Attitudes and Barriers to Women's Participation in a Proposed Community-Based Conservation Program in Western Belize

A Dissertation Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

Amanda Shay Kaeser
August 2016

Copyright © 2016 by Amanda S. Kaeser
All rights reserved.

DEDICATION

To the women around the globe that believe there are more environmentally friendly ways to accomplish development and are willing to work toward those goals.

ACKNOWLEDGEMENTS

This dissertation would not have been possible without the help of my advisor Adam Willcox. Through his continued support, ideas, and pep-talks I have been able to accomplish so much more than I ever dreamed. He has been there to help me on this long journey and see my dream of obtaining my PhD a reality. Thank you!

I would also like to thank Don Hodges for taking me on as a graduate student and helping me determine where my interests truly lie. Thanks to Robert Jones for introducing me to all of the different social science theories. As well, I appreciate all of your ideas, guidance, and constructive criticisms. You and your courses helped me learn to think more deeply about theory and life in general. Thanks to Bruce Tonn for encouraging me learn more about the government. You have opened my eyes to the influence of the president and the government in general in regard to environmental issues.

I would also like to express gratitude to multiple editors and idea bouncers of my papers: Kyle Rogers, Robert Augé, and Tobin Walton. The discussions I have had with you have been invaluable to me finishing this piece of literature.

I would also like to thank my Dad for instilling in me the desire to want to learn all that I can while on this planet and for paving the path for me to obtain my own PhD. You are greatly missed and never forgotten.

Lastly, but most importantly, I would like to thank my family for the continued support and understanding throughout this process. Thank you Mom for helping watch my children when I had deadlines to meet, for being interested in what I am trying to accomplish, and for keeping me company in Belize. Thanks to Krislyn and Lissa for

being such wonderful and easy children. I would not have been able to complete my studies without your laidback personalities. Finally, I would like to thank my partner in life and husband, Brad. You have been so understanding, even when I know you did not want to be. It has been a rough three years, but we have made it! Thank you for all the support you have given and that I know you will continue to give in the future. It is your turn! What's next?

ABSTRACT

World conservation issues have been addressed in many ways around the world. The use of community-based conservation (CBC) as a method to reduce harmful practices has gained in popularity in the past few decades. This dissertation reports results from a pre-analysis of a proposed CBC program in western Belize. Through qualitative interviews with 47 stakeholders, and a quantitative survey with 486 Belizean women, we determined that a CBC program designed especially for women should be successful. Some of the aspects of a program that women expressed a desire for was more conservation and forest education. However, contrary to our assumption that women would require an income to participate, we found that it was a matter of needing free time and gaining some education that would influence their increased participation. Additionally, the Connectedness to Nature Scale (CNS) is a scale that is widely used around the world to determine a person's feelings of being in connection to nature. It has been positively correlated with well-being, environmentally-friendly behaviors, and a person's contact with nature. We used this scale to determine if the greater contact with nature that people in Belize experience every day, compared to developed countries, would have an effect on their CNS scores. Therefore, we administered the CNS to women in Belize to determine if there was a difference between people's feelings of connectedness to nature in developing countries, where residents have extensive daily contact with nature, and in developed countries where the majority of residents have limited contact with nature. It was found that feelings of connectedness to nature are greater in Belizean women compared to 58 other study populations living in developed areas around the world. Our results have many implications for conservation group

developers in that they point to the need for pre-assessments of programs to help uncover key aspects that need to be included and to identify program aspects that are not necessary for its success.

TABLE OF CONTENTS

CHAPTER I: INTRODUCTION 1
References 5
CHAPTER II: ATTITUDES AND PERCEIVED BARRIERS TO WOMEN PARTICIPATING IN A PROPOSED COMMUNITY-BASED CONSERVATION PROGRAM IN WESTERN BELIZE 7
Abstract 8
Introduction 10
Theoretical Framework 12
Study Area 15
Methods 16
Results 19
Key Informant Characteristics 19
Behavioral Beliefs 19
Normative Beliefs 22
Control Beliefs 22
Cultural and Historical Forest Use and Conservation 24
Differences Between Men and Women Responses 26
Discussion 27
References 34
Appendix A:Full interview script 39
Appendix B:Example of coding process 41
CHAPTER III: PREDICTING WOMEN'S PARTICIPATION IN A PROPOSED COMMUNITY-BASED CONSERVATION PROGRAM IN WESTERN BELIZE 42
Abstract 43
Introduction 45
Theoretical Framework 49
Methods 52
Study Area and Participants 52
Survey Development 54
Survey Administration 55
Data Analysis 56
Results 58
Demographics 58
TPB Construct Analysis 59
Behavioral Intent 60
Attitudes 61
Subjective Norms 63
Perceived Behavioral Controls 63
Structural Equation Modeling Analysis 66
Discussion 69
Future Directions 73
References 74
Appendix C: Survey used in western Belize, 2015 79

CHAPTER IV: CONNECTEDNESS TO NATURE SCALE AND ITS USE IN DEVELOPING AREAS: A META-ANALYSIS AND BELIZE SURVEY 84
Abstract 85
Introduction 86
Connectedness to Nature Scale 89
Study 1: Meta-Analysis 90
Methods 90
Literature Search and Inclusion Criteria 90
Data Analysis 92
Results 93
Study Characteristics 93
Moderator Analysis 94
Sensitivity and Publication Bias 96
Discussion 98
Study 2: Belize CNS 99
Methods 100
Participants and Procedures 100
Measure 101
Results and Comparison of Means 102
Discussion 103
General Discussion 104
Limitations 106
Future Directions 107
References 109
Appendix D: Revised Connectedness to Nature Scale 114
Appendix E: Summary statistics for all CNS studies included in the meta-analysis 115
Appendix F:Reference for studies used in the meta-analysis 117
CHAPTER V: POLICY RECOMMENDATIONS AND CONCLUSION……121
Policy Recommendations 122
Conclusions 131
References 133
VITA 135

LIST OF TABLES

Table 1.1. Interview participant characteristics in western Belize, 2015..... 20
Table 1.2: Number of respondents who held each belief in western Belize, 2015 21
Table 1.3: Respondent's community concerns in western Belize, 2015 (n=41)..... 25
Table 1.4: Respondent's environmental concerns in western Belize, 2015 (n=42)..... 26
Table 1.5: Differences between male and female interview responses in western Belize, 2015..... 28
Table 2.1: Demographic characteristics of women (n=486) completing the survey in western Belize, 2015 59
Table 2.2: Variable factor loadings for the TPB constructs collected from women (n=486) completing the survey in western Belize, 2015 60
Table 2.3: Women's behavioral intent questions, means, and standard errors about participating in a conservation program in western Belize, 2015 (n=486)..... 61
Table 2.4: Unstandardized, standardized, and p-values for the full SEM model about participating in a conservation program in western Belize, 2015 (n=486)..... 62
Table 2.5: Women's attitudinal questions, means, and standard errors about participating in a conservation program in western Belize, 2015 (n=486)..... 64
Table 2.6: Women's subjective norm questions, means, and standard errors about participating in a conservation program in western Belize, 2015 (n=486)..... 65
Table 2.7: Women's perceived behavioral control questions, means, and standard errors about participating in a conservation in western Belize, 2015 (n=486)..... 67

LIST OF FIGURES

Figure 2.1: The Theory of Planned Behavior 50
Figure 2.2: Full SEM model 68
Figure 3.1: Meta-analysis forest plot: weighted summary sizes and 95% confidence intervals for Connectedness to Nature Scale (CNS) in relation to moderator variables 96
Figure 3.2: Forest plot comparing the overall meta-analysis CNS mean and the Belize CNS mean 104

CHAPTER I
INTRODUCTION

Deforestation and forest degradation are harmful to the environment, people, and wildlife (Board, 2005; Haines et al., 2006; Haines-Young and Potschin, 2010). Globally, forests are estimated to store 224 billion metric tons of carbon each year, and those that are degraded or cleared release 15-20% of the total annual global carbon emissions (Team et al., 2007; Buis and Cole, 2011; FAO, 2011). By implementing conservation programs to reduce deforestation and degradation, the world's carbon emissions can be substantially reduced and the total global carbon stores increased (Soares-Filho et al., 2010). Furthermore, increasing forest quality and quantity will provide more natural resources for local communities, increase and improve wildlife habitat, and possibly add to local economies through the sale of sustainably harvested resources. Tropical forests contain more than 50% of the world's species and are vital for the health of the global environment (Putz et al., 2001). However, many tropical countries lack the capacity to manage forest resources (Berrett et al., 2001). Empowering local communities to manage natural resources, as opposed to state or federal management, is often used in these countries to compensate for this reduced capacity. By creating conservation programs aimed at increasing the health and total area of tropical forests, we can potentially improve the local economies and the health of other species and help mitigate climate change.

Community-based conservation (CBC) is a people-centered approach to conservation that links development and conservation goals (Berkes, 2004). Many CBC programs have been implemented in areas where national governments have legally empowered local communities to manage and conserve their natural resources due to the expense or lack of management capacity by the local government (Barrett et al.,

2001; Berkes, 2004). By incorporating local people in the sustainable management and conservation of the natural resources on which they rely, illegal deforestation and other degrading practices have been shown to decrease. This relationship between the biodiversity of the area and the livelihood of the local communities should provide an incentive for conservation (Brown, 2002), and many forest CBC programs have been shown to reduce deforestation rates compared to government managed areas. This is attributed to locally-relevant, culturally-appropriate, and enforceable regulations being set by the local communities rather than the government in a command-and-control management styles (Porter-Bolland et al., 2012).

A well-designed CBC program, whose goal is forest enhancement and protection, could provide economic incentives through payments for ecosystem services or monetary benefits from participation in CBC activities, such as collecting, processing, and selling natural resources (Berkes, 2004). Franzen and Vogl (2013) concluded that wealthier countries have more environmental concern, suggesting that attention is pulled away from environmental issues in countries experiencing economic crises. Therefore, increasing an area's economic status, possibly through successful CBC programs, may eventually lead to individuals and groups placing a higher value on the environment and increasing conservation norms in the area.

One of the important aspects of an effective CBC is the inclusion of women. Westerman et al. (2005) contend that women have a special relationship with nature and therefore may be more likely to protect it. Additionally, involving women in conservation, and specifically in CBC efforts, increases efficiency (Westerman et al., 2005; Agarwal, 2009b).

Current research addressing CBC programs around the world has largely studied the effectiveness of the programs after implementation. However, we believe that a program will be more effective and less apt to fail if the program is thoroughly researched before implementation. A pre-assessment of a proposed program can identify attitudes toward the program, barriers to community member participation, and program features that should and should not be included, or are not necessary. Because of the potential economic, species health, and global benefits of CBCs, we determined the aspects of a proposed CBC group for women in western Belize that would increase its likelihood of success. Moreover, by assessing a proposed program before implementation, valuable resources can be saved. In order to accomplish this we addressed the following objectives in this research:

1. Determine the attitudes and barriers to women's participation in a proposed CBC program in western Belize.
2. Quantify women's attitudes, norms, and perceived behavioral controls toward a proposed CBC program.
3. Determine Belizean women's connectedness to nature and how their connectedness to nature relates to other study populations around the world.

The resulting information can be applied to create a successful CBC program for women in western Belize in conjunction with local conservation partners. Additionally, we anticipate objective three being a precursor to more in-depth research investigating differences between developed and developing countries in relation to connectedness to nature and the effect that that might have on attitudes and conservation behaviors.

References

Agarwal, B. (2009b). "Gender and forest conservation: The impact of women's participation in community forest governance." Ecological Economics 68(11): 2785-2799.

Barrett, C. B., K. Brandon, C. Gibson and H. Gjertsen (2001). "Conserving tropical biodiversity amid weak institutions." BioScience 51(6): 497-502.

Berkes, F. (2004). "Rethinking community-based conservation." Conservation Biology 18(3): 621-630.

Board, M. A. (2005). "Millennium ecosystem assessment." Washington, DC: New Island.

Brown, K. (2002). "Innovations for conservation and development." The Geographical Journal 168(1): 6-17.

Buis, A. and S. Cole (2011). "New NASA Map Reveals Tropical Forest Carbon Storage." from http://www.nasa.gov/topics/earth/features/earth20110531.html.

FAO, U. (2011). "FAOSTAT database." Website UN FAO.

Franzen, A. and D. Vogl (2013). "Two decades of measuring environmental attitudes: A comparative analysis of 33 countries." Global Environmental Change 23(5): 1001-1008.

Haines-Young, R. and M. Potschin (2010). "The links between biodiversity, ecosystem services and human well-being." Ecosystem Ecology: a new synthesis: 110-139.

Haines, A., R. S. Kovats, D. Campbell-Lendrum and C. Corvalán (2006). "Climate change and human health: Impacts, vulnerability and public health." Public Health 120(7): 585-596.

Porter-Bolland, L., E. A. Ellis, M. R. Guariguata, I. Ruiz-Mallén, S. Negrete-Yankelevich and V. Reyes-García (2012). "Community managed forests and forest protected areas: An assessment of their conservation effectiveness across the tropics." Forest Ecology and Management 268: 6-17.

Putz, F. E., G. M. Blate, K. H. Redford, R. Fimbel and J. Robinson (2001). "Tropical forest management and conservation of biodiversity: an overview." Conservation Biology: 7-20.

Soares-Filho, B., P. Moutinho, D. Nepstad, A. Anderson, H. Rodrigues, R. Garcia, L. Dietzsch, F. Merry, M. Bowman and L. Hissa (2010). "Role of Brazilian Amazon protected areas in climate change mitigation." Proceedings of the National Academy of Sciences 107(24): 10821-10826.

Team, C. W., R. Pachauri and A. Reisinger (2007). "IPCC 2007: climate change 2007: synthesis report." Geneva: International Panel on Climate Change.

Westermann, O., J. Ashby and J. Pretty (2005). "Gender and social capital: the importance of gender differences for the maturity and effectiveness of natural resource management groups." World Development 33(11): 1783-1799.

CHAPTER II
ATTITUDES AND PERCEIVED BARRIERS TO WOMEN PARTICIPATING IN A PROPOSED COMMUNITY-BASED CONSERVATION PROGRAM IN WESTERN BELIZE

A version of this chapter was originally submitted for publication by Amanda S. Kaeser, Adam S. Willcox, and Nidia C. Panti.

Amanda S. Kaeser, Adam S. Willcox, Nidia C. Panti. “Attitudes and Barriers to Participating in a Proposed Community-Based Conservation Program in Belize.” (2016) *In Review*. Oryx.

This chapter’s work was conceptualized by Amanda Kaeser and Adam Willcox as part of Amanda’s dissertation work. The research was carried out and analyzed by Amanda with the help of Nidia Panti, as an in-country assistant. Amanda Kaeser wrote this chapter and it was edited by Adam Willcox.

Abstract

Many global efforts to decrease deforestation have focused on community-based conservation (CBC) programs to reach their goals. However, numerous are lacking a potentially helpful population, women. Our research employed key-informant interviews to examine attitudes toward and barriers to women’s participation in a CBC program before implementation. We conducted 47 semi-structured interviews in January, 2015 in communities adjacent the Vaca Forest Reserve located in the Cayo District of Belize. Results indicated the benefits of involving women in CBC activities included learning more about the forest and conservation, transferring this knowledge to their family and community, and helping the environment. Some possible barriers to participation included lack of time and motivation to participate. However, there were some notable differences between men and women’s responses relating to women’s available time and their willingness to participate with men not mentioning time as a barrier and stating that women would need more motivation to participate. Results will be used to work with

local women to collaboratively develop and implement a CBC program around the Vaca Forest Reserve.

Introduction

To reach their goals, many global conservation efforts are moving to community-based approaches (Hackel, 1999; Barrett et al., 2001; Berkes, 2004). According to Brown (2002), “experience has shown that traditional, top-down exclusionary approaches to protected areas are often not effective in reaching conservation objectives” (p. 6). Programs designed to include communities in their conservation efforts, referred to as Community-Based Conservation (CBC), have shown success (Hartup, 1994; Porter-Bolland et al., 2012; Thompson, 2013). By incorporating local communities in the sustainable management and conservation of the natural resources on which they rely, illegal deforestation and other degrading practices may decrease, as local people have vested interests in forest resources to remain abundant. This dependent relationship between local livelihoods and natural resources should provide an incentive for conservation (Wollenberg and Ingles, 1998; Brown, 2002; Belcher and Schreckenberg, 2007). A meta-analysis determined that many tropical forest CBC programs have reduced deforestation rates compared to government-managed areas. This has been attributed to locally-relevant, culturally-appropriate, and enforceable regulations being set by local communities rather than the government (Porter-Bolland et al., 2012). Community-based conservation programs have also been shown to strengthen local governments, empower the poor, and reduce local conflicts through better rule compliance and cooperation (Thompson, 2013). By emphasizing community involvement and combining conservation efforts with economic development, conservation practitioners can enhance nature and improve local communities (Getz et al., 1999; Berkes, 2004). However, many of these programs are lacking women, a key

demographic that can lead to greater program success (Agarwal, 2000; Agarwal, 2001; Prasad Timsina, 2003; Westermann et al., 2005; Agarwal, 2009b).

Women have been noted as "having a special relationship with the environment due to their responsibilities for the family and concern for the well-being of future generations" (Westermann et al., 2005, p. 1784). This special relationship is found often in the literature, but is largely ignored in conservation efforts (Davidson, 1989; Jackson, 1993; Steady, 1998). Studies investigating CBC programs have documented the lack of involvement by women and have shown that programs involving women have better outcomes than those without (Agarwal, 2000; Agarwal, 2001; Agarwal, 2009b; Soe and Sato, 2012). Groups with more women tend to have better collaboration, solidarity, and conflict resolution, because "women tend to build more relational social capital than men" (Westermann et al., 2005, p. 1794). Agarwal (2009b) found that community forest groups with more women showed greater improvement in forest conditions on all indicators, with a 57% higher probability of improvement when the groups had two or more women. This reportedly was due to greater rule compliance, women's knowledge of plant species, more sustainable methods of resource harvest, and greater cooperation. Women were also found to have strong feelings of forest ownership and continued to monitor illegal activity while performing their daily work (Agarwal, 2009b). Because of the potential benefits of involving women, managers and organizations developing conservation programs are encouraged to include women in their design and implementation.

Community-based conservation programs around the globe have been implemented with and without women's participation (Agarwal, 2000). However, few

attitudinal and behavioral studies have been conducted before the CBC program was started. We believe this is a necessary step for the success of a CBC program. We argue that some of the roadblocks and failures of CBC programs can be anticipated and overcome by conducting an initial behavioral analysis of the potential program. This study's main objective is to determine local community members' and other stakeholders' attitudes and perceptions about the creation of a CBC program for women. Understanding the attitudes and potential barriers to participation before a program is created will help us design a program that maximizes participant numbers and better ensures its success.

Theoretical Framework

The Theory of Planned Behavior (TPB) is a commonly used model to predict behavioral intent. First proposed by Ajzen in 1985, the TPB uses a two-step research design: an elicitation study to identify salient beliefs about a behavior, followed by the administration of a fixed-item survey to quantify behavioral predictors (Ajzen, 1985). The elicitation study is conducted using personal interviews or focus groups with representatives of a population in a free-response format (Fishbein and Ajzen, 2011). The elicitation stage identifies the stakeholders' salient beliefs about attitudinal constructs (an individual's evaluation of performing a behavior), subjective norm (an individual's perception of what others close to them think about performing the behavior), and perceived behavioral control (an individual's perception of the ease or difficulty of performing a behavior). These three constructs have been found to be the determinants of intent to perform a behavior and intentions have been shown to be

strongly predictive of behaviors in many fields of study (Armitage and Conner, 2001; Fishbein and Ajzen, 2011). For example, they have been used to successfully predict pro-environmental behaviors such as: conservation behaviors among farmers (Beedell and Rehman, 2000; Willcox et al., 2012), water conservation (Lam, 1999), and general conservation behaviors (Kaiser et al., 2005), among others. The expectation is that by determining the social psychological factors that influence an individual performing a behavior, one can then change the frequency of the behavior through targeted outreach programs.

Our study focuses on the TPB elicitation stage. This stage identifies salient beliefs affecting the target behavior. Many researchers have noted the lack of emphasis on the importance of elicitation studies in TPB research (Sutton et al., 2003; Downs and Hausenblas, 2005; Curtis et al., 2010). Frequently, TPB studies are conducted using salient beliefs that were obtained from other populations or studies, which is problematic because the beliefs may not be salient nor representative of the target population (Downs and Hausenblas, 2005; Curtis et al., 2010).

Independent of TPB survey development, the elicitation stage yields deep and rich qualitative insights of the target population, which is crucial when the goal of the research is to determine appropriate interventions that can be applied to change a behavior. An elicitation study can identify terminology and specific wording used by the population that can later assist in intervention communications aimed at shifting the frequency of the behavior. The more that is understood about the beliefs of a population, the more persuasive the behavior change interventions will be (Curtis et al., 2010). Through face-to-face interviews, a researcher can gain valuable insights and

cultural knowledge about a population. Since scientists are often not part of the respondent population and do not have extensive knowledge about the social, political, and other important cultural aspects of the area, this type of qualitative research is invaluable. It has greater flexibility, attention to context, and can reveal social, political, historical, and economic factors that a quantitative study cannot (Sayre, 2004). Sayer (2004) maintains that qualitative studies can uncover unanticipated results of which quantitative studies are not capable. Drury et al. (2011) state that qualitative research is better at producing internal validity because it is "better at representing the diversity of the individuals and groups being analyzed and examining complex concepts in ambiguous and complex contexts" (p. 19). They also assert that researchers who conduct quantitative surveys that have large sample populations are often less aware of site-specific cultural differences in their sample population. Both authors believe that this can be overcome with an extensive qualitative study. Along with the elicitation study questions, we asked respondents to give their views on the history, politics, and economics to better understand the culture of the area (see Appendix A for a full list of the interview questions). This information will be used to help inform the researchers on how to better implement a CBC program in the area and identify possible barriers to participation that the women might face. By being better informed about cultural aspects of an area, efforts to create a conservation program may be more likely to succeed (Waylen et al., 2010).

Study Area

As of 2011, 62.7% of Belize was forested, which is the greatest percentage of forest cover of any country in the Mesoamerican Region (ChartsBin, 2011). However, between 1990 and 2010 it lost 12.2%, approximately 193,000 hectares, of its forests, mostly from illegal logging (FAO, 2011; Arevalo and Chan, 2012). The Vaca Forest Reserve (Vaca) is a 14,448 hectare protected area situated within the Chiquibul forest in the Cayo District of western Belize. It was established in 1991 to "to maintain adequate stock of renewable natural resources for sustainable use by the local communities and contribute to the national economy" (Manzanero and Melendez, 2013, p. 24). It stores large amounts of carbon, contains mineral deposits, has substantial stocks of valuable mahogany (*Swietenia macrophylla)* and Spanish cedar (*Cedrela Mexicana)* timber, and provides clean water for Belize and Guatemala (Cho, 2011). The Chiquibul forest, along with neighboring protected areas, comprise one of the largest continuous tracts of tropical forests in Central America (Bridgewater et al., 2006). These forested areas are also part of the Chiquibul-Maya Mountains Key Biodiversity Area, which is a priority area for conservation recognized by Conservation International (Arevalo and Chan, 2012). Despite these designations, as of 2012, a total of almost six million board feet of lumber have been illegally harvested, damaging 92,316 trees. This has resulted in a loss of almost 9.5 million dollars (Arevalo and Chan, 2012).

The Cayo District has the largest number of unemployed residents in the country and the unemployment rate is 13.4%, which is 3.3% higher than the national average (SIB, 2014). The national language of Belize is English, however, our study area is very

close to the Guatemalan border. This results in many citizens being bilingual, with some more comfortable speaking Spanish than English.

