Understanding Willingness to Pay for Pollination and

Sense of Place Connections on the Eastern Shore

Wesley Johnson

Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University in

partial fulfillment of the requirements for the degree of

Master of Science

In

Agricultural and Applied Economics

Kevin Boyle, Co-Chair

Michael Sorice, Co-Chair

Kurt Stephenson

September 28th, 2017

Blacksburg, VA

Keywords: Willingness to pay, pollination, Bobwhite quail, sense of place, place attachment,

place satisfaction, place meanings, rootedness, mixed logit, conditional logit

Understanding Willingness to Pay for Pollination and

Sense of Place Connections on the Eastern Shore

Wesley Johnson

Abstract (academic)

Globally pollinators are in decline. While the decline in any species can cause worry in the scientific community, the importance of these species in food production has helped generate substantial public awareness of the issue. My research works to measure public preferences for countering pollinator decline with a habitat creation program. A survey is used to conduct a choice experiment to estimate the public's willingness to pay for increasing pollinator abundance through a program to increase habitat on the Eastern Shore. Individual's Sense of Place is measured in the same survey instrument. Sense of Place is analyzed to see if it can help explain why individuals are willing to pay. The results conclude that the majority of individuals are unwilling to pay to increase pollinator abundance. Additionally, place attachment is found to not be significant in impacting program preferences.

Understanding Willingness to Pay for Pollination and

Sense of Place Connections on the Eastern Shore

Wesley Johnson

Abstract (general)

The global decline of pollinators, insects and animals that assist in pollination and fertilizing plants, poses a great risk to global food supply. This study investigates if people have preferences for a program to abate decline in a region along the East Coast of the United States. A survey is used to investigate these preferences and connections to the region to understand if individual connections can explain preferences. The majority of people were found to not have preferences to help increase pollinator abundance. Additionally, measures of connection to the region were found to be insignificant in explain individual preferences.

Acknowledgements

I would like to express my gratitude to the numerous individuals who had a hand in the completion of this thesis. I would like to thank my co- advisors, Kevin Boyle and Michael Sorice for their guidance and mentoring. I am truly grateful for the assistance provided by all committee members and other members of my greater research teams involved in this project.

Table of Contents

List of Figures:

List of Tables

Chapter 1 Introduction

1.1 Introduction

In recent years much scientific work has been focused on investigating and measuring the current decline in honeybees and other pollinating insect species known as pollinators. These species provide the important ecosystem function of pollinating plants and thus fertilizing their flowers allowing them to become the seeds and fruits important to both wildlife and humans. Work has documented this pollinator decline in the fields of entomology (Cameron et al. 2011), ecology (Potts et al. 2010) and beyond (Council, N. R. 2007; Calderone 2012; Goulson et al. 2015). This decline has received lots of public attention and reports of it have been produced on all levels of news media including the BBC (Walker 2015), New York Times (Schwartz 2016), NPR (Kennedy 2016), and the Obama White House (Secretary, T.W. H. 2014). The threat of losing pollinators is one that people recognize as serious because of its potential to substantially impact our food system. Thus, recent work has focused on determining the causes and reversing the trend of pollinator decline. My thesis dives into this specific issue of pollinator decline.

Improving populations of pollinating species, thereby provisioning the ecosystem function of pollination is a goal of scientists. Previous work has identified the value to agriculture of bees and other pollinators for their pollination work but to this point no study has tried to measure the value held by society for this function and the insects that provide it. It is this major gap in the literature this thesis investigates.

No prior valuation research has studied pollination. The public has been hearing from science and the media that pollination is important to crop production and plant species reproduction but has this information done anything to shape the public's preferences? The purpose of my research is to understand the public's preferences for actions to ameliorate the pollinator population decline. Preferences were investigated for increasing pollinator abundance through a program designed to create pollinator habitat. Specific action to counter population decline has focused on the creation of additional habitat for these species, as habitat loss has been mentioned as a key contributor to pollinator population decline (Pasari et al. 2013; Blaauw & Isaacs 2014).

A realistic program to create pollinator habitat was designed to elicit preferences for pollination and other ecosystem services enhanced through its establishment. The designed program would establish native flowering species and grasses planted on properties in areas know as pollination areas. Pollination areas have previously been developed by researchers within the horticulture and entomology disciplines and work has been done in these disciplines to measure the impacts these habitat areas have on pollinators (Williams 2011; Cusser & Goodell 2013; Blaauw & Isaacs 2014).

Pollination areas have the potential to impact a number of ecosystem services and functions. Ecosystem services are "components of nature, directly enjoyed, consumed, or used to yield human well-being" (Boyd & Banzhaf 2007) and ecosystem functions are intermediate products which aid in the production of ecosystem services but are not considered services themselves (Boyd & Banzhaf 2007). Ecosystem services cover a range of benefits experienced by humans including: regulating, provisioning, supporting, and cultural services (Millennium Ecosystem

Assessment, 2005). Examples of ecosystem services include the creation of resources vital for life like the production of oxygen by plants to the providing for leisure activities and aesthetics such as a landscape with lakes and rivers which can give people a place recreate.

I use a program, which will be referred to as the Pollination Area Program henceforth, to measure value of the pollination ecosystem function provided by pollinators. Boyd & Banzhaf (2007) do not consider pollination an ecosystem service in contrast to the Millennium Ecosystem Assessment (2005) because it is not the end product that is directly used. The specific ecosystem service is the pollen delivered. Because this end product is difficult to quantify I use pollinator population (an easier product to measure) as a proxy for quantifying this service in my study.

Other services in addition to pollination can be affected by the Pollination Area Program. These include: cultural and provisioning services provided with increasing Northern Bobwhite quail populations, erosion control and enhanced scenic beauty to the surrounding areas from wildflower presence. Creation of Pollination Areas could also lead to disservices to some individuals. If a person views the areas as weedy and an eyesore or dislikes the insect species attracted to Pollination Areas then they may have negative preferences for this program. Each individual service or disservice represents a service or amenity that people may also have unique preferences for but are not being specifically targeted with this policy action. As a Pollination Area Program could influence a great many services and even create some disservices, I limit the measurement of preferences for the program to only the several defined within my experiment.

Economists use a plethora of techniques to value ecosystem services. These valuation techniques are popular and important because they produce a quantifiable worth that is easier for the general public to understand than other discipline specific measures of ecosystem health used across the scientific community (Boyd & Banzhaf 2007; Fisher & Turner 2008; Johnston & Russell 2011). I will use economic valuation to measure the public preferences for increasing pollinator population.

This study investigates preferences for pollination ecosystem services using Stated Preference, the most common economic method used for the measurement of ecosystem service values. My study used a specific type of stated preference technique known as a choice experiment (CE) which was administered through a survey to reveal this preference. Choice experiments ask respondents to choose their preferred consumption option between different bundles of attributes and their levels (Hanley et al. 1998). By varying the choices and attribute levels, researchers can reveal the respondent's preferences based on their choice behavior (Hanley et al. 1998).

Choice experiments are effective in measuring preferences because they allow researchers to capture the value of certain aspects of the environment being investigated by allowing people voice their financial support for those aspects. This study explicitly looks at the attributes of increased pollinator populations and Northern Bobwhite quail populations in addition to factors of cost and program size. I include Northern Bobwhite quail populations as a benefit of the Pollination Areas Program within my research design because this species has also experience population decline (Sauer et al. 2017), is native to our study region, and is a popular species for

viewing and hunting. Bobwhite quail populations have declined 75% in the last 40 years because of habitat loss (Ford et al. "The State of)

1.2 Purpose Statement

Using a stated preference experiment, I will calculate the willingness-to- pay (WTP) of survey respondents for the Pollination Area Program. This allows the investigation of my key research question: **How does society value ecosystem services increased by the establishment of a Pollination Area Program?** Value for ecosystem services will be assessed by measuring preferences for the introduction of a Pollination Area Program that creates habitat for pollinators and other species including Bobwhite Quail on land parcels across the Delmarva Peninsula.

The study area for this research is the Delmarva Peninsula on the Eastern seaboard of the United States locally known as the Eastern Shore. I refer to the area as the Eastern Shore (ES) henceforth. The Eastern Shore is 180 miles long and up to 70 mile wide peninsula located between the Atlantic Ocean and Chesapeake Bay and includes portions of the States of Virginia, Maryland, and Delaware (Figure 1). This area was chosen because work is currently being done on the Eastern Shore to measure specific effects experienced by farmers with an experimental version of a Pollination Area Program. The introduction of uniformly designed Pollination Areas across the ES gives us assurance that the program is already feasible in terms of scope for the entire area.

With this research I wish to understand how Pollination Area benefits to ecosystem services are perceived by the public if established in a large scale program. The goal is to provide a baseline

estimate of pollinator value to provide policy makers and scientists with information on societal

preferences and plausible steps to combat pollinator population declines. Empirical research has

identified a link between individual interaction with the natural environment and the support or

care for these environments (Halpenny 2010). In light of this fact, this thesis also looks to

investigate how the interactions and relationships individuals have with the Eastern Shore and its

environment affect their level of support for a program to increase ecosystem services.

