 times the odds of having arranged a visit than those who did not agree) and

Acreage (a one-unit increase in the log of forested acres was associated with a 277% increase in the predicted odds of having arranged a visit with a woodland expert).

The only variable with a significant negative influence on arranging a visit was Knowledge. For respondents who agreed that "I do not know which woodland expert would be able to help me," the odds of having arranged a visit were 0.24 times the odds of those who did not agree.

There were no significant difference in the odds for arranging a visit for the following variables: Personalized, Cost, Effort, Information, Need, and wildlife value orientation.

Table 4. Descriptions of explanatory variables used in the logistic regression and contingency table analyses for the topic of expert visits.

Variable Name	Variable Description	Influence
Learn	A visit from an expert helps me learn something new about my land	Motivation
Personalized	A visit from an expert is the best way to get personalized information about my woodland	Motivation
Reassurance	A visit from an expert gives me reassurance that I am taking good care of my woodland	Motivation
Cost	A visit from an expert is too costly	Barrier
Effort	It is not worth the effort/time to request or schedule a visit with an expert	Barrier
Information	There are no woodland experts that provide the information I want	Barrier
Knowledge	I do not know which woodland expert would be able to help me	Barrier
Need	I do not need expert advice to keep my woodland healthy	Barrier

Table 5. The coefficient, odds ratio, and 95% confidence intervals for each explanatory variable in the logistic regression model regarding whether a landowner had arranged a visit with a woodland expert (1) or not (0).

	Variable	Coefficient	Odds Ratio	95% Confidence Interval	
Motivations	Learn	1.57 ***	4.79	2.48	9.27
	Personalized	-0.52	0.60	0.29	1.23
	Reassurance	0.92 **	2.52	1.31	4.85
Barriers	Cost	0.37	1.45	0.74	2.84
	Effort	-0.08	0.92	0.43	2.00
	Information	0.04	1.04	0.33	3.29
	Knowledge	-1.44 ***	0.24	0.14	0.41
	Need	0.32	1.37	0.74	2.54
Other	Acreage (log)	1.02 ***	2.77	2.13	3.60
	Distanced	-0.41	0.66	0.27	1.64
	Pluralist	-0.24	0.79	0.44	1.43
	Traditionalist	-0.04	0.96	0.50	1.85

Regression coefficient significance denoted as: ***p<.001, **p<.01, *p<.05
Hosmer & Lemeshow Goodness of Fit: $\chi^2 = 3.82$, df = 8, p = 0.87

I also assessed the results of the expert visit motivation and barrier statements in comparison to the respondents' Stages of Change (Figure 6). All Stages of Change were well populated for the expert visit action, so I was able to compare results across all five stages. The results of the chi-squared analyses indicated that all eight motivation and barrier variables showed a significant difference between the expected and observed results across one or more of the Stages of Change. Overall, the percentage of respondents who agreed with the motivation statements increased as the Stages of Change advanced; across all motivation variables, the lowest percentage of agreement occurred in the Resist stage, while the highest percentage of agreement occurred amongst

respondents in the Preparation or Action stage. No such pattern occurred for the barrier statements; there were no variables for which the percentage of agreement tended to increase or decrease as the Stages of Change progressed.

Next, I assessed the greatest motivators and barriers (measured by the percentage of respondents who agreed with each statement) per stage. For those in Resist, the greatest motivators were Reassurance and Learn, while the greatest barrier was Need. Similarly, the greatest motivator and barrier for those in Unaware was Learn and Need, respectively. For Contemplation, the greatest motivator was Personalized while the greatest barrier was Knowledge. The results for Preparation were similar to Contemplation; the greatest motivations were Reassurance and Personalized, while the greatest barrier was Knowledge. Lastly, for the Action stage, the greatest motivator was Learn, while the greatest barriers were Need and Cost.

I also determined which motivation and barrier statements were the most polarized between the stages, as measured by the percentage of those agreeing in the stage with the most agreement minus the percentage of those agreeing in the stage with the least agreement. The most polarized motivation statement was Personalized (with a 71 percentage point difference between Preparation and Resist) followed by Reassurance (with a 65 point difference between Preparation and Resist). The barrier statement with the greatest difference was Knowledge (with a 38 percentage point difference between Contemplation and Action) followed by Need (with a 36 point difference between Resist and Contemplation).

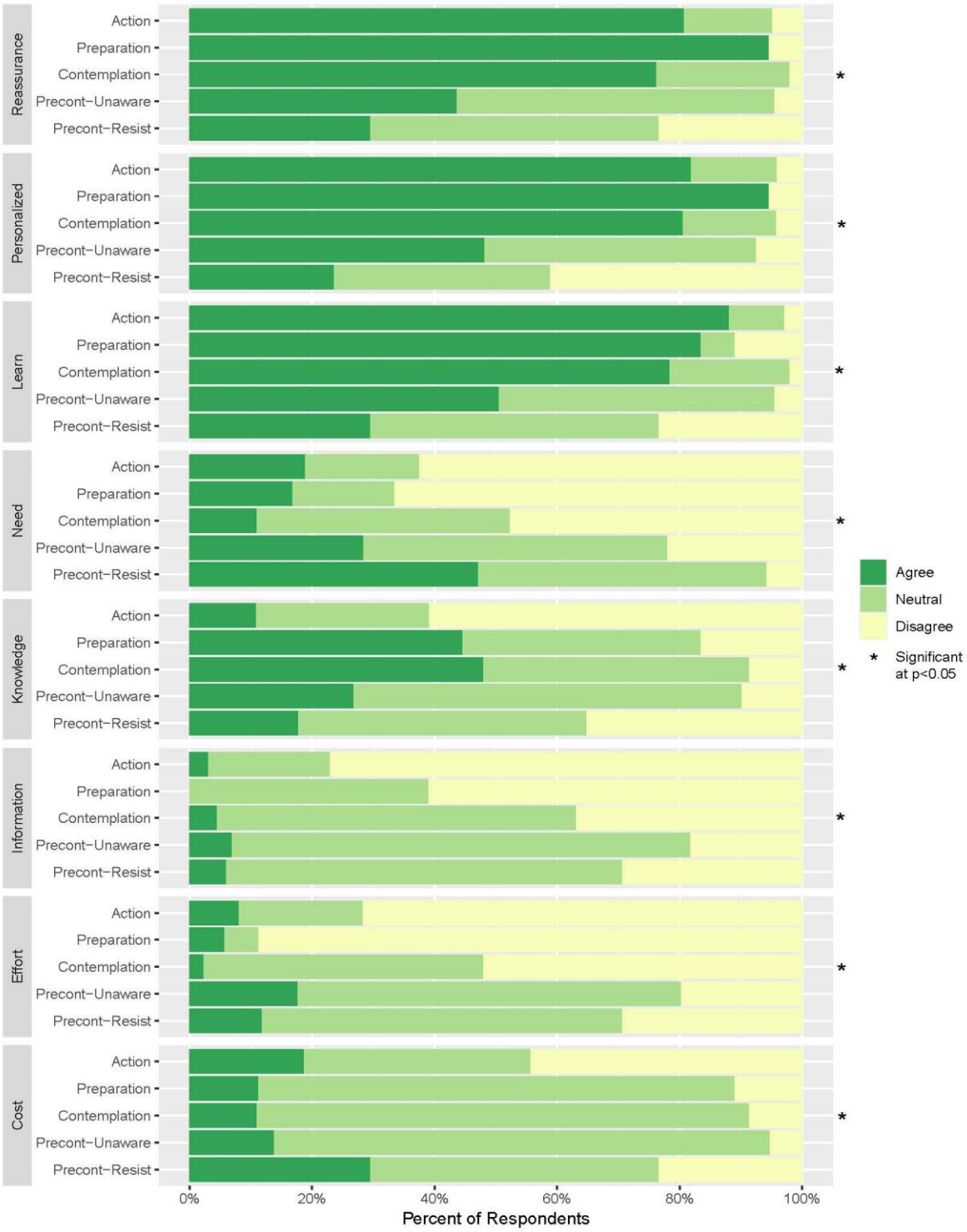

Figure 6. The percentage of respondents who agreed, were neutral, or disagreed with each of the above motivation and barrier statements about arranging for an expert visit by their Stage of Change.

2.5.2 Expert Trustworthiness

I also asked respondents about how trustworthy, or untrustworthy, various sources of information were regarding the care or protection of their forest. Information sources are described in Table 6. I provided respondents with six answer choices, which were collapsed as follows: Trustworthy ("extremely trustworthy" and "very trustworthy"), Untrustworthy ("somewhat trustworthy", "a little trustworthy" and "not at all trustworthy"), and "Do not know". The information source rated as trustworthy by the greatest percentage of respondents was county foresters, followed closely by consulting foresters. The sources rated as trustworthy by the smallest percentage of respondents were Vermont Coverts and Woods, Wildlife, and Warblers, however these two sources also had the highest percentage of respondents who indicated that they "did not know" how trustworthy these sources were. In contrast, the sources marked as untrustworthy by the highest percentage of respondents were "another woodland owner", "a family member or friend", and "myself" (Figure 7).

Table 6. Descriptions of the variables used in the analysis regarding information source trustworthiness.

Variable Name	Variable Description
Another	Another woodland owner
Audubon	Audubon Vermont
Consult	A consulting forester
County	A county forester
Coverts	Vermont Coverts
DFPR	Vermont Department of Forests, Parks and Recreation
DFW	Vermont Fish and Wildlife Department
Family	A family member or friend
Myself	Myself (my personal experience)
NRCS	USDA Natural Resources Conservation Service (NRCS)
UVM	University of Vermont Extension Services
VWA	Vermont Woodlands Association
Wild. Biol	A wildlife biologist
WWW	Woods, Wildlife and Warblers

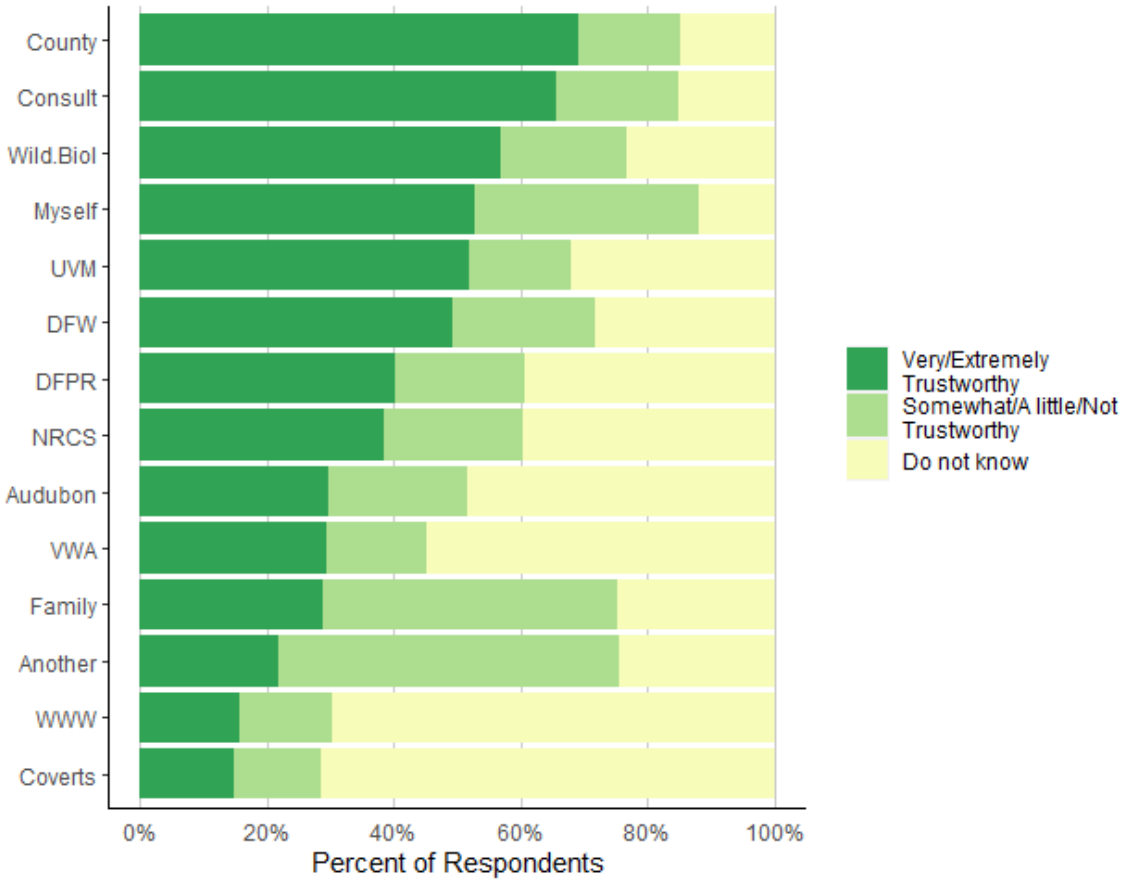

Figure 7. The percentage of respondents who stated that each of the above sources of information were trustworthy (very or extremely), untrustworthy (somewhat, a little, or not trustworthy), or did not know.