There is currently a small CBC group, Friends of the Vaca Forest Reserve (FVFR), working in the area. It is comprised of 21 men and 2 women farmers who participate in apiculture, agro-ecological methods of farming such as reforestation, composting, and other soil conservation techniques within the reserve borders. Long-term goals of FVFR include: empowering the community to serve as custodians of the natural and cultural resources, poverty reduction, and reforestation (Manzanero and Melendez, 2013). This access to and sustainable use of the land has provided FVFR participants a reason to monitor illegal poaching activities and become stewards of the forest. By increasing the presence of people in the forest, it may reduce illegal activities that are destroying the forest. However, many barriers to community involvement still persist in the Vaca, specifically with regard to women. To date, FVFR efforts have largely focused on sustainable agriculture, which is generally considered a man's job. However, FVFR leaders expressed a desire to encourage the greater participation of women in conservation efforts (Rafael Manzanero, personal communication, Feb. 2014).

Methods

We conducted interviews in January 2015 over a six-day period in the three communities surrounding the Vaca: Benque Veijo Del Carmen (pop. 6,140), San Jose Succotz (pop. 2,322), and Arenal (pop. 612). These communities were chosen due to their proximity and accessibility to the forest reserve and potential reliance on the forest

resources. We conducted 47 semi-structured key-informant interviews with those individuals knowledgeable about the forest, its resources, the communities, or conservation groups. The interviews included: police, mayors, educators, religious leaders, current CBC participants, a non-governmental organization leader, resort personnel, women's group leaders, and government agencies. Women from the general population of each community were also interviewed in order to elicit responses from the group that will potentially be participating in the CBC program. Sampling procedures followed the purposive method, due to the desire to obtain views and experiences of people who would most likely be impacted by, or have special knowledge about a possible conservation program (Bernard, 2012; Babbie, 2015)[1]. In order to better determine the age range of women who might be interested in participating in a CBC program, we selected women to interview who were in the younger generation (20-30 years), middle generation (40-50 years) and older generation (60 and older) in each community.

Local non-governmental organizations and a FVFR leader, all of whom are residents of the area, assisted to design the interview instrument. Multiple drafts were reviewed and revised. Questions were constructed to identify community and environmental concerns, knowledge of the forest reserve, knowledge of conservation and conservation groups in the area, and ways women could use forest resources sustainably. Additionally, following the TPB's elicitation interview format (Francis et al., 2004; Fishbein and Ajzen, 2010), questions were asked to determine respondents'

[1] [1] In purposive sampling 'cases are chosen because they are information rich; not because they are representative of a larger population' (Sirakaya-Turk, 2011, p. 119)

behavioral, normative, and control beliefs about women participating in a conservation program (see Appendix A for the full interview script).

All questions were open-ended in order to encourage dialogue between the interviewer and interviewee. The first and third authors conducted interviews in English or Spanish, depending on the language the interviewee was more comfortable speaking. We collected interviews until saturation was reached, or when no new concepts were emerging (Sirakaya-Turk, 2011). We recorded the interviews using Sony digital voice recorders and uploaded them onto a computer. English interviews were transcribed verbatim into a Word document by the first author, and Spanish interviews were translated to English by the third author and transcribed into a Word document. Interviews averaged 12 minutes and 26 seconds, with a total recording time of 9 hours and 12 minutes[2]. The transcripts were open-coded by identifying key words and salient belief statements in each response and entered into an Excel file. Open-codes were refined into axial codes of analytical categories and then grouped into common themes (see Appendix B for an example of the coding process). Only responses that were mentioned by at least three of the respondents were included in our analysis to give the results more credibility according to triangulation strategy of using multiple sources. This also provides more dependability based on replication logic through the use of multiple locations and groups (Ary et al., 2006).

[2] This total excludes two emailed responses to interview questions, due to the informant not living in a reasonable distance to interview in person.

Results

Key Informant Characteristics

A total of 47 interviews were conducted, 14 in Spanish and 33 in English (Table 1.1). Twenty-two women and 25 men were interviewed. Eight interviews were conducted in the small village of Arenal, 11 in the larger village of San Jose Succotz, and 10 were conducted in the town of Benque Viejo Del Carmen. The remaining 18 interviews were conducted at the respondent's place of business: in their office, at the resort, or on their farm. Two key-informants typed and emailed responses due to distance and time constraints.

Behavioral Beliefs

To determine the salient beliefs about women participating in a proposed CBC program, the respondents stated seven advantages which were mentioned three or more times (Table 1.2), and were grouped into three themes: benefits that the CBC program would provide for the women involved, benefits that a CBC program would provide for the community, and characteristics of women that would benefit a CBC program. Of these advantages, the belief that women would have an influence on others through sharing their passion and knowledge with their family and friends, especially their children, was mentioned most often. Many respondents stated that women are the centers of the household and the children follow what they do. Two participants stated:

> *…once a women has passion for something it is very strong and women play an important role in the aspect of influence, not only with her husband, but with her family. A women is very strong in the house so her word, her passion can be passed on to her kids very easily…*

Table 1.1: Interview participant characteristics in western Belize, 2015

Characteristic	N = 47
Gender	
Female	22
Male	25
Location of Interview	
Arenal	8
San Jose Succotz	11
Benque Viejo	10
Place of business	18
Stakeholder Group	
Women	11
Current CBC Participants	7
Teacher	6
Tourism Industry	6
Government Agency	3
Police	3
Mayor	3
Religious Leader	3
NGO/Development Group	2
Women's Group Leader	2
Private Industry	1

> *Directly here in Belize, women are the ones to nurture that family ambiance, and once that woman is empowered, she will transmit it to her entire family.*

Additionally, some expressed women's participation would also encourage men to participate.

> *I think that women are more persuasive. I think that if you have a group, women would be able to persuade the men to get more involved.*

The next most frequently mentioned advantage was that women would be able to gain more knowledge about the forest and conservation from participating.

They will learn and they will learn a lot of things, especially taking care of the environment and how to use the resources that the environment offers in order to have a sustainable life or earn some money.

Table 1.2: Number of respondents who held each belief in western Belize, 2015[1]

Behavioral Belief Advantages	**Times mentioned m^2=49, n^3=43**	**Behavioral Belief Disadvantage**	**Times mentioned m^2=49, n^3=44**
Benefits to Women	**21**	None	15
Learn more	13	Time	8
Gain an income	5	Safety in the forest	4
Socialize	3	Don't know	4
Benefits to the community	**21**	Need a good leader	3
Women influence others	14		
Help the environment	7		
Women's Characteristics that would benefit a program	**13**		
More/better ideas	4		
Good planners	3		
Normative Belief Approve	**m^2=47, n^3=41**	**Normative Belief Disapprove**	**m^2=43, n^3=43**
Community Group	10	No one	20
Don't know	8	Don't know	9
Government	8	Husbands	6
FCD	6	The Church	3
Most people would approve	4		
Control Belief Enable	**m^2=64, n^3=44**	**Control Belief Difficult**	**m^2=64, n^3=42**
Women's needs	**48**	**Women's barriers**	**45**
Interest/motivation	11	Time	15
Support	11	Children	9
More knowledge	9	No interest	7
Income	8	Money	5
Time	6	Machismo	4
Group needs	**13**	Need more knowledge	3
Materials	5	**Group barriers**	**10**
Place to sell products	3	**None**	**3**
Don't Know	**3**		

[1] Not all respondents were asked each question, due to them not living in the area and not having knowledge of the women.

[2] m=the total times something in this category was mentioned by a respondent. Some respondents mentioned multiple items per category allowing for the m to be greater than the number of respondents (n). Only responses mentioned at least three times were included in the analysis.

[3] n=the total number of respondents who offered an answer to that question

When asked about disadvantages, fifteen participants noted that there were no disadvantages of women participating with lack of time to participate being the next most frequently mentioned response.

Normative Beliefs

Respondents most frequently mentioned the approval of other community groups when asked who would approve of women's participation. Alternatively, when asked which individuals or group would disapprove, the majority could not think of anyone, with 20 respondents saying no one would disapprove and nine stating that they did not know. One respondent said:

> *Not to my knowledge, I don't think so. I don't think we still have that belief right now still effective. Probably some other part of the country women are not allowed to work or not allowed to be a part of organizations or groups, but in the area I don't think so. I think that it is open.*

Six respondents said that husbands might disapprove, and three people thought that the church may disapprove. Two respondents indicated the church had recently been advising women not to get involved with a new program in the area, but the details of the program type were unclear. Some women believed that men or husbands would disapprove, with six women stating it, while no men expressed this belief.

Control Beliefs

Respondents stated that women needed to have an interest or motivation, as well as them needing moral support were mentioned most often as things that would enable them to participate. Two respondents stated the following:

> *Willingness specifically. Willingness to be a part of it (the group). I believe that would be the main thing.*

I believe, support, moral support, and a constant motivation so that they do not lose track of their objective or goal.

The second most frequently mentioned response was that women would need knowledge about conservation and the program to participate.

I would say education would be the first thing. Get them to know what is the goals of the group. How they would benefit, what would be the advantages and disadvantages of why they are in that group.

Needing to make an income, needing time to participate, having the materials, and needing a place to sell the final product were mentioned less often.

When respondents were asked what would make it difficult or impossible to participate, time was mentioned by 15 respondents and was found to be the greatest barrier to participation.

That would be time, because most women who would participate would be women with family and sometimes they don't have the time to come out and do things for the environment.

If you have housewives or any other domestic worker you would have to check on the time available. I think that would be one factor that would affect.
One of the main issues sometimes is family, family problems, because many women have a family of their own so then they have to find time for the program and their family and many times their family demands much more than they should.

Having children and not having an interest were also viewed as barriers.

If they wanted to participate I would say the only thing that might keep them back would be family. A lot of people are focused on family so a lot of time I know from my personal experience women tend to leave their personal goals aside and take care of the family, their husband.

Overall, time, money (needed to participate or an income from participating), and knowledge acquisition were mentioned the most often by all respondents when all questions were analyzed together.

Cultural and Historical Forest Use and Conservation

When respondents were asked about the traditional roles of men and women in regard to the forest many believed that men had traditionally extracted wood by logging or for firewood collection, farmed, hunted, and cleared the forest through slash and burn methods. A few respondents mentioned that some men were involved in forest protection. Two respondents expressed the following:

> *I think in this area, men would be the ones that are destroying the forest because they would be the ones that actually go and do the slash and burn, because that is what is traditionally done here…*

> *Hunt and they grow their milpas* (traditional small agricultural plots) *in the forest, at the same time they do deforestation and that hurts the forest.*

Conversely, many thought that women traditionally had not participated directly in any forest practices, but may have assisted their husbands, by attending outings to cook for the men or help harvest crops when needed.

Respondents stated that women would be interested in participating in a conservation group that takes trips into the forest but that they were not sure what type of project in which women would want to participate. However, many different types of activities were suggested, such as:

> *Projects like arts and crafts… where they would actually make something and make a group to where they could make money for themselves and assist themselves financially.*

Infrastructure issues, such as drainage, roads, and sewage, were mentioned most often when asked to identify the major issues and concerns in their community. Lack of education and jobs were also mentioned (Table 1.3). One respondent stated:

> *A lot of the women are not educated. Education is the key. Here, it is very minimal of what it should be. We have a lot of people that left the school at a very very young age and there is a lot of teenage pregnancy, here especially in this*

village. I think they believe that primary school is all that they need. I think that is an issue. It started from way back because the mothers don't instill it. As you can see this village is kind of isolated, so that is not changing.

Table 1.3: Respondents' community concerns in western Belize, 2015 (n=41)

Community Concerns	Times mentioned* N = 77
Infrastructure	13
Education	9
Jobs/Poverty	9
Teen pregnancy	4
Trafficking/crime	4
Health	3

***Only responses mentioned at least 3 times where included in table. Not all respondents were asked the question due to them not residing in the study area.**

When asked about the environmental concerns in the area, garbage was mentioned most often, and river pollution and drainage were both mentioned in eight of the interviews (Table 1.4). Since drainage issues can cause river pollution, and does in this area, these are very closely related. One respondent expressed:

Definitely, especially during the dry seasons we will have a lot of people that visit the rivers and pollute it. That is a concern because we might not be seeing the effect immediately but I know that all of the animals and the habitat there is being effected.

Overall, 29 respondents were aware of the Vaca Forest Reserve. However, only 18 were able to say how the forest being designated as a 'reserve' actually protects the area. The benefits that the respondents believe they are getting from the forest reserve were clean air, flora and fauna protection, and a food source. Two respondents also mentioned the following:

Table 1.4: Respondents' environmental concerns in western Belize, 2015 (n=42)

Environmental Concerns	Times mentioned* N = 65
Garbage	17
River Pollution	8
Drainage	8
Pollution	5
None	5
Disease	4
Smoke	3

Only responses mentioned at least 3 times where included in table. Not all respondents were asked the question due to them not residing in the study area.

> *For example, water, that is the first thing that pops up in your mind. So if you do not protect the Vaca the water won't be there for very long, as it is right now. Well here especially in Belize yes, here tourism is a big industry so taking care of our forests is very important. People come and see what type of nature we have and if it is not here, people would not be coming and less economy for Belize.*

Thirty-nine respondents believe that women would be interested in participating in a conservation program. Not all respondents were asked the questions because they would not have knowledge of the women who would be participating due to not living in the area. Only two respondents gave negative responses to this question.

Respondents gave ideas such as: selling firewood, wood carving, collecting herbs for medicines, and collecting seeds for jewelry making, basket weaving, tree planting, and making cahune oil, a traditional cooking oil made from the native cahune nut, as possible activities for a women's CBC group.

Differences between Men and Women's Responses

Men and women's responses were analyzed separately to determine any differences. Answers were found to vary between the sexes on eight questions (Table

1.5). Women mentioned that having the required time to participate was a possible issue more frequently than men. It was mentioned by some men that women would need more knowledge in order to participate but no women expressed this belief. The belief that there are no disadvantages to women's participation was mentioned more often by men than by women. Safety while in the forest was mentioned by some men, but no women considered safety to be an issue.

Table 1.5: Differences between male and female interview responses in western Belize, 2015

Belief	Frequency mentioned	
	Women	Men
Not having time would be a barrier to women participating	**13**	2
Women will learn more by participating	**10**	3
Not having time to participate is a disadvantage	**7**	1
Husbands would disapprove of women participating	**6**	0
There are no disadvantages to participation	4	**11**
Women would need interest and a willingness to participate	2	**9**
Women being/feeling safe in the forest is a disadvantage to participating	0	**4**
Women not having enough knowledge about conservation or the program would make it difficult to participate	0	**3**

Discussion

By conducting qualitative interviews, we were able to acquire information about the women and culture in the area that would not have been possible through purely quantitative methods. One of the most important findings was to pass on information about conservation and its importance, you need to inform the women and get them

involved. This is not an aspect of women's involvement addressed in most CBC studies (Schmink, 1999; Westermann et al., 2005; Agarwal, 2009a; Agarwal, 2009b). Participants commented that women in these communities have influence on all people, especially within their household, and will be able to transfer information learned in the program and influence others to participate, therefore increasing the outreach and educational reach of the group.

We determined that women in our study area have the greatest familial influence on children and could pass on what they learn about conservation and the forest to them, potentially creating a social norm of conservation. This coincides with the idea that women are the matriarchs of the Latin American family and influence many "social sanctions emanating from the family itself" such as acceptable behavior (Pescatello, 1973, p. 19), which can be interpreted as social norms. Women were said to be social and share things with other women and are also able to influence men. This was a somewhat unexpected result due to our assumption of the presence of *machismo* and the resulting low status of women (Cianelli et al., 2008). Conversely, in our study area, women were found to be the centers of the families, and are therefore respected. As a result, women should be the origin for instilling conservation beliefs, attitudes, and lifestyles. In this area, involving men exclusively in a CBC program may achieve some immediate conservation goals, but the efforts will eventually fall short if interest is not generated in future generations and this could be accomplished through the inclusion of women in conservation efforts. By completing our qualitative study, we learned that it is imperative to involve women to spread information, generate interest, and cultivate a norm for conserving the natural environment.

Examining the disadvantages of participation, men who were interviewed generally believed that there was no disadvantage to women participating in a CBC program, but that women would need more interest and motivation before they would participate. That is, men think women should participate, but they also believe women may not because they do not have the required knowledge or interest. Interestingly, women did not express this belief. Women instead believed they will be able to learn by participating and learning new ideas motivates their interest. Unlike men, however, women see time as the biggest barrier to participation. This discrepancy between men and women could be evidence that men have an inaccurate perception of women's daily activities and their time requirements. These discrepancies may prove to be a barrier to starting a women's conservation program. It will be important during the planning and implementation phase of a program to invite men to the informational sessions so strategies can be collaboratively work out to create more free time for women.

Men thought that women may be or feel less safe in the forest, but this was not mentioned by women. Although not widespread, this manifestation of *machismo* was expressed as women being weak and not safe in the forest. Similarly, it was mentioned a few times by women that their husbands or other men might disapprove of women's participation. This fits with the common definition of *machismo* being male domination over women socially (Cianelli et al., 2008), or the idea that women are weak and need to be taken care of by men (Ingoldsby, 1991). Notably, many of the women who said husbands would disapprove of their participation lived in the smallest, most remote village, where it was expressed to us that *machismo* culture still exists. Potentially, this

may describe a transition that occurred as the two larger communities became more progressive and moved away from *machismo*, to a more gender equal society. Further evidence of this is the higher education levels, income, and job opportunities for the women in the two larger communities. The relative progressiveness of these two communities is also reflected in their improved infrastructure: roads, civil services, and construction materials. Moreover, the smaller, and more remote village is well known for illegal drug trafficking, which was witnessed by us while in the community conducting our research (personal observations). Discrepancies among communities aside, most respondents could not think of anyone, even husbands, who would disapprove of women participating, suggesting that a CBC program would be accepted and successful in this area.

When planning our research, we hypothesized that one of the main benefits of participation would be the ability for the women to gain an income. We based our assumption on the idea that people are more likely to change their behavior if they perceive a positive economic benefit in doing so (Pannell et al., 2006; Corbeels et al., 2014). However, this was not often expressed in the interviews. Instead, respondents indicated that women would need an interest, motivation, and support in order to participate. Rather than needing economic benefits, we found that women gaining new knowledge and being able to influence others to practice conservation were important advantages of participating. In these communities, it may be central to emphasize gaining knowledge over financial gain. This fits with Berkes' (2004) research that indicates that social benefits are often more important in rural communities in developing areas than economic benefits. Economic initiatives and profit should not be

completely excluded, as some participants noted financial gain was an important benefit to participation. Therefore, inclusion of economic benefits in a CBC program should be considered, but not the main focus.

Respondents indicated that other community groups would approve of their participation in a CBC group, which may be explained by the likelihood of a women's CBC group sharing similar goals with the existing groups. Current community groups include a women-in-business group, a local conservation group, and The House of Culture, a local organization whose goal is to maintain the historical culture of the area by working with youth. The proposed CBC program discussed in the interviews will likely be highly compatible with the objectives of these existing groups to empower women, improve education, and foster the local culture and traditions. Therefore, when a CBC program is designed and implemented, we believe it will be well supported and not conflict with existing local organizations' goals, and could allow for cooperation among community groups.

The information we gained about possible products to harvest or activities for a women's CBC group were varied. However, there are several barriers that should be addressed if the proposed CBC program involves the collection of forest products. Participants mentioned time constraints as one of the main barriers to participation, which may be exacerbated by the fact that forest product collection areas would be remote and likely be very time consuming. In an overview of marketing non-timber forest products (NTFP), Belcher and Schreckenberg (2007) also found distance to collection and marketing sites to be a barrier. The forest collection site, as well as the communities themselves, are somewhat remote, which may make it more difficult to

market a product, especially if primary consumers are the high-volume tourism industry on Belize's coast, more than 75 miles away. This is another barrier we identified, lack of specific market places, and is consistent with other research on the difficulties of marketing NTFP in developing countries. (Shanley, 2002; Belcher and Schreckenberg, 2007). Therefore, if the proposed CBC program wants to market NTFP products to tourist or local consumers, it will be important to analyze the value and supply chains for efficiency and profitability.

A CBC program could provide some valuable outreach opportunities for the area. We found a lack of specific knowledge about the Vaca and its importance. This could be addressed by a CBC program that focuses on educating women about conservation issues, specifically in regard to their local forests. In addition to education being a motivating factor for initial CBC program participation, once knowledgeable, they could extend their education through outreach activities. These activities should focus on local environmental concerns expressed by respondents such as river pollution, garbage, drainage issues, and smoke pollution. By informing the CBC program participants about the importance of the Vaca and how it's ecosystem services mitigate some of these environmental concerns, positive attitudes about the Vaca may increase, ultimately influencing local communities to become more actively involved in Vaca conservation and management.

Overall, it appears there is support and need for a women's CBC program in Vaca-adjacent communities. This is evidenced by almost all of the respondents stating that women would want to participate in a conservation program. With the information provided by these interviews, we designed and administered a survey to the women in

this area. Through the results of both the interviews and the surveys, we will be able to collaboratively design and implement a successful CBC program with the women that will spread conservation knowledge, empower the women, and help conserve the local forest and its resources.

Our interviews were integral to uncovering desired qualities and underlying conditions that should facilitate the collaborative establishment of a successful women's CBC program. It is unlikely that some of the key findings, for example, differences regarding gender responses around women's roles and time, could have been uncovered through quantitative studies alone. It has been found that conservation initiatives that "ignore traditional values and beliefs are less likely to succeed" (Waylen et al., 2010, p. 1126). Therefore, we set out to determine not only aspects of a CBC program that would make it successful, but to understand the culture, community, and its members through the rich data yielded by our interviews.

References

Agarwal, B. (2000). "Conceptualising environmental collective action: why gender matters." *Cambridge Journal of Economics* **24**(3): 283-310.

Agarwal, B. (2001). "Participatory exclusions, community forestry, and gender: An analysis for South Asia and a conceptual framework." *World Development* **29**(10): 1623-1648.

Agarwal, B. (2009a). "Rule making in community forestry institutions: The difference women make." *Ecological Economics* **68**(8): 2296-2308.

Agarwal, B. (2009b). "Gender and forest conservation: The impact of women's participation in community forest governance." *Ecological Economics* **68**(11): 2785-2799.

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. New York, NY, Springer.

Arevalo, B. and D. Chan (2012). "Mitigating and Controling Illegal Logging in the Chiquibul Forest." Report to the Forest Department of Belize.

Armitage, C. J. and M. Conner (2001). "Efficacy of the theory of planned behaviour: A meta-analytic review." *British Journal of Social Psychology* **40**(4): 471-499.

Ary, D., L. Jacobs, A. Razavieh and C. Sorensen (2006). Introduction to Research in Education: Florence. Belmont, CA, KY Thomson/Wadsworth.

Babbie, E. (2015). The practice of social research. Boston, MA, Cengage Learning.

Barrett, C. B., K. Brandon, C. Gibson and H. Gjertsen (2001). "Conserving tropical biodiversity amid weak institutions." *BioScience* **51**(6): 497-502.

Beedell, J. and T. Rehman (2000). "Using social-psychology models to understand farmers' conservation behaviour." *Journal of Rural Studies* **16**(1): 117-127.

Belcher, B. and K. Schreckenberg (2007). "Commercialisation of non-timber forest products: a reality check." *Development Policy Review* **25**(3): 355-377.

Berkes, F. (2004). "Rethinking community-based conservation." *Conservation Biology* **18**(3): 621-630.

Bernard, H. R. (2012). Social research methods: Qualitative and quantitative approaches. Thousands Oaks, CA, Sage.

Bridgewater, S., D. Harris, C. Whitefoord, A. Monro, M. Penn, D. Sutton, B. Sayer, B. Adams, M. Balick and D. Atha (2006). "A preliminary checklist of the vascular plants of the Chiquibul Forest, Belize." *Edinburgh Journal of Botany* **63**(2-3): 269-321.

Brown, K. (2002). "Innovations for conservation and development." *The Geographical Journal* **168**(1): 6-17.

ChartsBin (2011). "Proportion of Land Area Covered by Forest." from http://chartsbin.com/view/2673.

Cho, P. P. (2011). "The Chiquicul Forest: A Carbon Conservation Area." Proposal to The Forest Department of Belize.

Cianelli, R., L. Ferrer and B. J. McElmurry (2008). "HIV prevention and low-income Chilean women: machismo, marianismo and HIV misconceptions." *Culture, Health & Sexuality* **10**(3): 297-306.