Figure 1. Map of Eastern Shore research area. The research area is denoted by the black oval.

This second goal of this research is intended to answer the question: **"Does a person's**

relationship with the Eastern Shore relate to their support for a program to increase

ecosystem services?" The impacts of relationships on personal preferences and values will be

identified using questions to understand survey respondents residency status, time spent on the ES and their Sense of Place (SOP) (Tuan 1979; Hay 1998; Jorgensen & Stedman 2001).

SOP is the meaning or attachment that an individual or group has to a setting (Stedman 2002). SOP has its foundation in place meaning research within the field of social psychology and has been measured with both quantitative and qualitative methods throughout the literature. Because place meanings represent a value of a different type, there is reason to expect them to also relate and possibly influence an individual's WTP. Previous studies (Stedman 2002; Halpenny 2010; Tonge et al. 2015) have looked at the relationship between SOP and behavior, finding a connection between the two. To investigate this relation in the context of an economic valuation study this thesis will investigate if this alternative value to an area and its services has an effect on value attributed to increasing ecosystem services by individuals.

1.3 Research Contributions

The research of this thesis aims to contribute to the literature in several ways. First, this research will perform the first valuation study of pollination. Many studies have looked at understanding the contribution that pollination services make to agricultural production (Morse & Calderone 2000; Allsopp et al. 2008; Winfree et al. 2011; Calderone 2012) but none have tried to understand the value held by the general public for this critical service. The results of this research will create a baseline measure of this valuable service.

This study also represents the first of ecosystem service valuation on the Eastern Shore. Many prior studies have worked to measure the value of ecosystem services but none have looked to

identify them in this area. The Eastern Shore's proximity to major metro areas along the East Coast and its stature as a premier tourist destination mean that policy decisions here could impact millions of people. I outline a strategy for sampling visitors and residents of the ES within Chapter 4.

This research will also contribute to the literature by exploring crowdfunding as a payment vehicle within Stated Preference experiments. At the time of this study, crowdfunding had been used just once in the valuation of ecosystem services in a study by Roesch-McNally & Rabotygov (2016). We will expand on the use of this payment vehicle by using it in a new ecosystem service context.

Crowdfunding has unique potential as a payment vehicle for non-market valuation research. It can be used across jurisdictions to look at how public goods are valued. As crowdfunding becomes increasingly popular due to the increased presence in technology in daily life, this type of payment could become a great tool for future studies. Crowdfunding is not associated with government entities. Because of this, crowdfunding is a less political method of eliciting payment from individuals which could prove to be advantageous for certain valuation studies.

Tying in the concept of SOP to economic valuation research represents a new area of exploration within the literature. In this thesis, I explore the role that SOP can have in valuation research for ecosystem services. SOP measures attachment and meanings which represent a different type of value that people have with a place or item. Previously, SOP has not been combined with stated preference techniques in identifying preferences for an environmental attribute. Putting the two

together is an intriguing combination because SOP can perhaps give a wider, more interrelated understanding of welfare changes with policy decisions. If it is found that SOP can be an important covariate or even predictor of economic value, then the combination of these techniques might be helpful for future research estimating non-market values.

1.4 Organization of Subsequent Chapters

The subsequent chapters are organized in the following way. Chapter 2 describes the previous work on stated preference experiments for evaluation of environmental amenities, procedures for eliciting truthful responses, the basis for crowdfunding as a payment vehicle, and the literature surrounding Sense of Place and its elements. The discussion begins detailing the structure of stated preference techniques and steps to be taken in design and implementation to elicit true value. The history of crowdfunding and its feasibility as a payment vehicle is then explained next. Finally, the chapter concludes with a brief literature review of SOP and its elements. The purpose of this is to a give brief background to this literature which is not widely understood within the economic community. How and what is measured for SOP is defined providing the bridge to Chapter 3 and the development of the empirical models for this research.

Chapter 3 presents the economic, econometric, and conceptual models that serve as the backbone of valuation research. The Random Utility Model developed by McFadden serves as the base of our model. We extend into how willingness- to- pay is derived from our experiment for measuring preferences for a Pollination Area Program. Econometric models are proposed to identify WTP and measure SOP factors. The chapter next summarizes the covariates to WTP and

SOP measures and explains the measurement and connection of these to the research. The conceptual framework is elaborated and the survey design and measures are explained in detail.

Chapter 4 details the sampling methods and strategy of the experiment. An intercept survey was designed and implemented prior to experiment and survey design. The chapter begins with a discussion of the need for this prior survey and descriptions of sampling procedures. The process of testing the final survey prior to release is detailed next. A focus group and pre-test version of the survey were used to fine tune design.

Chapter 5 provides the econometric and statistical summarization of the survey results. Respondent demographics and descriptive statistics are explained first. Next econometric model results describe preference and value results. SOP measure are evaluated and tested for their connections within the conceptual framework. Finally, the results of using place attachment as a predictor of WTP are provided.

Chapter 6 discusses the results of the study. Key results and policy implications relating to the research of pollination valuation are discussed and the research results are summarized. Limitations and future research is discussed and the research is summarized in the conclusion.

Chapter 2 Conceptual Framework and Literature Review

2.1 Introduction

This chapter will serve as a review of the literature surrounding our stated preference experiment and the additional value measure of Sense of Place (SOP) we explore with this study of pollinator value. The chapter begins with the conceptual framework behind the experiment. The chapter next outlines Stated Preference experiments and their prior use for environmental valuation and non- market valuation. Issues associated with stated preference techniques and eliciting true value with these types of experiments are also discussed. SOP is incorporated into this valuation research to identify if this different type of valuation technique from the field of social psychology can help explain responses within my State Preference experiment. The background and components that are associated with SOP and prior work in this area are discussed as well as SOP covariates in the concluding sections of the chapter.

2.2 Conceptual Framework

This study measures the total economic value associated with the creation of a Pollination Area Program. The creation of a program will impact numerous ecosystem values, but as mentioned previously, the chief goals of this study are to look at the services associated with pollinator and quail populations. The services these species provide are separated into two groups, non-use values (e.g. including the pollination of plants by pollinators) and use values (e.g. the watching and hunting values that quail can provide). Because there are non-use and use values associated with the program we must measure total economic value which includes the use and non-use components associated with our species of interest. These types of values are considered, non-

market values in economics since they are not valued in a market. Stated preference methods are used to measure WTP for use and non-use nonmarket values.

For the purpose of this research a new conceptual framework was developed to organize and understand the connections between the two measures, SOP and WTP, and the ecosystem services being impacted through pollination areas. The framework breaks down into three pieces: determining ES personal connections, sense of place evaluation and a willingness to pay measure for our environmental entities of importance.

The economic conceptual framework is consistent with Stated Preference methods within the literature used to determine willingness to pay. When looking at WTP two factors are considered important to understanding choice. The first is the attributes of the choice or the positive or negative outcomes that a chooser considers when making a choice. The second is characteristics or qualities of the chooser, like sociodemographic traits. Stated preference valuation identifies the effects of attributes of a choice on individual preferences, expressed through their choice among the presented options. Stated preference studies traditionally also measure sociodemographic variables to look for any effects they exhibit on WTP values. Beyond sociodemographic variables, other individual specific traits or personal attributes that could affect preferences for a good are important to measure. In the context of this study, these variables are factors in determining personal connections to the ES and help describe the decision making individual.

The conceptual framework for this study goes beyond the tradition stated preference framework as it incorporates sense of place (illustrated in Figure 2). This incorporation represents the novel part of the conceptual framework. My research works to investigate a connection between WTP and SOP measures. I hypothesize that an individual's SOP will affect their WTP for a program on the ES to enhance ecosystem services. I propose that because the program and its benefits to ecosystem services associated with pollinators and quail, is functionally determined by a place, that an individual's relationship with that place will affect their value for that good. As place attachment (one dimension of SOP) is a bond formed with a place, actions that would enhance the functionality of the place or the benefits experienced by an individual could be more important to attached individuals. Because of this, place attachment could have a role in determining preferences for a program with environmental implications.