I then compared the trustworthiness of these information sources by the respondents' Stage of Change for arranging an expert visit to determine whether levels of trust varied by stage (Figure 8). By conducting chi-squared analyses, I found that 13 out of 14 information sources showed a significant difference between the expected and observed results across one or more of the Stages of Change. The only information source that did not show a significant difference was Family.

I determined which information sources had the most variability in trustworthiness between the Stages of Change, as measured by the percentage of those

agreeing in the stage with the most agreement minus the percentage of those agreeing in the stage with the least agreement. Trustworthiness changed the most between stages for consulting foresters (45 percentage point difference between Action and Resist) followed closely by county foresters (43 point difference between Action and Resist) and then by wildlife biologists (38 point difference between Action and Resist).

I also assessed which information source was the most and least trusted by members of each Stage of Change. For Resist, the highest levels of trust were for Myself, while the lowest levels of trust were for Woods, Wildlife, and Warblers (WWW) and Vermont Coverts (0% agreed that either group was trustworthy, although approximately half of respondents in Resist selected "do not know" for both information sources). For Unaware, the source with the highest agreement on trustworthiness was also Myself, and the lowest level was for Vermont Coverts. For Contemplation, the highest levels of trust were for wildlife biologists, and the lowest levels were for Coverts. Those in the Preparation stage agreed that county foresters were the most trustworthy, and Vermont Coverts the least trustworthy. Lastly, those in the Action stage had the highest levels of trust for county foresters and the lowest levels for WWW.

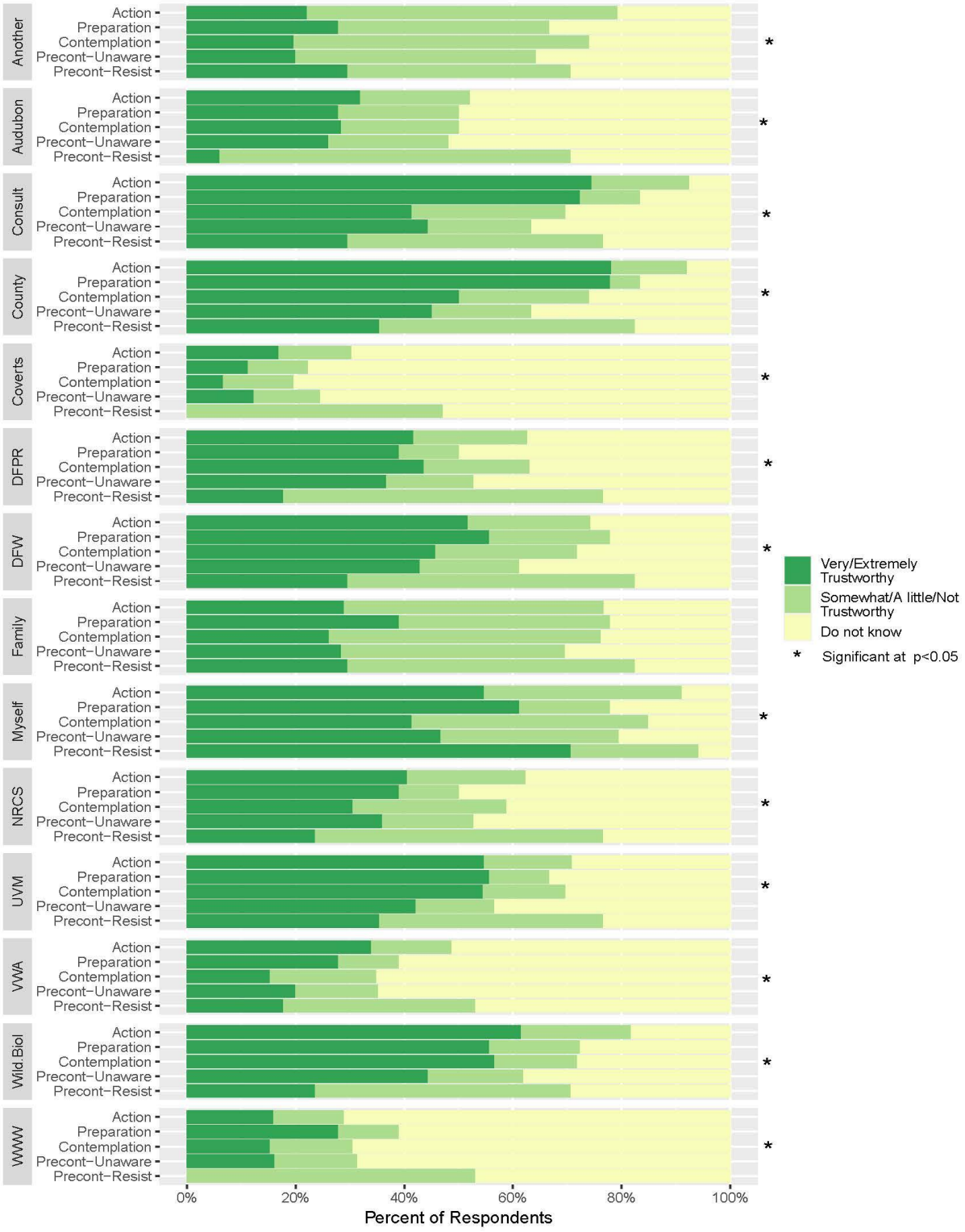

Figure 8. The percentage of respondents who indicated that each of the above information sources were trustworthy ("very" or "extremely" trustworthy), untrustworthy ("not at all", a little", or "somewhat" trustworthy), or did not know by Stage of Change.

2.5.3 Cost-share Programs

The topic of cost-share programs had the lowest levels of familiarity amongst respondents. Overall, only 31% of respondents were considered to be "familiar" (either somewhat, very, or extremely) with this subject (n=223). The most common level of familiarity about the topic of cost-share programs was "I have never heard of the term 'cost share program'" (43% of respondents), followed by "I have heard of the term 'cost share program' but I do not know much about it" (26% of respondents) (Figure 9).

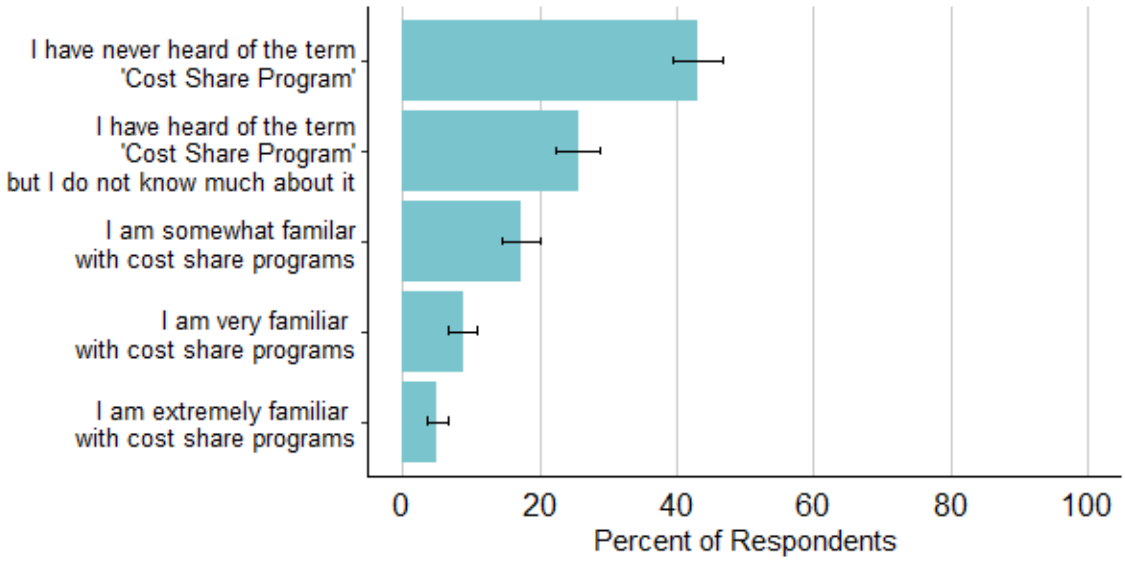

Figure 9. The level of familiarity survey respondents had with cost-share programs by percentage. Respondents could select only one statement.[1]

For respondents who were familiar with cost-share programs, I used a logistic regression model to estimate the influence of all the barrier and motivation statements - as well as wildlife value orientation - on whether or not the respondent had applied to a

[1] The error bars on all graphs indicate a 95% confidence interval.

program (Tables 7 and 8). Three explanatory variables had a significant positive influence on the action of applying. Only one of these variables, Recommended, reflected a motivation. Those who agreed with this motivation had five times the odds of applying compared to those who did not agree. The second variable, Acreage, was a control variable and showed that a one unit increase in the log of forested acres owned was associated with a 139% increase in the predicted odds of applying to a program. Interestingly, the third variable, Fund, represented a barrier statement. Those that agreed that "cost share programs do not fund the improvements I am interested in doing" had nearly four times the odds of applying than those who disagreed with this statement.

The variable in the model with the most significant negative influence was NGO. For respondents who agreed that "cost share programs are too complicated to enroll in when administered by non-governmental groups", the odds of having applied were 0.14 times the odds of those who did not agree. The variable Knowledge also had a significant negative influence; those who agreed that "I do not know enough about cost share programs to apply" had 0.18 times the odds of applying than those who did not agree. There were no significant difference in the odds of applying to a cost-share program for the following variables: Afford, Finance, Information, Reassure, Effort, Government, No Interest, and wildlife value orientation.

Table 7. Description of the explanatory variables used in the logistic regression and contingency table analyses for the topic of cost-share programs.

Variable Name	Variable Description	Influence
Afford	Cost share programs help me improve an aspect of my woodland that I could not otherwise afford	Motivation
Finance	Cost share programs ease the financial burden of making an improvement that I was already planning to make	Motivation
Information	Cost share programs provide me with valuable information	Motivation
Reassure	Cost share programs help reassure me that I am taking good care of my woodland	Motivation
Recommended	Cost share programs were recommended to me by a woodland expert	Motivation
Effort	Cost share programs do not cover enough of the costs to make the application worth the effort	Barrier
Fund	Cost share programs do not fund the improvements I am interested in doing	Barrier
Government	Cost share programs are too complicated to enroll in when administered by the government	Barrier
No Interest	Cost share programs are not of interest because I am already taking good care of my woodland	Barrier
Knowledge	I do not know enough about cost share programs to apply	Barrier
NGO	Cost share programs are too complicated to enroll in when administered by non-governmental groups	Barrier

Table 8. The coefficient, odds ratio, and 95% confidence intervals for each explanatory variable in the logistic regression model regarding whether a respondent had applied to a cost-share program (1) or not (0).

	Variable	Coefficient	Odds Ratio	95% Confidence Interval	
Motivations	Afford	0.21	1.23	0.51	2.99
	Finance	0.79	2.20	0.88	5.49
	Information	0.55	1.74	0.65	4.68
	Reassure	-0.18	0.83	0.28	2.47
	Recommended	1.64 ***	5.17	2.31	11.54
Barriers	Effort	-0.75	0.47	0.18	1.25
	Fund	1.32 *	3.72	1.19	11.68
	Government	0.71	2.04	0.82	5.08
	No Interest	-0.59	0.56	0.26	1.17
	Knowledge	-1.71 ***	0.18	0.07	0.49
	NGO	-1.96 **	0.14	0.04	0.49
Other	Acreage (log)	0.33 *	1.39	1.01	1.91
	Distanced	-0.88	0.41	0.09	1.91
	Pluralist	0.22	1.25	0.52	2.98
	Traditionalist	-0.14	0.87	0.35	2.13

Regression coefficient significance denoted as: ***p<.001, **p<.01, *p<.05
Hosmer & Lemeshow Goodness of Fit: $\chi^2 = 7.16$, df = 8, p = 0.52

I also assessed the results of the cost-share program motivation and barrier statements in comparison to the respondents' Stages of Change (Figure 10). There were not enough respondents in the Preparation stage for a meaningful analysis, so only those in the Action, Contemplation, Unaware, and Resist stages were directly compared. The results of the chi-squared analyses indicated that the percentage of respondents who agreed with each statement was significantly different than expected for at least one Stage of Change for all 11 motivations and barriers tested.

Overall, the percentage of respondents who agreed with the motivation statements generally increased as the Stages of Change advanced from Pre-contemplation (Unaware or Resist) to Action for the following variables: Information, Reassure, and Finance.

However, this increasing trend across the stages was not seen for the other motivation variables (Recommended and Afford). The barrier variables NGO, No Interest, and Government followed the reverse trend, with the percentage of agreeing respondents generally decreasing as the Stages of Change progressed. However, the barrier variables Knowledge, Fund, and Effort did not follow this pattern.