Corbeels, M., J. de Graaff, T. H. Ndah, E. Penot, F. Baudron, K. Naudin, N. Andrieu, G. Chirat, J. Schuler and I. Nyagumbo (2014). "Understanding the impact and adoption of conservation agriculture in Africa: A multi-scale analysis." *Agriculture, Ecosystems & Environment* **187**: 155-170.

Curtis, J., S. H. Ham and B. Weiler (2010). "Identifying beliefs underlying visitor behaviour: A comparative elicitation study based on the theory of planned behaviour." *Annals of Leisure Research* **13**(4): 564-589.

Davidson, J. (1989). "Restoring womens link with nature." *Earthwatch* (37): 2-3.

Downs, D. S. and H. A. Hausenblas (2005). "Elicitation studies and the theory of planned behavior: a systematic review of exercise beliefs." *Psychology of Sport and Exercise* **6**(1): 1-31.

Drury, R., K. Homewood and S. Randall (2011). "Less is more: the potential of qualitative approaches in conservation research." *Animal Conservation* **14**(1): 18-24.

FAO, U. (2011). "FAOSTAT database." Website UN FAO.

Fishbein, M. and I. Ajzen (2010). Predicting and changing behavior: The reasoned action approach. New York, NY, Taylor & Francis.

Francis, J. J., M. P. Eccles, M. Johnston, A. Walker, J. Grimshaw, R. Foy, E. F. Kaner, L. Smith and D. Bonetti (2004). "Constructing questionnaires based on the theory of planned behaviour." *A manual for health services researchers* **2010**: 2-12.

Getz, W. M., L. Fortmann, D. Cumming, J. Du Toit, J. Hilty, R. Martin, M. Murphree, N. Owen-Smith, A. M. Starfield and M. I. Westphal (1999). "Sustaining natural and human capital: villagers and scientists." *Science(Washington)* **283**(5409): 1855-1856.

Hackel, J. D. (1999). "Community conservation and the future of Africa's wildlife." *Conservation Biology* **13**(4): 726-734.

Hartup, B. K. (1994). "Community conservation in Belize: demography, resource use, and attitudes of participating landowners." *Biological Conservation* **69**(3): 235-241.

Ingoldsby, B. B. (1991). "The Latin American family: familism vs. machismo." *Journal of Comparative Family Studies*: 57-62.

Jackson, C. (1993). "Doing what comes naturally? Women and environment in development." *World Development* **21**(12): 1947-1963.

Kaiser, F. G., G. Hübner and F. X. Bogner (2005). "Contrasting the Theory of Planned Behavior With the Value-Belief-Norm Model in Explaining Conservation Behavior." *Journal of Applied Social Psychology* **35**(10): 2150-2170.

Lam, S. P. (1999). "Predicting intentions to conserve water from the theory of planned behavior, perceived moral obligation, and perceived water right1." *Journal of Applied Social Psychology* **29**(5): 1058-1071.

Manzanero, R. and A. Melendez (2013). "Evolution of a new management alternative in the Vaca Forest Reserve." Report for Friends for Conservation and Development, Belize.

Pannell, D. J., G. R. Marshall, N. Barr, A. Curtis, F. Vanclay and R. Wilkinson (2006). "Understanding and promoting adoption of conservation practices by rural landholders." *Animal Production Science* **46**(11): 1407-1424.

Pescatello, A. M. (1973). Female and male in Latin America; essays. Pittsburg, PA, University of Pittsburgh Press.

Porter-Bolland, L., E. A. Ellis, M. R. Guariguata, I. Ruiz-Mallén, S. Negrete-Yankelevich and V. Reyes-García (2012). "Community managed forests and forest protected areas: An assessment of their conservation effectiveness across the tropics." *Forest Ecology and Management* **268**: 6-17.

Prasad Timsina, N. (2003). "Promoting social justice and conserving montane forest environments: a case study of Nepal's community forestry programme." *The Geographical Journal* **169**(3): 236-242.

Sayre, N. F. (2004). "Viewpoint: The need for qualitative research to understand ranch management." *Rangeland Ecology & Management* **57**(6): 668-674.

Schmink, M. (1999). Conceptual framework for gender and community-based conservation, MERGE, Managing Ecosystems and Resources with Gender Emphasis, Tropical Conservation and Development Program, Center for Latin American Studies, University of Florida.

Shanley, P. (2002). Tapping the green market: certification and management of non-timber forest products. Sterling, VA, Earthscan.

SIB (2014). "Annual Report, 2014." Statistical Institute of Belize. from http://www.sib.org.bz/publications/annual-reports. Accessed on April 10, 2015.

Sirakaya-Turk, E. (2011). Research methods for leisure, recreation and tourism. Cambridge, MA, CABI.

Soe, A. K. and N. Sato (2012). "Local People's Attitudes towards the Community Forestry: The Case Studies in the Central Dry Zone of Myanmar." *Journal of the Faculty of Agriculture, Kyushu University* **57**(1): 273-280.

Steady, F. C. (1998). "Gender equality and ecosystem balance: Women and sustainable development in developing countries." *Race, Gender & Class*: 13-32.

Sutton, S., D. P. French, S. J. Hennings, J. Mitchell, N. J. Wareham, S. Griffin, W. Hardeman and A. L. Kinmonth (2003). "Eliciting salient beliefs in research on the theory of planned behaviour: The effect of question wording." *Current Psychology* **22**(3): 234-251.

Thompson, I., B. Mackey, S. McNulty and A. Mosseler (2009). Forest resilience, biodiversity, and climate change. A synthesis of the biodiversity/resilience/stability relationship in forest ecosystems. Secretariat of the Convention on Biological Diversity, Montreal. Technical Series.

Thompson, P. M. (2013). "Sustainability of community-based organizations in Bangladesh." *Society & Natural Resources* **26**(7): 778-794.

Waylen, K. A., A. Fischer, P. J. McGowan, S. J. Thirgood and E. Milner-Gulland (2010). "Effect of Local Cultural Context on the Success of Community-Based Conservation Interventions." *Conservation Biology* **24**(4): 1119-1129.

Westermann, O., J. Ashby and J. Pretty (2005). "Gender and social capital: the importance of gender differences for the maturity and effectiveness of natural resource management groups." *World Development* **33**(11): 1783-1799.

Willcox, A. S., W. M. Giuliano and M. C. Monroe (2012). "Predicting cattle rancher wildlife management activities: An application of the theory of planned behavior." *Human Dimensions of Wildlife* **17**(3): 159-173.

Wollenberg, E. and A. Ingles (1998). Incomes from the forest: methods for the development and conservation of forest products for local communities. Bogor, Indonesia, Cifor.

Appendix A: Full interview script

Interview Questions

Please take a few minutes to share your thoughts about the following questions.

1. a. What are some of the major issues and concerns in your community?
   b. Are there any specific environmental concerns?

2. a. Are you aware of the Vaca Forest Reserve? If no, skip to #3.
   b. Do you know what protections the Vaca Forest Reserve provides for the forest?
   c. Do you get any benefits or occur any costs because of the forest protection?

3. a. What role do men currently/traditionally play in regard to the forest?
   b. What role do women play?

4. a. Do you know what a conservation program is? Explain, if no.
   b. Are you aware of any conservation programs or groups in the area? What are they?
   c. Are you involved in any conservation programs or efforts? What are they?
   d. What type of conservation program might you be interested in participating in?
   e. Are you aware of the Friends of the Vaca Forest Reserve conservation group? If no skip f.
   f. Do you think that your community is benefiting from this program?

5. a. Do you think the women in the area would be interested in participating in a conservation program?
   b. What type of projects do you think the women in your community would be most interested in?
   c. Do you have any ideas of ways women could sustainably use resources that are currently found in the Vaca Forest Reserve for subsistence and profit?
   d. Are there any forest products that you feel could be harvested to make a profit?

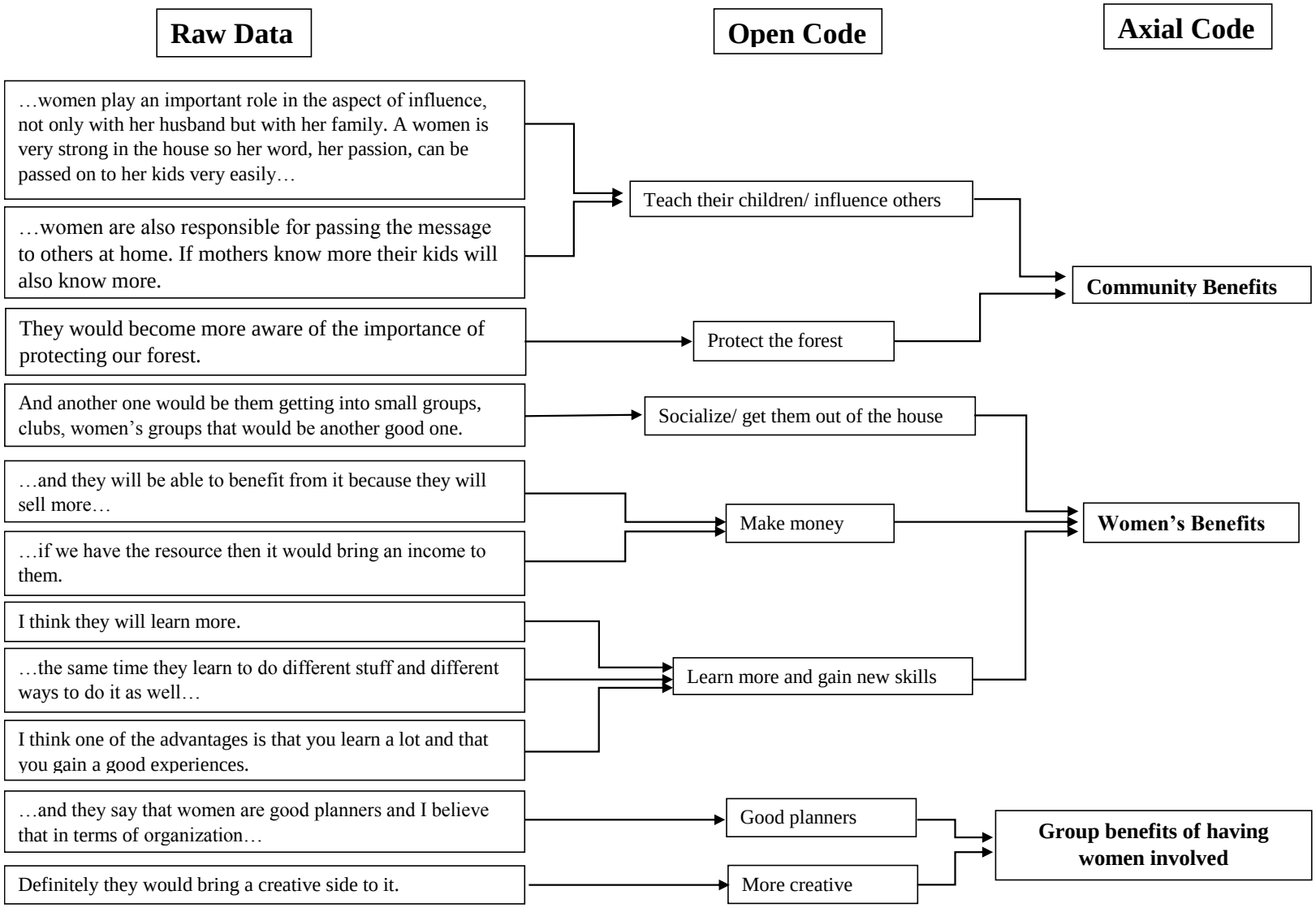
   If the respondent is male, use “women”, if the respondent is female use “you”.

6. a. What do you believe are the ***advantages*** of (you or women) participating in a conservation program?
   b. What do you believe are the ***disadvantages*** of (you or women) participating in a conservation program?
   c. Is there anything else you would like to share about (you or women) participating in a conservation program?

7. a. Are there any individual or groups who would ***approve*** of (your or women) participating in a conservation program?
   b. Are there any individual or groups who would ***disapprove*** of (you or women) participating in a conservation program?
   c. Is there anything else you can add about other people's views about (you or women) participating in a conservation program?

8. a. What factors or circumstances would enable (you or women) to participating in a conservation program?
   b. What factors or circumstances would make it difficult or impossible for (you or women) to participating in a conservation program?
   c. Are there any other issues that come to mind when you think about (you or women) participating in a conservation program?

Appendix B: Example of coding process



CHAPTER III
PREDICTING WOMEN'S PARTICIPATION IN A PROPOSED COMMUNITY-BASED CONSERVATION PROGRAM IN WESTERN BELIZE

A version of this chapter will be submitted May, 2016 to Biological Conservation by Amanda S. Kaeser and Adam S. Willcox.

This chapter's work was conceptualized by Amanda Kaeser and Adam Willcox as part of Amanda's dissertation work. The research was conducted and analyzed by Amanda. Amanda Kaeser wrote this chapter and it was edited by Adam Willcox.

Abstract

Community-based conservation (CBC) programs, whose goals are to conserve forest resources, have succeeded in some developing countries. To address illegal deforestation issues and empower local forest management, communities surrounding the Vaca Forest Reserve (Vaca), in western Belize, have created a CBC program. This program increases community member presence in the reserve conducting conservation-compatible agriculture, but with little women involvement. With mounting research showing the many benefits of having women involved in CBC efforts, the purpose of this study was to identify and measure the attitudes and barriers to women participating in a CBC program in western Belize. We surveyed 500 women in communities surrounding the Vaca in May and June 2015 to measure their interest in, attitudes toward, and possible barriers to participating in a CBC program. We assessed women's intent to participate in CBC activities using the Theory of Planned Behavior via structural equation modeling to identify the attitudinal, normative, and behavioral control constructs that best predict their intentions to participate. Women indicated they held positive attitudes toward participating in a CBC program and indicated they would likely participate in the program. Perceived behavioral controls, specifically current

conservation knowledge, had the largest influence on their intent to participate. Lack of conservation knowledge is likely beyond women's control, indicating the need for more educational opportunities for women. Understanding the relative importance of these constructs and how they influence women's participation will help us work with local women to collaboratively design an effective conservation program that will engage more women in addressing conservation and development issues in the area.

Introduction

Increased greenhouse gas emissions, habitat loss, and species extirpations resulting from deforestation and forest degradation remain critical conservation issues (Board, 2005). Notably, the Paris Climate Agreement contains many provisions about reducing emission from deforestation and forest degradation and recognizes the need to involve more communities in addressing and responding to climate change (UNFCCC, 2015). Community-based conservation (CBC) is a people-centered approach to conservation that attempts to link development and conservation goals (Berkes, 2004), and has been employed globally to reduce forest degradation by empowering natural resource dependent communities to sustainably manage forest resources (Brown, 2002; Porter-Bolland et al., 2012). However, there needs to be more successful CBC programs to better address current global issues.

For CBC programs to be successful, forest resource management needs to shift from central governments to local communities. Brown (2002) states "experience has shown that traditional, top-down exclusionary approaches to protected area are often not effective in reaching conservation objectives" (p. 6). Historically, community development was seen as the cause of environmental degradation, not as a possible solution (Brown, 2002). However, scientists are beginning to recognize the benefits that may come from local community involvement in management practices, shifting conservation efforts from top-down or command-and-control forms of management to including local communities (Berkes, 2004). Furthermore, command-and-control management styles often alienate local communities, do not further social equity, and may actually harm the poor rural communities that live in the vicinity (Wells, 1992).

Recently, a goal to “ensure responsive, inclusive, participatory, and representative decision-making at all levels” was one of the policies supported by leaders attending the UN Sustainable Development Summit 2015 (UNFCCC, 2015), providing more evidence of the needed shift from government to local management.

This devolution of power has produced notable successes in CBC programs globally (Hartup, 1994; Prasad Timsina, 2003; Pagdee et al., 2006; Adhikari et al., 2007; Agarwal, 2009b; Baral and Stern, 2011; Porter-Bolland et al., 2012; Thompson, 2013). For example, in a meta-analysis of community managed forests and forest protected areas in the tropics, Porter-Bolland et al. (2012) found community-managed forests to have less annual deforestation rates than government-managed protected areas. A review of 153 community-based groups in Bangladesh found these programs improved the productivity of the natural resources harvested by these groups (Thompson, 2013). Still, some CBC efforts have been criticized because they were designed with little *a priori* data or input from the target population (Songorwa, 1999; Brown, 2002; Mulrennan et al., 2012). By omitting formative studies and excluding local communities in program development and decision making, many CBC programs have relied on trial and error, resulting in an inefficient use of limited resources (Songorwa, 1999; Campbell and Vainio-Mattila, 2003).

Current evaluative research on CBC programs has largely been summative and often occur after the program has been implemented. They are generally employed assess program outcomes, participation, and people’s attitudes toward an existing program (Baral and Stern, 2011; Porter-Bolland et al., 2012; Soe and Sato, 2012). In these summative evaluations, the authors outline barriers to program implementation

and suggest improvements to increase CBC program impacts. We believe that some of the barriers and failures of CBC programs can be anticipated and overcome by conducting an initial analysis of the communities' attitudes and barriers to participation as a formative evaluation. We consider formative evaluations necessary to increase program efficiency and ultimately increase its impacts.

Involving women is another method researchers have found to increase CBC success, however there is a noted lack of women's participation in CBC efforts (Schmink, 1999; Westermann et al., 2005; Agarwal, 2009a; Agarwal, 2009b). Women have often been seen as "having a special relationship with the environment due to their responsibilities for the family and concern for the well-being of future generations" (Westermann et al., 2005, p. 1784). However, this special relationship is largely ignored in conservation efforts (Davidson, 1989; Jackson, 1993; Steady, 1998; Agarwal, 2009b) even though studies examining CBC programs that involve women have reported better program outcomes, such as improved rule compliance and forest protection (Agarwal, 2009b), better collaboration, solidarity, and conflict resolution due to them building "more relational social capital than men" (Westermann et al., 2005, p. 1794). Schmink (1999) indicated women may be more observant of the entire ecosystem, instead of focusing on only one aspect of it at a time, due to their many activities in their household that may include: food procurement and preparation, and firewood collection. Agarwal (2009b) found that community forest groups involving women showed greater improvement in forest conditions on all indicators, with a 57% higher probability of improvement when the groups had two or more women involved. Women also had strong feelings of forest stewardship and watched for and reported illegal activity while

performing their daily work. Therefore, it is important that more programs include women to increase their effectiveness.

In an effort to increase women's involvement in CBC, the Friends for Conservation and Development (FCD), a local conservation NGO in western Belize, approached us in February 2014 to assist them in designing a CBC program to specifically include women in current conservation efforts in the Vaca Forest Reserve (Vaca). The leader of FCD recognized the need to increase women's participation to improve the effectiveness of conservation efforts and environmental awareness around the Vaca. Our research objective was to identify potential CBC activities for local women and to predict their intent to participate in a CBC program. This was accomplished by conducting an exploratory study using the Theory of Planned Behavior (TPB) (Ajzen, 1991) to identify the attitudes, norms, and barriers to women's participation in a proposed CBC program to sustainably use and protect the local rainforest.

The TPB has been used successfully to predict intent to perform a wide range of behaviors and specifically conservation-related behaviors such as, landowners participation in conservation easements (Brain et al., 2014), hunter behavior (Hrubes et al., 2001), rancher conservation activities (Willcox et al., 2012), and general conservation and environmental behaviors (Kaiser et al., 2005; Oreg and Katz-Gerro, 2006). We chose the TPB because of its strong predictive ability in conservation behavior research and the inclusion of the perceived behavioral control (PBC) construct (Fishbein and Azjen, 2010). We wanted to include this construct to determine if there were any aspects of participation that the women perceived as being beyond their

control. As our partners at FCD indicated, anecdotal evidence showed that women have positive attitudes toward conservation, but there are likely some unknown barriers to their participation in conservation groups and activities. By considering women's PBC, a program can be better designed and implemented to minimize barriers and increase participation.

Theoretical Framework

The Theory of Planned Behavior (TPB) is a social psychological theory that links beliefs to intent to perform a behavior. Ajzen (1985) hypothesized that in order to predict intentions to perform a behavior, you must determine the explanatory variables of attitude, subjective norm, and PBC of performing the behavior (Figure 2.1).
The TPB authors state that the very specific behavioral intent response variables increase the model's predictive power. However, for general behaviors such as ours regarding participation in a proposed CBC program, a suite of response variables have been successfully used to predict intentions, however, suites tend to yield lower R^2 values than specific, individual behavioral intent variables (Kaiser et al., 2005). We recognized that obtaining a lower R^2 value in order to increase the applicability of our research by measuring a suite of variables was an acceptable tradeoff.

The first explanatory variable, attitude, is defined by Fishbein and Ajzen (2010) to be an individual's "tendency to respond with some degree of favorableness or unfavorableness to a psychological object" (p. 76). Two components are used to indirectly measure attitudes toward the behavior: behavioral belief (a person's

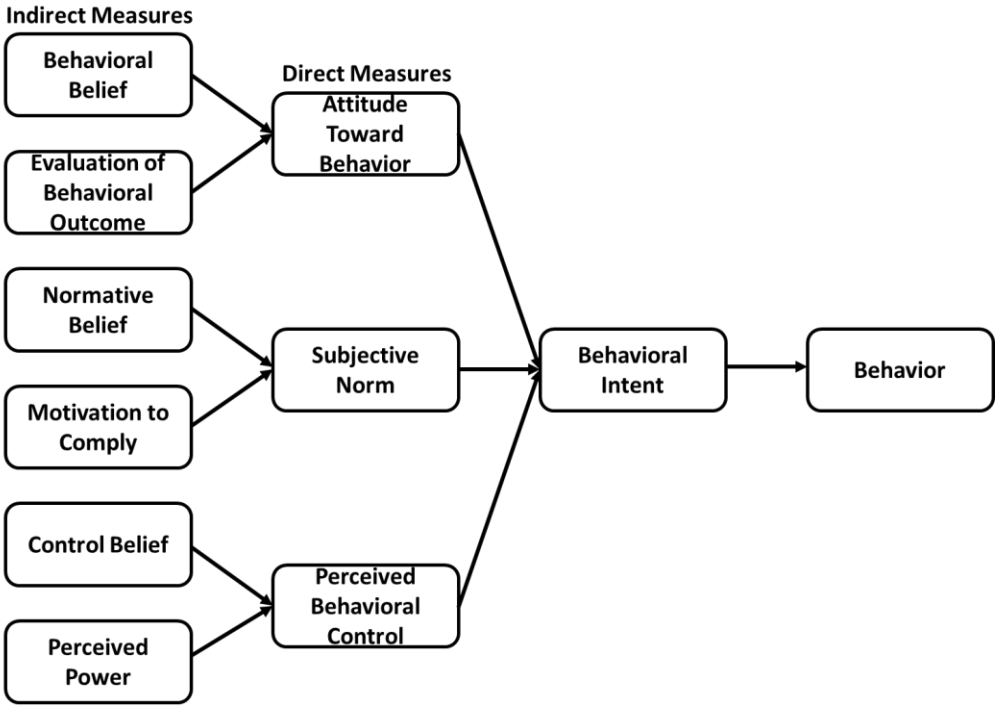


Figure 2.1: The Theory of Planned Behavior

beliefs about the behavior) and outcome evaluation (their evaluation of the outcomes of performing the behavior). Multiplied together, these two measures result in an overall attitude score. Each attitude question's score are then added together for the overall attitude score. This construct is expressed as:

$$A = \sum b_i e_i$$

where A is the overall attitude score, b_i is the strength of the belief that the behavior has a certain characteristic (behavioral belief), and e_i is the evaluation of the relative importance of that characteristic to the respondent (outcome evaluation) (See Appendix C for the full survey).

The second TPB explanatory variable, subjective norm, is defined as an individual's perception about whether or not the people who are important to them expect them to perform or not perform a behavior. This construct also has two components: normative belief and motivation to comply. Subjective norms can be indirectly measured by asking which groups a person thinks would want them to perform a behavior (normative belief), followed by a paired question to measure their motivation to comply with that groups beliefs. These two components are calculated similarly to attitudes by multiplying the two components together to get the respondents overall subjective norm score.