Figure 2 helps to explain how SOP fits into traditional economic framework. The SOP section contained within the blue circle shows where SOP fits between identification of an individual's personal connections and traits and WTP valuation. The three SOP dimensions I investigate and their relation are illustrated within the circle. According to the literature (Wynveen & Kyle, 2015), meanings and attitudes are connected in how they are influenced by place. Meaning can have strong implication on attitudes, which are expressed in attachment and satisfaction to place. In this research, I hypothesize that meanings and attitudes, as evaluated with SOP, are also related to WTP for improving ecosystem services in a place.
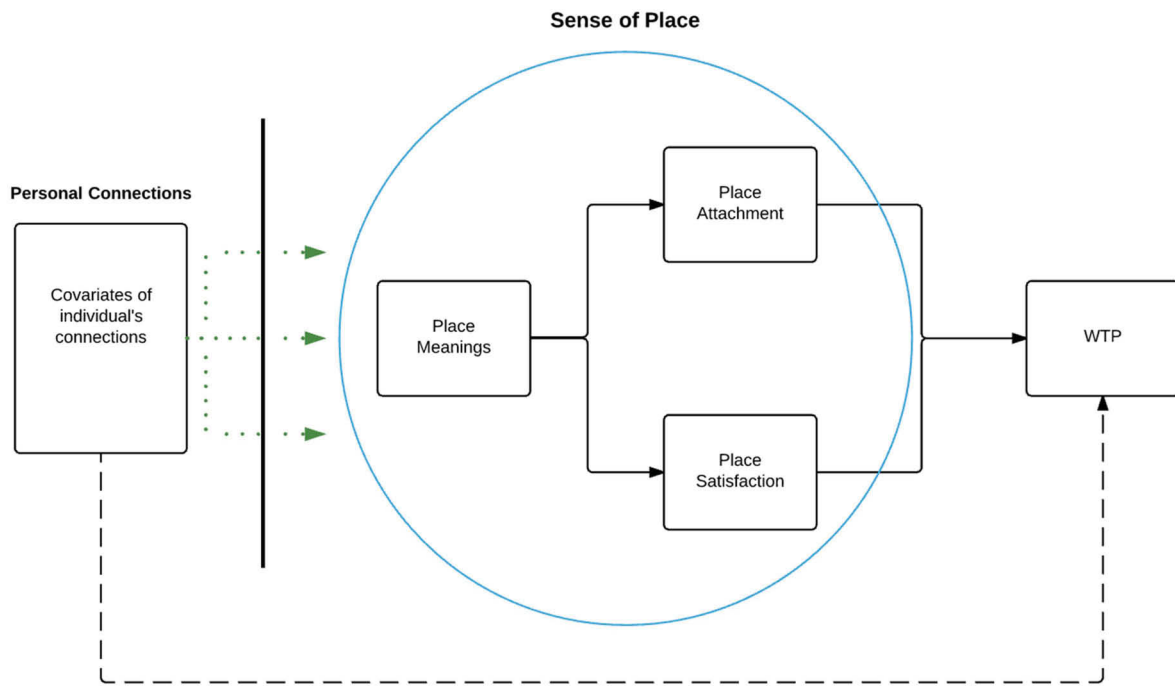
Figure 2. Conceptual Framework showing the connections between ES personal connections, SOP, and WTP

I suggest that attributes of an individual and their person connections to the ES will have an impact on both this measure of psychological value (i.e. SOP) as well the measure of economic value of preferences (WTP). Traits about a person who lives or visits the Eastern Shore (ES) can affect their interaction with and expectations for the ES. Aspects of individuals that could contribute to differences in these values include: residency status, family heritage, spatial use patterns, rootedness, previous experiences and activities, time of involvement, and what period of time in life spent on the ES.

Measuring other factors or covariates of individuals apart from their attitudes and meanings has been used in prior SOP research to identify their effects on individual's connections with place. These variables are looked at to see if they can be predictors of SOP for individuals. In Jorgensen & Stedman 2006 for example, length of residence, time spent in place, and recreational activities were all looked at as predictor variables for SOP. For my investigation of SOP on the ES I also choose to investigate these and other covariates to try to understand the different groups of people who live or travel to the Eastern Shore and work to measure the value that these groups have in terms of connection to place and in willingness to pay for environmental services.

Having discussed the conceptual framework behind this research, the prior literature for Stated Preference and Sense of Place will be explained in the context of this study.

2.3 Stated Preference Experiments

2.3.1 Stated Preference Techniques and Environmental Valuation

Stated preference techniques have been used in the environmental context for some time in the literature. Some of the first studies with stated preference in this context include Boxall et al. 1996 and Adamowicz et al. 1998. The functionality of stated preference methods lies in their ability to measure economic value in areas where market data is limited or non-existent. Examples of these types of values include non-use or passive values (Weisbrod 1964; Krutilla 1967; Randall 1987; Loomis 1988) where value to individuals is not reflected in some observable behavior. Stated preference techniques offer a way to elicit these values (Adamowicz et al. 1998). With stated preference therefore, "individuals can be induced to reveal their true

preferences for environmental goods through their behavior in hypothetical markets" (Hanley et al. 1998).

Choice Experiments (CEs) are a specific type of stated preference technique. They differ from Contingent Valuation (also known as the Contingent Valuation Method (CVM)) by offering more than a two-alternative choice to individuals. While CVM may offer two specific alternatives to some situation (usually a change or no change option) CEs can elicit the preferences from individuals for three or four alternatives to some situation. The CE method seeks to understand the respondent's preference for the attributes of the scenario rather the preference held for a specific scenario like CVM (Adamowicz et al. 1998).

Choice Experiments are different from conjoint analysis. While CEs may have origins in conjoint analysis they differ because they require respondents to choose one group of attributes instead of asking them to rate or rank alternatives (Adamowicz et al.1998). The significance of this is that CEs, "place choices in a welfare-theoretic framework" (Hanley et al. 1998). CEs are modeled under Random Utility Theory which will be explained in the methods section.

CEs allow independence of attributes from the alternative choices as well as a more precise estimation of the value of an attribute than CVM. In addition to identifying which attributes influence choice, CEs can provide an implied ranking of specific attributes and their levels, (a marginal willingness to pay for a change in a significant attribute), and the willingness to pay (WTP) for a choice (a program for example) which changes multiple attributes simultaneously (Hanley et al. 1998). Finding this WTP value is a central reason why this valuation method has

become popular. Economic valuation is not all about money but money provides a convenient measure to compare what individuals are willing to give up for choice (Swallow 2013). Because of this, the WTP measurement has become a key reference for decision- makers in making action or management decisions.

A CE is used for the measurement of preferences for ecosystem services for a Pollination Area Program. CEs are better designed to look at multidimensional choices than CVM and are more suited to look at environmental programs as a result of this (Hanley et al. 2001). "CE avoids the part-whole bias problem of CVM, since different levels of the good can be easily built into the experimental design" (Hanley et al. 1998). With several ecosystem services being affected by the adoption of pollination areas we wish to look at how each part or individual service impacts preference. CEs have also been shown to exhibit a greater sensitivity to scope than CVM (Foster & Mourato 2003). This is important to note because I want to look at program size (a measure of scope) within my Pollination Area Program on the ES.

CEs have been used in many instances to look at environmental programs and decisions. Studies have been conducted in Rhode Island looking at landfill siting (Opaluch et al. 1993), in Scotland observing conservation benefits of Environmentally Sensitive Areas (Hanley et al. 1998), and for Woodland Caribou Habitat Enhancement program in Alberta Canada (Adamowicz et al. 1998) to mention a few. The ability of CEs to look at environmentally focused programs and to isolated attributes of the program are key reasons why an experiment most resembling a CE was used for this research.

2.3.2 Procedures for Eliciting a Truthful Response

As stated preference methods are not bona fide referendums or policies, steps are taken in designing them such that they elicit truthful responses from respondents. Experimental design must take steps to counter hypothetical bias, protest responses and unfamiliarity with topic issues which could prevent accurate estimation of value.

Stated preference experiments can be designed to counter the reality that they represent hypothetical situations. The issue is that in a hypothetical situation a true valuation of preference is not guaranteed. This is in contrast to a real or binding decision where individual has no incentive to not answer truthfully. The solution to dealing with hypothetical bias is to generate choice questions and scenarios that are realistic or consequential. Consequential survey questions are those seen as potentially influencing action (Carson & Groves 2007). If the individual cares about the outcome of these questions then they will treat question as an opportunity to influence an action in their favor, or maximize their expected welfare (Carson & Groves 2007).

"To ensure the eventual policy relevance of valuation results, enough applied science and engineering expertise has to be available to translate changes in ecosystem functioning into meaningful ecosystem service descriptions, and to relate these changes to realistic policy or project interventions" (Barkmann et al. 2008). The good needs to be described in terms of benefits that respondents actually care for or understand so they appropriately value the ecosystem service in an environmental context with CEs. With the appropriate context of the situation described individuals are free to engage in selecting their most preferred alternative

with in the CE with the strategy to get the most or best set of attributes for the lowest price (Carson & Groves 2007).

Steps also must be taken to combat unfamiliarity of the good in question among the population being surveyed. Barkmann et al. 2008 summarizes the issue saying, "Without sufficient familiarity with ecosystem functions, respondents are not able to make meaningful preference statements." This paper concluded that lay people were able understand a topic as intimidating as hydrology and provide "a meaningful economic valuation of a closely related ecosystem service" (Barkmann et al. 2008) with the careful design and explanation of the topic. Lack of familiarity was combatted with a lot of effort on the researchers end to translate the ecosystem services to the study population through work with experts in the natural science fields tied to their study. This allowed for the conveying of important information to research participants as well as the service being presented in a way that was easy to understand.