Next, I assessed the greatest motivators and barriers (measured by the percentage of respondents who agreed with each statement) for each stage. The greatest motivator for those in Resist was Information, for those in Unaware was Reassurance, for those in Contemplation was Afford, and for those in Action was tied between Information and Finance. The greatest barrier for those in Resist and Unaware was No Interest. For respondents in Contemplation the barriers No Interest and Effort were equally agreed upon, while the greatest barrier for those in Action was Government.

I also determined which motivation and barrier statement changed the most between stages, as measured by the percentage of those agreeing in the stage with the most agreement minus the percentage of those agreeing in the stage with the least agreement. The motivation statement that varied the most between stages was Recommended (with a 45 percentage point difference between Action and Contemplation) followed by Finance (with a 43 point difference between Action and Unaware). The barrier statement with the greatest variation was Interest (with a 45 percentage point difference between Resist and Action) followed by Knowledge (with a 27 point difference between Unaware and Action) and Effort (with a 27 point difference between Unaware and Resist).

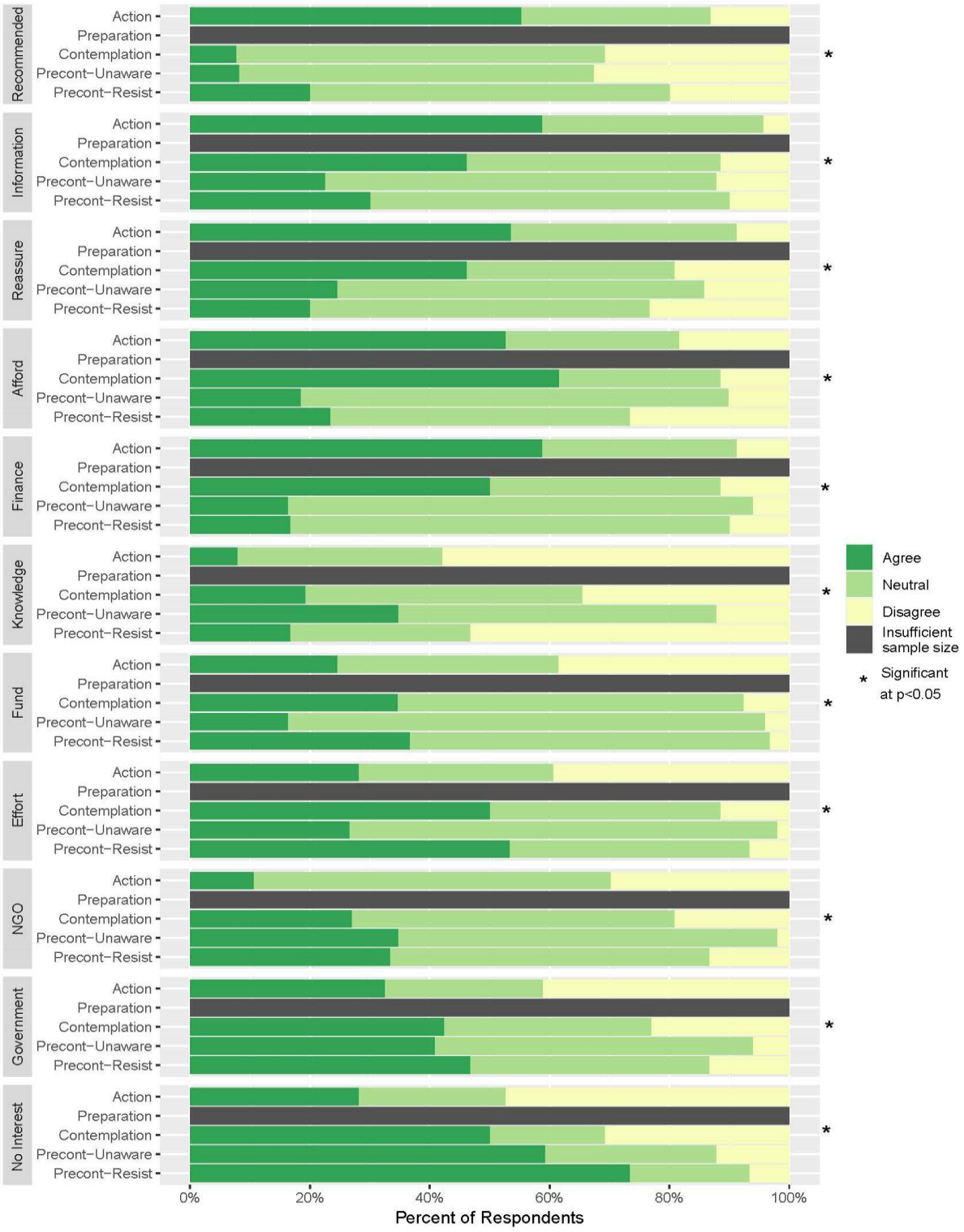

Figure 10. The percentage of respondents who agreed, were neutral, or disagreed with each of the above motivation and barrier statements about applying for a cost-share program by their Stage of Change.

2.5.4 Patch Cuts

Respondents indicated very mixed levels of familiarity with the term “patch cut”. Overall, 57% of respondents (n= 406) were considered to be “familiar” with patch cuts because they indicated that they were either somewhat, very, or extremely familiar with the term. However, the most frequently-occurring response was “I have never heard of the term ‘patch cut’”, which strongly contributed to the mixed nature of the results (Figure 11).

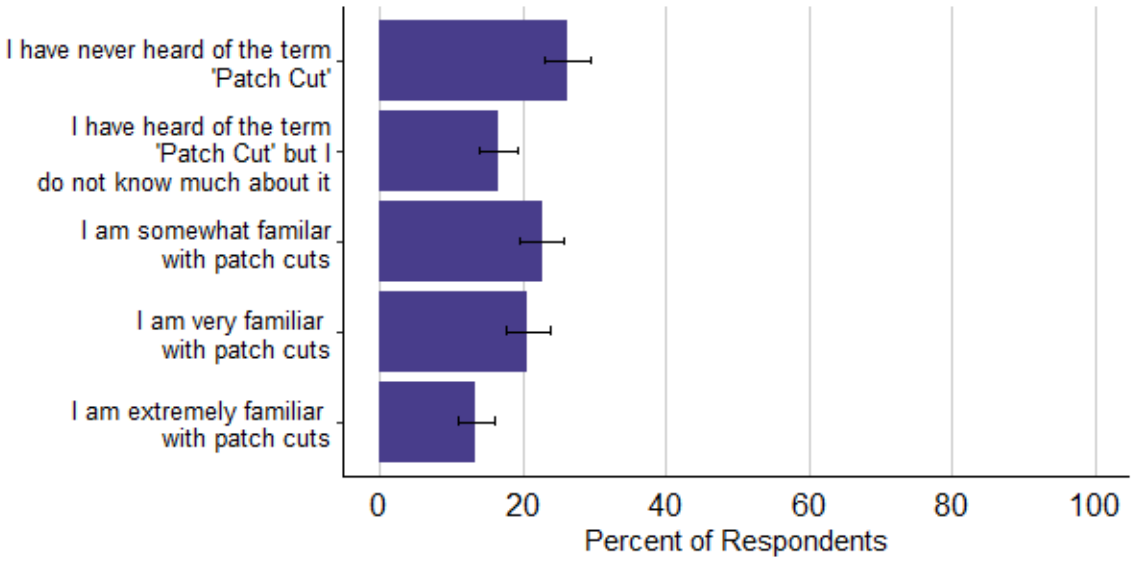

Figure 11. The level of familiarity survey respondents had with patch cuts by percentage. Respondents could select only one statement.

Respondents who were familiar with patch cuts were asked to answer questions about their Stage of Change, motivations, and barriers towards making this type of cut. I then used a logistic regression model to estimate the influence of all the barrier and motivation statements, as well as wildlife value orientation, on whether the respondent had made a patch cut or not (Tables 9 and 10). Of the explanatory variables included in

the model, the variable with the greatest positive influence on the action of making a patch cut was Recommended. I found that the odds of having completed a patch cut amongst those who agreed that "a patch cut was recommended to me by a woodland expert" was over five times greater than the odds of having made this cut if the respondent did not agree. The other variables with a significant positive influence were Health (those who agreed that "making a patch cut is good for the overall health of my woodland" had nearly 2.5 times the odds of having made a patch cut compared to those who did not agree) and having a distanced wildlife value orientation (distanced individuals had over 2.7 times the odds of having made a patch cut than mutualists). In addition, a one-unit increase in Acreage (log of the acres of forestland owned) was associated with a 131% increase in the predicted odds of having made a patch cut.

No variables in the model had a significant negative influence on patch cuts. Overall, there were no significant differences in the odds for completing a patch cut for the following variables: Trees, Habitat, Hunt, Effort, Ugly, Harm, Income, and Unwanted.

Table 9. Description of the explanatory variables used in the logistic regression and contingency table analyses for the topic of patch cuts.

Variable Name	Variable Description	Influence
Habitat	Making a patch cut improves the habitat for some animals	Motivation
Health	Making a patch cut is good for the overall health of my woodland	Motivation
Hunt	Making a patch cut improves the hunting on my land	Motivation
Recommended	Making a patch cut was recommended to me by a woodland expert	Motivation
Trees	Making a patch cut helps establish young trees on my woodland	Motivation
Effort	Making a patch cut is not worth the effort/time	Barrier
Harm	Making a patch cut will harm the types of wildlife I care about	Barrier
Income	Making a patch cut will cause me to lose income	Barrier
Ugly	Making a patch cut looks ugly	Barrier
Unwanted	Making a patch cut will encourage the growth of unwanted plants/trees	Barrier

Table 10. The coefficient, odds ratio, and 95% confidence intervals for each explanatory variable in the logistic regression model regarding whether a respondent had made a patch cut on their woodland (1) or not (0).

	Variable	Coefficient	Odds Ratio	95% Confidence Interval	
Motivations	Habitat	0.28	1.32	0.45	3.87
	Health	0.90 **	2.45	1.33	4.52
	Hunt	0.53	1.70	0.95	3.04
	Recommended	1.76 ***	5.82	3.44	9.85
	Trees	0.46	1.59	0.77	3.29
Barriers	Effort	-0.76	0.47	0.19	1.17
	Harm	-0.15	0.86	0.29	2.57
	Income	0.51	1.66	0.62	4.45
	Ugly	-0.21	0.81	0.47	1.40
	Unwanted	0.12	1.13	0.67	1.91
Other	Acreage (log)	0.27 *	1.31	1.04	1.64
	Distanced	1.01 *	2.74	1.04	7.22
	Pluralist	0.56	1.74	0.93	3.28
	Traditionalist	0.42	1.52	0.79	2.90

Regression coefficient significance denoted as: ***p<.001, **p<.01, *p<.05
Hosmer & Lemeshow Goodness of Fit: $\chi^2 = 7.12$, df = 8, p = 0.52

I also assessed the results of the patch cut motivation and barrier statements in comparison to the respondents' Stages of Change (Figure 12). All Stages of Change were well populated for the patch cut action, so I was able to compare results across all five stages. The results of the chi-squared analyses indicated that agreement levels were significantly different than expected for at least one Stage of Change for all 10 motivation and barrier variables. Overall, the percentage of respondents who agreed with the motivation statements generally increased as the Stages of Change progressed from Pre-contemplation (Unaware or Resist) to Action for the following variables: Habitat, Health, Hunt, and Recommended. However, the motivation variable Trees did not follow this

pattern of increase across the stages. Similarly, all of the barrier variables followed no clear pattern of increase or decrease across the Stages of Change, although Income, Harm, and Effort had low levels of agreement across all stages.

Next, I assessed the greatest motivators and barriers (measured by the percentage of respondents who agreed with each statement) per stage. Interestingly, the greatest motivator across all five Stages of Change was Habitat. The greatest barrier for each stage was either Ugly (Resist), Unwanted (Contemplation, Preparation, and Action), or was a tie between these two barriers (Unaware).

I also determined which motivation and barrier statements were the most polarized between stages, as measured by the percentage of those agreeing in the stage with the most agreement minus the percentage of those agreeing in the stage with the least agreement. The motivation statement that changed the most between stages was Recommended (64 percentage point difference between Preparation and Unaware) followed by Health (48 point difference between Action and Resist). The barrier statement with the greatest variation was Ugly (33 point difference between Resist and Preparation) and Income (18 point difference between Resist and Contemplation).