The final explanatory variable, PBC, is the measure of the person's perception of the degree of control they have over the performance of a behavior. This variable can be indirectly measured by two components: control belief, what a person believes the barriers are to performing a behavior, and perceived power of control, the extent they believe those barriers are under their control. Perceived behavioral control is calculated similarly to the above equation. Fishbein and Ajzen (2010) contend that a person's perception of their control over performing a behavior can serve as a proxy for actual control, because it is quite possible that their perception of control is accurate.

We choose to use indirect measures in our survey because the detailed components of each construct will be critical to apply our results to CBC program development. The addition of direct measure questions would have increased the number of survey questions and may have increased respondent survey fatigue. The TPB authors suggest using direct semantic differential questions relating to attitude, subject norm, and PBC to assess the accuracy of the indirect measures or to measure

the constructs directly (Fishbein and Ajzen, 2010). However, they do state that the three explanatory constructs can be inferred from the indirect measures. They also note that "many investigators prefer more complicated techniques developed earlier because these techniques can provide interesting information about the content of the attitude domain that is not available with the semantic differential" (Fishbein and Ajzen, 2010, p. 85). Additionally, researchers have obtained high R^2 values using only indirect measures (Rossi and Armstrong, 1999; Willcox et al., 2012; Brain et al., 2014).

Methods

Study Area and Participants

Belize is 63% forested and accounts for the greatest percentage of forest cover in the Mesoamerican Region (ChartsBin, 2011). Between 1990 and 2010, Belize lost 12.2%, or approximately 193,000 hectares of its forests, mostly from illegal logging (FAO, 2011; Arevalo and Chan, 2012). Additionally, Belize's population density (15 people/km^2) is relatively small compared to neighboring Central American countries such as Guatemala (149 people/km^2) where forests are highly degraded. The population to land ratio in Belize suggests there is opportunity for proactive, rather than restorative forest conservation efforts.

The Vaca is in the Cayo District of western Belize and was established in 1991 to "to maintain adequate stock of renewable natural resources for sustainable use by the local communities and to contribute to the national economy" (Manzanero and Melendez, 2013, p. 24). It is a 14,448 hectare protected area situated within the Chiquibul forest, which stores a large amount of carbon, contains mineral deposits,

large stocks of valuable mahogany (*Swietenia macrophylla)* and Spanish cedar (*Cedrela mexicana*) timber, and provides clean water for Belize and Guatemala (Cho, 2011). The Chiquibul forest, along with neighboring protected areas, comprise one of the largest continuous tracts of tropical forests in Central America (Bridgewater et al., 2006). These forests are also part of the Chiquibul-Maya Mountains Key Biodiversity Area, which is a priority conservation area recognized by Conservation International (Arevalo and Chan, 2012). Despite this distinction, as of 2012, a total of almost six million board feet of lumber has been illegally harvested from the Chiquibul forest, damaging 92,316 trees. This has resulted in a loss of almost 9.5 million dollars and destroyed substantial wildlife habitat (Arevalo and Chan, 2012).

The Cayo District has the largest number of unemployed residents in the country and the unemployment rate is 13.4%, which is 3.3% higher than the national average (SIB, 2014). The national language of Belize is English, however, our study area is very close to the Guatemalan border. This results in many citizens being bilingual, with some more comfortable speaking Spanish than English.

There is currently a small CBC program, Friends of the Vaca Forest Reserve (FVFR), working in the area. It is comprised of about 24, mostly male, farmers who participate in apiculture, agro-ecological methods of farming, reforestation, composting, and other soil conservation techniques adjacent to and within the Vaca. Long-term goals of FVFR include: empowering communities to manage natural and cultural resources, reducing poverty, and reforestation (Manzanero and Melendez, 2013). This access to and sustainable use of the Vaca has resulted in FVFR participants increasing forest stewardship by monitoring and reporting poaching activities.

Survey Development

We designed a survey from the results of an elicitation study that was completed following the TPB guidelines (Ajzen, 1985)(see chapter 1). We conducted the elicitation study by interviewing 47 local key informants: police, mayors, educators, religious leaders, current CBC participants, non-governmental organization leaders, resort personnel, government agencies, and women. Results determined common beliefs held by the target population about attitudes, norms, and behavioral controls that might influence women's ability to participate. The final survey was reviewed by two researchers familiar with the TPB and by two native Belizeans experienced in surveying the target population, and revisions were made as needed. The survey contained 24 questions, 11 of which were matrix style with multiple parts (See Appendix C for full survey). We translated our survey into Spanish and then tested the English and Spanish versions with eight bilingual community members to check for content validity and understanding.

As an icebreaker, the first two questions asked respondents if they were happy with the community they lived in and if they thought Belize was a beautiful country. We asked these two questions to put the respondents in a positive frame of mind and to gain their interest to complete the survey (Babbie, 2015). Next, we displayed an informational page, which provided basic information to define a hypothetical conservation program for those unfamiliar with the idea. The majority of survey questions focused on TPB components. We measured behavioral intent with four questions about potential CBC activities and 18 paired statements to indirectly measure attitudes, subjective norms, and perceived behavioral control. Responses were

recorded on 5-point scales (i.e. 1-strongly agree, 2-agree, 3-neutral, 4-disagree, 5-strongly disagree). We also included questions on CBC program logistics (i.e. what days would you be able/willing to meet) and socio-demographics. (See Appendix C for the full survey)

Survey Administration

We collected surveys in the town of Benque Viejo Del Carmen (total pop.= 6,140; women = 3,091), and the two villages of San Jose Succotz (total pop.= 2,322; women = 1,180), and Arenal (total pop.= 612; women = 292)(SIB, 2014). We chose these communities because they are adjacent the Vaca. We administered surveys to women over a four-week period in May and June 2015 using three iPads and three Android tablets with iSurvey and driodSurvey apps (Cohn, 2016). Although some of the research areas were remote, the use and familiarity with tablets and other technology was widespread enough for us to feel comfortable using this method. Additionally, as the surveys were read to the participants we felt that the administrating device would not have an effect on the results. We collected surveys between 8:30am and 11:30am and returned in the afternoon and evening between 3:30 and 7:30pm to avoid times when women would be busy preparing food for their families.

We surveyed one woman over the age of 18 at each residence due to the likelihood that women within the same household may hold similar views about the topic. We initially overlaid a 61x61m grid onto the communities using Google Maps. We numbered all squares and used a random number generator to select sample squares. We initially attempted to visit all houses in the chosen squares. After a few days of

collection, we determined that our approach was not practical to reach our target sample size due to no female residents or none being home at the time of the survey. Therefore, from that point forward, we attempted to visit all houses in each community, although we may have omitted some due to a lack of current and detailed street maps.

After we collected a few surveys, we determined self-administered surveys were impractical and taking a long time (>30 minutes), likely due to low literacy. Education levels and literacy rates in the area are quite low, with 62% of women, ages 14 and older only completing eighth grade or less (SIB, 2014). Therefore, after women completed 11 self-administered surveys, we administered the remaining by reading questions to women and recording their answers. Researcher-administered surveys have been previously employed here as a means to increase comprehension, reduce respondent fatigue, and ultimately improve data quality (Panti, personal communications). Researchers fielded questions from respondents as necessary to clarify any survey questions. All field assistants were trained on how to answer respondent questions about the survey. We compared the 11 self-administered surveys to the researcher-administered surveys on all TPB responses using one-way ANOVAs. Finding no differences, the 11 surveys were included in our sample. We had four women refuse to take surveys, resulting in a less than 1% refusal rate.

Data Analysis

We conducted all analyses in STATA 13.1. We used Cronbach's Alpha to assess internal reliability, the degree to which items in a measure are consistent, of the dependent and independent variables measuring latent constructs (Kline, 2011).

Confirmatory factor analysis was used to measure the observed variables convergent and discriminant validity within and among our four constructs (Garson, 2015).

We employed Structural Equation Modeling (SEM) with maximum likelihood estimation to determine relationships between behavioral intent questions (response variable) and the calculated indirect measures of attitude, subjective norm, and PBC (explanatory variables) (Hox and Bechger, 1998). We chose SEM to compare the TPB model to empirical data, as it can analyze data even if multicollinearity exists, and is a more flexible tool than regression as SEM can consider multiple equations at once, i.e. covariances and direct relationships (Garson, 2015; Nachtigall et al., 2003). One of its main benefits is that from observed variables it can determine or measure latent variables, the factors underlying the observed variables, unlike regressions which can only model observed variables (Nachtigall et al., 2003). This is important for our analysis because only indirect measures were used to determine the three constructs. It can also be used as a confirmatory factor analysis, in that an acceptable goodness-of-fit can serve as evidence that indirect, but observable, measures were successfully used to determine the latent variables (Nachtigall et al., 2003).

Fourteen cases were dropped before the analysis due to missing data for all questions relating to at least one of the three constructs. We imputed overall construct means for missing data on construct question pairs, using the respondents mean from the remaining answered questions for that construct. For example, if a respondent did not have a significant other, the normative belief question “My husband/boyfriend would approve of my participation in a women’s conservation group” and its paired motivation to comply question were legitimately skipped. Therefore, the overall subjective norm

mean for that respondent was imputed and used in place of the missing data. This method ensures the subjective norm mean for each respondent is maintained and STATA 13.1 does not remove all of this respondent's data from the model. All field assistants were told to skip questions when they did not apply to the respondent instead of answering neutral. This was done to assure that responses were not skewed toward neutral by respondents who could not respond to a question.

Results

Demographics

All respondents were women with 52% residing in Benque Viejo, 40% in San Jose Succutz, and 8% in the small village of Arenal (Table 2.1). The average age of the respondents was 36, with 62% having what they consider a job. The education level of the respondents was low, with 51% completing school through the 8th grade or less. The majority of women (69%) were married or in a common law relationship.

To assess our sample's representativeness of the larger population, we compared our sample's age to the 2010 Belize census for the Cayo District and our sample's education level to the entire country (SIB, 2014). Our sample was not different in most age categories, with the exceptions that we had 4% more in the 30-34 age range ($p=0.011$; $z=2.52$). Proportions of women completing most education levels in our sample did not differ from the Belize census, apart from secondary school completion, where our sample contained 10% more than in the general population ($p=.000$; $z=5.55$). We were not able to perform other demographic comparisons due to the lack of

comparable census data. Therefore, our sample is largely representative of the actual population except for the two caveats described above.

Table 2.1: Demographic characteristics of women (n=486) completing the survey in western Belize, 2015*

	N	*%*
Community		
Benque Viejo Del Carmen	254	52
San Jose Succotz	192	40
Arenal	40	8
Average Age = 36		
Employed		
Yes	303	62
No	183	38
Education Level		
8th grade or less	246	51
Some high school	134	28
Some junior college	52	11
Some bachelors courses	16	3
Marital Status		
Single	119	25
Married	193	40
Common Law Married	139	29
Divorced	19	4
Widowed	16	3

*Percentages do not add up to 100 due to missing data

TBP Construct Analysis

Confirmatory factor analysis indicated strong convergent and discriminant validity between behavioral intent, attitude, subjective norm, and PBC, with all these variables loading on different factors (Table 2.2).

Table 2.2: Variable factor loadings for the TPB constructs collected from women (n=486) completing the survey in western Belize, 2015

	Intent	Attitude	Norm	PBC
Int 1	0.714	-0.064	0.017	0.042
Int 2	0.695	-0.111	0.026	0.101
Int 3	0.827	0.067	-0.031	-0.035
Int 4	0.834	0.091	0.017	-0.017
Att 1	0.055	0.687	0.051	0.012
Att 2	0.030	0.784	-0.032	0.093
Att 3	0.004	0.505	-0.034	0.241
Att 4	-0.031	0.845	0.027	0.030
Att 5	0.021	0.954	0.029	-0.096
Att 6	-0.024	0.694	-0.009	0.033
Norm1	-0.033	-0.013	0.728	0.034
Norm2	-0.017	0.049	0.633	0.029
Norm3	-0.013	-0.012	0.778	0.063
Norm4	-0.044	-0.087	0.763	-0.033
Norm5	0.042	0.063	0.829	-0.042
Norm6	0.051	0.060	0.772	0.007
Control1	0.073	-0.020	-0.039	0.759
Control2	0.008	0.011	0.010	0.773
Control3	0.007	-0.006	0.111	0.545
Control4	-0.104	-0.076	-0.088	0.601
Control5	0.037	0.154	0.013	0.677
Control6	-0.023	0.023	0.053	0.782

Behavioral Intent

Cronbach's Alpha for the four behavioral intent questions was high (α = 0.8553), indicating adequate convergent validity and reliability. Overall intent to participate in the four proposed activities ranged from 2.13 – 2.57, with intent averaging 2.36 on a 1-5 scale with 1 = very likely, 2 = likely, 3 = neutral, 4 = unlikely, and 5 = very unlikely (Table 2.3). This demonstrates that the average respondent is "likely" to participate in all CBC group activities. The SEM analysis showed all path weights to be above the 0.6 minimum and therefore all were included in the model (Garson, 2015) (Table 2.4)

Table 2.3: Women's behavioral intent questions, means, and standard errors about participating in a conservation program in western Belize, 2015 (n=486).

Statement	$\bar{x}$	*SE*
How likely is it that you would participate in the following activities?[a]		
Attending conservation group meetings	2.53	0.058
Going on conservation group outings into the forest to collect resources	2.57	0.063
Making forest resources into something that can be sold at market	2.13	0.056
Selling a processed forest product at a market	2.22	0.057

[a] Intent questions. Ordered responses: 1=very likely, 2=likely, 3=neutral, 4=unlikely, 5=very unlikely.

Attitude

The six attitude question scores exhibited a high Cronbach's Alpha (α = 0.8875), indicating adequate convergent validity and reliability. All outcome evaluation and attitudinal strength question means denoted respondents had very favorable attitudes toward participating in the proposed CBC program, with outcome evaluation and attitude strength means ranging from 1.27 – 1.50 on a 1-5 scale. Attitude means ranged from 1.75 to 2.37 with a global mean of 1.97 on a scale of 1-25, with lower numbers indicating more favorable attitudes (Table 2.5). This low global attitude mean demonstrated that the respondents hold very positive attitudes toward participating in the proposed CBC program and believed that participating would provide them benefits that are important to them. All path weights were above 0.6 (Table 2.4).

Table 2.4: Unstandardized, standardized, and p-values for the full SEM model about participating in a conservation program in western Belize, 2015 (n=486).

Parameter Estimate	*Unstandardized*	*Standardized*	*P*
Measurement Model Estimates			
Attitude → Att 1	1.000	0.741	0.00
Attitude → Att 2	0.841(.05)	0.824	0.00
Attitude → Att 3	1.090(.08)	0.633	0.00
Attitude → Att 4	1.091(.06)	0.874	0.00
Attitude → Att 5	1.016(.05)	0.906	0.00
Attitude → Att 6	0.972(.06)	0.703	0.00
Subjective Norm → Norm 1	1.000	0.706	0.00
Subjective Norm → Norm 2	0.761(.06)	0.628	0.00
Subjective Norm → Norm 3	0.779(.05)	0.739	0.00
Subjective Norm → Norm 4	0.923(.07)	0.664	0.00
Subjective Norm → Norm 5	0.995(.06)	0.887	0.00
Subjective Norm → Norm 6	1.023(.06)	0.867	0.00
PBC → Control 1	1.000	0.751	0.00
PBC → Control 2	0.898(.05)	0.776	0.00
PBC → Control 3	0.689(.06)	0.584	0.00
PBC → Control 4	0.663(.07)	0.447	0.00
PBC → Control 5	0.815(.05)	0.806	0.00
PBC → Control 6	0.803(.05)	0.819	0.00
Intent → Int 1	1.000	0.611	0.00
Intent → Int 2	1.071(.09)	0.604	0.00
Intent → Int 3	1.384(.09)	0.891	0.00
Intent → Int 4	1.472(.10)	0.929	0.00
Covariance Attitude and Subjective Norm	1.473(.21)	0.421	0.00
Covariance Attitude and PBC	1.742(.19)	0.596	0.00
Covariance Subjective Norm and PBC	2.786(.39)	0.429	0.00
Structural Model Estimates			
Attitude → Intent	0.110(.04)	0.176	0.003
Subjective Norm →Intent	0.031(.01)	0.112	0.032
PBC → Intent	0.090(.02)	0.267	0.000

Subjective Norm

All subjective norm questions also factored together and had a high Cronbach's Alpha (α = 0.8837), indicating adequate convergent validity and reliability. Respondents indicated strong subjective norms to participate with normative belief and motivation to comply question means ranging from 1.86 – 2.33 on a scale from 1-5. Subjective norm means ranged from 3.97 – 5.20 on a 1-25 scale with a global mean of 4.59 on a 1-25 scale, with lower scores indicating more positive subjective norm scores (Table 2.6). This indicates respondents believed the normative groups that are important to them would be in favor of their participation. All path weights were above 0.6, therefore all norms were included in the SEM analysis (Table 2.4).

Perceived Behavioral Control

Perceived behavioral control questions exhibited a high Cronbach's Alpha (α = 0.8353), indicating adequate convergent validity and reliability. Individual control belief and control power question means ranged from 1.5 – 2.89 on a 1-5 scale. Individual PBC means ranged from 2.67 – 4.53, on a 1-25 scale (Table 2.7), with lower means indicating participants feel more in control of performing the behavior. The global PBC mean was 3.47 on a 1-25 scale, indicating that participants feel they are in control of participating in a CBC program.

Table 2.5: Women's attitudinal questions, means, and standard errors about participating in a conservation program in western Belize, 2015. (n=486)

			Calculated Attitude Scores	
Statement	$\bar{x}^c$	*SE*	$\bar{x}^d$	*SE*
How likely is it that participating in a women's conservation group would provide you with the following benefits?[a]				
1. Providing opportunities to meet and get to know other people	1.31	0.026	2.02	0.077
2. Learning more about the forest and conservation	1.27	0.023	1.75	0.058
3. Providing an additional source of income	1.45	0.032	2.37	0.098
4. Helping you inform others about conservation	1.33	0.025	1.94	0.071
5. Helping the forest and the environment	1.32	0.025	1.83	0.064
6. Reducing deforestation in Belize forests	1.37	0.032	1.88	0.079
How important are the following to you?[b]				
1. Having opportunities to meet and get to know other people	1.46	0.034		
2. Learning more about the forest and conservation	1.32	0.027		
3. Having an additional source of income	1.50	0.035		
4. Informing others about conservation	1.36	0.028		
5. Helping the forest and the environment	1.31	0.027		
6. Reducing deforestation in Belize forests	1.29	0.027		

[a] Outcome evaluation questions. Ordered responses: 1 = very likely, 2 = likely, 3 = neutral, 4 = unlikely, 5 = very unlikely.

[b] Attitudinal strength questions. Ordered responses: 1 = very important, 2 = important, 3 = neutral, 4 = unimportant, 5 = very unimportant.

[c] Raw question means without any imputations (with missing data)

[d] Calculated attitude score (outcome evaluations[a] x attitudinal strength[b]) with imputed means, used in SEM model.

Table 2.6: Women's subjective norm questions, means, and standard errors about participating in a conservation program in western Belize, 2015. (n=486)

			Calculated Subjective Norm Scores	
Statement	$\bar{x}^c$	*SE*	$\bar{x}^d$	*SE*
Who would approve of disapprove of your participation in a women's conservation group?[a]				
1. My community leaders	2.14	0.040	5.20	0.179
2. My husband/boyfriend	2.17	0.042	4.54	0.153
3. My friends, relatives, and others important to me	1.95	0.038	3.97	0.133
4. The religious or spiritual leaders in the area	2.16	0.041	5.18	0.176
5. Friends for Conservation and Development	1.91	0.036	4.34	0.142
6. Other community groups (for example: women's groups or the House of Culture)	1.86	0.034	4.31	0.149
How important are the following people's opinions to you?[b]				
1. My community leaders	2.33	0.058		
2. My husband/boyfriend	2.00	0.050		
3. My friends, relatives, and others important to me	1.94	0.047		
4. The religious or spiritual leaders in the area	2.32	0.056		
5. Friends for Conservation and Development	2.07	0.050		
6. Other community groups (for example: women's groups or the House of Culture)	2.15	0.050		

[a] Normative belief questions. Ordered responses: 1 = strongly approve, 2 = approve, 3 = neutral, 4 = disapprove, 5 = strongly disapprove.

[b] Motivation to comply questions. Ordered responses: 1 = very important, 2 = important, 3 = neutral, 4 = unimportant, 5 = very unimportant.

[c] Raw question means without any imputations (with missing data)

[d] Calculated subjective norm score (normative belief[a] x motivation to comply[b]) with imputed means. Used in SEM model.

The observed variable that addressed the need to make money in order to participate had a path weight below the required 0.6 (Table 2.4). However, this variable was included in the model due to its importance for the application of this research and when removed the R^2 value for the dependent variable (intent) was not increased.

Structural Equation Model Analysis

The test for goodness-of-fit was acceptable (Hooper et al. (2008)) with RMSEA = 0.079, CFI = 0.903, and SRMR = 0.050, suggesting that the relationship between the observed and latent variables is supported and that the specified model cannot be disconfirmed (Nachtigall et al., 2003). All regression path p-values were significant, signifying that none need to be removed to improve the model (Garson, 2015). Behavioral intent had an R^2 value of 0.21, explaining 21% of the variance of the dependent variables. The SEM model's standardized results show that the relationship between PBC and behavioral intent has the largest effect size ($\beta = 0.27$, $p = 0.000$) (Fig. 2.2), with attitude having the next largest effect size ($\beta = 0.18$, $p = 0.003$), and subjective norm having the smallest effect size ($\beta = 0.11$, $p = 0.032$). All observed variable loadings were significant at the .001 level and all constructs were found to have significant covariance, with attitude and PBC having the largest covariance at $\beta = 0.6$ ($p = 0.000$, Table 2.7).

Table 2.7: Women's perceived behavioral control questions, means, and standard errors about participating in a conservation program in western Belize, 2015. (n=486)

			Calculated PBC Scores	
Statement	$\bar{x}^c$	*SE*	$\bar{x}^d$	*SE*
There are things that would influence a women's ability to participate in a women's conservation group. Please tell me how much you agree with the following statements.[a]				
1. Having time to participate in a women's conservation group would influence her ability to participate.	1.50	0.035	3.65	0.141
2. A women's comfort level while in the forest would influence her ability to participate.	1.60	0.038	3.17	0.122
3. A women's access to childcare would influence her ability to participate.	1.63	0.038	3.88	0.125
4. The potential to make money would influence her ability to participate.	1.55	0.037	4.53	0.157
5. A women's interest in the local forest and conservation would influence her ability to participate.	1.52	0.032	2.92	0.107
6. A women's current knowledge about the forest and conservation would influence her ability to participate.	1.47	0.032	2.67	0.103
How much do you agree or disagree with the following statements?[b]				
1. I have time to participate in a women's conservation group.	2.33	0.055		
2. I would feel comfortable going into the forest to collect things.	1.92	0.051		
3. My children would be taken care of while I am participating in a women's conservation group.	2.41	0.055		
4. I would need to make money from my participation in a women's conservation group.	2.89	0.059		
5. My interest in the local forest and conservation makes me want to participate in a women's conservation group.	1.79	0.036		
6. I would need more knowledge about the forest and conservation to participate in a women's conservation group.	1.69	0.038		

[a] Control belief questions. Ordered responses: 1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree.

[b] Control power questions. Ordered responses: 1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree.

[c] Raw question means without any imputations (with missing data)

[d] Calculated perceived behavioral control score (control belief[a] x control power[b]) with imputed means. Used in SEM model.