The work by Barkmann and his co-authors shows that researchers can take steps to eliminate information gaps or biases that could interfere with results. An additional point relating to unfamiliarity is also important to consider. This point being that knowledge about a topic could already be a source of preference for it. "The fact that certain members of society are uninformed about a particular good is a conscience decision on their part and an expression of their preferences at that point in time"(Chilton & Hutchinson 1999). These authors argue that if a good was important people would already know about it. Not having a preference for a good because it seems irrelevant is still a valid preference that needs to be captured by valuation studies. Caron & Groves 2007, has shown that experience with a good could influence true WTP

for that good but not influence the incentive properties of the question format. This result is important because we want to avoid capturing bias or dealing with strategic behavior which would skew WTP estimates.

Stated preference studies have frequently used a voluntary payment method as their payment vehicle when a mandatory option was not feasible. Two major reasons have discouraged the use of voluntary payment or donation type studies despite their ability to replace a mandatory payment method. The first reason is that voluntary methods are not demand revealing and allow for freeriding (Champ & Bishop 2001; Murphy et al. 2005). The second is that voluntary payments have the propensity to overestimate actual donation or payment levels (Champ & Bishop 2001; Poe et al. 2002).

Voluntary payment mechanisms persist despite theoretical limitations to their accuracy. The reason for this is that in many cases, voluntary payment mechanisms represent the only feasible way to finance certain goods (Murphy et al. 2005). It has been suggested that donation methods may be less subject to vehicle bias than referenda methods (Champ & Bishop 2001). Additionally, the rarity of referendums particularly on the nation level may make this method less believable to survey respondents then a voluntary payment situation (Champ & Bishop 2001).

In order to help elicit truthful responses, Provision Point Mechanisms (PPMs) have been developed to conquer issues with voluntary payments in stated preference. PPMs work with a threshold level of funding called the provision point (Swallow 2013). Below this point of

aggregate donations or funding, the public good being offered is not provided (Rondeau, et al. 1999; Champ & Bishop 2001). PPM is an advantageous tool because it reduces the value of strategies like free or cheap- riding because contributions are necessary to reach point of good provision (Swallow 2013). It has also been shown by Champ & Bishop 2001 and Poe et al. 2002 that using a PPM can increase the credibility of hypothetical CVM scenarios amongst respondents.

PPMs are often combined with a money back guarantee (MBG) and promises like proportional rebates for donors or extended benefits for use of extra funds. These provisions within the scenario can increase respondent interest (Poe et al. 2002) and the MBG acts as insurance against losses if the provision point is not reached (Rondeau et al. 1999).

I employ a PPM in the design of this stated preference experiment by using crowdfunding as the payment vehicle. Crowdfunding is a voluntary donation style fundraising method that works by eliciting a large number of small donations from individuals for a project. These types of projects have been successful in raising billions of dollars and are growing in annual contributions according to Massolution and their Crowdfunding Industry Reports (2012 "Crowdfunding Industry Report"; March 31, 2015 "Crowdfunding Market"). Crowdfunding is almost completely done in an online format through one of many websites where individuals can find or share projects.

Crowdfunding is being used for environmental projects and many platforms (crowdfunding websites) have specific environmentally-oriented sections or pages for these types of projects.

Horisch 2015 studied how environmental crowdfunded initiatives compared in their funding success to other categories of projects on the crowdfunding website Indiegogo.com. Horisch mentions a key obstacle to crowdfunding environmentally oriented projects compared to other types is that, "rational choice theory expects individuals to be less likely to contribute to the creation of goods which are non-excludable and non-rival in consumption." Unlike funding other types of campaigns, an individual is less likely to personally benefit over others from a successful funding of some environment project compared to other campaign types. Funders for other campaigns may be provided exclusive benefits like copies of a finished product or rights to view or enjoy a music or movie for free. Horisch's results reflected this issue, as environmentally oriented projects were less likely to be funded than other types of projects. An important caveat to make regarding this result is that comparing project success should be cautiously considered as each can be significantly different from each other thus making direct comparisons impossible.

I am interested in crowdfunding because structurally it works as a voluntary contribution mechanism with a PPM format. Typically, crowdfunding works with a threshold (i.e. provision point) and a refund (MBG) for each project (Swallow 2013). The combination of voluntary payments being used along with the funding threshold and a MBG for unfunded project allows crowdfunding to fit within the stated preference methods of a PPM for measuring preferences for ecosystem services.

Crowdfunding has been used to measure preferences for environmental services only one time previously (at the time of this paper) in the literature (Roesch-McNally & Rabotygov 2016).

Here the authors studied the WTP pay for forest ecosystem services using a tax mechanism and a crowdfunding style mechanism in order to compare the two methods and determine the reliability of the crowdfunding mechanism. They found that respondents chose the status quo more frequently in the crowdfunding compared to tax mechanism method. Additionally, they found that respondent WTP for a program was 35% higher under than mandatory payment (tax) but not statistically significant at a 95% confidence interval from the voluntary payment.

Roesch-McNally & Rabotygov conclude that their results are consistent with Rondeau et al. 1999 showing that a PPM was demand revealing (i.e. respondents answered hypothetical questions in line with their preferences). However, because of the large difference in WTP between the two methods they are not convinced that voluntary contributions would achieve public provision levels of the forest ecosystem services they studied. They note the trend that, "Private provision of public goods has grown tremendously as technological infrastructure developments have allowed online crowdfunding platforms to aggregate private values for public goods" (Roesch-McNally & Rabotygov 2016).

A final task in considering reliability of stated preference techniques is to discern protest responses when analyzing data and measuring preferences. Respondents to stated preference studies are broken down into those who choose the status quo option and those who pick an alternative. Those who do not always choose the status quo are defined as people who are willing to pay (Meyerhoff & Liebe 2009). The people who are not willing to pay break down into two groups, those whose preference is actually they are willing to pay zero and those who are protesting. Protest responses have been defined as "responses in which respondents reject some

aspects to the [market or choice scenario], rather than reveal their true preferences" (Chen and Hua 2015). Researchers must decide how to separate out these two types of responses.

Respondents may protest for several reasons (Meyerhoff & Liebe 2008). A first reason is that they do not understand choice scenario. If this is the case, they will be unwilling to consider the scenario and will decide to stay with the status quo since they are unclear of the benefits of selecting another alternative. Secondly, individuals may also protest strategically in order to change the provision of a good. Finally, individuals may protest to voice their displeasure against a component or aspect of the choice scenario. For example, individuals may reject the prospect of having to pay new or higher taxes for a good they view as being free.

Protest responses take the form of selecting the status quo but contrast with valid or legitimate reasons for not selecting an alternative to the status quo. Individuals who have these legitimate reasons have what are referred to as "real no" responses. Examples for "real no" responses include being unable to afford to pay or feeling no need to pay because the current state is sufficient for meeting the individual's preferences (Chen & Hua 2015).

Protest responses must be identified to understand how they may impact WTP results. Why? Because "[i]f protesting occurs, stated preference methods might fail to determine the correct economic value of the good in question" (Meyerhoff & Liebe 2008). It is often the standard to throw out protest responses in the evaluation of WTP, but it is important to note that this exclusion could cause a sample selectivity bias (Chen & Hua 2015). Additionally, if protesters who have their responses are dropped, have a WTP equal to people who are WTP, then assuming

their WTP value is zero underestimates the economic value of the good being studied (Meyerhoff & Liebe 2008).

2.4 Sense of Place

2.4.1 Sense of Place Introduction

Sense of Place is a topic that has been looked at across disciplines but holds foundations in Geography (e.g. Tuan 1979; Shamai 1991) and Psychology (e.g. Hay 1998; Jorgensen & Stedman 2001; Ardoin 2014). SOP can be defined as "the meaning attached to a spatial setting by a person or group" (Jorgensen & Stedman 2001). It is built around the concept of place, which is considered more than a spatial setting or geographic location. Place has been defined as "a space that has been given meaning through personal, group, or cultural processes" (Vorkinn & Riese 2001) and as "a spatial location that is assigned meanings and values by society and individuals" (Halpenny 2010).

The sub components or dimensions of place are known as place identity, place attachment, and place dependence respectively. Together these components form a multidimensional measure of place by investigating cognitive, affective, and conative relationships with humans and the environment (Jorgensen & Stedman 2006). These components, "weave together the physical environment, human behaviors, and social and/or psychological process" (Stedman 2003).

The multidimensional measures of SOP have been studied by Stedman 2002, Ardoin 2014, and Donatuto & Poe 2015 among others. SOP was made up of place attachment, place satisfaction, and symbolic place meanings in Stedman's 2002 multidimensional study. He considered place

identity and dependence as sub-factors of attachment and extended his multidimensional measure to include place satisfaction and place meanings. He found attachment and satisfaction exerted independent influences on behavior and meanings affected behavior in a lake region in Wisconsin. Ardoin (2014) used a SOP and scale of place index to look at SOP and connections to place across multiple regions. Her scale considered aspects of place identity, dependence, attachment, and connections. Environmental concerns and actions taken to address them were also measured to see how SOP affected action. Her results were mixed in how SOP influenced action depending on ecoregion study location. Donatuto and Poe (2015) determined SOP was comprised of four dimensions in their study on the Puget Sound. Their qualitative study identified dimensions of activity, heritage, personal experiences and social connections as key in indicating SOP. A table of additional SOP, place attachment, and place meaning studies dealing with environmental entities is found in Appendix I.