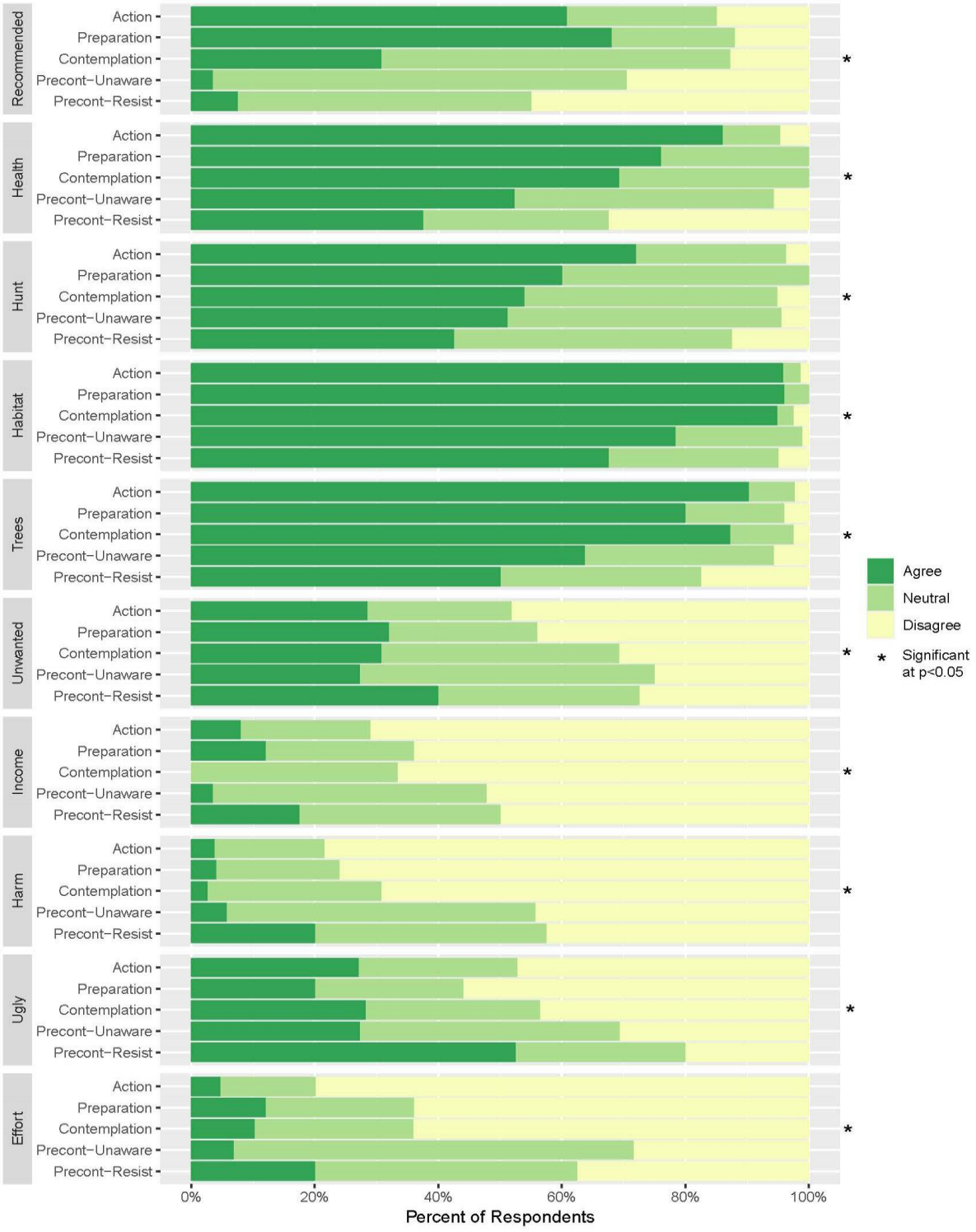

Figure 12. The percentage of respondents who agreed, were neutral, or disagreed with each of the above motivation and barrier statements about making a patch cut on their land by their Stage of Change.

2.6 Discussion

Using logistic regression analyses, I was able to identify multiple significant motivations and/or barriers for each of the three conservation actions. Across at least two actions, expert recommendations were prevalent as a motivating factor and a lack of a certain type of knowledge (see Tables 4 and 7 for specific wording) was repeatedly a barrier. The landowner's acreage also had a significantly positive influence on all actions. Based on the findings from other family forest owner studies (e.g. Kilgore et al. 2008, Song et al. 2014, and Ma et al. 2012), I expected acreage to be positively associated with forest management activities. Additionally, wildlife value orientations were generally not a significant influence on the conservation actions. My finding that wildlife value orientation does not have a significant influence on enrolling in a traditional cost-share program is supported by Gigliotti and Sweikert (2019), who found that wildlife value orientation for landowners in the upper Midwest was not related to participation in USDA Farm Bill conservation programs for grassland conservation.

Using the Transtheoretical Model to assess the variation found among family forest owners regarding their barriers and motivations for taking a conservation action was also very insightful. Overall, the levels in which family forest owners agreed with motivation and barrier statements varied significantly between one or more Stages of Change for all 29 statements tested across the three actions. In addition, I found that 13 out of 14 information sources showed a significant difference between the expected and observed results across one or more Stages of Change.

For 13 out of the 29 motivation or barrier variables, levels of agreement tended to follow a pattern: as respondents' Stage of Change progressed from Pre-contemplation to

Action, agreement levels for motivation statements increased progressively and agreement levels for barrier statements decreased in progression. While I cannot establish causality, I conclude from this analysis that family forest owners' interests and needs differ based on their Stage of Change for some variables. In addition, five of these progression-pattern variables (Learn and Reassurance for the expert visit action, NGO for the cost-share action, and Health and Recommended for the patch-cut action) were found to be significant through the logistic regression analysis. If forestry professionals or outreach organizations can establish a landowner's Stage of Change for these significant variables, perhaps through a pre-visit screener question or as part of an online automated tool, these professionals may be able to provide more targeted information with a higher conservation impact.

My contingency table analyses also revealed that the variation in levels of agreement was usually greater for motivation statements than for barrier statements. This pattern shows that in general, motivating factors are more polarized than barrier factors. The only exception to this pattern occurred for the cost-share action, where the variation in levels of agreement between the most polarized motivation and the most polarized barrier were tied at 45 percentage points each.

Overall, my study of the Stages of Change in relation to motivations, barriers, and trustworthiness revealed important details about Vermont FFO behavior change processes. In the future, I would like to incorporate the Transtheoretical Model into a multinomial logistic regression model to better understand the influence of motivations and barriers not just on whether an action was taken, but on the landowner's Stage of Change regarding that action. It may also be useful to make estimates of population-level

attributes in terms of forested area and number of ownerships, as the current study reflects only survey respondents. I will now discuss my detailed findings for each of the three conservation actions in the sections below.

2.6.1 Expert Visits

Of the three actions assessed in this study, arranging a visit with a woodland expert was the most frequently conducted forest management activity. Visits with consulting or county foresters were much more common than visits with the remaining expert types (Vermont Fish and Wildlife employees, Audubon Vermont representatives, or knowledgeable fellow landowners), and nearly half of all respondents had had both forester types visit their land since they have owned it. My results regarding multiple forester type visits may indicate that landowners wanted second opinions about actions recommended by one forester type, that certain forester types may have been more accessible than the other over different time periods, or that different forester types were preferred and/or necessary for different actions (e.g. discussing versus implementing a timber harvest).

The high percentage (66%) of respondents who had visited with an expert also indicated that my survey respondents might have been more engaged with this activity than the typical Vermont family forest owner. According to the results of the 2018 National Woodland Owner survey, about 51% of Vermont respondents had sought advice about their forest in the past five years (Butler et al. 2020). However, my results were not directly comparable to those of the National Woodland Owner Survey because my survey question did not specify a timeframe within which the advice had to be sought; only that

the advice must have been sought since the landowner had owned their land. In the future, I would like to test the survey question specifying both the five-year and entire-ownership timelines to quantify the effect of the question's phrasing.

In addition, many landowners indicated that they "did not know" whether a specific type of expert had visited their land. It is important to recognize that my results reflect the organizations to which landowners think their experts belong, which is a limitation of this study. There may be some misperceptions about which organizations were represented, although I tried to minimize any inaccuracies by including the "do not know" option. Overall, the prevalence of the "do not know" response may indicate that some forestry professionals/organizations have brand recognition challenges, which may be especially prevalent when experts represent smaller or newer organizations, or if the experts represent a partnership between multiple groups which share resources. Recall issues regarding an organization's name may present a barrier for landowners when trying to follow-up on conversations with their expert or when planning future management action. In future studies, I recommend that surveys include questions about the general timeframe in which an expert visited (i.e. within five years or over five years) so that "do not know" responses can be better attributed to low brand recognition versus other issues, such as the passage of a long period of time since the expert visited.

From the results of my logistic regression and contingency table analysis regarding expert visits, I found that the motivations Learn and Reassurance had significant positive influences on whether a visit with an expert had occurred. Landowners in the Action, Preparation, and Contemplation stages all had high levels of agreement with these motivations. My findings regarding Learn and Reassurance can be

used by groups seeking to increase awareness of, or interest in, expert visits. For example, it may be most effective to move landowners through the Stages of Change by employing messaging about how forestry professionals can help landowners learn something new about their forest, or help reassure the landowner that they are currently taking good care of their forest. Emphasizing the fact that foresters can help landowners learn about topics such as wildlife and overall ecosystem health, not just timber harvesting, may also increase the efficacy of messaging.

My analysis also revealed that barriers for visiting with an expert were fairly low; compared to the percentage of respondents who agreed with the motivation statements, the barrier statements had low levels of agreement. Only one barrier, "I do not know which woodland expert would be able to help me," significantly influenced whether a landowner had visited with an expert. This Knowledge barrier was also the most highly agreed-upon barrier for those in the Contemplation and Preparation stages. Interestingly, Knowledge was not the barrier that was most agreed upon by those in the Unaware category; instead, the greatest barrier was "I do not need expert advice to keep my woodland healthy." The findings emphasize the importance of providing information about *why* visits from forest experts can be helpful, and then clearly explaining *who* can provide this advice and how to contact them. If an organization's goal is to move people from the Contemplation stage to the Preparation stage for expert visits, it appears that the most efficient barrier to address would be Knowledge; however if they wish to engage more landowners overall the organization must address the Need barrier.

2.6.2 Information Source Trustworthiness

My analysis of information-source trustworthiness revealed interesting insights about family forest owner's perceptions of the different forestry organizations and types of professionals available in Vermont. Importantly, respondent's lack of knowledge about certain information sources (i.e. "do not know" responses) played a substantial role in the analysis and the interpretation of results.

When "do not know" answers were excluded from the analysis, 12 out of 14 information sources were found to be trustworthy (either very or extremely) by over half of respondents. The other two sources, "a family member or friend" and "another woodland owner," were marked as untrustworthy (somewhat, a little, or not at all trustworthy) by the majority of respondents. I suggest that these two answer choices were marked as untrustworthy by a relatively high percentage of respondents because I did not specify any attributes to these sources, leaving room for a wide array of interpretations. For example, some respondents may have been considering a knowledgeable fellow landowner when answering the question, while others might have been averaging the trustworthiness of all the fellow woodland owners they know.

The analysis especially highlighted the importance of name recognition, as "do not know" responses often had a larger impact on reducing an entity's trustworthiness ranking than "untrustworthy" responses. This pattern was especially important for non-government groups like Woods, Wildlife, and Warblers and Vermont Coverts, which ranked lowest in terms of the absolute number of respondents who found them to be trustworthy, yet were still considered trustworthy by more than half of respondents if "do not know" answers were removed from the analysis. I also recognize that the

differentiation between “do not know” and “untrustworthy” might be a source of measurement error, and thus a limitation, of this survey question. It is possible that some respondents who were unfamiliar with a certain information source selected “do not know” because they had no opinion on an unfamiliar source, while others selected one of the “untrustworthy” response choices because unfamiliar information sources were viewed as inherently untrustworthy.

I also found a wide range of variability in the trustworthiness of some information sources when respondents were grouped by their Stages of Change for the action of arranging an expert visit. Foresters had the highest degree of change in their trustworthiness between the stages, with a 45 percentage point difference for consulting foresters and a 43 point difference for county foresters between the Action and Resist stages. Interestingly, respondents in the Resist and Unaware categories trusted “Myself” (referring to their own personal experience) more than any other source, but the most trustworthy sources switched to county foresters and wildlife biologists for respondents in the remaining Stages of Change. While the analysis cannot establish causality, my results indicate that Vermont’s foresters and wildlife biologists have been well-received by landowners because the majority of respondents who have met with these experts consider their information to be trustworthy.

2.6.2 Cost-share Programs

Of the three conservation topics analyzed in this study, cost-share programs had the lowest levels of familiarity amongst respondents. It is important to note that due to the

skip pattern utilized in the survey instrument, the logistic regression and contingency table analyses included only 223 respondents (31% of all survey responders).

Of the five motivation variables tested in the logistic regression model, only one variable – Recommended - was significant in influencing whether the respondent had applied for cost-share funds. This variable specifically emphasized the importance of the cost-share program itself being recommended by a woodland expert, as a distinct motivation from a recommendation regarding the implementation of a forest management activity. Based on the results from this study and my findings in Chapter 1, I argue that landowners who receive recommendations for both a forest management activity *and* a cost-share program will be among the most highly motivated to apply.