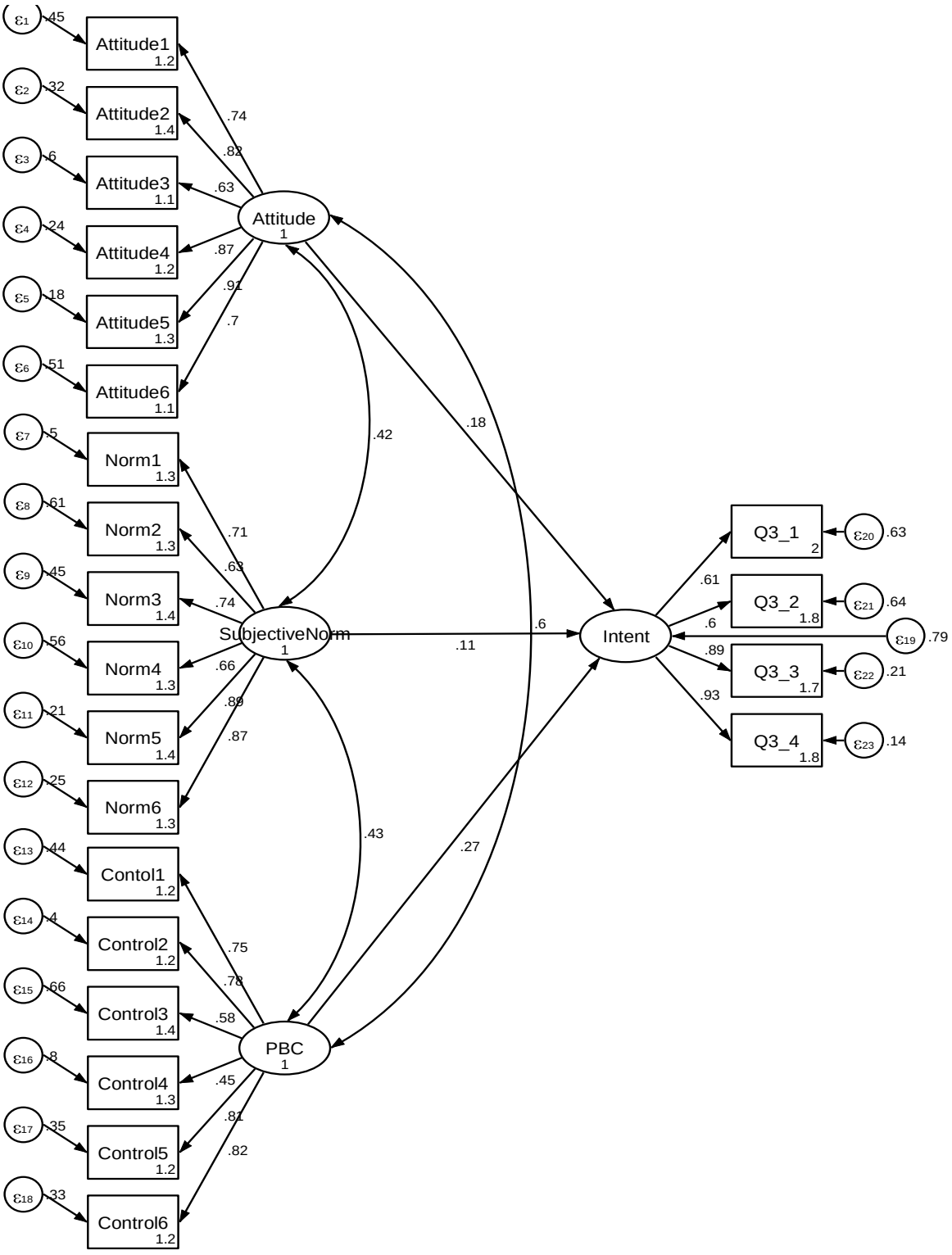


Figure 2.2: Full SEM model using the TPB regarding women's participation in a conservation program in western Belize, 2015 (n=486)

Discussion

Discussion

The acceptable goodness-of-fit statistics serve as evidence that the use of indirect observed variables can determine the latent variables of attitude, subjective norm, and PBC. The SEM analyses indicated that this empirical data fits well with the TPB model to predict women's intent to participate in a CBC program. In agreement with the TPB, attitudes, subjective norms, and PBC were found to be determinants of behavioral intent. Although there was covariance between the three constructs (attitude, subjective norm, and PBC), they clearly represent different concepts to the respondents as indicated by our factor analysis (see Table 2.2). The covariance between attitude and PBC was $\beta = 0.6$, suggesting that either the women's attitudes are effecting their perceived control or that the PBCs are affecting their attitudes. We believe our low R^2 value for the dependent variable was due to using a suite of behavioral intent questions instead of one specific behavior, inferring the three constructs from indirect measures, and the study being in an uncontrollable environment in a developing country.

Examining the behavioral intent activities individually, converting forest resources into products that could be sold at a local market was the activity in which women were most likely to participate. This is likely linked to the result that women perceive they have less control over the amount of time they have to participate than some of the other barriers. Making marketable products can be done at home and at their own pace, potentially alleviating the 'time' PBC. Similarly, the least likely behavioral intent activity was going into the forest to collect resources. Again, this may relate to the 'time' PBC. Going into the forest would take at least an hour of travel and many hours to collect resources each trip. Therefore, as we collaboratively design specific program activities,

time constraints need to be strongly considered and mechanisms designed either to free up time or focus on activities that can be done concurrently with daily activities.

Our results are similar to those of Kaiser et al. (2005) in a study that used the TPB to explain general conservation behavior. They also determined that PBC had the greatest effect on behavioral intent. However, this result is uncommon in TPB studies of conservation behavior. Generally, in most TPB studies, attitude has the largest effect on intent, followed by subjective norm (Ajzen, 1991). Some studies have found that PBC did not have a significant effect on intent, which was explained by the target behavior being largely under a person's volitional control (Hrubes et al., 2001; Willcox et al., 2012). Ajzen (1988) added the variable of PBC to the Theory of Reasoned Action model, which only contains the constructs of attitude and subjective norm (Fishbein and Ajzen, 1975; Ajzen and Fishbein, 1980), in order to enable the prediction of behaviors that are nonvolitional, or those not considered to be under a person's own control (Netemeyer et al., 1991; Kurland, 1995). Therefore, it is possible in our population there are behavioral aspects of participating in a CBC program that the women believe are out of their control. For example, possessing the required knowledge about conservation and the forest and having the time required to participate, are not things that the women may perceive as being under their control. It would take specialized education to increase forest knowledge, which they cannot easily access without outside support. Moreover, a dramatic lifestyle change would have to occur to increase available time. Women in this area are not well educated and have many household and familial tasks (SIB, 2014; personal observation). This is supported by the evidence

that women ‘strongly agree’ that having knowledge about the forest and conservation would influence their ability to participate.

Regardless of the finding that PBC had the greatest effect, women’s attitudes toward participation were very positive. The possibility of learning more about the forest and conservation was very important to them and they believe that this would occur if they participated in a conservation group. Therefore, any CBC program implemented should focus on conservation education and local forest resources and their importance. Increasing women’s knowledge about conservation and the forest should give them more confidence about their ability to participate. Learning more about the importance of conservation may increase their interest in the forest and conservation, decreasing another possible barrier to participation as identified in the PBC analysis. Additionally, it may be beneficial to train them in effective knowledge transfer strategies and provide opportunities for them to incorporate their family and friends into group conservation activities, furthering the reach of the program by harnessing these positive attitudes. Offering ways for family and friends to participate in group activities could also work to free some of the women’s time by having their dependents with them instead of relying on child care.

An unexpected finding was that the least positive attitude to participation was potential financial gain. It was still important (2.37 on a scale of 1-25, with low numbers representing more positive attitudes), but ranked last in the individual attitude scores. However, this is similar to results from another study we conducted in that area (see Chapter 1). In this, women did not express a great desire to gain an income from participation in a conservation group, but would rather have the opportunity to increase

their conservation knowledge. A lesser importance on financial gain also concurs with Berkes' (2004) finding that indicates social benefits are often more important in rural communities in developing areas than economic benefits. Furthermore, our PBC questions showed similar results with regard to income. Women agreed that the potential to make money would influence their ability to participate, however, the mean for the question "I would need to make money from my participation" was 2.89, almost neutral. Therefore, a good portion of women surveyed did not indicate they would need to make money in order to participate. This result is contrary to findings that people are more likely to change their behavior if they perceive a positive economic benefit from the change (Pannell et al., 2006; Corbeels et al., 2014). The benefits of education and increased conservation are more of a motivation for this particular population and these elements should be highlighted in program design and implementation.

This study provides evidence for the importance of program analyses prior to its implementation, rather than relying on trial and error and wasting time and project resources. These pre-implementation analyses can uncover unexpected cultural and logistical barriers to participation. For example, our results demonstrated that women do not need an income and their main motivations are education and transfer of knowledge to others. Without our *a priori* results, these motivations would not have been included in the program design and increasing personal income may have been unnecessarily highlighted, making it less palatable to potential participants.

Future Directions

The next step in this project will be the collaborative design and implementation of a CBC program in Vaca communities. Local leaders will be identified to help with planning and implementation and to assist in surmounting any resistance. Workshops will then be held, led by the leaders, with women who are interested in participating to determine the best ways to overcome some of the barriers, to identify the best activities to accomplish the group's goals, and to determine resource needs. These women will serve as the opinion leaders of these new ideas and should "help hasten the rate of diffusion" of the new ideas and activities (Rogers, 2003, p. 388). We will continually reflect on and assess the program design and implementation and adjust the program based on the shared experiences of the group.

Our research also uncovered topics that warrant further investigation. Our study could be replicated locally or regionally with men to understand if observations regarding income generation as a non-essential CBC component is unique to women. Additionally, more studies are needed to contextualize the determinants of the low importance of financial gain and if this is a phenomenon found only locally, or is held by women regionally, nationally, or internationally.

References

Adhikari, B., F. Williams and J. C. Lovett (2007). "Local benefits from community forests in the middle hills of Nepal." Forest Policy and Economics **9**(5): 464-478.

Agarwal, B. (1997). "Gender, environment, and poverty interlinks: Regional variations and temporal shifts in rural India, 1971–1991." World Development **25**(1): 23-52.

Agarwal, B. (2009a). "Rule making in community forestry institutions: The difference women make." Ecological Economics **68**(8): 2296-2308.

Agarwal, B. (2009b). "Gender and forest conservation: The impact of women's participation in community forest governance." Ecological Economics **68**(11): 2785-2799.

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. New York, NY, Springer.

Ajzen, I. (1988). Attitudes, behavior and personality. Chicago, IL, Dorsey.

Ajzen, I. (1991). "The theory of planned behavior." Organizational Behavior and Human Decision Processes **50**(2): 179-211.

Ajzen, I. and M. Fishbein (1980). Understanding attitudes and predicting social behaviour. Edgewood Cliffs, NJ, Prentice Hall.

Arevalo, B. and D. Chan (2012). "Mitigating and Controling Illegal Logging in the Chiquibul Forest." Report to the Forest Department of Belize.

Babbie, E. (2015). The practice of social research. Boston, MA, Cengage Learning.

Baral, N. and M. J. Stern (2011). "A comparative study of two community-based conservation models in Nepal." Biodiversity and Conservation **20**(11): 2407-2426.

Berkes, F. (2004). "Rethinking community-based conservation." Conservation Biology **18**(3): 621-630.

Board, M. A. (2005). "Millennium ecosystem assessment." Washington, DC: New Island.

Brain, R. G., M. E. Hostetler and T. A. Irani (2014). "Why do cattle ranchers participate in conservation easement agreements? Key motivators in decision making." Agroecology and Sustainable Food Systems **38**(3): 299-316.

Bridgewater, S., D. Harris, C. Whitefoord, A. Monro, M. Penn, D. Sutton, B. Sayer, B. Adams, M. Balick and D. Atha (2006). "A preliminary checklist of the vascular plants of the Chiquibul Forest, Belize." Edinburgh Journal of Botany **63**(2-3): 269-321.

Brown, K. (2002). "Innovations for conservation and development." The Geographical Journal **168**(1): 6-17.

Campbell, L. M. and A. Vainio-Mattila (2003). "Participatory development and community-based conservation: Opportunities missed for lessons learned?" Human Ecology **31**(3): 417-437.

ChartsBin (2011). "Proportion of Land Area Covered by Forest." from http://chartsbin.com/view/2673.

Cho, P. P. (2011). "The Chiquicul Forest: A Carbon Conservation Area." Proposal to The Forest Department of Belize.

Cohn, S. (2016). "Harvest Your Data, Data Collection." from harvestyourdata.com.

Corbeels, M., J. de Graaff, T. H. Ndah, E. Penot, F. Baudron, K. Naudin, N. Andrieu, G. Chirat, J. Schuler and I. Nyagumbo (2014). "Understanding the impact and adoption of conservation agriculture in Africa: A multi-scale analysis." Agriculture, Ecosystems & Environment **187**: 155-170.

Davidson, J. (1989). "Restoring womens link with nature." Earthwatch (37): 2-3.

FAO, U. (2011). "FAOSTAT database." Website UN FAO.

Fishbein, M. and I. Ajzen (1975). Belief, attitude, intention and behavior: An introduction to theory and research. Reading, MA, Addison-Wesley.

Fishbein, M. and I. Ajzen (2011). Predicting and changing behavior: The reasoned action approach. New York, NY, Taylor & Francis.

Garson, D. (2015). Structural Equation Modeling (Statistical Associates Blue Book Series), Statistical Associates Publishers, Asheboro NC.

Hartup, B. K. (1994). "Community conservation in Belize: demography, resource use, and attitudes of participating landowners." Biological Conservation **69**(3): 235-241.

Hooper, D., J. Coughlan and M. Mullen (2008). "Structural equation modelling: Guidelines for determining model fit." Dublin Institute of Technology: Articles: 2.

Hox, J. and T. Bechger (1998). "An introduction to structural equation modelling." Family Science Review **11**(354-373).

Hrubes, D., I. Ajzen and J. Daigle (2001). "Predicting hunting intentions and behavior: An application of the theory of planned behavior." Leisure Sciences **23**(3): 165-178.

Jackson, C. (1993). "Doing what comes naturally? Women and environment in development." World Development **21**(12): 1947-1963.

Kaiser, F. G., G. Hübner and F. X. Bogner (2005). "Contrasting the Theory of Planned Behavior With the Value-Belief-Norm Model in Explaining Conservation Behavior1." Journal of Applied Social Psychology **35**(10): 2150-2170.

Kline, R. B. (2011). Principles and practice of structural equation modeling. Guilford publications. New York, NY.

Kurland, N. B. (1995). "Ethical intentions and the theories of reasoned action and planned behavior." Journal of Applied Social Psychology **25**(4): 297-313.

Manzanero, R. and A. Melendez (2013). "Evolution of a new management alternative in the Vaca Forest Reserve." Report for Friends for Conservation and Development, Belize.

Mulrennan, M. E., R. Mark and C. H. Scott (2012). "Revamping community-based conservation through participatory research." The Canadian Geographer/Le Géographe canadien **56**(2): 243-259.

Nachtigall, C., U. Kroehne, F. Funke and R. Steyer (2003). "Pros and Cons of Structural Equation Modeling." Methods of Psychological Research Online 8(2): 1-22.

Netemeyer, R. G., S. Burton and M. Johnston (1991). "A comparison of two models for the prediction of volitional and goal-directed behaviors: A confirmatory analysis approach." Social Psychology Quarterly: 87-100.

Oreg, S. and T. Katz-Gerro (2006). "Predicting proenvironmental behavior cross-nationally values, the theory of planned behavior, and value-belief-norm theory." Environment and Behavior **38**(4): 462-483.

Pagdee, A., Y.-s. Kim and P. Daugherty (2006). "What makes community forest management successful: a meta-study from community forests throughout the world." Society and Natural Resources **19**(1): 33-52.

Pannell, D. J., G. R. Marshall, N. Barr, A. Curtis, F. Vanclay and R. Wilkinson (2006). "Understanding and promoting adoption of conservation practices by rural landholders." Animal Production Science **46**(11): 1407-1424.

Porter-Bolland, L., E. A. Ellis, M. R. Guariguata, I. Ruiz-Mallén, S. Negrete-Yankelevich and V. Reyes-García (2012). "Community managed forests and forest protected areas: An assessment of their conservation effectiveness across the tropics." Forest Ecology and Management **268**: 6-17.

Prasad Timsina, N. (2003). "Promoting social justice and conserving montane forest environments: a case study of Nepal's community forestry programme." The Geographical Journal **169**(3): 236-242.

Rogers, E. M. (2003). Diffusion of innovations. New York, NY, Free Press.

Rossi, P. H., M. W. Lipsey and H. E. Freeman (2003). Evaluation: A systematic approach, Thousand Oaks, CA, Sage publications.

Rossi, A. N. and J. B. Armstrong (1999). "Theory of reasoned action vs. theory of planned behavior: Testing the suitability and sufficiency of a popular behavior model using hunting intentions." Human Dimensions of Wildlife 4(3): 40-56.

Schmink, M. (1999). Conceptual framework for gender and community-based conservation, MERGE, Managing Ecosystems and Resources with Gender Emphasis, Tropical Conservation and Development Program, Center for Latin American Studies, University of Florida.

SIB (2014). "Annual Report, 2014." Statistical Institute of Belize. http://www.sib.org.bz/publications/annual-reports.

Soe, A. K. and N. Sato (2012). "Local People's Attitudes towards the Community Forestry: The Case Studies in the Central Dry Zone of Myanmar." Journal of the Faculty of Agriculture, Kyushu University **57**(1): 273-280.

Songorwa, A. N. (1999). "Community-based wildlife management (CWM) in Tanzania: Are the communities interested?" World Development **27**(12): 2061-2079.

Steady, F. C. (1998). "Gender equality and ecosystem balance: Women and sustainable development in developing countries." Race, Gender & Class: 13-32.

Thompson, P. M. (2013). "Sustainability of community-based organizations in Bangladesh." Society & Natural Resources **26**(7): 778-794.

UNFCCC. (2015). Adoption of the Paris Agreement (FCCC/CP/2015/L.9/Rev.1). United Nations Framework Convention on Climate Change, Paris.

Warwick, D. P. (1993). Social research in developing countries: Surveys and censuses in the Third World, Psychology Press.

Wells, M. (1992). "Biodiversity conservation, affluence and poverty: mismatched costs and benefits and efforts to remedy them." Ambio (Sweden) **21**(3): 237-243.

Westermann, O., J. Ashby and J. Pretty (2005). "Gender and social capital: the importance of gender differences for the maturity and effectiveness of natural resource management groups." World Development **33**(11): 1783-1799.

Willcox, A. S., W. M. Giuliano and M. C. Monroe (2012). "Predicting cattle rancher wildlife management activities: An application of the theory of planned behavior." Human Dimensions of Wildlife **17**(3): 159-173.

Appendix C: Survey used in western Belize 2015.

Please tell me how much you agree with the following statements. (strongly agree, agree, neutral, disagree, strongly disagree)

1. I am generally happy with the community I live in.
2. Belize is a beautiful country.
1. Environmental concerns are more important than all other concerns in my life.
2. I would call myself an environmentalist (nature lover).

A locally run and operated conservation group aimed at getting women involved in the sustainable use of the forest in your area is being considered. This program would require them to take day trips into the forest to collect things and prepare them for sale in a sustainable (without harming the environment) way. The money earned by the sale of these goods would be distributed among the members of the group. Keep this in mind when filling out the following survey.

1. How likely is it that you would participate in the following activities? (very likely, likely, neutral, unlikely, very unlikely)

    a. Attending conservation group meetings
    b. Going on conservation group outings into the forest to collect resources
    c. Making forest resources into something that can be sold at market
    d. Selling a processed forest product at a market

2. How interested would you be in helping a women's conservation group collect, process, or sell the following products? (very interested, interested, neutral, uninterested, very uninterested)

    a. Reeds for woven baskets
    b. Ramon seed (Maya nut)
    c. Seeds for jewelry
    d. Cahoon nut
    e. Firewood
    f. Are there any other forest resources you believe could be used for a women's conservation group? (a box was available to enter an answer)

3. How likely is it that participating in a women's conservation program would provide you the following benefits? (very likely, likely, neutral, unlikely, very unlikely)

    a. Providing opportunities to meet and get to know other people
    b. Learning more about the forest and conservation

c. Providing an additional source of income
d. Helping you inform others about conservation
e. Helping the forest and the environment
f. Reducing deforestation in Belize forests

4. How important are the following to you? (very important, important, neutral, unimportant, very unimportant)

    a. Having opportunities to meet and get to know other people
    b. Learning more about the forest and conservation
    c. Having an additional source income
    d. Informing others about conservation
    e. Helping the forest and the environment
    f. Reducing deforestation in Belize forests

5. Who would approve or disapprove of your participation in a women's conservation group. (strongly approve, approve, neutral, disapprove, strongly disapprove)

    a. My community leaders
    b. My husband/boyfriend
    c. My friends, relatives, and others important to me
    d. The religious or spiritual leaders in the area
    e. Friends for Conservation and Development
    f. Other community groups (for example: women's groups, or the House of Culture)

6. How important are the following people's opinions to you? (very important, important, neutral, unimportant, very unimportant)

    a. My community leaders
    b. My husband/boyfriend
    c. My friends, relative, and others important to me
    d. The religious or spiritual leaders in the area
    e. Friends for Conservation and Development
    f. Other community groups (for example: women's groups, or the House of Culture)

7. There are things that would influence a woman's ability to participate in a women's conservation program. Please tell me how much you agree or disagree with the following statements. (strongly agree, agree, neutral, disagree, strongly disagree)

    a. Having time to participate in a woman's conservation group would influence her ability to participate.
    b. A woman's comfort level while in the forest would influence her ability to participate.
    c. A woman's access to childcare would influence her ability to participate.
    d. The potential to make money would influence a woman's ability to participate.
    e. A woman's interest in the local forest and conservation would influence her ability to participate.
    f. A woman's current knowledge about the forest and conservation would influence her ability to participate.

8. How much do you agree or disagree with the following statements. (strongly Agree, agree, neutral, disagree, strongly disagree)

    a. I have time to participate in a women's conservation program.
    b. I would feel comfortable going into the forest to collect things.
    c. My children would be taken care of while I am participating in a women's conservation program.
    d. I would need to make money from my participation in a women's conservation group.
    e. My interest in the local forest and conservation makes me want to participate in a women's conservation program.
    f. I would need more knowledge about the forest conservation to participate in a women's conservation program.
    g. I would be interested in attending an informational session to gain more knowledge about participating in a women's conservation group.

Please answer each of the following questions in terms of the way you generally feel. (strongly agree, agree, neutral, disagree, strongly disagree)

1. I often feel that I am part of the natural world around me.
2. I think of the natural world as a community to which I belong.
3. I recognize and appreciate the intelligence of other living organisms.
4. I often feel disconnected from nature.
5. When I think of my life, I imagine myself to be part of a larger cyclical process of living.
6. I often feel a close relationship with animals and plants.

7. I feel as though I belong to the Earth as equally as it belongs to me.
8. I have a deep understanding of how my actions affect the natural world.
9. I often feel part of the web of life.
10. I feel that all inhabitants of Earth, human and nonhuman, share a common 'life force'.
11. Like a tree can be part of a forest, I feel included within the broader natural world.
12. When I think of my place on Earth, I consider myself to be above all other things in nature.
13. I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the tress.
14. My personal well-being does not rely on the health of the natural world.

Answer the following 3 questions as if a locally run and operated women's conservation program was started in your area that you would want to participate in.

1. What days would you be able/willing to meet?
    a. Monday
    b. Tuesday
    c. Wednesday
    d. Thursday
    e. Friday
    f. Saturday
    g. Sunday

2. What time of day would be best for you to meet?
    a. Morning, before lunch time
    b. Lunch time
    c. After lunch, before 5:00pm
    d. After 5:00pm
    e. Night, after 7:00pm

3. Are you willing to go out into the forest to collect resources?
    a. Yes
    b. No

Please answer the following 7 demographic questions for statistical purposes only.

4. What year were you born?

5. How many children live in your home that you are responsible for?

6. How much schooling have your completed?
    a. Primary school
    b. High school
    c. Sixth Form
    d. Bachelors
    e. Graduate school

7. Which village/town do you live in?
    a. San Jose Succotz
    b. Benque Viejo
    c. Arenal

8. Do you have a job?
    a. Yes
    b. No

9. What is your marital status?
    a. Single
    b. Married
    c. Divorced
    d. Widowed
    e. Common Law

10. What language are you more comfortable speaking?
    a. English
    b. Spanish
    c. Either

CHAPTER IV
CONNECTEDNESS TO NATURE SCALE AND ITS USE IN DEVELOPING AREAS: A META-ANALYSIS AND BELIZE SURVEY

A version of this chapter will be submitted May, 2016 to the Journal of Environmental Psychology by Amanda S. Kaeser, Adam S. Willcox, and Robert M. Augé.