Several SOP frameworks are found in the literature leading to some criticism for its disjointed and inconsistent appearance (Stedman 2002; Lincoln & Ardoin 2016). The key sources of any inconsistency in SOP research centers around the definitional differences in key terms. These differences specifically concern definitions of the place dimensions and different choices regarding the attitudes or meanings necessary to measure in order to identify SOP. This thesis follows the conceptual framework and measures developed by Stedman 2002 and his other studies on SOP. His framework is established in the literature and his conceptualization of SOP suggests a social-psychological model of human- environment interaction fitting for the investigation of ecosystem service valuation.

2.4.2 Sense of Place Elements

The most notable of the three place dimensions is place attachment. Place attachment has been measured in some places in the literature as an overarching concept encompassing the other two dimensions, place identity and place dependence (Moore & Graefe 1994; Jorgensen & Stedman 2001; Kyle et al. 2004; Halpenny 2010). Place attachment is measured as a unidimensional construct consistently by Stedman through his SOP work starting with his 2002 paper (Stedman 2002; Stedman 2003; Stedman 2006). While Stedman has looked at SOP as both multi- and unidimensional we will proceed with the unidimensional approach also known as the place attachment approach which "emphasizes the potential role of natural resource attributes as bases of attachment" (Stedman 2006).

Stedman argues that the measurement of SOP as a unidimensional concept without specific measures for place dependence and place identity makes terms more agreed upon and variable relationships more empirically specifiable (Stedman 2002). To some, SOP studies are often synonymous with studies of place attachment. While the two are looking at measuring a similar concept "sense of place differs from place attachment by considering the social and geographical context of place bonds and the sensing of places, such as aesthetics and a feeling of dwelling"(Hay 1998). In essence, SOP is looking beyond the measurement of attachment to try to understand more of the depth of the relationship with place and the factors that affect it. Stedman argues for these additional measures (those beyond place attachment) for the understanding of connection saying, "[k]nowing that someone is strongly attached to place does not by itself suggest much about the nature of this attachment or what behaviors may ensue"(Stedman 2002).

Place satisfaction is another concept measured when identifying SOP. "Place satisfaction is adopted from the field of community sociology as a complementary concept to place attachment" (Stedman 2003). It is consistent with definitions of attitude regrading setting (Stedman 2003) and as such is another factor in generating environmental action. Place attachment and place satisfaction have been measured together to identify SOP (Stedman 2002, Stedman 2003, Rickard & Stedman 2015). Stedman 2003 found that attachment and satisfaction exert independent and oppositely signed influence on intentions to engage in place- protective behavior. Because of this, measuring place satisfaction as a factor in my SOP study is important since I am also investigating individual's potential to engage in a protective behavior with the Pollination Area Program that will increase ecosystem services. The work in Stedman 2003 "demonstrates that landscape characteristics matter, they underpin both place attachment and satisfaction". In response to these findings I expect ecosystem services which are functions of landscape to be factors in SOP.

"Knowing that someone is strongly attached to place does not by itself suggest much about the nature of this attachment or what behaviors may ensue" (Stedman 2002). This argument necessitates the measure of place meanings as well when trying to measure individual's connections to place as part of SOP. Lin & Lockwood 2014 state, that by themselves, place attachment type studies "are not well suited to address spatial attributes or the sources of place meanings." It has also been argued that place meanings are more descriptive and can give a greater depth to understanding meanings than place attachment scales (Wynveen & Kyle 2015).

Meanings are important to measure because they are "the cognitive building blocks of attitude" (Stedman 2002). Smith et al. 2011 contends that meanings and the types of meanings individuals hold for a resource are "key drivers" in their desired outcome from management. Connecting place meanings with how they affect actions and response to outcomes provides planners with ability to design socially accepted management plans that adhere to group SOP concerns (Smith et al. 2011). "Place meanings can have greater managerial utility owing to their ability to reveal more detail concerning why and to what extent relevant groups value a given landscape" (Wynveen & Kyle 2015).

Stedman also measures place meanings, as what he calls "symbolic meanings", about location as a part of his work to measure SOP (Stedman 2002). In his 2002 paper, Stedman incorporates all three, in his definition of SOP, "SOP can be conceived as a collection of symbolic meanings, attachment, and satisfaction with a spatial setting held by and individual or group." We will measure all of these elements as a part of measuring SOP on the ES. Meanings possessed about biodiversity, ecosystem services, environmental health, and purposes of the ES are all crucial to understand "why and to what extent stakeholders value [the ES] landscape" (Wynveen & Kyle 2015) in the context our research.

2.4.3 Sense of Place Covariates

Sense of Place studies have considered other covariates to better understand what factors affect SOP. One important covariate to consider with SOP is rootedness. A concept from psychology, rootedness, explores the importance of a place based on time spent living there. Tuan 1980 was the first to identify this concept. He defined rootedness as a long habitation with a place or an

incuriosity toward the world at large and insensitive to flow over time. Relph (Relph 1976) expanded this concept to include a less restrictive definition for those without a long period of habitation. Relph, maintains that people can experience rootedness in places that represent a safe and secure base regardless of the duration of time they have spent there. Beyond this physical connection, McAndrew 1998 concludes that, "individuals usually develop very strong sentimental and emotional attachment to the place in which they live" making them rooted. Graefe & Dawson 2013 add that in a recreation context, those who are rooted in a specific place have developed a powerful bond there such that they are so attached they have no desire to find or visit another location for that activity. Rootedness, can therefore be experienced in recreation locations, areas of short but meaningful time spent, and areas of extended habitation.

Rootedness has been looked at explicitly and implicitly by authors seeking to better understand SOP but never before with WTP. For example, Moore & Graefe 1994 look at length of association in their conceptual framework as a way to look for rootedness. Hay 1998 contends that, "The development of a SOP is particularly influenced by residential status. Those with more superficial connections to place, such as transients or tourists, do not develop the strong attachment that is found among insiders raised in the place". Hay refers to those who have been raised in a place and are thus rooted there more than short term visitors as "insiders". In contrast to Hay, Stedman 2006 found that second homeowners could have a higher attachment to place than full time residents although the meanings for attachment varied between the groups. Because of this discrepancy we cannot assume residency can explain differences in SOP values.

Another important pair of covariates to investigate with our survey is the type of activities and places people spend their time on the ES. Understanding these factors will give a clearer picture to the meanings and importance of a place based on previous experience (Ujang & Zakariya 2015). Many previous SOP studies including Stedman 2003, Gunderson & Watson 2007, Lincoln & Ardoin 2016, and Jenkins et al. 2016 have indicated activities and experiences have a connection to SOP. Stedman 2003 maintains that "Previous behaviors or experiences in the landscape may create lenses through which humans attribute meanings to landscape." By measuring these, we can see how they may influence SOP findings. Because "[e]xperiences and activities at a location can transform it from a geometric concept to an experiential construct" (Jenkins et al. 2016) I expect them to influence meanings and attitudes about place.

Another covariate to consider is an individual's personal life history which a place. Understanding personal life history can help explain levels of importance placed on items, activities, and places. A person's past experiences can affect their values orientation, personal identity, and social values. People are motivated by their self- interests, which focus on their individual well-being. Stedman 2006 looked at this covariate and found that year round and seasonal residents had different place meanings for the same place. Lin & Lockwood 2014 noted in their study that, "[p]hysical place characteristics and historical associations, as well as sensory responses and social experiences, were revealed as important factors underlying the formation of place attachment".

Understanding the period of time spent interacting with a place or group is a term known as Enduring Involvement. This concept "describes the cognitive linkage between an individual and

an object. It focuses on the level of interest or personal relevance to the object" (Lu & Schuett 2014). This concept is also important to investigate with SOP to explore if there is a connection between the two. Moore & Graefe (1994) found years of use and frequency of use in a particular location were important predictors of place attachment. Vorkinn & Riese 2001 also saw in their study that user experiences and engagement in recreational activities were predictors of level of place attachment. These measures were incorporated into the survey design to identify a possible connection to our SOP and WTP results.

A final covariate to consider in terms of SOP is the importance of a place to an individual. Some studies (Jorgensen & Stedman 2001; Halpenny 2010) have considered this as place affect or "the emotions and feelings of an individual towards place" (Halpenny 2010). Other studies asked respondents to map important places (Lin & Lockwood 2014) or to explain the importance of the places they spend time (Gunderson & Watson 2007). Asking individual's about this covariate helps to explain the importance of a place in relation to its surroundings or similar areas nearby.