Of the six barrier variables tested for cost-share programs, all were found to have high levels of agreement amongst respondents. Unlike the barriers for the other actions in this study, the cost-share barrier statements had levels of agreement that were similar to the levels of agreement for the motivation statements. This similarity indicated that landowners face substantial barriers to applying for cost-share programs. Specifically, three barrier variables were found to be significant in the logistic regression model. The significant variable Knowledge, representing the sentiment "I do not know enough about cost share programs to apply," has been discussed in previous cost-share program literature. According to Rouleau et al. (2016), as well as my own findings (Chapter 1), cost-share programs can generate confusion among landowners and program administrators alike because of the choices available and the applicable regulations. Increasing landowner awareness of cost-share programs may be most effective through a targeted approach, as cost-share programs tend to be of most interest to landowners who

already actively manage their land or have received a recommendation to apply (see Chapter 1). I propose that the best way to inform landowners about cost-share programs is through foresters, other woodland experts, and woodland associations, who in turn must feel confident identifying landowners likely to benefit from the programs, explaining the program, and recommending its worthwhileness. Therefore, increasing awareness will require training and periodically updating these experts about cost-share programs, especially as funding levels and regulations affecting the program change.

The other two significant barriers – NGO and Fund – were more perplexing. I propose that the significance of the NGO variable may be due to misperceptions, misinformation, or a general lack of knowledge about non-governmental organizations' administration of cost-share funds. Fund, as a barrier, also defied my expectations that this variable would have a negative impact on action. Instead, the results of the model indicated that landowners still applied for cost-share funds even if they were more interested in receiving funding for a different management action. This finding reflects a general sentiment described by some landowners during the interviews, in which landowners described a desire for cost-share funds to cover a wider variety of forest management actions. For example, several landowners who eventually applied for cost-share funds for herbicide application wished that the funds would cover mechanical removal methods, and another landowner wished that the funds could be used to re-write an existing managing plan to include more habitat enhancement actions. I conclude that while some landowners who are interested in cost-share programs wish that the programs would cover different/additional management activities, this sentiment does not necessarily prevent them from applying for funds for other actions.

2.6.3 Patch Cuts

Overall, respondents had fairly low levels of familiarity with the topic of patch cuts. This finding is similar to that of Peterson and Vaske (2016), who found that the term had the lowest mean level of familiarity out of nine forest management terms amongst Colorado residents. In the logistic regression analysis, two motivating factors had a significant influence on whether the respondent had completed a patch cut: whether this action was recommend by a woodland expert, and whether the landowner agreed that a patch cut would be good for the overall health of their woodland. These findings highlight the importance of receiving a clear, memorable recommendation from a trusted expert to take a specific management action, and that this recommendation emphasized the benefits of the patch cut in the context of overall ecosystem health.

Surprisingly, the Habitat motivation did not appear to be significant through the logistic regression model, even though the habitat value of these cuts was highly memorable to the landowners I interviewed prior to the survey. However, the contingency table analysis made it apparent that habitat was highly agreed-upon as a motivation for patch cuts regardless of Stage of Change. Therefore, I argue that Habitat was not significant for the logistic regression model because there was low variability in opinions amongst respondents about the habitat benefit of patch cuts.

I was also surprised to find that no barriers significantly impacted patch cut completion according to the logistic regression model. Patch cuts were the only action amongst those I analyzed with no significant barriers. However, two barriers – related to the fact that patch cuts look ugly, and that they may encourage unwanted plants/trees to

regenerate – stood out in the contingency table analysis as having the highest levels of agreement across all Stages of Change. Interestingly, Ugly appeared to be especially important to those in the Resist category, with many more people in this stage agreeing with the Ugly barrier than in other stages. This barrier appears to be very difficult to address, as Peterson and Vaske (2016) found that aesthetic evaluations were the strongest predictor of approval for patch cuts. Aesthetics were also rated as a "very important" or "important" reason for 82% of Vermont family forest owners for owning their land (Butler et al. 2020). Other barriers I tested – such as those related to reduced income loss, harming wildlife, and effort – were agreed upon by very few respondents and appeared to have little influence on preventing landowners from moving through the Stages of Change.

Lastly, a Distanced wildlife value orientation was found to have a significant positive impact on whether a respondent had made a patch cut. However, this finding may be a reflection of Distanced individuals' low prevalence within the survey sample; only 8% of respondents were Distanced. Therefore, I cannot conclude that having a Distanced orientation significantly influences the choice to make a patch cut. However, further research is needed on the interaction of wildlife value orientation and the willingness of family forest owners to manage their forest for wildlife.

2.7 Management Implications and Conclusions

The results of the logistic regressions and the analyses of motivations and barriers by Stage of Change suggest several ways through which communication and targeted messaging can be improved to increase conservation assistance program participation.

For example, I propose that providing information about *why* a landowner should consider taking a conservation action will be most influential in moving landowners from the Precontemplation stage to the Contemplation stage, and that providing landowners with information about *how* to take action will be most useful for moving people between the Contemplation and Preparation stage. This information needs to come from a trustworthy information source that ideally shares the same values (such as wildlife, timber management, legacy planning, etc.) as the landowner. By learning which stage of change a landowner is in regarding the adoption of a new behavior, managers can provide information that is the most relevant while ensuring that the landowner is not overwhelmed by too much information.

To increase the rate at which landowners meet with forestry professionals or other woodland experts, messaging should promote the idea that experts can help landowners learn something new about their land, and that experts can help reassure knowledgeable landowners about specific management actions that will help them achieve their goals. Managers should also address the largest barrier for landowners in the Contemplation stage, which is a lack of understanding about which woodland expert would be able to help them. Because Vermont FFOs show high levels of trust for county foresters and wildlife biologists, I conclude that concise, written material that provides information on why and how to contact these professionals would be particularly beneficial for increasing the percentage of landowners who have consulted with a woodland expert. Additional results from my survey indicate that information about whether there is a financial cost associated with these visits would also be helpful.

To increase the rate at which patch cuts are performed on suitable sites, the results from the study indicate that woodland experts need to provide a clear and memorable recommendation for the cut. Discussing or demonstrating the patch cut's contribution to the overall health of the forest may be the most important for moving a landowner from the Contemplation to Preparation stage. For Resist landowners, emphasizing the cut's value for wildlife habitat may be the best message because this motivation is generally well-accepted across all Stages of Change.

To increase participation in cost-share programs, my study indicates that experts should provide clear, memorable recommendations to apply. Managers should also spend time helping landowners learn about the programs, and help them understand why they might be of interest. If possible, reducing the complexity of the application process will address one of the significant barriers indicated by the model. A detailed description of further suggestions for cost-share program improvement can be found in Chapter 1.

Overall, several findings from this study - particularly regarding the significant variables from the logistic regression analyses and the progressively increasing/decreasing Stage of Change variables - may have a wider applicability to family forest owners across the northeastern United States due to the region's similar economic and ecological forest management considerations. The influence of these motivation and barrier variables to landowner actions outside of Vermont, especially beyond the scope of the Northeast, remains a focus for future research.

APPENDIX 1: INTERVIEW GUIDE

A. Preparation

Materials:

- Audio recorder
- Backup recorder
- Technical Assistance List
- Extra consent form
- Incentive payment
- Receipt forms
- Water bottle

B. Background

- Introduce interviewers
- Thank for participation
- Obtain consent form
- Discuss questions about consent form; reiterate salient points (confidentiality, use of recorder, etc.)
- Address any questions about study in general

C. Introductions

1a. To get us started, I'd love it if you could tell me something about this land that is special to you.

1b. *Confirm property details*

- Do you own any other properties in Vermont besides where we are today?
- How many acres do you have total?
  - How many are covered by woods? (vs. pasture, houses, etc)
- Are there any natural or manmade features such as ponds, rivers, barns, etc?
- How long have you owned it?
- What types of property abut your land? Are they all privately held, or do you have any public or conservation land around you?

D. Ownership Objectives

1. Why did you choose to purchase your property in Vermont?
   A. What was your vision for your land when you first got it?

2. What do you currently enjoy most about your property?
   A. Do you enjoy having woods on your land?

I. Do you spend time there?
I. What do you like to do?
II. Do you enjoy seeing certain plants or animals?

B. What do you enjoy the least?

3. Do you have any future goals for your property?
   A. Are there any activities you hope to start in the near-future?
   B. Do you plan to sell it or pass it onto someone in the near future?
      I. What motivated this decision?
      II. Do you have any worries about it?
   C. 100 years from now, what do you hope is happening on your land?
      [PROBE] Would you want your property to remain wooded?

E. Wildlife

4. What does the term "wildlife" mean to you?

5. What is your favorite wildlife on your property?

6. What, if anything, do you like about the "wildlife" on your wooded land?

7. What, if anything, do you dislike about the "wildlife" on your wooded land?
   [PROBE] negative issues associated with wildlife

8. Do you go hunting or fishing on your land?

   a. [if they hunt/fish] Why do you hunt/fish and what do you enjoy about it?
   b. Who else, if anyone, has hunted or fished on your land?
   c. What did you/they hunt?

9. [Endangered species]
   A. The Bald Eagle is an example of an endangered species in the state of Vermont. How would you feel if you found a Bald Eagle nesting on your property?
   B. Timber rattlesnakes are also an endangered species in Vermont. How would you feel if you found a timber rattlesnake?

F. Habitat Management

10. What, if anything, do you do to help wildlife on your land?
    [If yes]

a. [PROBES] wildlife habitat, leaving dead/dying wood standing, leaving woody material on the ground/creating piles of brush and branches, planting/maintaining native trees/shrubs, restoring riparian areas, keeping large forest patches unbroken, removing invasives, thinning woods to encourage diversity, minimizing the harvest of timber during breeding seasons, create early-successional habitat]
b. What wildlife are you helping?
c. Have you noticed any differences in the amount, or types, of wildlife since [taking this action]?

11. Is there anything you would like to have done or might do in the future?
    A. What has or might prevent this from happening?
        I. Probe alpha and omega resistance factors

12. What, if anything, do you do to control wildlife on your land?

13. Have you ever harvested trees from your land?

    a. Why or why not?
    b. Do you think harvesting trees is helpful or harmful for the wildlife on your land?
        i. Why?

G. Advice

14. Who, if anyone, do you typically talk to - or where do you get advice – when you want information about your land?
    [PROBE] neighbor, family member, friend, town official, internet

15. Have you ever talked to a forester, biologist, or other professional about your land?

    [IF YES]
    a. Who did you talk to?

    b. How did it go?
        I. What did you talk about?
        II. Was it helpful?
        III. Is there any way it could have been improved?

    C. What, if any, specific actions did they recommend?

I. Did they give you a written report of their recommendations?
II. Have these [recommendations] happened?
I. [IF YES] Who did the work?
II. [IF NO] Why not?
[PROBE] alpha and omega resistance factors
a. Have you read through the recommendations in detail?
b. Have you discussed the recommendations with family/other decision makers?

[IF NO]
A. Would you consider contacting one in the future?
I. Why or why not?
[PROBE] alpha and omega resistance factors

16. Have you heard of something called a forest management plan? [offer definition if needed]
A. Do you have one?
I. [IF YES]
I. What do you like best about it?
II. What do you like least about it?
III. What, if any, actions have you taken to implement it?
[PROBE] Alpha/omega resistance factors
II. [IF NO] Have you ever considered getting one?
I. Why or why not?
[PROBE] Alpha/omega resistance factors

H. UVA and Technical Assistance

17. Are you familiar with the Vermont Current Use Tax Program, also called Use Value Appraisal or simply UVA?

[If they have heard of it]
a. What do you know about it?
b. Have you participated?
c. What are the reasons why you [did not] participate?
[PROBE] alpha and omega resistance factors

18. In Vermont, there are a variety of programs designed to help landowners implement conservation practices on their land. Some of these programs, called

technical assistance programs, provide advice to landowners, help them create management plans for their land, or offer funding for doing conservation activities.

Have you ever heard of technical assistance programs?
[PROBE] What specific programs they can recall, and what they know about those programs.

19. Have you ever heard of: [IF YES, what do you know about it?] (present list)

20. Have you ever participated in a technical assistance program?
[IF NO]
    A. Why not? [PROBE] Alpha/omega resistance factors
    B. Do you think you might participate in the future?
        I. What might encourage or discourage you from doing so?

[IF YES]
    C. What programs have you participated in? Let's walk through these one by one.
    D. How did you first hear about [the program]?
    E. Who did you work with?
        I. How did that go?
    F. What was your initial reaction to it?
    G. What, if anything, were your initial hesitations about participating?
        I. What are/were the biggest challenges?
    H. What, if anything, would have made [the program] more appealing?
    I. What, if any, actions were recommended through this program?
        I. Have these been implemented?
            I. Why or why not? [PROBE] Alpha/omega.
            II. Did you receive a written report?
            III. Have you read through the report in detail?
            IV. Were you offered funding to complete any of these recommendations?
            V. Have you discussed the report with other decision makers?
    j. How could [the program] be improved?

I. Closing

That wraps up everything I'd hoped to talk to you about today. Thank you very much for your time. Are there any other comments or questions for me before I head out? Thanks again, I hope you have a good [morning/afternoon/evening]!