This chapter's work was conceptualized by Amanda Kaeser as part of Amanda's dissertation work. The research was carried out by Amanda and analyzed by Amanda and Robert Augé. Amanda wrote this chapter and it was edited by Robert Augé and Adam Willcox.

Abstract

It has been proposed that people who grow up experiencing more contact with nature will have greater feelings of connectedness to nature later in life. Based on personal observations that people in rural areas of developing countries have more day-to-day contact with nature, we theorized that they would have higher Connectedness to Nature Scale (CNS) scores than individuals in developed areas. We tested this in Belize in May 2015 using a survey of women in 450 households. Additionally, we conducted a meta-analysis to describe moderator effects on CNS scores. We found no moderating effects for sex, student status, language of survey, number of CNS scale items, peer-reviewed status, or sample size. However, when metadata from developed world studies were compared with Belize data, we found that Belizean women had higher mean CNS scores. Along with past research demonstrating the correlation between the CNS and pro-environmental behaviors, this research presents possible evidence of the importance of having greater contact with the natural world to increase conservation efforts and makes a call for more research to address these topics.

Introduction

As the world develops, people experience less contact with natural settings (Pretty, 2002). With ever-growing cities, more and more concrete, and less access to open space, people are losing the benefits that contact with nature brings; mentally and physically (Mayer et al., 2009). Researching these benefits has become a popular field of study for social and behavioral scientists (Frantz et al., 2005; Cervinka et al., 2011; Howell et al., 2011; Leong et al., 2014; Zhang et al., 2014a). Additionally, greater conservation and more environmental behaviors associated with increased feelings of connection with nature has become a common topic in environmental studies (Davis et al., 2011; Barbaro and Pickett, 2015; Geng et al., 2015; Pereira and Forster, 2015). Leopold (1949) and Wilson (1984), common names in natural science courses around the world, both pointed to this disconnection with nature. They argued that time spent in nature would nurture greater feeling of affiliation with the natural world, which in turn would increase pro-environmental behaviors and conservation. Since their observations, this diminished connection to nature has been found to be correlated with less pro-environmental and conservation behaviors (Mayer and Frantz, 2004). This puts our world at great risk due to the rising concerns about climate change and other human-made natural disasters that result from greater development and industrialization. More recently, it has been found that people who grew up in more rural areas, theoretically with more contact with nature, are more emotionally connected to nature (Hinds and Sparks, 2008). As a consequence, less industrialized areas might have greater feelings of connection to nature because of their greater contact with nature, making them more likely to exhibit pro-environmental behaviors.

To date, many studies have been conducted using the Connectedness to Nature Scale (CNS) developed by Mayer and Frantz (2004) to determine people's "affective experiential connection to nature" (p.504) . It has been used to determine the level of connection to nature of many different populations, such as Australian farmers (Gosling and Williams, 2010), children in environmental education programs (Ernst and Theimer, 2011; Johnson-Pynn et al., 2014; Leong et al., 2014), general populations in multiple countries (Olivos et al., 2011; Shaw et al., 2013; Poon et al., 2015), undergraduates worldwide (Davis et al., 2011; Howell et al., 2011; Olivos and Aragonés, 2011; Tam, 2013; Leong et al., 2014), and people who have recently participated in a nature experience (Hine and Pretty, 2008; Mayer et al., 2009; Zhang et al., 2014b), among others. The CNS has been positively correlated with well-being (Cervinka et al., 2011), pro-environmental behaviors (Brick and Lewis, 2014; Barbaro and Pickett, 2015; Geng et al., 2015; Pereira and Forster, 2015), willingness to sacrifice (Davis et al., 2011), self-awareness (Frantz et al., 2005), place attachment (Gosling and Williams, 2010), environmental concern (Mayer and Frantz, 2004; Gosling and Williams, 2010), and environmental beliefs (Olivos et al., 2011). It has also been shown that increasing a person's contact with nature increases their CNS score thus their feeling of being connected with nature (Mayer et al., 2009). Connectedness to Nature Scale scores differ significantly between the general public and people who already exhibit a propensity toward nature through regular participation in outdoor activities (Shaw et al., 2013) or through self-reported environmentalist measures (Mayer and Frantz, 2004; Markowitz and Malle, 2012).

Therefore, we hypothesize that because higher CNS scores have been shown to be affected by the amount of time spent outdoors and can be increased by more contact with natural settings (Mayer et al., 2009; Loureiro and Veloso, 2014), people in less developed areas that have more actual contact with nature should have higher scores on the CNS scale than people in more developed areas. This would be an important finding for climate change behavioral studies around the world because of the correlation of CNS scores and pro-environmental behavior. A large portion of climate change activities, such as deforestation and forest degradation, occur in developing countries and these two activities contribute 15-20% of all greenhouse gases released in a year (Buis and Cole, 2011; FAO, 2011). If people in developing areas are found to have more feelings of connectedness to nature, this would help researchers working to reduce deforestation by providing more evidence that these populations may be willing to help reduce deforestation and other harmful environmental activities if given the means to do so.

We present a meta-analysis of 58 individual means from 38 papers which used the CNS to address these questions:

(1) Have CNS scores differed with population demographics such as gender or student status?

(2) To what extent have CNS scores been influenced by methodological factors, such as sample size, scale length, survey language, or peer review?

(3) Are CNS scores higher in developing than developed areas of the world?

Connectedness to Nature Scale

Human's connection to nature has been measured using many different scales and tests: Nature Relatedness (Nisbet et al., 2009), Inclusion of Nature in Self Scale (Schultz, 2001), Environmental Identity Scale (Clayton, 2003) among others. This study focuses on the CNS developed by Mayer and Frantz (2004). Leopold (1949) believed that there was a great need for humans to feel connected with nature to decrease the idea that land is a commodity to be used and abused. He believed that if we saw nature as a "community to which we belong, we may begin to use it with love and respect" (p. xviii). Following these ideas, the CNS was created to measure humans' feelings of connection with nature. Mayer and Frantz (2004) found that those who exhibit higher connection to nature have greater concern for nature, self-identify more as an environmentalist, and report participating in more eco-friendly behaviors. They found the scale to have high internal reliability (alphas found to be between .72 - .84) and validity. The CNS has been widely used and accepted as a measure of a person's affective connection to nature, with one exception. Perrin and Benassi (2009) propose the CNS is actually a measure of a cognitive dimension of connection to nature. However, they also state that it is a consistently reliable measure and strongly correlates with measures of environmentalism. We believe this widely used scale provides a reasonable measure of a person's connection with nature and can be used to compare populations from studies with different characteristics.

Study 1: Meta-Analysis

Meta-analysis and systematic reviews are used to synthesize the evidence from a number of studies for a given question or objective, to direct future research, and to provide context for the interpretation of individual studies (Borenstein et al., 2009). The analysis allows us to characterize the consistency of study means and to estimate the overall magnitude of effects much more precisely than from single studies alone. Meta-analysis procedures also enable us to test factors, often called moderators, which might impact the magnitude of the effect. We performed a meta-analysis to determine what demographic or methodological factors might influence CNS scores.

Methods

Literature Search and Inclusion Criteria

The goal of our search was to locate all studies that used the CNS to provide representation of as many different countries, cultures, and populations as possible. We began by completing a Google Scholar search in December 2015 for all papers citing Mayer and Frantz (2004), the original CNS paper. The initial search returned over 600 citations. We refined the search of these results to include all papers that included the terms *connectedness to nature scale*, *mean*, and *CNS*. This resulted in 152 unique articles. We verified the comprehensiveness of our results with searches of ISI Web of Science (Thompson Reuters Corp., Toronto) and Scopus (Elsevier, Amsterdam) with the search term *connectedness to nature*, which revealed no further articles. Search results contained peer-reviewed articles as well as dissertations, theses, and other non-peer-reviewed reports.

After examining the methods and results sections of the selected articles, 112 were excluded because they did not conduct a survey with the CNS, or did not contain a scale of at least 10 items, a CNS mean, and its sample size. An additional two publications were excluded due to the use of the state version of the CNS rather than the original trait version. Thirty-eight publications, with 58 individual CNS means, met our screening criteria (details of primary studies provided in Appendices E and F).

The CNS means, standard deviations (SD), and sample sizes were collected for each study. In experimental studies, pre-treatment means were used as they provide a baseline CNS mean instead of an experimentally manipulated mean. Several papers contained multiple CNS means from different populations, which were treated as independent studies and included as individual survey means in the analysis. For example, Tam (2013) provided separate CNS means for two locations (China, USA), resulting in two individual means from that article. Olivos et al. (2011) provided distinct means for students and the general population from one study and a separate mean from a second study of only undergraduates, resulting in three study means. Although using multiple means from one publication increases the dependence among means, that are assumed to be independent for meta-analyses (Gurevitch and Hedges, 1999), the greater number of studies increases statistical power (Lajeunesse and Forbes, 2003) and allows for moderator analysis (Lehmann and Rillig, 2015). This approach has been used often in social science meta-analyses (Hawcroft and Milfont, 2010; Rise et al., 2010). Where studies reported multiple means using the same population (Kamitsis and Francis, 2013; Scarborough, 2013), individual means were only included in the analysis once. Therefore, we derived 58 separate study means from the 38 articles.

Data Analysis

We conducted meta-analysis on CNS as a raw, single-group index, where the single group summaries are categorized for moderator comparison[3]. Mean standardization, commonly applied in meta-analyses was unnecessary because CNS was a standard measure employed across the studies (Borenstein et al., 2009). The meta-analysis provides a weighted overall mean CNS score. Our analyses followed the methodology and terminology of Borenstein et al. (2009). We employed a random-effects model and data were analyzed using Comprehensive Meta-Analysis (CMA) software (Version 3, Biostat, Englewood, NJ, USA; 2014). Studies were weighted by the inverse of their variance (w=1/variance), with variance computed from the SD of each study's mean, to insure greater weight was given to studies with small SD, i.e. those that were more precise. Studies that broke participants into randomly assigned groups and did not report the descriptive statistics of each group were averaged for a total mean and SD for the sample size and demographics reported. Two studies did not report a SD so it was imputed using the mean of all other studies' SD.

In addition to mean CNS values, their SD, and sample sizes, we recorded information for six "moderators". Two involved participant characteristics: sex (both/female/male), student population (yes/no). Four involved methodology: peer-reviewed (yes/no), 14-item scale used (yes/no), English survey (yes/no), sample size

[3] While the effect size for the majority of meta-analyses defines the relationship between two groups, commonly mean difference or ratio of means between treatment and control, some meta-analyses are focused on means of a single group or population. This is the case for CNS; it is a single group effect size or simply single group summary (since effect implies a relationship). Whether the index is a two-group effect size or single group summary has no bearing on the meta-analysis computations (Borenstein et al., 2009).

(≤200/>200). Language of studies was assumed to be in the native language for that country if it was not specified.

Studies that used a 7-point response scales required a transformation of the means to a 5-point scale, for consistency and comparison. We used the formula suggested by Aiken (1987):

$$M_Y = L_y - .5w_y + c_y w_y(M_X - L_x + .5w_x)/c_x w_x$$

Where M_Y = 5pt scale score, M_X = 7pt scale score, L_y = lowest Y category option, w_y = Y category width, c_y = number of Y categories, L_x = lowest X category option, w_x = X category width, and c_x = number of X categories. Standard deviations for these studies were also transformed using:

$$SD_y = SD_x(c_y w_y/c_x w_x)$$

Heterogeneity was assessed with the Q statistic and was quantified using I^2, a descriptive index that estimates the ratio of true variation (heterogeneity) to total variation across studies (Borenstein et al., 2009). An I^2 value of zero indicates no true heterogeneity and positive values indicate true heterogeneity in the dataset. We assumed a common among-study variance across all moderator subgroups.

Results

Study Characteristics

The analysis included 58 individual study means, which ranged from 2.78 to 4.54, with a total of 11,883 participants across studies. Peer-reviewed articles constituted 81% (n=47) of the samples, 55% (n=30) were student only populations, and 79% (n=44) were written in English. Studies that included both sexes totaled 78%

(n=45) of the sample, 12% (n=7) were female only, and 10% (n=6) were male only. Also, 86% (n=49) used the original 14-item scale and 59% (n=34) had sample sizes below 200. Studies conducted in the United States comprised 41% of the studies, Australia 16%, and Canada 10% (all other countries fell below 10%).

Moderator Analysis

The forest plots show that CNS summary sizes have been remarkably consistent across experimental variables (Fig. 3.1). This is borne out by several of the analysis statistics. Confidence intervals for each of the levels overlap within each moderator as well as across moderators. The heterogeneity p-values exceeded 0.10, providing no evidence that moderators had any effect on summary CNS values. While a significant heterogeneity p-value would provide evidence that subgroups differ among studies, Borenstein et al. (2009) caution that the converse does not hold. A *p*-value above 0.05 does not necessarily provide evidence that subgroups are consistent among studies, as lack of significance may be due to low statistical power. In this case, however, lack of hetergeneity is strongly indicated by each of the moderator forest plots, as well as by I^2 values of zero for each moderator.

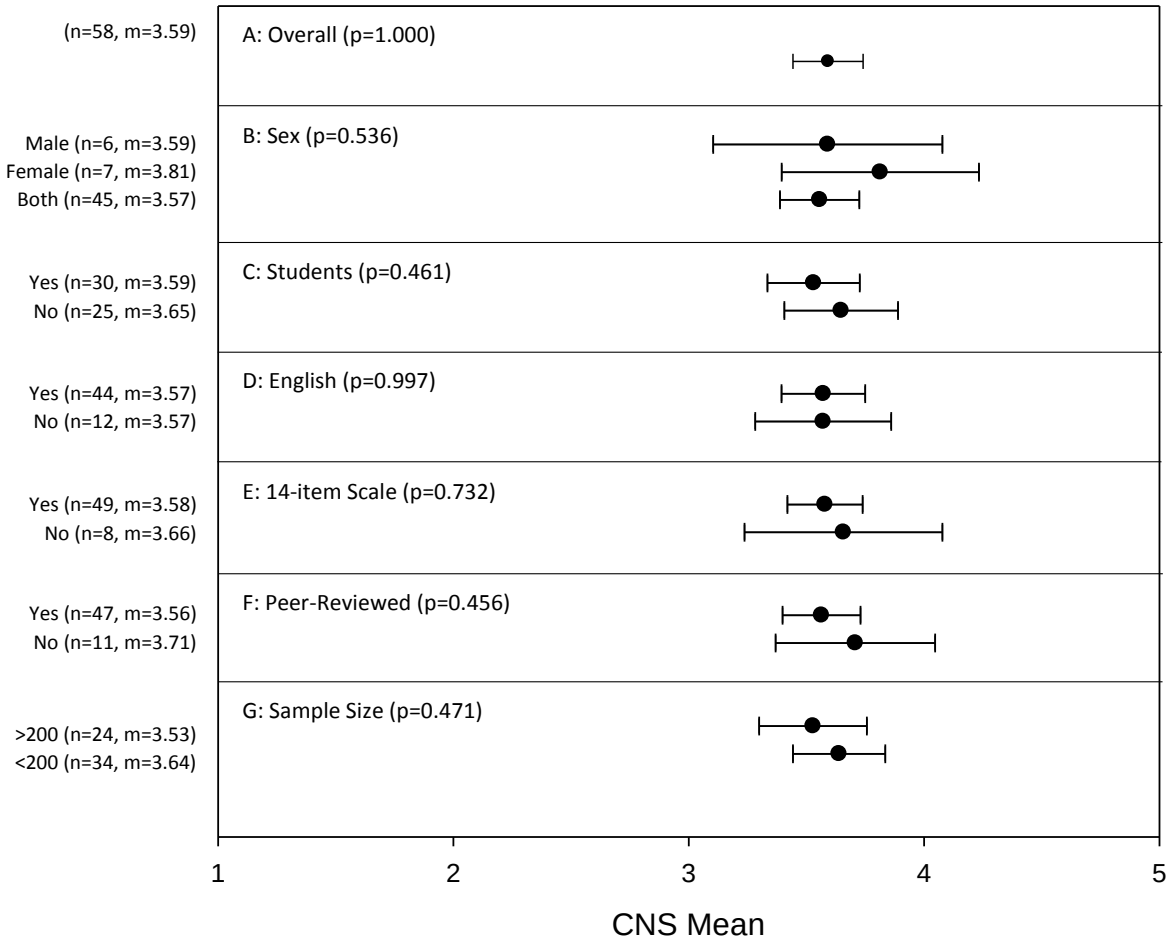


Figure 3.1. Meta-analysis forest plot: weighted summary sizes and 95% confidence intervals for Connectedness to Nature Scale (CNS) in relation to moderator variables. *Note*. n = number of studies contributing to the summary, m = summary value, p = probability that the observed heterogeneity was due entirely to sampling error and not to variation among true effects.

Although there was much overlap, women have tended to score more highly than men (Fig. 3.1B). This is consistent with the literature stating that women express more environmental concern (Franzen and Vogl, 2013; McCright and Xiao, 2014). However, the majority of studies in this analysis did not report separate means for men and women, most noting that there was no significance found. Similarly, students and non-students exhibited similar CNS score (Fig. 3.1C), and CNS scores have been identical whether or not the survey was presented in English (Fig. 3.1D). The number of items included in the scale has had little impact on scores (Fig. 3.1E), as long as they included at least 10 of the original items, and scores have been similar in papers published in peer-reviewed and non-peer-reviewed venues (Fig. 3.1F). Additionally, the summary CNS values have been similar in studies with larger and smaller sample sizes (Fig. 3.1G).

Sensitivity Analysis and Publication Bias

The stability of the overall summary size was assessed with sensitivity analysis. This indicates how much each study contributed to the summary effect, by noting how much the summary effect changes in its absence. One study was removed and the summary value recalculated, and this was repeated for all studies to determine how much any one study affected the summary outcome. There were no extreme studies. The largest change observed was only 0.020; with the removal of study 53's CNS of 4.170 (Geng et al., 2015), the overall summary size was reduced from 3.592 to 3.572. The removal of the study with the lowest CNS, 2.780 in study 45 (Barbaro and Pickett, 2015), caused a shift of 0.014 in the summary size, to 3.606. These very small changes

confirm the consistency of the summary size across studies as portrayed in the moderator analysis and forest plots.

Comparing weighted and unweighted meta-analyses has been used as a form of sensitivity analysis (Cooper, 2010). We applied the comparison to provide an additional perspective on the impact that study precision had on the overall summary size. Across all 58 studies, the overall summary CNS mean was 3.592 with studies weighted by the inverse of variance and 3.600 in an unweighted analysis. The essentially identical overall summary values further illustrate the consistency (lack of heterogeneity) of the CNS survey scores across investigative teams and their varying research conditions.

In meta-analysis of effect sizes, where the summary of interest involves comparison of two groups via a mean difference, it is important to assess the potential for publication bias. This relates to the possibility that non-significant treatment effects may be less likely to be published than significant ones (Rothstein et al., 2005). If this were the case, smaller studies would tend to have larger effect sizes, raising a concern about missing data from smaller, unpublished studies. The possibility of publication bias was assessed statistically with Begg and Mazumbar rank (Kendall) correlation and evaluated graphically with funnel plots of effect sizes versus their standard errors (Begg and Mazumdar, 1994; Borenstein et al., 2009). We visually examined the funnel plot, to identify any tendency for smaller, less precise studies (those with larger SE) to vary more from the overall summary value than larger studies. Large and small studies across the range of standard errors had the expected variability around the common summary size. The Begg and Mazumbar rank correlation test across all CNS means in our analysis resulted in an absolute Kendall tau value below 0.10 and a two-tailed *p*

value of 0.27, indicating no tendency for CNS mean values to increase or decrease according to study size.

We also employed the Egger's linear regression method, generally considered a more powerful test than rank correlation, to assess the relation between a study's "normal deviate" *z*, where *z* = standardized effect size/standard error, and its precision (reciprocal of variance) (Sterne and Egger, 2005). The Egger's linear regression method, like the Kendall rank correlation, is intended to quantify bias revealed by the funnel plot. The two-tailed significance test (Egger's *p* value of 0.90) also indicated no bias.

Discussion

The result of finding no effect for any of the moderators is evidence of the reliability and consistency of this scale. The fact that the summary sizes were extremely consistence across moderators shows that the CNS scale is not affected by any of the moderators used in our analysis and should give researchers confidence in using the scale to compare populations or studies that do not have identical demographics or study methodologies. This is further evidence that treatment effects in experimental studies are actually caused by the treatment and not demographics or methodologies that may differ between sub-populations or studies.

Individual studies have reported differences between males and females (Hine et al., 2008; Cervinka et al., 2011; Frauman and Shaffer, 2014; Swami et al., 2016). However, we did not come to this conclusion for two reasons: (1) four of the six studies reporting a separate mean for males and females did so because their study found a

significant difference between the sexes, and most studies that did not find a difference did not report the means separately (2) the difference in the means is only 0.22 on a scale from 1-5, which would not be considered a substantial difference. Some studies have pointed to student populations not being representative of the general public (Sears, 1986; Tam, 2013), but that was not supported in this analysis as there was no difference found between the means of student and general public samples. No differences between studies that have been peer-reviewed and those that have not shows that the rigor of non-peer reviewed studies is still quite high. Moreover, sample sizes for certain social science analysis methods is often a concern, but our results show that this did not have a moderating effect on mean CNS scores. Additionally, the scales given in a language other than English had almost identical means to the English versions (3.571 and 3.572, not rounded). We believe that this is evidence that this scale can be effectively used and compared with international, non-English, populations.

Study 2: Belize CNS

We wanted to begin to address the CNS research gap in developing countries and determine if there is a difference in feelings of connectedness to nature in the developing areas of these countries and more developed areas around the world. Through personal observation, we determined that populations in some developing areas, specifically our study area in Belize, have more daily contact with the natural world. In our study area, it is common for windows and doors to be open all day, people to walk instead of ride in vehicles, and town and villages are small and rural. We hypothesized that the mean CNS scores for this population will be higher than the mean

found in our meta-analysis of CNS scores from developed areas. Although some of the CNS studies used in the meta-analysis have been conducted in developing countries, these studies' participants were all students, most being university students from large cities, and we considered them to live in a developed area within their country (Tam, 2013; Geng et al., 2015). The one study that could be considered in a developing area, other than our own, was Johnson-Pynn et al. (2014). However, in this study secondary school students from Uganda, Africa had all been in an environmental organization for at least a year and where taking the CNS in English, not their first language. When this study is removed from the overall meta-analysis mean, there is no change in the overall mean score (m=3.59).

Methods

Participants and Procedures

In order to test our hypothesis, we administered the CNS to women residents in a rural section of the developing country of Belize. Only women were surveyed because the CNS was contained in the survey for a larger study conducted in the Cayo District of Belize quantifying women's willingness to participate in a conservation program (see Kaeser et al. 2015 for further information on this survey instrument). We conducted surveys in the town of Benque Viejo Del Carmen (pop. 6.140) and the villages of San Jose Succotz (pop. 2.322) and Arenal (pop. 612) over a 4 week period in May and June 2015. We surveyed one woman over the age of 18 at each residence due to the likelihood that women in the same household may hold similar views about the topic. We attempted to visit every house in each community, however, we may have omitted

some due to a lack of current and detailed street maps. Surveys were read to the participants due to low literacy rates and were conducted in the language of their choosing, English or Spanish, to allow for better understanding (since our meta-analysis did not show a difference in CNS means between studies conducted in difference languages, results were not separated for this study). Participants included 450 (after 29 participants were dropped due to missing data on this scale) native Belizean women between the ages of 18 and 89 (m = 35.5, SD = 14.1). Of the participants, 50% had completed only primary school, 27% had completed high school, 11% had completed some junior college equivalent, 3% had completed some bachelor's degree equivalent, and 9% choose not to respond.

Only women were surveyed because that was the population of interest of the larger study. Women have been shown to score higher on the CNS than men in some populations (Mayer and Frantz, 2004; Mayer et al., 2009; Cervinka et al., 2011; Frauman and Shaffer, 2014), but was not found to be the case in our meta-analysis. Therefore, we believe the results from these women can work as an exploratory study to determine the need for future research in developing areas.