Chapter 3 Methods and Design

The economic framework and design of this study's stated preference experiment are explained and defined in Chapter 3. The Random Utility Model that forms the basis for SP and the WTP measure for determining value are explained in the context of this study. Covariates that are hypothesized to effect valuation results are also discussed in both their origin and relationship to the conceptual framework of this SP experiment. The concepts used to measure SOP in the context of this study are next discussed and the scale construction is elaborated. The final portion of the chapter details the survey instrument and the design and questions used to implement the conceptual framework.

3.1 Choice Experiment Empirical Methods

3.1.1 Random Utility Model

I use a choice experiment to study how individual's choice regarding a Pollination Area Program is affected by the attributes of that program.. The Random Utility Model (RUM) provides the theoretical framework for analyzing discrete choice using the utility maximization framework of neoclassical microeconomic theory (McFadden 1973). With a CE it is possible to observe a discrete choice from a set of alternatives (Adamowicz et al. 1998). One of these alternatives should be a status quo option to keep the CE consistent with utility maximization and demand theory (Hanley et al. 2001).

Following work by McFadden (McFadden 1973) and consistent with others (Rolfe et al. 2000; Hanley et al. 1998) I set up my economic empirical model. In this model, each individual (*i*) has

a utility function (U_{ij}) for their choice (j) which is made up of an observable component (V_{ij})

and an unobservable component represented as an error term (ε_{ij}).

(1) $$U_{ij} = V_{ij} + \varepsilon_{ij}$$

Individuals are utility maximizers such that the probability an individual (i) choses alternative (j)

is shown by

(2) $$P_{ij} = \text{Prob} \left(U_{ij} > U_{ih} \text{ for all } j \neq h \right)$$

$$= \text{Prob}(V_{ij} + \varepsilon_{ij} > V_{ih} + \varepsilon_{ih} \text{ for all } j \neq h)$$

3.1.2 Conditional Logit

A conditional logit model can be used to model this indirect utility from the observed choice j.

The probability of choosing j over h in a choice set takes the general form of

(3) $$P_{ij} = \frac{\exp(V_{ij})}{\sum_{j \in C} \exp(V_{ih})}$$

This framework is consistent with the modern economic choice theory assumption that

individuals behavior in a market is caused by a decision to maximize preferences (McFadden

1986) such that the individual will pick option j over h if it is preferred.

With the RUM, maintaining Luce's Independence from Irrelevant Alternatives (IIA) lets us infer

behavior from paired comparisons (McFadden 1986). The IIA property "requires that the

probability of choosing one alternative over a second depends on the utility of these two

alternatives" (Morrison et al. 1999). The choice should depend exclusively on the attributes of an

alternative and characteristics of individuals and not on the choice set or attributes of different

alternatives not present in the choice question (McFadden 1986).

The basic conditional logit model for our CE is found in Eq. 4, where a choice to contribute to a pollination area program is determined strictly by the different attributes of the alternatives.

(4) $V_i = \beta_1 numPAs + \beta_2 polabundinc + \beta_3 quabundinc + \beta_4 payment$

In this Eastern Shore study I look at four attributes of a pollination area program that is designed to improve ecosystem services. These four attributes are the number of pollination areas, pollinator increase in abundance, Bobwhite quail increase in abundance, and the one-time payment to crowdfund the implementation of the program.

When evaluating a CE it is common to include the alternative specific constant or ASC into the model. The ASC represents the choice(s) that is/are changes or different from the status quo or base condition. It is helpful for computing a willingness to pay estimate because choice scenario attributes do not capture all possible reasons for choosing an alternative that is a change over the status quo (Morrison et al. 1999). In the context of my experiment, the ASC is not particularly meaningful because there are only two alternatives with one being the status quo. I do not estimate any models with an ASC for this reason.

Influences of socio-demographic traits are important to look at when understanding individual's preferences. For understanding the effects of these traits using the ASC is necessary. These individual defining variables can be interacted with the ASC to capture the influence of individual traits on the probability of selecting a Pollination Area Program. An example of a conditional logit model including respondent age, income, and level of education is shown in Eq. 5.

(5) $V_i = \zeta_1 age * ASC + \zeta_2 income * ASC + \zeta_3 education * ASC + \beta_1 numPAs +$

$\beta_2 polabundinc + \beta_3 quabundinc + \beta_4 payment$

3.1.3 Mixed Logit

Random Parameter Mixed logit models also fall under the structure of the RUM (McFadden &

Train, 2000; Hensher & Greene 2003). Unlike conditional logit, the mixed logit model removes

the Independence of Irrelevant Alternatives (IIA) assumption (Zeng 2016). Relaxing this

assumption with mixed logit is reasonable because there is likely to be some correlation across

decisions apart from the choice attributes of the experiment. The individual coefficients vary by

individual decision makers in the population with a density $f(\beta \mid \Theta)$. "The random-coefficients

structure [of this model] allows heterogeneity in the sensitivity of individuals to exogenous

attributes" (Bhat 2001).

The probability conditional on β_i of making a choice out of j alternatives is given as:

(6) $L_{ij}(\beta_i) = \dfrac{e^{\beta_i' v_{ij}}}{\Sigma_j e^{\beta' v_{ih}}}$

The unconditional probably captured by the mixed logit is represented by the integral of the

conditional probability over all possible values of β_i is:

(7) $P_{ij} = \int (\dfrac{e^{\beta' v_{ij}}}{\Sigma_j e^{\beta' v_{ih}}}) f(\beta) d\beta$

The mixed logit model estimated for this research looks specifically at the main effects of the

choice experiment choice and is represented by the model:

(8) $V_{ij} = \beta_{1i}(numPAs_j) + \beta_{2i}(polabuninc_j) + \beta_{3i}(quailabuninc_j) + \beta_4(payment_j)$

where the coefficient of payment (β_4) is fixed and the remaining attribute coefficients are normally distributed.

3.1.4 Willingness to pay

Willingness to pay (WTP) is a measure of welfare that is consistent with demand theory (Hanley, et al. 2001). Its purpose is to estimate the compensating variation (CV) for a change from the status quo that would be brought about by choosing one of the Pollination Area Programs included in the choice set. This value is derived from Eq. (2) and is found below in Eq. (9) in the form derived by Rolfe et al. 2000 and is consistent with the work of Hanemann, 1984.

(9)
$$CV = -\frac{1}{\alpha[\ln \exp \sum V_{i0} - \ln \text{ex } \sum V_{i1}]}$$

Here CV is the compensating variation, α is the marginal utility of income, and V_{i0} and V_{i1} are the indirect utility functions before and after the change performed by the choice. This equation can be further simplified into Eq. (10) which represents the marginal rate of substitution between money cost and the attribute be studied.

(10)
$$WTP = -1 * \frac{\beta_{attribute}}{\beta_{money}}$$

The marginal rate of substitution between some attribute of interest and the cost (or monetary) attribute is the implicit price of that attribute of interest (Morrison et al. 1999). Finding these implicit prices associated with ecosystem services is one of the goals of this research.

3.2 SOP Methods

Sense of place was investigated as a multidimensional concept within my study. This is consistent with work by Stedman 2002 and others. I estimate SOP by looking at three factors: place attachment, place satisfaction, and place meanings. SOP has been measured both

qualitatively (Hay 1998; Donatuto & Poe 2015) and quantitatively (Jorgensen & Stedman 2001; Stedman 2002; Jorgensen & Stedman 2006) in the literature and occasionally measured together (Ardoin 2014; Lin & Lockwood 2014; Lincoln & Ardoin 2016). A quantitative measurement strategy was used for consistency with prior SOP studies which looked at place satisfaction. Quantitative measurement also allowed the use of a single survey instrument for data collection that measured both SOP on the ES and WTP for the Pollination Area Program.

Both satisfaction and attachment were measured as attitudes that contribute to SOP on the ES. Measuring these two attitudes together was consistent with work by Stedman (Stedman 2002, Stedman 2003, Rickard & Stedman 2015). Place attachment items were collected from previous research around this attitude and SOP. The literature supports a more standardized set of survey items to measure place attachment. The six items used to measure place attachment represent items most supported in the literature and include items linked to dependence, identity, and activities. All attachment items are found in at least several of the following previous papers: Moore and Graefe 1994, Jorgenson & Stedman 2001, Stedman 2002, Stedman 2003, Kyle et al. 2004, Stedman 2006, Gross & Brown 2008, Halpenny 2010, Ardoin 2014, Lin & Lockwood 2014, Morrison & Dowell 2015, Tonge et al. 2015, Lincoln & Ardoin 2016. A group of six items was chosen to use the most consistent measures in the literature and keep the place attachment scale to a minimal size because of the length of entire survey.

Place satisfaction items were developed based on previously investigated items from papers by Stedman. In his 2002 and 2003 papers, Stedman considers all five of the satisfaction items used in the ES survey. These five items are scenery, solitude, wildlife populations, number of users,

and development. All are relevant to the ES as they correlate with current environmental conditions. Number of users was changed to number of tourists and visitors to make the item more appropriate for the ES location.