APPENDIX 2: SURVEY INSTRUMENT

Vermont Woodlands and Wildlife Survey

VERMONT FISH & WILDLIFE

WOODS AND WILDLIFE WARBLERS

American Forest Foundation

Vermont Woodlands Association

University of Massachusetts Amherst

Vermont Coverts Woodlands for Wildlife

Audubon | VERMONT

Instructions

Please answer the following questions based on the property you own in Vermont. If you own more than one property in Vermont, please answer the questions based on your largest wooded property.

- "Woodland" or "wooded property" is defined as an area with trees, at least one acre in size, that is not mowed. It does not include Christmas tree farms, orchards, or nurseries.
- If your largest wooded property in Vermont is owned by more than one person, the owner who makes most of the decisions about the woodland should answer this questionnaire.
- If you do not currently own land in Vermont, please write "No Land Owned" on the cover of this questionnaire. Leave the rest of the questionnaire blank and return it in the postage-paid envelope provided.

General Questions about your Ownership

1. a) How many acres of land do you currently own in Vermont?

   If you own more than one property in Vermont, please answer this question, and all of the following questions, based on your largest property.

   ☐☐☐☐ Acres of Land

   ↳ b) About how many acres are wooded?

   ☐☐☐☐ Acres of Woodland

2. In what year did you acquire your woodland in Vermont?

   ☐☐☐☐ Year

3. Is your home (primary residence) on or within a mile of your woodland in Vermont?

   ☐ Yes ☐ No

22757

4. Is your woodland part of a farm?

   ☐ Yes ☐ No

5. How important are the following reasons for why you currently own your woodland in Vermont? *Please check only one box for each statement.*

	Not important	Of little importance	Moderately important	Important	Very important	Not applicable
To enjoy beauty or scenery	☐	☐	☐	☐	☐	☐
To protect nature or biological diversity	☐	☐	☐	☐	☐	☐
To protect water resources	☐	☐	☐	☐	☐	☐
To protect or improve wildlife habitat	☐	☐	☐	☐	☐	☐
For land investment	☐	☐	☐	☐	☐	☐
For privacy	☐	☐	☐	☐	☐	☐
To raise my family	☐	☐	☐	☐	☐	☐
To pass land on to my children or other heirs	☐	☐	☐	☐	☐	☐
For firewood	☐	☐	☐	☐	☐	☐
For timber products, such as logs or pulpwood	☐	☐	☐	☐	☐	☐
For nontimber forest products, such as berries or maple syrup	☐	☐	☐	☐	☐	☐
For hunting	☐	☐	☐	☐	☐	☐
For recreation, other than hunting	☐	☐	☐	☐	☐	☐
Other ↳ (Please specify): _____	☐	☐	☐	☐	☐	☐

6. Below are statements that represent a variety of ways people feel about fish and wildlife. To what extent do you agree or disagree with each statement? *Please check one box for each statement.*

	Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
Humans should manage fish and wildlife populations so that humans benefit	☐	☐	☐	☐	☐
The needs of humans should take priority over fish and wildlife protection	☐	☐	☐	☐	☐
Fish and wildlife are on earth primarily for people to use	☐	☐	☐	☐	☐
We should strive for a world where there is an abundance of fish and wildlife for hunting and fishing	☐	☐	☐	☐	☐
Hunting is cruel and inhumane to animals	☐	☐	☐	☐	☐
Hunting does not respect the lives of animals	☐	☐	☐	☐	☐
People who want to hunt should be provided the opportunity to do so	☐	☐	☐	☐	☐
We should strive for a world where humans and wildlife and fish can live side by side without fear	☐	☐	☐	☐	☐
I view all living things as part of one big family	☐	☐	☐	☐	☐
Animals should have rights similar to the rights of humans	☐	☐	☐	☐	☐
Wildlife are like my family and I want to protect them	☐	☐	☐	☐	☐
I care about animals as much as I do other people	☐	☐	☐	☐	☐
I feel a strong emotional bond with animals	☐	☐	☐	☐	☐
I value the sense of companionship I receive from animals	☐	☐	☐	☐	☐

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History of Your Woodland

7. For which of the following reasons, if any, have trees been cut or removed from your woodland in Vermont since you have owned it? *Please check either "Yes" or "No" for each activity.*

Yes	No	Activity
☐	☐	For sale
☐	☐	For personal use
☐	☐	To improve forest health
☐	☐	To improve wildlife habitat
☐	☐	To clear or maintain space for a field, pasture, or cropland
☐	☐	To clear or maintain space for a house, barn, or other building

8. Which of the following activities, if any, have you conducted for the purpose of helping wildlife on your woodland in Vermont? *Please check either "Yes" or "No" for each activity.*

Yes	No	Activity
☐	☐	Removed invasive plants
☐	☐	Piled brush or branches to create habitat
☐	☐	Created or updated a forest management plan to specifically include activities for helping wildlife
☐	☐	Minimized harvesting or mowing during bird breeding season (May to mid-July)
☐	☐	Left dead or dying trees to maintain or create habitat
☐	☐	Cut trees to maintain or create habitat
☐	☐	Maintained or created a food plot to provide food for wildlife
☐	☐	Planted apple trees, or helped apple trees grow, to provide food for wildlife
☐	☐	Planted oak trees, or helped oak trees grow, to provide food for wildlife

Current Use Program

9. Vermont's Use Value Appraisal (UVA) program, often called the "Current Use" or "Land Use" program, reduces property taxes for qualified woodland owners by calculating taxes based on the value of the land for forestry, rather than its fair market (typically development) value.

a) How familiar are you with Vermont's Current Use Program? *Please select only one statement.*

If you checked either of these two boxes please skip to question #10

- ☐ I have never heard of the term "Current Use Program"
- ☐ I have heard of the term "Current Use Program" but I do not know much about it
- ☐ I am somewhat familiar with the Current Use Program
- ☐ I am very familiar with the Current Use Program
- ☐ I am extremely familiar with the Current Use Program

b) Which statement below best describes your thoughts, or personal experience, about enrolling <u>your</u> woodland in Vermont's Current Use Program? *Please select only <u>one</u> statement.*

- ☐ My land is currently enrolled in Current Use
- ☐ My land was enrolled in Current Use, but now it is not
- ☐ I am in the process of enrolling my land now
- ☐ I plan to begin the Current Use application <u>within the next year</u>
- ☐ I plan to begin the Current Use application <u>more than one year from now</u>
- ☐ I have thought about enrolling my land in Current Use, but have not yet made a decision
- ☐ I have thought about enrolling my land in Current Use, but decided NOT to enroll
- ☐ I have thought about enrolling my land in Current Use, but my land does not qualify for the program
- ☐ I have not thought about whether I want to enroll my land in Current Use

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c) How much do you agree or disagree with each of the following statements about enrolling <u>your</u> woodland in Vermont's Current Use Program? *Please select only one box for each statement.*

	Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree	Do not know
I want to have the option to develop my land in the future	☐	☐	☐	☐	☐	☐
I want to reduce my taxes	☐	☐	☐	☐	☐	☐
I want my land to stay undeveloped	☐	☐	☐	☐	☐	☐
Current Use does not give me enough flexibility to cut trees when I need to	☐	☐	☐	☐	☐	☐
Current Use requires me to cut trees that I do not want to cut	☐	☐	☐	☐	☐	☐
I (or my family) could not afford to keep my land without Current Use	☐	☐	☐	☐	☐	☐
Enrolling in Current Use is not worth the effort	☐	☐	☐	☐	☐	☐
The forestry practices required by Current Use help keep my woodland healthy	☐	☐	☐	☐	☐	☐
I do not know enough about Current Use to enroll	☐	☐	☐	☐	☐	☐
I do not want anybody telling me what to do on my land	☐	☐	☐	☐	☐	☐

Expert Visits

10. To learn more about their woodland, Vermont landowners can arrange a visit with a woodland expert to walk their land and answer questions/provide personalized advice. Experts include foresters, biologists, and fellow landowners who represent both government agencies and non-governmental groups. Depending on the type of expert, landowners may pay for the visit or receive the visit free of charge.

a) Who, if any, of the following experts have visited your woodland? *Please select either "Yes", "No" or "Do Not Know" for each expert.*

Yes	No	Do Not Know	Woodland Expert
☐	☐	☐	Vermont county forester
☐	☐	☐	Consulting forester/private consultant
☐	☐	☐	Natural Resources Conservation Service (NRCS) employee
☐	☐	☐	Vermont Fish and Wildlife employee
☐	☐	☐	Audubon Vermont representative
☐	☐	☐	A knowledgeable fellow landowner (such as a Vermont Coverts or Tree Farm participant)

b) Which statement below best describes your thoughts, or personal experience, about arranging for a woodland expert to visit <u>your</u> land? *Please select only <u>one</u> statement.*

- ☐ A woodland expert has visited my land
- ☐ I am currently in the process of arranging for an expert to visit my woodland
- ☐ I plan to arrange a visit with an expert <u>within the next year</u>
- ☐ I plan to arrange a visit with an expert <u>more than one year from now</u>
- ☐ I have thought about arranging a visit with an expert, but have not yet made a decision
- ☐ I have thought about arranging a visit with an expert, but decided NOT to do so
- ☐ I have not thought about whether I want to arrange a visit with a woodland expert

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c) How much do you agree or disagree with each of the following statements about arranging for a woodland expert to visit <u>your</u> land? *Please select only one box for each statement.*

	Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree	Do not know
A visit from an expert is too costly	☐	☐	☐	☐	☐	☐
A visit from an expert helps me learn something new about my land	☐	☐	☐	☐	☐	☐
A visit from an expert is the best way to get personalized information about my woodland	☐	☐	☐	☐	☐	☐
A visit from an expert gives me reassurance that I am taking good care of my woodland	☐	☐	☐	☐	☐	☐
Is it not worth the effort/time to request or schedule a visit with an expert	☐	☐	☐	☐	☐	☐
There are no woodland experts that provide the information I want	☐	☐	☐	☐	☐	☐
I do not know which woodland expert would be able to help me	☐	☐	☐	☐	☐	☐
I do not need expert advice to keep my woodland healthy	☐	☐	☐	☐	☐	☐

Patch Cuts

11. A "patch cut" describes an area of woodland, between 1/2 acre and 5 acres in size, in which all or most of the trees have been cut to open the canopy and allow plants/trees to grow back naturally.

a) How familiar are you with patch cuts? *Please select only one statement.*

If you checked either of these two boxes please skip to question #12

- ☐ I have never heard of the term "patch cut"
- ☐ I have heard of the term "patch cut" but I do not know much about it
- ☐ I am somewhat familiar with patch cuts
- ☐ I am very familiar with patch cuts
- ☐ I am extremely familiar with patch cuts

b) Which statement below best describes your thoughts, or personal experience, about making a patch cut on <u>your</u> woodland? *Please select only <u>one</u> statement.*

- ☐ I have completed a patch cut on my woodland
- ☐ I am in the process of making my first patch cut on my woodland now
- ☐ I plan to make my first patch cut <u>within the next year</u>
- ☐ I plan to make my first patch cut <u>more than one year from now</u>
- ☐ I have thought about making my first patch cut, but have not yet made a decision
- ☐ I have thought about making a patch cut, but decided NOT to make this type of cut
- ☐ I have not thought about whether I want to make a patch cut on my woodland

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c) How much do you agree or disagree with each of the following statements about making a patch cut on <u>your</u> woodland? *Please select only one box for each statement.*

Making a patch cut...	Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree	Do not know
Helps establish young trees on my woodland	☐	☐	☐	☐	☐	☐
Improves the habitat for some animals	☐	☐	☐	☐	☐	☐
Improves the hunting on my land	☐	☐	☐	☐	☐	☐
Is good for the overall health of my woodland	☐	☐	☐	☐	☐	☐
Is not worth the effort/time	☐	☐	☐	☐	☐	☐
Looks ugly	☐	☐	☐	☐	☐	☐
Was recommended to me by a woodland expert	☐	☐	☐	☐	☐	☐
Will harm the types of wildlife I care about	☐	☐	☐	☐	☐	☐
Will cause me to lose income	☐	☐	☐	☐	☐	☐
Will encourage the growth of unwanted plants/trees	☐	☐	☐	☐	☐	☐

Conservation Easements

12. Land development rights can be sold or voluntarily given away to a conservation organization, which permanently prevents the land from being developed. This is commonly called a "conservation easement."

a) How familiar are you with conservation easements? *Please select only one statement.*

If you checked either of these two boxes please skip to question #13

- ☐ I have never heard of the term "conservation easement"
- ☐ I have heard of the term "conservation easement" but I do not know much about it
- ☐ I am somewhat familiar with conservation easements
- ☐ I am very familiar with conservation easements
- ☐ I am extremely familiar with conservation easements

b) Which statement below best describes your thoughts, or personal experience, about putting a conservation easement on all or part of your woodland? *Please select only one statement.*