Measure

The CNS (Mayer and Frantz, 2004) was designed to assess affective connectedness of a person toward the natural environment. This 14-item scale includes statements such as "I think of the natural world as a community to which I belong" and was rated on a 5-point scale (1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree; coding was reversed for the meta-analysis for consistency, i.e. 1 =

strongly disagree; 5 = strongly agree, and will be presented in this manner throughout the rest of the paper). Four of the items were reworded for better comprehension by this population due to their low literacy. For example, “My personal welfare is independent of the welfare of the natural world” was changed to “My personal well-being does not rely on the health of the natural world” (reverse coded). The English and Spanish versions were checked by bilingual natives for understanding and content consistency (See Appendix D for all scale items).

A factor analysis to test internal reliability revealed a Cronbach’s alpha of 0.74, showing that the scale is reliable and all items are measuring the intended construct. The three reverse coded items loaded low on the first factor and all loaded high on a second factor, and one other item loaded on a third factor. However, the Eigenvalue of the first factor was 5.071 and had an explained variance of 36.2%, very similar to the original studies completed by the scales authors (Mayer and Frantz, 2004). Dropping the reverse coded items raised the overall mean to 4.41 and the Cronbach’s alpha to 0.87. However, for consistency all 14 items were left in for the comparison, even though it would have resulted in a higher overall mean.

Results and Comparison of Means

Participants were found to have high connectedness to nature scores (m = 4.22 SD = 0.47). When the mean from the Belize study was compared to the overall mean from the meta-analysis, there was a difference of 0.63 points on a 5-point scale (meta-analysis overall m=3.59, Belize m=4.22).

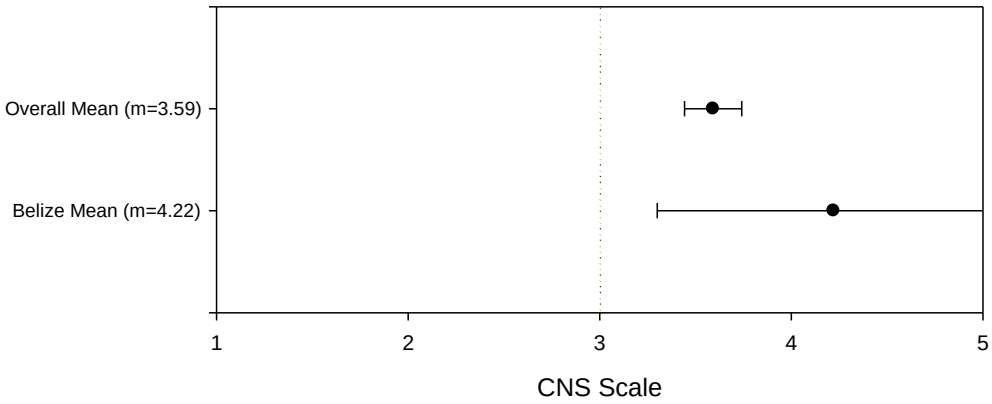


Figure 3.2: Forest plot comparing the overall meta-analysis CNS mean and the Belize CNS mean (Note: The large CI bar for the Belize mean reflects the small sample size of a single study in the overall analysis)

Discussion

We found that the Belize population, observed to have more daily contact with nature than a typical developed area (personal observation), did have a higher CNS mean than the overall meta-analysis mean. This provides some evidence that developing areas have higher feelings of connection to nature, possibly because their residents are in more contact with nature on a daily basis. For example, they walk more because there are fewer cars, live and work in open air buildings due to less use of air conditioners, and frequent outdoor food markets instead of indoor super markets.

We believe that these results are reliable for this particular population, however, there may have been some acquiescence bias in our results. This population is a very agreeable population (personal observations). Additionally, surveys were read to the respondent for better understanding and opportunity for explanation, which may have led to the respondents choosing more favorable answers to please the researcher. This

is also evidenced by the negatively worded questions all loading on a second factor. However, this could also be explained by the negatively worded questions being harder to comprehend as our population had low educational attainment levels and may have chosen positive responses when the survey question was not well understood (Krosnick, 1991).

General Discussion

The meta-analysis provides evidence that the CNS is not only reliable, but it is consistent across populations, study sizes, peer-reviewed status, sexes, scale length, and languages. Researchers should be confident in their results because of its consistency between these moderators. This makes the CNS good for comparisons between treatments or populations, because demographics and methodologies are not affecting the differences between means. This meta-analysis is evidence that the CNS is a robust instrument for comparing populations' connection to nature, as no moderating effects were identified for the examined measures.

The Belize study was found to be the second highest of all the means. It was one of six studies whose mean was above 4.00. In two of these studies' participants were outdoor recreation members or leaders (Brymer et al., 2010; Frauman and Shaffer, 2014) which most likely explains their high feelings of connectedness with nature. Of the other studies, one was conducted in England (Swami et al., 2016), one in China (Geng et al., 2015), and one with students from the west coast of the United States. Although, none of these study characteristics likely explains their higher means, it is interesting that two of them were conducted outside the United States, one of which was in China,

a developing country. Even though the meta-analysis does not suggest it, there may be some differences between cultures around the world, as suggested by Tam (2013) between US and China populations.

We believe the high mean of the Belize study is due to the population being in more contact with nature on a regular basis, therefore, they actually have more feelings of being in connection with nature. This fits with another study that found that participants who reported more contact with nature on a daily basis have higher CNS scores (Kamitsis and Francis, 2013), and with studies that showed increases in CNS scores after participants were given a nature experience (Hine and Pretty, 2008; Mayer et al., 2009; Zhang et al., 2014b). These results support the hypothesis that more contact with nature leads to greater feelings of connectedness to nature. This is important because it has been determined that greater feelings of connectedness to nature lead to more pro-environmental behaviors (Mayer and Frantz, 2004; Brick and Lewis, 2014; Barbaro and Pickett, 2015; Geng et al., 2015; Pereira and Forster, 2015). Therefore, in order to increase participation in conservation, environmental policy support, and other pro-environmental behaviors, developed nations need to put a greater emphasis on getting people out of the built environment and into nature. Additionally, this is good news for developing countries in that they may have large populations of people who are already more likely to participate in pro-environmental behaviors than their developed country counterparts. Therefore, developing countries trying to progress in more environmentally friendly ways, or trying to reduce their carbon output may face less resistance than already developed areas.

Furthermore, there is still the question of whether men and women differ in their feelings of connection with nature. There have been some studies that have found a significant difference in CNS means between the sexes (Hine et al., 2008; Cervinka et al., 2011; Frauman and Shaffer, 2014; Swami et al., 2016). However, the majority of studies using the CNS reported no significant difference. This is a topic that may need further investigation.

The difference between our Belize study mean and the meta-analysis summary size, as well as the fact that the Belize mean was the second highest of all the means, suggests a possible difference between developed and developing areas' connectedness to nature. However, since only two of the studies included were in developing areas, we cannot generalize our results to other developing areas, but suggest that further research needs to be executed to confirm our findings.

Limitations

It is important to note that there are areas in developing countries that would be considered developed areas and vise-versa for developed countries. We are not concluding that all populations in developing countries would have high CNS score, because some people live in major cities that are much like those in developed countries. However, we do believe that the more rural, less developed areas that rely more on natural resources and have more actual contact with nature would have greater feelings of connectedness to nature and may be more willing to work toward development in a more sustainable manner.

One of the limitation of the Belize study was that only women were surveyed. If women do in fact have greater feelings of connection with nature, as some studies suggest, then our study mean may be slightly inflated. However, we still believe that it was high enough above the overall meta-analysis mean to conclude that it likely represents a real difference. Additionally, we believe the survey's negatively worded questions may pose a comprehension problem for population with lower literacy rates. These questions should be carefully thought out and possibly reworded for use with populations in developing areas who may have lower literacy rates than the populations used in studies in more developed areas.

Future Directions

Based on these results, we recommend that the CNS be further tested with populations in developing areas of the world. Additionally, it would be important to define and measure the respondents' actual or self-reported daily contact with nature. This would give further evidence that being in greater contact with nature actually increases a person's feelings of connection with the natural world. Having more substantial evidence for this could help to influence policy makers, educators, and the general public about the importance of people having more contact with nature to increase pro-environmental behaviors. We would like to continue to use the scale in conjunction with other measures, such as well-being and pro-environmental behaviors, in developing areas to determine if there is a difference from similar studies completed in developed areas. It would also be interesting to assess connectedness to nature in rural areas of developed countries and its link to their contact with nature to determine if

there is a true difference between developed and developing countries CNS scores, when amount of contact with nature is kept constant.

References

Aiken, L. R. (1987). "Formulas for equating ratings on different scales." Educational and Psychological Measurement **47**(1): 51-54.

Barbaro, N. and S. M. Pickett (2015). "Mindfully green: Examining the effect of connectedness to nature on the relationship between mindfulness and engagement in pro-environmental behavior." Personality and Individual Differences **93**: 137-142.

Begg, C. B. and M. Mazumdar (1994). "Operating characteristics of a rank correlation test for publication bias." Biometrics: 1088-1101.

Borenstein, M. H., L. Higgins and J. Rothstein (2009). "HR (2009). Introduction to meta-analysis." Chichester, England: Wiley. doi **10**: 9780470743386.

Brick, C. and G. J. Lewis (2014). "Unearthing the “Green” Personality Core Traits Predict Environmentally Friendly Behavior." Environment and Behavior: 1-24.

Brymer, E., T. Gray, C. Carpenter and W. Cotton (2010). "Profiling outdoor leadership." The Journal of Outdoor Recreation, Education, and Leadership **2**(1): 93-108.

Buis, A. and S. Cole (2011). "New NASA Map Reveals Tropical Forest Carbon Storage." http://www.nasa.gov/topics/earth/features/earth20110531.html.

Cervinka, R., K. Röderer and E. Hefler (2011). "Are nature lovers happy? On various indicators of well-being and connectedness with nature." Journal of Health Psychology **17**: 379-388.

Clayton, S. D. (2003). Identity and the natural environment: The psychological significance of nature. Cabridge, MA, MIT Press.

Cooper, H. (2010). Research synthesis and meta-analysis (Vol. 2), London: Sage.

Davis, J. L., B. Le and A. E. Coy (2011). "Building a model of commitment to the natural environment to predict ecological behavior and willingness to sacrifice." Journal of Environmental Psychology **31**(3): 257-265.

Ernst, J. and S. Theimer (2011). "Evaluating the effects of environmental education programming on connectedness to nature." Environmental Education Research **17**(5): 577-598.

FAO, U. (2011). "FAOSTAT database." Website UN FAO.

Frantz, C., F. S. Mayer, C. Norton and M. Rock (2005). "There is no “I” in nature: The influence of self-awareness on connectedness to nature." Journal of Environmental Psychology **25**(4): 427-436.

Franzen, A. and D. Vogl (2013). "Two decades of measuring environmental attitudes: A comparative analysis of 33 countries." Global Environmental Change **23**(5): 1001-1008.

Frauman, E. and F. Shaffer (2014). "A Preliminary Examination of College Outdoor Program Staff Connectedness to Nature." Proceedings of the 2013/2014 Southeastern Recreation Research Conference: 38.

Geng, L., J. Xu, L. Ye, W. Zhou and K. Zhou (2015). "Connections with Nature and Environmental Behaviors." PLoS ONE **10**(5): e0127247.

Gosling, E. and K. J. Williams (2010). "Connectedness to nature, place attachment and conservation behaviour: Testing connectedness theory among farmers." Journal of Environmental Psychology **30**(3): 298-304.

Gurevitch, J. and L. V. Hedges (1999). "Statistical issues in ecological meta-analyses." Ecology **80**(4): 1142-1149.

Hawcroft, L. J. and T. L. Milfont (2010). "The use (and abuse) of the new environmental paradigm scale over the last 30 years: A meta-analysis." Journal of Environmental Psychology **30**(2): 143-158.

Hinds, J. and P. Sparks (2008). "Engaging with the natural environment: The role of affective connection and identity." Journal of Environmental Psychology **28**(2): 109-120.

Hine, R., J. Peacock and J. Pretty (2008). "Evaluating the impact of environmental volunteering on behaviours and attitudes to the environment." Report for the British Trust of Conservation Volunteers.

Hine, R. and J. Pretty (2008). "Feed your Senses': The effects of visiting a LEAF farm." Report for LEAF (UK) as part of Open Farm Sunday.

Howell, A. J., R. L. Dopko, H.-A. Passmore and K. Buro (2011). "Nature connectedness: Associations with well-being and mindfulness." Personality and Individual Differences **51**(2): 166-171.

Johnson-Pynn, J. S., L. R. Johnson, R. Kityo and D. Lugumya (2014). "Students and Scientists Connect with Nature in Uganda, East Africa." International Journal of Environmental and Science Education **9**(3): 311-327.

Kamitsis, I. and A. J. Francis (2013). "Spirituality mediates the relationship between engagement with nature and psychological wellbeing." Journal of Environmental Psychology **36**: 136-143.

Krosnick, J. A. (1991). "Response strategies for coping with the cognitive demands of attitude measures in surveys." Applied Cognitive Psychology **5**(3): 213-236.

Lajeunesse, M. J. and M. R. Forbes (2003). "Variable reporting and quantitative reviews: a comparison of three meta-analytical techniques." Ecology Letters **6**(5): 448-454.

Lehmann, A. and M. C. Rillig (2015). "Arbuscular mycorrhizal contribution to copper, manganese and iron nutrient concentrations in crops–A meta-analysis." Soil Biology and Biochemistry **81**: 147-158.

Leong, L. Y. C., R. Fischer and J. McClure (2014). "Are nature lovers more innovative? The relationship between connectedness with nature and cognitive styles." Journal of Environmental Psychology **40**: 57-63.

Leopold, A. (1949). "Sand County Almanac." New York, Oxford.

Loureiro, A. and S. Veloso (2014). "Outdoor Exercise, Well-Being and Connectedness to Nature." Psico **45**(3): 299-304.

Markowitz, E. M. and B. F. Malle (2012). "Did you just see that? Making sense of environmentally relevant behavior." Ecopsychology **4**(1): 37-50.

Mayer, F. S. and C. M. Frantz (2004). "The connectedness to nature scale: A measure of individuals' feeling in community with nature." Journal of Environmental Psychology **24**(4): 503-515.

Mayer, F. S., C. M. Frantz, E. Bruehlman-Senecal and K. Dolliver (2009). "Why is nature beneficial? The role of connectedness to nature." Environment and Behavior **41**(5): 607-643.

McCright, A. M. and C. Xiao (2014). "Gender and environmental concern: Insights from recent work and for future research." Society & Natural Resources **27**(10): 1109-1113.

Nisbet, E. K., J. M. Zelenski and S. A. Murphy (2009). "The nature relatedness scale: Linking individuals' connection with nature to environmental concern and behavior." Environment and Behavior **41**(5): 715-740.

Olivos, P. and J.-I. Aragonés (2011). "Psychometric properties of the Environmental Identity scale (EID)." Psyecology **2**(1): 65-74.

Olivos, P., J. I. Aragonés and M. Amérigo (2011). "The connectedness to nature scale and its relationship with environmental beliefs and identity." International Journal of Hispanic Psychology **4**(1): 5-19.

Pereira, M. and P. M. Forster (2015). "The Relationship Between Connectedness to Nature, Environmental Values, and Pro-environmental Behaviours." Reinvention: An International Journal of Undergraduate Research **8**(2).

Perrin, J. L. and V. A. Benassi (2009). "The connectedness to nature scale: A measure of emotional connection to nature?" Journal of Environmental Psychology **29**(4): 434-440.

Poon, K.-T., F. Teng, J. T. Chow and Z. Chen (2015). "Desiring to connect to nature: The effect of ostracism on ecological behavior." Journal of Environmental Psychology **42**: 116-122.

Pretty, J. N. (2002). Agri-culture: Reconnecting people, land, and nature. Sterling, VA, Earthscan.

Rise, J., P. Sheeran and S. Hukkelberg (2010). "The role of self-identity in the theory of Planned behavior: A meta-analysis." Journal of Applied Social Psychology **40**(5): 1085-1105.

Rothstein, H., A. J. Sutton and M. Borenstein (2005). Publication bias in meta-analysis. Chichester, West Sussex, UK, Wiley.

Scarborough, N. (2013). "Feelings of connectedness to nature: A comparison of Park & Recreation Management students and Sport Management students." Undergraduate Honors Thesis **Paper 85**. http://dc.etsu.edu/honors/85.

Schultz, P. W. (2001). "The structure of environmental concern: Concern for self, other people, and the biosphere." Journal of Environmental Psychology **21**(4): 327-339.

Sears, D. O. (1986). "College sophomores in the laboratory: Influences of a narrow data base on social psychology's view of human nature." Journal of Personality and Social Psychology **51**(3): 515.

Shaw, A., K. Miller and G. Wescott (2013). "Wildlife gardening and connectedness to nature: Engaging the unengaged." Environmental Values **22**(4): 483-502.

Sterne, J.A.C., and M. Egger (2005). Regression methods to detect publication and other bias in meta-analysis. In "Publication Bias in Meta-Analysis – Prevention, Assessment and Adjustments", eds. H.R. Rothstein, A.J. Sutton, M. Borenstein. John Wiley & Sons, Ltd.

Swami, V., L. von Nordheim and D. Barron (2016). "Self-esteem mediates the relationship between connectedness to nature and body appreciation in women, but not men." Body Image **16**: 41-44.

Tam, K.-P. (2013). "Concepts and measures related to connection to nature: Similarities and differences." Journal of Environmental Psychology **34**: 64-78.

Wilson, E. O. (1984). Biophilia. Cambridge, MA, Harvard University Press.

Zhang, J. W., R. T. Howell and R. Iyer (2014a). "Engagement with natural beauty moderates the positive relation between connectedness with nature and psychological well-being." Journal of Environmental Psychology **38**: 55-63.

Zhang, J. W., P. K. Piff, R. Iyer, S. Koleva and D. Keltner (2014b). "An occasion for unselfing: beautiful nature leads to prosociality." Journal of Environmental Psychology **37**: 61-72.

Appendix D: Revised Connectedness to Nature Scale

1. I often feel that I am part of the natural world around me.
2. I think of the natural world as a community to which I belong.
3. I recognize and appreciate the intelligence of other living organisms.
4. I often feel disconnected from nature.
5. When I think of my life, I imagine myself to be part of a larger cyclical process of living.
6. I often feel a close relationship with animals and plants.
7. I feel as though I belong to the Earth as equally as it belongs to me.
8. I have a deep understanding of how my actions affect the natural world.
9. I often feel part of the web of life.
10. I feel that all inhabitants of Earth, human and nonhuman, share a common ‘life force’.
11. Like a tree can be part of a forest, I feel included within the broader natural world.
12. When I think of my place on Earth, I consider myself to be above all other things in nature.
13. I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the tress.
14. My personal well-being does not rely on the health of the natural world.

Appendix E: Summary statistics for all CNS studies included in the meta-analysis

Authors	Location	Sample Size	Sex (% female)	Students	Average Age	Means	SD	Peer-reviewed	14 - Item scale	English
Arbuthnott et al. (2014)	Canada	90	66	no	-	3.74	0.66	yes	no	yes
Barbaro and Pickett (2015)	1. USA	360	68	yes	20.1	3.32	0.48	yes	yes	yes
	2. USA	296	60	no	38.0	2.78	0.58	yes	yes	yes
Brick and Lewis (2014)	USA	345	53.3	no	36.7	3.54	0.74	yes	yes	yes
Byrmer and Cuddihy (2009)	Australia	131	36.6	yes	20.2	3.66	0.87	no	yes	yes
Brymer et al. (2010)	Worldwide	104	32.7	no	39.8	4.10	0.97	yes	yes	-
Cervinka et al. (2011)	1. Austria	284	100	no	36.9	3.66	0.73	yes	no	no
	2. Austria	263	0	no	36.9	3.40	0.70	yes	no	no
Davis et al. (2011)	USA	248	57.3	yes	22.0	3.06	-	yes	yes	yes
Frantz et al. (2005)	1. USA	66	59	yes	-	3.29	0.58	yes	yes	yes
	2. USA	60	48	yes	-	3.17	0.59	yes	yes	yes
Frauman and Shaffer (2014)	USA	168	45.9	-	-	4.13	0.62	no	no	yes
Geng et al. (2015)	China	113	44	yes	26.5	4.17	0.41	yes	yes	no
Gosling and Williams (2010)	Australia	138	14	-	-	3.90	0.66	yes	no	yes
Hine et al. (2008)	England	403	44	no	-	3.50	0.58	no	yes	yes
Hine and Pretty (2008)	England	71	80	no	35.0	3.63	??	no	no	yes
Howell et al. (2011)	1. Canada	437	69.4	yes	22.2	3.27	0.63	yes	yes	yes
	2. Canada	265	68	yes	20.4	3.27	0.55	yes	yes	yes
Howell et al. (2013)	1. Canada	311	68	yes	22.1	3.31	0.56	yes	yes	yes
	2. Canada	227	63	yes	23.3	3.32	0.60	yes	yes	yes
James and Henderson (2008)	USA	144	-	-	-	3.71	0.60	no	yes	yes
Johnson-Pynn et al. (2014)	Uganda	84	50	yes	19.6	3.72	0.43	yes	yes	yes
Kaeser et al.	Belize	450	100	no	35.5	4.22	0.47	no	yes	both
Kamitsis and Francis (2013)	1. Australia	53	100	no	-	3.59	0.66	yes	yes	yes
	2. Australia	123	0	no	-	3.86	0.63	yes	yes	yes
LaCharite (2014)	USA	23	34.8	yes	-	3.92	-	no	yes	yes
Lee et al. (2015)	Canada	324	63.2	yes	19.7	3.28	0.54	yes	yes	yes
Leong et al. (2014)	1. Singapore	138	45.7	yes	14.6	3.61	0.52	yes	yes	no
	2. Singapore	185	47	yes	13.5	3.42	0.46	yes	yes	No
Loureiro and Veloso (2014)	1. Portugal	159	51.6	no	33.0	3.41	0.67	yes	yes	No
	2. Portugal	123	33.3	no	32.0	3.43	0.65	yes	yes	no

Authors	Location	Sample Size	Sex (% female)	Students	Average Age	Means	SD	Peer-reviewed	14 - Item scale	English
Lovell (2010)	USA	75	61.3	yes	18.6	3.24	0.56	no	no	yes
Markowitz and Malle (2012)	USA	63	64	yes	19.7	3.52	0.60	yes	yes	yes
Mayer and Frantz (2004)	1. USA	29	100	no	31.0	3.76	0.47	yes	yes	yes
	2. USA	31	0	no	31.0	3.54	0.74	yes	yes	yes
	3. USA	270	-	yes	-	3.82	0.48	yes	yes	yes
	4. USA	135	66	no	36.0	3.52	0.56	yes	yes	yes
Olivos and Aragonés (2011)	Spain	282	81	yes	21.4	3.58	0.50	yes	yes	no
Olivos et al. (2011)	1. Spain	135	68	yes	20.0	3.42	0.44	yes	yes	no
	2. Spain	112	49	no	44.0	3.44	0.45	yes	yes	no
	3. Spain	204	82	yes	20.0	3.65	0.47	yes	no	no
Pereira and Forster (2015)	1. Australia	57	100	yes	33.0	3.52	0.60	yes	yes	yes
	2. Australia	19	0	yes	33.0	3.30	0.75	yes	yes	yes
Putnam (2006)	USA	213	-	yes	-	3.52	0.65	no	yes	yes
Scarborough (2013)	1. USA	17	100	yes	-	3.57	0.63	no	yes	yes
	2. USA	37	0	yes	-	3.56	0.43	no	yes	yes
Shaw et al. (2013)	1. Australia	261	-	no	-	3.91	0.52	yes	yes	yes
	2. Australia	417	60	no	-	3.57	0.59	yes	yes	yes
Swami et al. (2016)	1. England	210	100	no	36.9	4.00	0.55	yes	yes	yes
	2. England	170	0	no	36.9	3.79	0.63	yes	yes	yes
Tam (2013)	1. China	322	45	yes	20.4	3.34	0.48	yes	yes	no
	2. USA	185	64	no	33.4	3.61	0.74	yes	yes	yes
Trigwell et al. (2014)	Australia	216	71.8	no	35.3	3.76	0.62	yes	yes	yes
Vess et al. (2012)	1. USA	48	67	yes	18.7	3.93	0.84	yes	yes	yes
	2. USA	84	64	yes	18.4	3.91	0.86	yes	yes	yes
Zhang et al. (2014a)	1. USA	1108	44.4	no	41.1	3.59	0.83	yes	yes	yes
	2. USA	151	73.1	yes	21.4	4.54	0.88	yes	yes	yes
Zhang et al. (2014b)	USA	846	41.5	no	39.6	3.48	0.88	yes	yes	yes

Appendix F: References for studies used in the meta-analysis

1. Arbuthnott, K. D., G. C. Sutter and C. T. Heidt (2014). "Natural history museums, parks, and connection with nature." Museum Management and Curatorship **29**(2): 102-121.