Place meaning was measured to better explain these attitudes. While place attachment can give understanding about emotional and functional attachment, it does not explain how those attitudes were formed. Meanings can do this. Wynveen & Kyle 2015 argue for a location specific development of place meaning scale items. This is necessary because unlike place attachment scales which look at measuring a dichotomy, attached or not attached which can be standardized, meanings are not dichotomous, they are more of a spectrum and place specific.

The place meaning scale items were developed by looking at place meaning categories from previous studies and designing new survey items that appropriately captured meanings held by individuals on the ES. Developing an original list of meaning items allows us to reveal more detail about different groups and their values for the ES landscape (Wynveen & Kyle 2015).

Through living on the ES and interacting with residents and visitors over the summer of 2016, I was able to identify several important areas of meaning that are important to individuals. A place meaning item list was developed around six key meaning categories: nature/wildlife, family/friend connections, recreation/activities, escape from day to day/urban areas, community, and work/living. Looking at each of these groups of meanings is important to understand relationship with the ES and level of interest or connection with a pollination areas program.

Looking at meanings about wildlife and nature are important because these meanings dictate a great deal of recreational activities on the ES. In addition, they are likely correlated with preferences for ecosystem services on the ES. As the CE works to measure the preferences for environmental improvements, it is necessary to also measure how people agree with meanings about current statements about ES ecosystem health.

Meanings about the ES as they relate to whom people spend time with and the recreational activities they enjoy there are important to measure. In my interactions with people on the ES, individuals highlighted the importance of friend and family relations regarding the ES. Additionally, they referenced how recreation and other activities motivated experiences suggesting too that they constitute a group of meanings. Understanding these two types of meanings will help explain the relationship to place and behavior related to satisfaction (Stedman 2002) or behavior relating to program contribution to maintain or improve ecosystem services.

The other meaning categories of escape, community, and living deal with more functional meanings with the ES. They allow the investigation of meanings associated with living and work or escape and vacationing. They also address meanings regarding interaction and attitude with current residents and communities on the ES. A full list of meaning items and their distinction among place meaning categories is shown in Table 19 in Appendix A.

3.3 Personal Connections and Rootedness

I suggest that personal connections have an impact on both psychological value (i.e. SOP) as well as economic value (WTP). Personal connections that could contribute to differences in these

values include: residency status, family heritage, spatial use patterns, rootedness, previous

experiences and activities, and involvement of time and what period of time in life were spent on

the ES.

One important measure of connection to consider is rootedness. Rootedness is an important

concept to explore because it can explain the importance of the Eastern Shore to people in a

different way than the place attachment or place meaning scales involved with Sense of Place. I

evaluate rootedness from questions about ES residency over time, family history and visitation

patterns. Measuring rootedness in this way incorporates the covariates of enduring involvement,

personal life history, and importance of a place into one measure.

Measuring rootedness is not done uniformly in the literature as explained previously. By

incorporating many factors to compute groups of individuals differing in level of rootedness, I do

my best to capture this latent concept across the different groups of individuals who may exhibit

this quality differently. For this study I suggest that rootedness is a function of all the factors in

Eq. 11 among many possible others.

$$(11) \quad Rootedness = f(ES\ birth, ES\ family\ connections, ES\ place\ importance,$$
$$length\ of\ residency\ or\ visitation, propotion\ of\ childhood\ lived$$
$$on\ ES, proportion\ of\ adulthood\ lived\ on\ ES)$$

As previous work has found that factors that affect rootedness can effect attachment, I

hypothesize that rootedness should effect SOP scores by increasing place attachment.

3.4 Survey Design

For the purpose of this study, a survey instrument was developed to investigate both Eastern Shore Sense of Place and willingness to pay for a Pollination Area Program to increase ecosystem services on the ES. Survey design followed the design of prior WTP and SOP studies. A focus group and a pretest were implemented to discern any issues of combining the two types of designs from these differing techniques. The final survey was divided up into five sections to look at the conceptual framework laid out previously and separating the main sets of questions used to measure WTP and SOP. In this section, we detail how the different elements of this study's conceptual framework were measured within the survey and its components. A complete copy of the survey instrument is available in Appendix E.

3.4.1 Personal Connections and Covariates

The first two sections and the last section of the survey instrument were used to investigate ES connections and individual covariates that were important because of their possible correlation to SOP and WTP measures. A table of covariates and questions used to measure them is found in Table 2. Individual's preferences for ecosystem services, their WTP for service improvements, level of SOP and connections to place and depth of those connections could all be affected by these exogenous variables.

Section one investigates the nature of the respondents relationship with the ES. The questions in this section help look at rootedness and enduring involvement on the ES. Several questions are used to determine whether respondents are residents, former residents, or visitors. From here we investigate the length of time spent annually and the total duration of their visitation or habitation

of the ES to look at enduring involvement. Additional questions investigate the portions of time individuals have spent on the ES during their childhood and adult stages of life to identify if there are SOP affects based on life stages.

Several questions were used to look at residency over time and family because these variables sort people into different groups on the ES. Assuming simple dichotomy between residents and visitors is inadequate because it falsely suggests that within those groups, individuals share the same interests or priorities (Paris 2009). The answers from questions about residency can separate two groups within the residents; "come here's" and "from here's". These locally developed classifications are used to designate residents who are from (i.e. born and raised on) the ES from those who came (i.e. moved to ES later) from elsewhere to live on the ES. Many "from here's" have deep family heritage in the area and socially separate from groups of people who do not.

Section two was designed to understand the places the respondents spend their time and their levels of involvement in certain recreational activities. As the number of places and types of experiences can differ depending on location within the ES I hypothesize that what areas a respondent has visited and how important they are could impact their levels of SOP and WTP for pollination areas. I also hypothesize respondents reporting higher levels of importance for places on the ES will correspond to higher SOP scores. The items within questions on this section were randomized in the order they appeared on the survey to prevent against bias associated with ordering of places or activities in terms of selection and rating.

Section five consists of demographic questions that were modeled after US Census Bureau question designs for measuring these items. Additional, questions were added to this basic set including asking if a respondent was born on the ES or owns property there. These factual questions are not likely to be affected by any questions or material previously contained in the survey so we are not worried about endogeneity from survey location of these questions. While questions in sections 1 or 2 are included earlier in the survey to ensure the exogeneity of these variables to the SOP and WTP sections, the questions and demographic answers are not expected to be affected by their location at the end of the survey.

3.4.2 SOP

SOP was measured in the third survey section using three separate scales looking at identifying meanings and attitudes regarding the ES. Place meanings were measured using 14 items on a 5 point unidimensional likert scale. Respondents were asked to look at meaning statements and asked to rate how truthful each was for them from "Not true at all for me" to "Completely true for me". The attitudes of Place Attachment and Place Satisfaction were measured in separate scales. Respondents were asked to respond with their level of agreement to 6 items for place attachment on a 7 point two dimensional likert scale. This was consistent to place attachment measurement in Stedman 2002 and allows for a more continuous scale of responses compared to 5 point scale used in many other studies.

Place satisfaction was measured in with 5 items with a 5 point two dimensional likert scale. Respondents were asked to indicate their level of satisfaction from extremely dissatisfied to extremely satisfied for different characteristics of the both the natural and physical environment

on the ES. All three scales were evaluated and used to identify the SOP for the ES for survey respondents.

3.4.3 Choice Experiment

The fourth survey section consisted of a CE involving a Pollination Area Program on the ES. To ensure consistent base level of knowledge and guard against unfamiliarity problems with the experiment subject, several pages of text with break questions were used prior to CE questions to inform respondents. The concepts relating to ecosystem services impacted by the program, current ES conditions and pollination area program structure and implementation details were explained to respondents. Questions were also asked to measure prior knowledge regarding quail and pollinator decline and crowdfunding.

To improve the credibility of the Pollination Area Program, the Virginia Native Plant Society (VNPS) was contacted and asked to partner in the survey design. The VNPS agreed to partner with us and provided permission to use their name and logo (Appendix F). Respondents were told in the survey that the Virginia Native Plant Society was considering implementing the program and that their feedback to the choice questions would be used to inform the design of the program by the VNPS.

Reducing cognitive burden was a crucial aspect to survey design. Based on both the length of the survey (in terms of time and number of questions) and unfamiliarity of the topic I wished to minimize complexity with the CE. To minimize cognitive burden within the CE a couple decisions were made. The first was to ask respondents only 4 choice questions. The second was

to design our choice questions with only two alternatives, a pollination area program with specific levels of attributes and a status quo option called "No Program".

With no previous studies existing that have looked at pollination service preferences and a limited sample size from our intercept survey recruiting, a decision was made to keep limit the choice question to 4 attributes. These attributes had varying numbers of levels depending on the attribute. With no previous estimates, attribute levels were determined based on collective effort of the research team and its diverse expertise in the different services and effects of pollination areas research. The focus group and pretest survey were both used to check attribute levels among the sample pollination. CE attributes are described and levels detailed in Table 1 and an example choice question is shown in Figure 3.