- ☐ I currently have a conservation easement on all or part of my woodland
- ☐ I plan to put a conservation easement on my woodland within the next year
- ☐ I plan to put a conservation easement on my woodland more than one year from now
- ☐ I have thought about putting a conservation easement on my woodland, but have not yet made a decision
- ☐ I have thought about putting a conservation easement on my woodland, but decided NOT to do so
- ☐ I have not thought about whether I want to put a conservation easement on my woodland

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c) How much do you agree or disagree with each of the following statements about putting a conservation easement on all or part of your woodland? *Please select only one box for each statement.*

	Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree	Do not know
The process of getting an easement is not worth the effort/time	☐	☐	☐	☐	☐	☐
The process of getting an easement is too expensive	☐	☐	☐	☐	☐	☐
I cannot find a conservation organization/land trust willing to hold an easement on my woodland	☐	☐	☐	☐	☐	☐
I do not know how to put a conservation easement on my woodland	☐	☐	☐	☐	☐	☐
I do not trust conservation organizations/land trusts	☐	☐	☐	☐	☐	☐
A conservation easement would reduce the value of my property	☐	☐	☐	☐	☐	☐
I want to have the ability to develop my woodland	☐	☐	☐	☐	☐	☐
I want future generations to have the ability to develop my woodland	☐	☐	☐	☐	☐	☐
I want a conservation easement on my woodland to help preserve the character of Vermont	☐	☐	☐	☐	☐	☐
I want a conservation easement on my woodland to protect the overall health of the land	☐	☐	☐	☐	☐	☐
I want a conservation easement on my woodland as a legacy for future generations	☐	☐	☐	☐	☐	☐
I want a conservation easement on my woodland to help wildlife	☐	☐	☐	☐	☐	☐

Cost Share Programs

13. Cost share programs provide financial assistance to qualified woodland owners to conduct specific conservation activities on their land, such as removing invasive plants, creating a forest management plan, or enhancing wildlife habitat. Funding for cost share programs can come from federal, state, or non-governmental groups, such as the Natural Resources Conservation Service (NRCS) or the Woods, Wildlife and Warblers program.

a) How familiar are you with cost share programs for woodland owners? *Please select only one statement.*

If you checked either of these two boxes please skip to question #14

- ☐ I have never heard of the term "cost share program"
- ☐ I have heard of the term "cost share program" but I do not know much about it
- ☐ I am somewhat familiar with cost share programs
- ☐ I am very familiar with cost share programs
- ☐ I am extremely familiar with cost share programs

b) Which statement below best describes your thoughts, or personal experience, about participating in a cost share program for <u>your</u> woodland? *Please select only <u>one</u> statement.*

- ☐ I have completed one or more cost share programs in the past
- ☐ I have applied for a cost share program in the past, but have never completed a program
- ☐ I am currently participating in my first cost share program now
- ☐ I plan to participate in my first cost share program <u>within the next year</u>
- ☐ I plan to participate in my first cost share program <u>more than one year from now</u>
- ☐ I have thought about participating in a cost share program, but have not yet made a decision
- ☐ I have thought about participating in a cost share program, but decided NOT to do so
- ☐ I have not thought about whether I want to participate in a cost share program

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c) How much do you agree or disagree with each of the following statements about participating in a cost share program to conduct a conservation activity on <u>your</u> woodland? *Please select only one box for each statement.*

Cost share programs...	Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree	Do not know
Are not of interest because I am already taking good care of my woodland	☐	☐	☐	☐	☐	☐
Are too complicated to enroll in when administered by the government	☐	☐	☐	☐	☐	☐
Are too complicated to enroll in when administered by non-governmental groups	☐	☐	☐	☐	☐	☐
Do not cover enough of the costs to make the application worth the effort	☐	☐	☐	☐	☐	☐
Do not fund the improvements I am interested in doing	☐	☐	☐	☐	☐	☐
Ease the financial burden of making an improvement that I was already planning to make	☐	☐	☐	☐	☐	☐
Help me improve an aspect of my woodland that I could not afford otherwise	☐	☐	☐	☐	☐	☐
Help reassure me that I am taking good care of my woodland	☐	☐	☐	☐	☐	☐
Provide me with valuable information	☐	☐	☐	☐	☐	☐
Were recommended to me by a woodland expert	☐	☐	☐	☐	☐	☐
I do not know enough about cost share programs to apply	☐	☐	☐	☐	☐	☐

13. d) Are you currently participating, or have you already participated, in any of the following cost share programs? *Please select either"Yes", "No" or "Do Not Know" for each program.*

Yes	No	Do Not Know	Cost share program
☐	☐	☐	EQIP, the Environmental Quality Incentives Program
☐	☐	☐	CSP, the Conservation Stewardship Program
☐	☐	☐	WHIP, the Wildlife Habitat Incentives Program
☐	☐	☐	The Woods, Wildlife and Warblers cost share program
☐	☐	☐	I have applied for a cost share program, but I cannot remember the name of it
☐	☐	☐	Other (please specify):_____

Information Sources

14. Which of the following topics regarding the care or protection of your woodland, if any, are you interested in learning more about? *Please selected either "Yes" or "No" for each topic.*

Yes	No	I am interested in learning more about...
☐	☐	Control of unwanted insects or tree diseases
☐	☐	Wildlife or wildlife habitat
☐	☐	Timber production
☐	☐	Conservation easements
☐	☐	Invasive plants
☐	☐	Vermont's Current Use Program
☐	☐	Arranging for an expert to visit my land
☐	☐	Cost share programs
☐	☐	Patch cuts
☐	☐	Other (please specify): _____

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15. How trustworthy, or untrustworthy, are the following sources of information about the care or protection of your woodland? *Please select only one box for each information source.*

	Not at all trustworthy	A little trustworthy	Somewhat trustworthy	Very trustworthy	Extremely trustworthy	Do not know
A consulting forester	☐	☐	☐	☐	☐	☐
A county forester	☐	☐	☐	☐	☐	☐
A family member or friend	☐	☐	☐	☐	☐	☐
A wildlife biologist	☐	☐	☐	☐	☐	☐
Another woodland owner	☐	☐	☐	☐	☐	☐
Myself (my personal experience)	☐	☐	☐	☐	☐	☐
Audubon Vermont	☐	☐	☐	☐	☐	☐
Vermont Coverts	☐	☐	☐	☐	☐	☐
Vermont Woodlands Association	☐	☐	☐	☐	☐	☐
Woods, Wildlife and Warblers	☐	☐	☐	☐	☐	☐
University of Vermont Extension Services	☐	☐	☐	☐	☐	☐
Vermont Department of Forest, Parks and Recreation	☐	☐	☐	☐	☐	☐
Vermont Fish and Wildlife Department	☐	☐	☐	☐	☐	☐
USDA Natural Resources Conservation Service (NRCS)	☐	☐	☐	☐	☐	☐

16. How would you prefer to receive information/advice, if at all, about the care or protection of your woodland in the future? *Please check either "Yes" or "No" for each information source.*

Yes	No	I would prefer to...
☐	☐	Talk to someone
☐	☐	Arrange for an expert to visit my land
☐	☐	Receive a brochure, magazine, or other written material
☐	☐	Attend a conference, workshop, or class in-person
☐	☐	Search on the internet
☐	☐	Receive an email/e-newsletter
☐	☐	Attend an online workshop/class
☐	☐	Other (please specify): _____

17. Do you know if there is an agency, organization, or program in your area that will send a woodland expert (such as a forester, wildlife biologist, or knowledgeable fellow landowner) to visit your land in Vermont free of charge?

☐ Yes ☐ No ☐ Do Not Know

↳ If yes, what is the name of this agency, organization, or program?

_____

18. Have you ever spoken to an expert about improving wildlife habitat on your woodland in Vermont?

☐ Yes ☐ No ☐ Do Not Know

General Questions About You

19. What is your gender? _____

20. What is your age?

☐☐☐ Years

21. What is the highest degree or level of school you have completed?

☐ Less than 12th grade
☐ High school/GED
☐ Some college
☐ Associate degree
☐ Bachelor's degree
☐ Advanced degree

22. Are you a member of any conservation or natural resource management organizations?

☐ Yes ☐ No

↓

If yes, please list them:

_____

_____

_____

_____

If there are any additional comments or concerns you would like to share, please list them below:

Thank you for participating in this survey! Please return the questionnaire in the postage-paid envelope provided. If you would like a copy of the results of this survey, print your name and address on the back of the return envelope.

Comments or questions?
Please contact us:

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Email: meharrington@umass.edu

Version: VWW 1.0

APPENDIX 3. ANALYSES OF TWO ADDITIONAL CONSERVATION ACTIONS: USE VALUE APPRAISAL PROGRAM (CURRENT USE) AND CONSERVATION EASEMENTS

This study incorporated the Transtheoretical Model into survey questions centered on five conservation topics. I presented the results of my analysis regarding three topics (Expert Visits, Patch Cuts, and Cost-share Programs) in the main text above. My findings for the remaining two topics – the Use Value Appraisal Program and Conservation Easements – can be found below. For both topics, I present the results of 1) a descriptive statistical analysis regarding topic familiarity, 2) a logistic regression analysis comparing the relative influence of motivations and barriers on taking action, and 3) a contingency table analysis comparing motivations and barriers by Stage of Change. The analyses for these two topics mirror that of the topics in the main text; see the Methods section for an in-depth explanation of my analytical methods.

A3.1 Use Value Appraisal Program (Current Use)

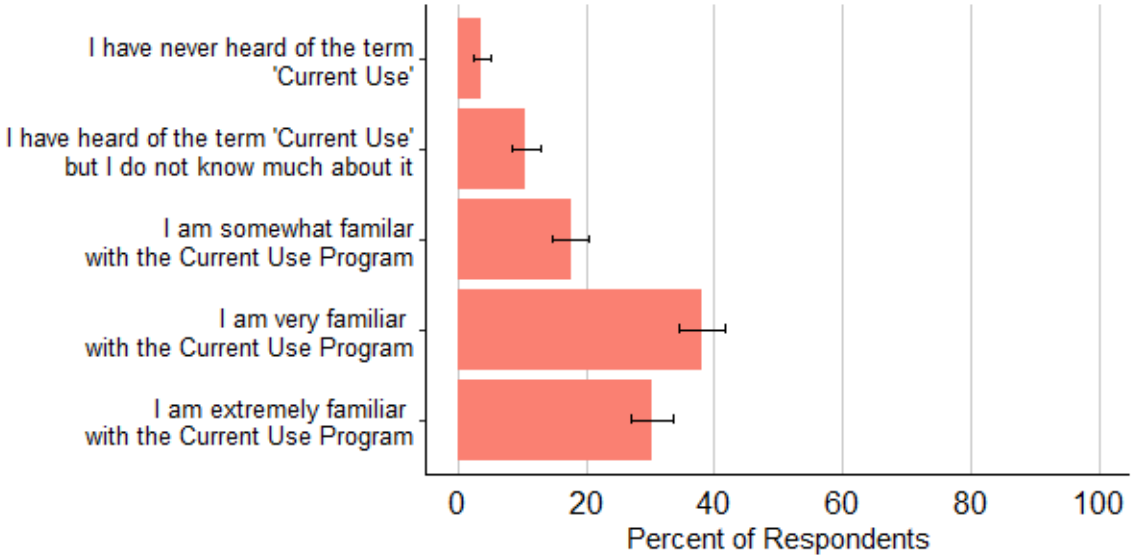

Figure 13. The level of familiarity survey respondents had with the Current Use (UVA) Program by percentage. Respondents could select only one statement. Error bars indicate a 95% confidence interval.

Table 11. Description of the variables used in the logistic regression and contingency table analyses for the topic of the Current Use program.

Variable Name	Variable Description	Influence
Options	I want to have the option to develop my land in the future	Barrier
Flexibility	Current Use does not give me enough flexibility to cut trees when I need to	Barrier
Requirements	Current Use requires me to cut trees that I do not want to cut	Barrier
Effort	Enrolling in Current Use is not worth the effort	Barrier
Knowledge	I do not know enough about Current Use to enroll	Barrier
Control	I do not want anybody telling me what to do with my land	Barrier
Taxes	I want to reduce my taxes	Motivation
Undeveloped	I want my land to stay undeveloped	Motivation
Afford	I (or my family) could not afford to keep my land without Current Use	Motivation
Health	The forestry practices required by Current Use help keep my woodland healthy	Motivation

Table 12. The coefficient, odds ratio and 95% confidence intervals for each explanatory variable in the logistic regression model regarding whether a respondent had enrolled their forested land (1) or not (0) in Vermont's Use Value Appraisal (i.e. Current Use) program.