2. Barbaro, N. and S. M. Pickett (2015). "Mindfully green: Examining the effect of connectedness to nature on the relationship between mindfulness and engagement in pro-environmental behavior." Personality and Individual Differences **93**: 137-142.

3. Brick, C. and G. J. Lewis (2014). "Unearthing the “Green” Personality Core Traits Predict Environmentally Friendly Behavior." Environment and Behavior: 0013916514554695.

4. Brymer, E., T. Gray, C. Carpenter and W. Cotton (2010). "Profiling outdoor leadership." The Journal of Outdoor Recreation, Education, and Leadership **2**(1): 93-108.

5. Byrmer, E. and T. F. Cuddihy (2009). Ecological perspectives and wellness. Edited Proceedings of the 26th ACHPER International Conference: Creating Active Futures, School of Human Movement Studies, Queensland University of Technology, Brisbane, QLD 4059, Australia.

6. Cervinka, R., K. Röderer and E. Hefler (2011). "Are nature lovers happy? On various indicators of well-being and connectedness with nature." Journal of Health Psychology: 1359105311416873.

7. Davis, J. L., B. Le and A. E. Coy (2011). "Building a model of commitment to the natural environment to predict ecological behavior and willingness to sacrifice." Journal of Environmental Psychology **31**(3): 257-265.

8. Frantz, C., F. S. Mayer, C. Norton and M. Rock (2005). "There is no “I” in nature: The influence of self-awareness on connectedness to nature." Journal of Environmental Psychology **25**(4): 427-436.

9. Frauman, E. and F. Shaffer (2014). "A Preliminary Examination of College Outdoor Program Staff Connectedness to Nature." Proceedings of the 2013/2014 Southeastern Recreation Research Conference: 38.

10. Geng, L., J. Xu, L. Ye, W. Zhou and K. Zhou (2015). "Connections with Nature and Environmental Behaviors." PLoS ONE **10**(5): e0127247.

11. Gosling, E. and K. J. Williams (2010). "Connectedness to nature, place attachment and conservation behaviour: Testing connectedness theory among farmers." Journal of Evironmental Psychology **30**(3): 298-304.

12. Hine, R., J. Peacock and J. Pretty (2008). "Evaluating the impact of environmental volunteering on behaviours and attitudes to the environment." Report for the British Trust of Conservation Volunteers.

13. Hine, R. and J. Pretty (2008). "Feed your Senses': The effects of visiting a LEAF farm." Report for LEAF (UK) as part of Open Farm Sunday.

14. Howell, A. J., R. L. Dopko, H.-A. Passmore and K. Buro (2011). "Nature connectedness: Associations with well-being and mindfulness." Personality and Individual Differences **51**(2): 166-171.

15. Howell, A. J., H.-A. Passmore and K. Buro (2013). "Meaning in nature: meaning in life as a mediator of the relationship between nature connectedness and well-being." Journal of Happiness Studies **14**(6): 1681-1696.

16. James, P. A. and K. A. Henderson (2008). "An exploration of camp directors' affective connection to nature and camp programming." Ninth Biennial Research Symposium: 36.

17. Johnson-Pynn, J. S., L. R. Johnson, R. Kityo and D. Lugumya (2014). "Students and Scientists Connect with Nature in Uganda, East Africa." International Journal of Environmental and Science Education **9**(3): 311-327.

18. Kaeser, A.S., Willcox, A.S., and Auge, R.M. *Presented in this paper*.

19. Kamitsis, I. and A. J. Francis (2013). "Spirituality mediates the relationship between engagement with nature and psychological wellbeing." Journal of Environmental Psychology **36**: 136-143.

20. LaCharite, K. (2014). "Cultivating Sustainability: Impact of Campus Agriculture Projects on Undergraduate Student Connections to Nature, Environmentally Responsible Behaviors, and Perceptions (Doctoral Dissertation)." Available from ProQuest(3681161).

21. Lee, K., M. C. Ashton, J. Choi and K. Zachariassen (2015). "Connectedness to Nature and to Humanity: their association and personality correlates." Frontiers in Psychology **6**: 1-11.

22. Leong, L. Y. C., R. Fischer and J. McClure (2014). "Are nature lovers more innovative? The relationship between connectedness with nature and cognitive styles." Journal of Environmental Psychology **40**: 57-63.

23. Loureiro, A. and S. Veloso (2014). "Outdoor Exercise, Well-Being and Connectedness to Nature." Psico **45**(3): 299-304.

24. Lovell, C. E. (2010). "Letting the Outside In: Connectedness to Nature's Buffering Effects Against Social Rejection (Electronic These or Dissertation)." Retrieved from https://etd.ohiolink.edu/.

25. Markowitz, E. M. and B. F. Malle (2012). "Did you just see that? Making sense of environmentally relevant behavior." Ecopsychology **4**(1): 37-50.

26. Mayer, F. S. and C. M. Frantz (2004). "The connectedness to nature scale: A measure of individuals' feeling in community with nature." Journal of Environmental Psychology **24**(4): 503-515.

27. Olivos, P. and J.-I. Aragonés (2011). "Psychometric properties of the Environmental Identity scale (EID)." Psyecology **2**(1): 65-74.

28. Olivos, P., J. I. Aragonés and M. Amérigo (2011). "The connectedness to nature scale and its relationship with environmental beliefs and identity." International Journal of Hispanic Psychology **4**(1): 5-19.

29. Pereira, M. and P. M. Forster (2015). "The Relationship Between Connectedness to Nature, Environmental Values, and Pro-environmental Behaviours." Reinvention: An international journal of undergraduate research **8**(2).

30. Putnam, T. E. (2006). Environmental Paradigm Shifts: Their Causes, Attributes, and Implications for Environmental Sustainability. Proceedings of the National Conference on Undergraduate Research (NCUR).

31. Scarborough, N. (2013). "Feelings of connectedness to nature: A comparison of Park & Recreation Management students and Sport Management students." Undergraduate Honors Thesis **Paper 85**: http://dc.etsu.edu/honors/85.

32. Shaw, A., K. Miller and G. Wescott (2013). "Wildlife gardening and connectedness to nature: Engaging the unengaged." Environmental Values **22**(4): 483-502.

33. Swami, V., L. von Nordheim and D. Barron (2016). "Self-esteem mediates the relationship between connectedness to nature and body appreciation in women, but not men." Body Image **16**: 41-44.

34. Tam, K.-P. (2013). "Concepts and measures related to connection to nature: Similarities and differences." Journal of Environmental Psychology **34**: 64-78.

35. Trigwell, J. L., A. J. Francis and K. L. Bagot (2014). "Nature Connectedness and Eudaimonic Well-Being: Spirituality as a Potential Mediator." Ecopsychology **6**(4): 241-251.

36. Vess, M., J. Arndt and C. R. Cox (2012). "Faith and Nature The Effect of Death-Relevant Cognitions on the Relationship Between Religious Fundamentalism and Connectedness to Nature." Social Psychological and Personality Science **3**(3): 333-340.

37. Zhang, J. W., R. T. Howell and R. Iyer (2014a). "Engagement with natural beauty moderates the positive relation between connectedness with nature and psychological well-being." Journal of Environmental Psychology **38**: 55-63.

38. Zhang, J. W., P. K. Piff, R. Iyer, S. Koleva and D. Keltner (2014b). "An occasion for unselfing: beautiful nature leads to prosociality." Journal of Environmental Psychology **37**: 61-72.

CHAPTER V
POLICY RECOMMENDATIONS AND CONCLUSIONS

Policy Recommendations

A community-based conservation (CBC) group, that works to sustainably harvest and manage resources, could reach greater success with policy changes implemented locally and nationally. Additionally, CBC goals often align with those of international policy agreements and accords. For example, reducing deforestation is an objective of the Belize Forest Department (FD) and the Department of the Environment; internationally-reducing deforestation and degradation is an objective of the recent Framework Convention on Climate Change signed in Paris (UNFCCC, 2015), and The United Nations' Sustainable Development Goals (SDG; SDG, 2016). Partnerships with these organizations could increase the environmental and societal impacts of CBC groups locally, nationally, and internationally. Therefore, it is important to discuss policy recommendations to increase the success and impacts of the proposed women's CBC group and how it could address global policies.

Decentralization of natural resource management is one of the key components of many CBC projects and has been successful in reducing deforestation rates. Providing local community members with land tenure rights would be an important first step toward decentralization and the creation of a successful CBC program. Tenure rights define how property rights are allocated; who can use what, when, and under what conditions (FAO, 2002). The Vaca is currently designated a forest reserve, prohibiting resource use except through logging concessions, which presently are only granted to large companies (Belize, 2000). A women's CBC group would need to be granted tenure rights to legally harvest forest resources. Friends of the Vaca Forest Reserve (FVFR), is a CBC group currently using forest resources sustainably under an

unofficial verbal agreement with the Belize FD, but this agreement is tenuous and technically illegal (Arnoldo Melendez, personal communication). Local land tenure rights could provide the Belize FD, who has been said to lack the capacity to properly manage this forest reserve (Rafael Manzanero, personal communication), with more monitoring and management capacity by putting more people in the forest to identify and report illegal activities. However, improved coordination between local officials and governmental agencies is necessary to foster this sustainable management and address tenure rights. To accomplish this the local alcaldes (leaders of small villages such as San Jose Succotz and Arenal) and mayor (leader of Benque Viejo Del Carmon) could work with the FD to create policies to grant tenure rights to use the lands in the Vaca for sustainable harvest and monitoring of illegal activities.

The Belize FD's mission is to "foster Belize's economic and human development by effectively enforcing relevant policies and regulations for the sustainable management of its natural resources through strategic alliances and efficient coordination with relevant stakeholders" (Forest Department, 2016). This alludes to a devolution of forest management to the locals and an opportunity for a women's CBC group to work with the FD to develop a sustainable forest management plan for the Vaca. The women we surveyed expressed interest in and a willingness to venture into the forest, and these women could be a potentially untapped resource for the FD to better manage the forests. A policy to create a partnership between a CBC group and the FD could help achieve these objectives and would be beneficial to both parties. The FD could help train the CBC group to identify illegal activity, how to harvest resources sustainably, and teach them management techniques to improve resource availability. A

partnership between these entities would also work to address the 17th goal of the SDG of “Revitalising the global partnership for sustainable development” (SDG, 2016). The description of this goal states “A successful sustainable development agenda requires partnerships between governments, the private sector and civil society”. Thus, it would be advantageous for all involved to work toward a policy creating a partnership between the FD and CBC groups.

Another local policy that a women’s CBC group could influence would be to increase the amount of education, especially conservation education, available to these rural communities. We identified education as a barrier to women’s participation in a CBC group and this barrier could be overcome with greater access to education, especially after their formal schooling has ended (see chapters 2 and 3). In Belize, education is not a free resource provided by the government, families must pay for each level of education received. Therefore, the higher the education level attained, the greater the expense. A CBC program could address Belize’s low educational achievement in several ways. For example, to obtain land tenure rights, a CBC program could be required to use some of its profits to provide scholarships for economically disadvantaged people and work to better educate women in the group. A policy could be implemented to award certificates recognized by the Belize Government or a conservation group for women’s participation in educational opportunities provided by the CBC group. These certificates would verify the knowledge they learned and could empower them by increasing job opportunities. The women could also be required to give presentations in local schools on the importance of the local forest and conservation as increasing student knowledge could influence conservation activities in

the future. Education is a key component of empowerment and one of the most important and most mentioned goals of many agreements and accords, such as SDG #4 (SDG, 2016), Millennium Development Goal #2 (Poverty, 2015), and is mentioned multiple times by the Millennial Ecosystem Assessment (Board, 2005). Creating educational opportunities for more people could address many international goals and increase educational levels in Belize.

As mentioned previously, a common international policy goal is to create partnerships between local, national, and international organizations. Many international agreements and accords address the significance of partnerships and their importance for the success of reaching environmental goals. Partnerships between CBC programs and relevant organizations or agencies have also been found to be important for their success. Thompson (2013) found that Bangladesh community-based organizations (CBO) increased productivity of their resources and that long-term success depends on co-management policies. He also states that in some CBO performance declined after outside support was removed. Common goals between and women's CBC and some of Belize's governmental agencies could provide for the creation of these partnerships. Much like FVFR, a women's CBC group would be using forest resources in a sustainable manner and could help replant illegally harvested trees (Rafael Manzanero, personal communication). Both of these activities would address some of the objectives of the Ministry of Forestry, Fisheries, and Sustainable Development, the Ministry of Natural Resources and Immigration, and the Ministry of Agriculture and Fisheries in relation to conservation, the sustainable management of natural resources to ensure a better quality of life for current and future residents, and to alleviate poverty and

promote sustainable rural development (DOE, 2016; MAF, 2016; MNRI, 2016). These agencies could form key partnerships to address both entities goals. Therefore, creating policies to make forming partnerships between complimentary organizations easier could work to better address common goals and objectives.

Belize's various Ministries have environmental technicians that could also work to provide much needed support for a women's CBC group. In our research, we found women's attitudes to be extremely high toward participating in a CBC, but some interview respondents noted that women would need some kind of support in order to participate. Suggested CBC group activities, such as the sustainably collection of cahune nuts to make cooking oil and maya nuts to make flour, would increase local food availability and increase the local economy. This would assist both the Ministry of Natural Resources and Immigration and the Ministry of Agriculture and Fisheries by helping to ensure a better life for residents and could help the Ministry of Forestry, Fisheries, and Sustainable Development alleviate poverty and promote sustainable development. Two of the objectives of the Department of the Environment, under the Ministry of Forestry, Fisheries, and Sustainable Development, are to foster an appreciation for the natural environment and work closely with local organizations on environmental issues. One of their strategies is to strengthen the coordination of environmental activities between the government and non-governmental organizations. Therefore, it would be beneficial for the CBC group to work with the Department of the Environment to help coordinate group activities such as the collection of materials, selling of products, and group and community conservation education. These partnerships may also be able to provide the support needed to help the group achieve

success and longevity. Again, this would be a beneficial partnership to work toward SDG #17 to revitalize global partnerships. Therefore, policies could be created to allow for more inclusion of local groups in governmental strategies to achieve common goals.

Along with strategic partnerships, it may also be beneficial for these communities to include more women in leadership roles. Our research determined that women are influential in these communities, however all leaders we came in contact with, or heard of, were men. Our research found that it is the women who need to be involved in and support a cause to transfer knowledge to and influence others. To better influence others to be conservation-friendly these communities should actively seek to promote and elect women into leadership positions. To prepare women for these positions, a policy could be implemented to provide more leadership development opportunities for women in rural areas.

One of the proposed activities for a women's CBC program was to sustainably harvest, process, and sell forest resources. A readily available market for these items would be to the substantial Belize tourism industry. Yet a large majority of items for sell to tourists come from Guatemala (personal observation). According to the Belize Tourism Board, 18-25% of the national GDP comes from the tourism industry and it accounts for 28% of all employment in the country (BTB, 2016). The sustainable harvest of local resources to make souvenirs could boost this industry and many local economies. Policies to decrease the number of imported goods could work to increase the success of CBC groups and provide more income to rural areas by providing locals more opportunities to sell locally made and harvested goods.

A women's CBC could also work to address some international policy goals. The United Nations has established the SDG, many of which could begin to be realized through the work of a women's CBC group. For example, goal number one, "End all poverty in all its forms everywhere", could be addressed through the sale of sustainably harvested forest resources to locals and tourists, as well as employment for monitoring and managing the forest. Goal two, "End hunger, achieve food security and improved nutrition and promote sustainable agriculture" could be addressed by harvesting resources that could be processed into food, such as the cahune and the maya nut. Both nuts are local, plentiful, and nutritious. The maya nut is being used in neighboring Guatemala to feed porridge lunches to children who would have none at home (Maya Nut, 2016). The processing and sale of the Maya nut to low income, poverty stricken areas, for its high nutritional value could greatly increase the income of women in the area while providing valuable nutrition to rural disadvantaged areas of Belize. Moreover, this option for increasing nutrition to poverty stricken and possibly malnourished children would not face the same barriers a similar product, Plumpy'nut, used in Africa (Bourdier, 2009). Plumpy'nut is a peanut-based protein product manufactured in France. It has successfully been used in some areas in Africa but faces social, cultural, and economic barriers in other areas (Bourdier, 2009). The maya nut is an abundant native forest resource that has historical and cultural significance in this area. Therefore, maya nut products could be cheaply made and would be socially accepted.

Women gaining knowledge through a CBC would help address SDG #4, "Ensure inclusive and quality education for all and promote lifelong learning." There are not many educational opportunities for women in these areas once they finish school, and

most do not continue beyond primary school (SIB, 2015). A program providing additional education to the women, and certificates of completion, could work to increase educational attainment. The importance placed on education may also increase, as we found women to be the ones to transfer knowledge and they hold influence on others in the family and in the community, therefore women pursuing additionally education would show others, especially their children, that educational achievement is important. This could also address goal number 5, “Achieve gender equality and empower all women and girls”, as education is often cited as the best way to increase equality and empowerment (SDG, 2016).

Internationally, creating conservation programs that use local resources sustainably could set the stage for the success of bigger initiatives, such as REDD+. REDD+ is a mechanism to reward countries for reducing deforestation by creating economic value for standing forests, as opposed to the timber or agriculture land they would provide if removed (REDD+, 2016). Funds are provided by developed countries with large carbon outputs and global partners to parties who work to reduce emissions from slowing deforestation, conserving or enhancing forest carbon stock, or sustainably managing forests. A CBC program, like the one proposed, could open the door for the UN-REDD Programme to assist in getting the area ready to participate in REDD+. UN-REDD is a program that provides financial and technical support to help developing countries implement REDD+ (UN-REDD, 2016). This support would work to accelerate the REDD+ implementation process that would provide much needed income to the area and possibly help them secure other international donors to successfully reach conservation and sustainable development goals.

In conclusion, a successful women's CBC program by using local forests sustainably, could address goals set by the many global environmental agreements and missions of local forest conservation and management agencies. Partnerships with local, national, and international organizations and agencies could provide the group with needed support, increase the likelihood of success, and address objectives and goals of all involved. Polices focused on providing tenure rights, increasing education, creating partnerships, and increasing women in leadership roles could lead to an increase in CBC impacts. In turn, this will help national and global organizations reach their environmental and societal objectives and goals.

Conclusions

This research has shown the importance of qualitative and quantitative methods for the pre-assessment of a proposed CBC program. Qualitative research is vital to social research in that it helps to uncover personal and cultural differences in populations that can help or hinder a new program's implementation. Additionally, it can work as a conformation of assumptions the researcher or program advocates may have about the people, culture, or aspects of the program that are needed or wanted. Our qualitative study determined that the preconceived notion we had about women needing to make an income from their participation was false and helped to identify some aspects of a program that are needed for women to become involved. Moreover, the quantitative research conducted informed us that there are elements of behavior that are not under women's volitional control that will affect whether or not they are able to participate in a CBC program, such as time. Therefore, it is important that CBC

programs be pre-assessed qualitatively and quantitatively before its implementation to work out any possible barriers before the program is implemented.

The use and analysis of the Connectedness to Nature Scale with this population and the comparison to developed countries populations is important as a starting point for further investigation. The implication that developing countries feel more connected to nature and therefore may perform more environmentally friendly behaviors is important on many levels. First, it is important for the developing countries to know that their citizens may be in favor of developing in a more sustainable way. Second, it is important to have a better understand of how contact with nature, as a child and as an adult, can affect a person's environmentally friendly behaviors. If people who grew up with, or currently have more contact with, nature have greater feeling of connection to nature and are subsequently more willing to participate in environmentally friendly behaviors, this can have great significance for developed countries' policies about people and nature. For example, policy decisions about how many natural areas are available in cities, time required outdoors and recess time for children, or access to green spaces in office buildings could be influenced by increased knowledge about societies' connectedness to nature.

The positive environmental attitudes found in our research and the high intent to participate in a conservation program of Belizean women are an example of the positive results that can come from having more daily contact with nature. As this country continues to develop, it is our hope that through groups like our proposed CBC program, a conservation norm will be created in the country and will influence their leaders to work to develop in a more sustainable and environmentally-friendly way.

In conclusion, this research will be used a starting point for the collaborative development and implementation of a successful CBC program in western Belize. Furthermore, our determination that a pre-assessment of a program is needed before its implementation is imperative for any researcher, social or environmental advocate, or NGO to understand before they attempt to develop similar programs in any area of the world. Through better understanding of indigenous populations and cultures, more successful environmentally beneficial programs can be established.

References

Belize (2000). Belize Forest Act Chapter 213 Revised Edition. Department of Law Revision; Ministry of the Attorney General.

Board, M. A. (2005). Millennium ecosystem assessment. Washington, DC: New Island.

Bourdier, F. (2009). Socio-anthropological investigation related to the acceptability of Plumpy'nut in Cambodia. *Paris: institut de Recherche pour le Développement (IRD)*.

BTB. (2016). Belize Tourism Board. https://btb.travelbelize.org/btb/tourism-in-belize/tourism-today/tourism-statistics. Accessed May 2016.

DOE. (2016). Department of the Environment. http://www.doe.gov.bz. Accessed May 2016.

FAO. (2002) Land Tenure and Rural Development. Food and Agriculture Organization of the United Nations. FAO Land Tenure Studies 3.

Forest Department. (2016). Belize Forest Department. Forestdepartment.gov.bz. Accessed April, 2016.

Gadgil, M., Berkes, F., & Folke, C. (1993). Indigenous knowledge for biodiversity conservation. *Ambio*, 151-156.

MAF. (2016). Ministry of Agriculture and Fisheries. http://www.agriculture.gov.bz. Accessed May 2016.

Maya Nut. (2016). Maya Nut Institute. http://mayanutinstitute.org/where-we-work/guatemala. Accessed May 2016.

MNRI. (2016). Ministry of Natural Resources and Immigration. http://www.mnra.gov.bz. Accessed May 2016.

Poverty, E. (2015). Millennium development goals. United Nations. http://www. un. org/millenniumgoals. Accessed May 2016.

SDG. (2016). Sustainable Development Goals. https://sustainabledevelopment.un.org/sdgs. Accessed May 2016.

UNFCCC (2015). Adoption of the Paris Agreement (FCCC/CP/2015/L.9/Rev.1). United Nations Framework Convention on Climate Change, Paris.

UN-REDD. (2016). About the UN-REDD Programme. http://www.un-redd.org/AboutUN-EDDProgramme/tabid/102613/ Default.aspx. Accessed May 2016.

REDD+. (2016) About REDD+. http://www.un-redd.org/AboutREDD/tabid/102614/Default.aspx. Accessed May 2016.

VITA

Amanda S. Kaeser was raised in Duncan, Oklahoma. She graduated from Texas A&M University with a Bachelors in Wildlife and Fisheries Sciences. She then worked with chimpanzees at two different primate facilities studying their behavior and cognition. When she settled in Tennessee, she went back to school to obtain her Masters in Education, after which she taught high school science for five years. During this time, she completed her Educational Specialist degree in curriculum and instruction. After teaching Environmental Science for several years, she become more passionate about the environment and the harm humans were causing. She returned to the University of Tennessee to complete her PhD in Natural Resources with a human dimensions focus. She is now an applied social scientists whose work focuses on the human/environment interface and is interested in researching better ways to engage people in pro-environmental behaviors.