	Variable	Coefficient		Odds Ratio	95% Confidence Interval	
Motivations	Taxes	1.22	*	3.38	1.50	7.60
	Undeveloped	0.33		1.39	0.67	2.87
	Afford	2.48	*	11.99	5.58	25.80
	Health	1.58	*	4.86	2.70	8.76
Barriers	Options	0.20		1.22	0.63	2.36
	Flexibility	-1.30	*	0.27	0.11	0.66
	Requirements	-0.87	*	0.42	0.19	0.90
	Effort	-0.85		0.43	0.18	1.03
	Knowledge	-2.73	*	0.07	0.02	0.18
	Control	-0.37		0.69	0.37	1.27
Other	Acreage (log)	0.95	*	2.59	1.89	3.55
	Traditionalist	-0.18		0.83	0.38	1.83
	Pluralist	-0.19		0.83	0.38	1.77
	Distanced	0.07		1.08	0.34	3.41

*regression coefficient is significant at $p<0.05$

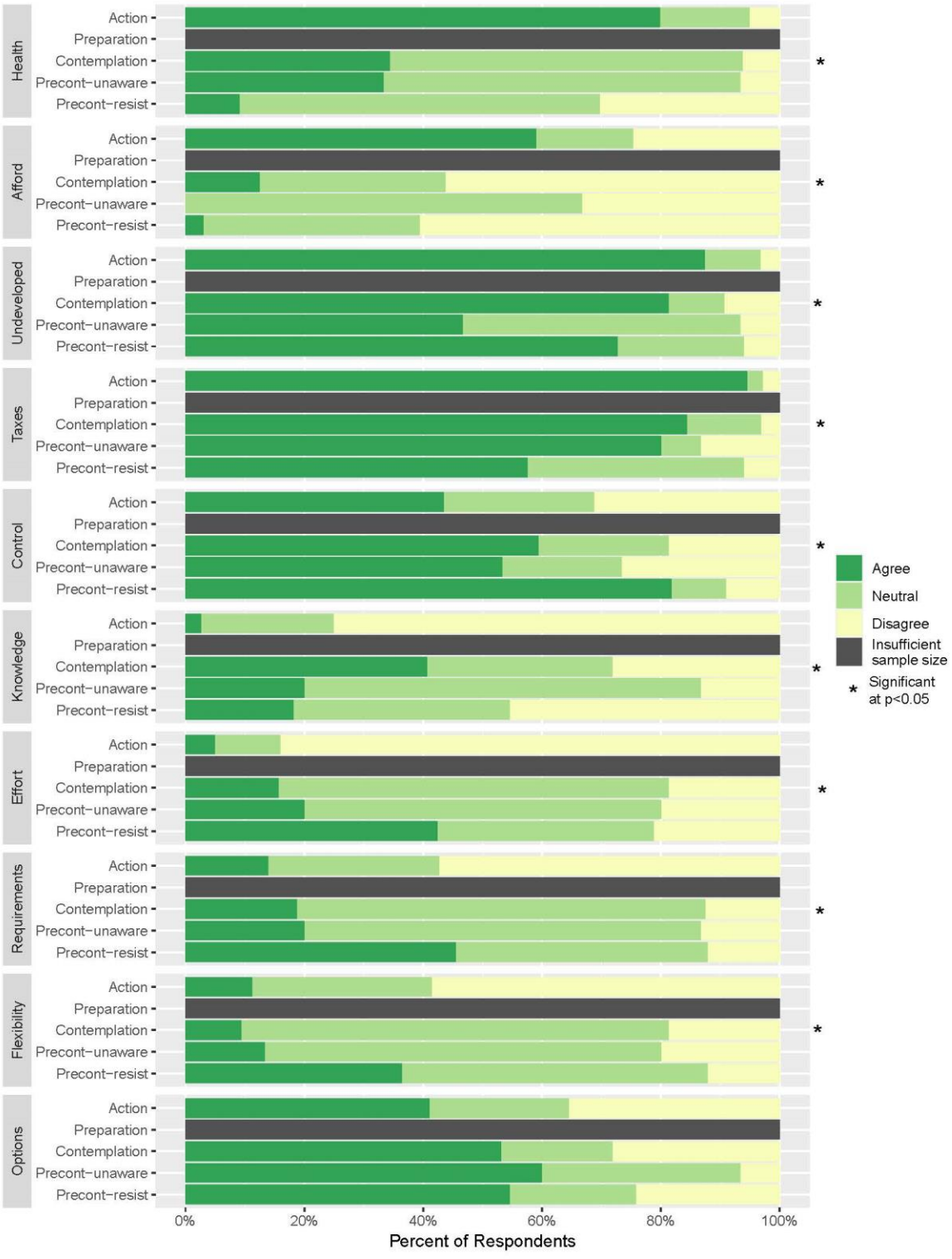

Figure 14. The percentage of respondents who agreed, were neutral, or disagreed with each of the above motivation and barrier statements about enrolling in Vermont's Use Value Appraisal (Current Use) program by their Stage of Change.

A3.2 Conservation Easements

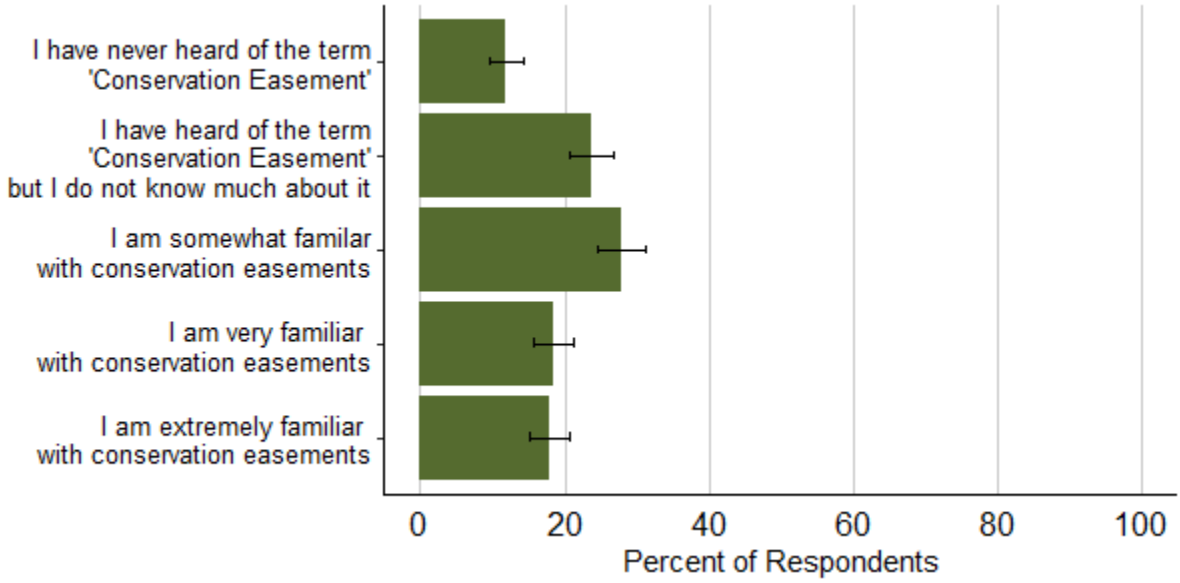

Figure 15.The level of familiarity survey respondents had with conservation easements by percentage. Respondents could select only one statement. Error bars indicate a 95% confidence interval.

Table 13. Descriptions of the variables used in the logistic regression and contingency table analyses for the topic of conservation easements.

Variable Name	Variable Description	Influence
Effort	The process of getting an easement is not worth the effort/time	Barrier
Cost	The process of getting an easement is too expensive	Barrier
Search	I cannot find a conservation organization/land trust willing to hold an easement on my woodland	Barrier
Knowledge	I do not know how to put a conservation easement on my woodland	Barrier
Trust	I do not trust conservation organizations/land trusts	Barrier
Value	A conservation easement would reduce the value of my property	Barrier
Options	I want to have the ability to develop my woodland	Barrier
Future	I want future generations to have the ability to develop my woodland	Barrier
Character	I want a conservation easement on my woodland to help preserve the character of Vermont	Motivation
Health	I want a conservation easement on my woodland to protect the overall health of my land	Motivation
Legacy	I want a conservation easement on my woodland as a legacy for future generations	Motivation
Wild	I want a conservation easement on my woodland to help wildlife	Motivation

Table 14. The coefficient, odds ratio, and 95% confidence intervals for each explanatory variable in the logistic regression model regarding whether a respondent had put a conservation easement on all or part of their forested land (1) or not (0).

	Variable	Coefficient	Odds Ratio	95% Confidence Interval	
Motivations	Character	1.10 *	3.00	1.09	8.27
	Health	0.19	1.21	0.39	3.74
	Legacy	2.21 *	9.08	2.30	35.76
	Wildlife	-0.22	0.80	0.27	2.36
Barriers	Effort	0.30	1.35	0.42	4.36
	Cost	-0.27	0.76	0.27	2.13
	Search	-1.01	0.36	0.06	2.13
	Knowledge	-3.58 *	0.03	0.00	0.21
	Trust	-0.41	0.66	0.27	1.66
	Value	-0.34	0.71	0.37	1.37
	Options	-0.07	0.93	0.35	2.45
	Future	-0.97 *	0.38	0.15	0.99
Other	Acreage (log)	0.20	1.22	0.91	1.63
	Traditionalist	0.85	2.33	0.94	5.77
	Pluralist	0.25	1.28	0.62	2.63
	Distanced	0.31	1.36	0.38	4.94

*regression coefficient is significant at $p<0.05$

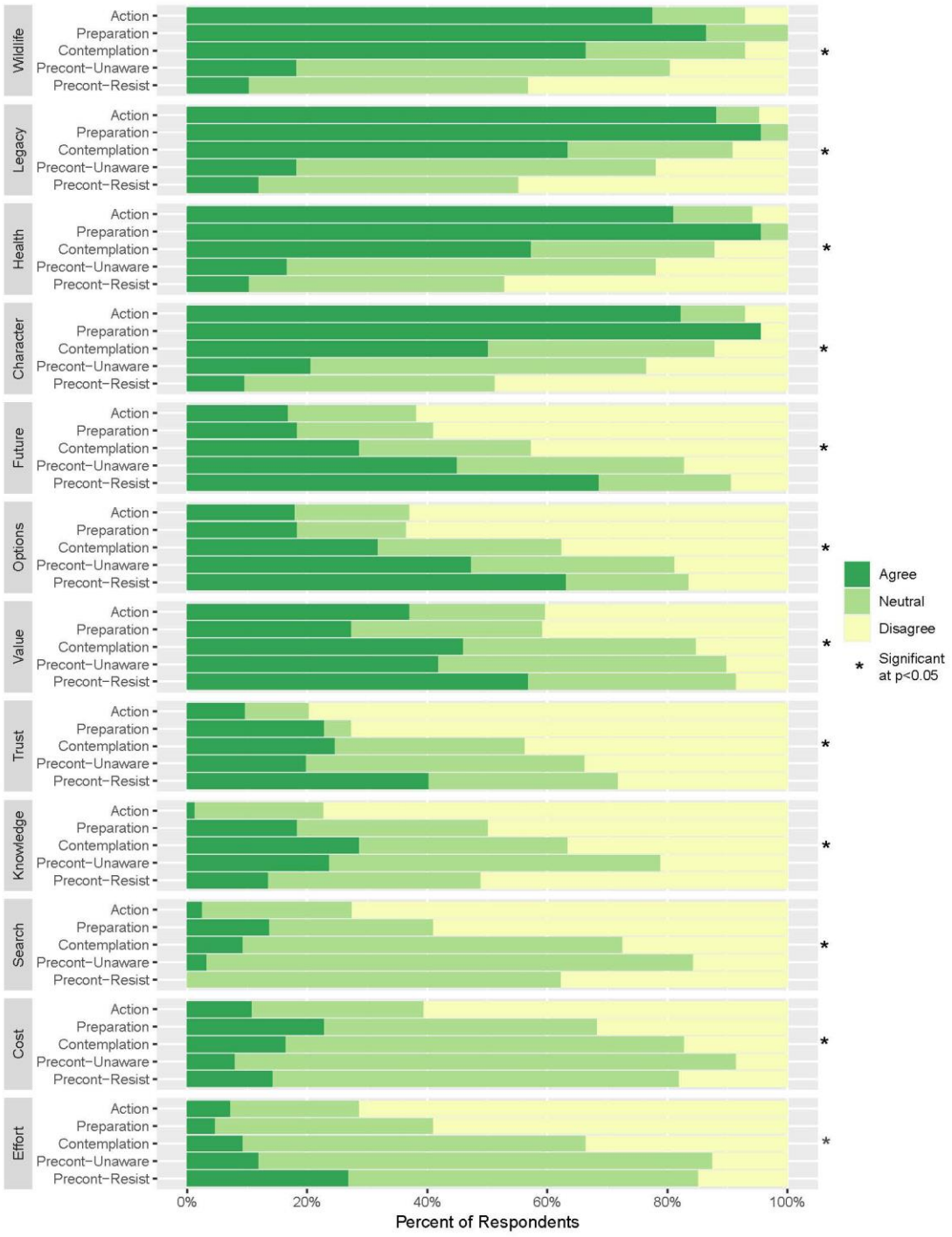

Figure 16.The percentage of respondents who agreed, were neutral, or disagreed with each of the above motivation and barrier statements about putting a conservation easement on all or part on their forested land by their Stage of Change.

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