Following the 4 question choice set, respondents were debriefed with questions to understand why they made the choices they met. To measure protest responses, respondents who chose any "No Program" option were asked to explain why by selecting reasons from a bank of true no and protest no answers consistent with previous studies (Meyerhoff & Liebe 2008, Chen & Hua 2015). For consistency, respondents were also asked what motivated their choice to pay to support a pollination area program if they selected any of the programs in the choice set. Answers to these questions about why a response was chosen were randomized to eliminate bias relating to ordering. Respondents were also asked to rate how successful they believed the pollination area program would be at improving pollinator species populations, quail populations, ES scenic beauty, and water quality.

Table 1. Choice Experiment Pollination Area Program Attribute Descriptions and Levels

Attribute	Level	Value	Description
Number of Pollination Areas	5	200	This attribute explains the size of the program in terms of number of planted areas. Using number instead of acreage allows landowner preference to influence size and helps respondents visualize how Pollination Areas will be spread around the Eastern Shore. Ex. There will be 200 pollination areas established across the Eastern Shore
	4	150	
	3	100	
	2	75	
	1	60	
	0	50	
Increase in Pollinator Abundance	5	30	This attribute explains the change in pollinating species abundance. Abundance in this attribute corresponds with population increases of these insect species. Ex. There will be a 30% increase in the current population of pollinators
	4	25	
	3	20	
	2	15	
	1	10	
	0	5	
Increase in Quail Abundance	1	Increase	This attribute explains the change in quail abundance. There is no scientific information regarding levels of quail population change so this corresponds to an increased presence but not of some percentage. Ex There will be an increased presence of quail
	0	No Change	
One-time Payment	4	$224	This is a one-time payment to the crowdfunded pollination area program. Ex. Pay $224 to the program
	3	$185	
	2	$108	
	1	$59	
	0	$29	

Table 2. Connections and covariates investigated on ES Stated Preference and SOP survey

Covariate	Survey Data Collected
Rootedness	Portion of Childhood on ES
	Portion of Adult life on ES
	Family members on the ES
	Born on the ES
	Property ownership on the ES (home, second home)
	Length on living or visiting
Residency Group	"Come here", "From here", former resident visitor, frequent visitor or infrequent visitor
Previous Experiences	Places visited on ES
	Place that respondent has spent the most time
	Recreation activities on the ES
Enduring Involvement	Activities
	Importance of ES places
	Frequency of visitation
	Years lived/ visited ES

Please indicate which you would choose (select one)

	Pollination Area Program	**No Program**
Number of Pollination Areas	200	**I would not choose the Program**
Pollinator Abundance	30% Increase in pollinator abundance	
Quail Abundance	Increased presence of quail	
One-time Payment	$29	

❑ I would choose the *Pollination Area Program* and pay $29
❑ I would choose *No Program* and pay $0

Figure 3. Example choice experiment question.

Chapter 4: Sampling Methods and Strategy

The steps taken to perform our Eastern Shore survey are outlined here in Chapter 4. An initial survey on the Eastern Shore was necessary to create our sample population. This field intercept survey was implemented across the study area and performed in differing settings in order to engage as many different groups of people on the ES as possible. Designing the final survey instrument involved a focus group held at Virginia Tech and was followed by a pretest mailed draft version on the survey. The finished survey was distributed through an online format through email. The sampling strategy and methods of all surveys and contacts are outlined her in this chapter.

4.1 Summer Pre-Survey Sampling Methodology

The preparations for designing the survey to test the research questions of this thesis began with a survey conducted in the field on the Eastern Shore the summer of 2016. This field survey occurred prior to the development and implementation of the CE and SOP survey. The purpose of this in- the- field survey was to recruit a group of respondents for the final survey.

The summer survey was designed to meet people across the Eastern Shore who had all sorts of residency and personal connections with the study area. Sampling took place at 14 locations across the Eastern Shore. 6 locations were in Virginia, 5 in Maryland, and 3 in Delaware (Figure 4). The types of locations were varied with the intention of engaging different types of people visiting or living on the Eastern Shore. The locations consisted of 9 towns or cities, 3 farmers markets, and 2 roadside farm markets, which I refer to as farm stands. Sampling was

conducted at these farm markets and stands to identify if people who frequented these locations

were different in their preferences for ecosystem services than those in towns or cities. Because

pollination areas currently exist on farms on the Eastern Shore and farmers are more likely to

experience direct benefits from the species they attract it is hypothesized that people who buy

from local farms would have a stronger preference for increasing services liable to affect these

farms. To test this, these sampling locations were included and respondents were asked a

question about their connection to farms and local produce.
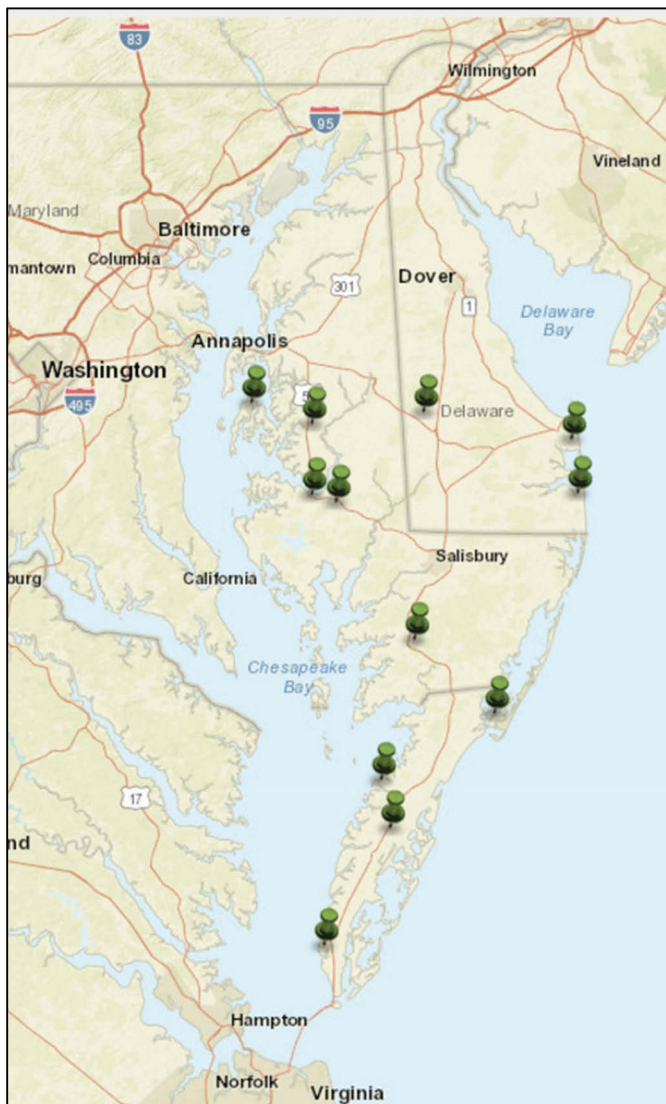
Figure 4. Map of Summer 2016 survey sampling locations on the Eastern Shore

Summer survey questions were designed to extract certain information from respondents. Questions were asked to identify local versus visitors to the Eastern Shore. Within the local residents groups questions were asked to identify how long respondents had lived on the Eastern Shore. During survey development, contacts on the ES identified that discerning if residents were born and raised on the Eastern Shore (called "from here's") or had moved to the ES (called "come here's") was important. It was explained that this piece of information was important because the two represent distinct groups of people who have differences in residency history and family heritage in the area.

To understand the temporal connection to the ES, respondents were asked about the length of time they spent there. For visitors, questions asked about length and frequency of ES visits were used to identify the same concept. A final element that was crucial in the summer survey was asking respondents about their knowledge of crowdfunding. This was important to ask because crowdfunding is the payment vehicle being used in the CE on the final survey. Understanding the familiarity with crowdfunding of future respondents could help with designing the future survey and deciding how much detail would be needed to explain what crowdfunding is.

Consent was administered verbally at the beginning of the survey and consent to participate in the subsequent survey was obtained at the end of the survey. Those who were willing to participate in the follow- up (the survey used for this thesis) had their name and contact information collected at completion of survey. No other identifying information was collected from any participants. Survey results were collected with the Fulcrum App which would record answers and make a geo reference point for each survey administered.

Summer sampling resulted in a sample size of 633 respondents with 560 agreeing to be contacted with the subsequent survey that is the subject of this research. There was a 51% to 49% split in favor of residents compared to visitors in the summer survey. Summary stats and information regarding summer survey results can be found in Appendix H. Table 3 includes the date and number of surveys collected for each day working in the field. There are numerous reasons why responses per day were lower than some may expect. Some of the factors influencing these numbers included: long traveling time to survey locations, only one interviewer, limited hours at certain farmers markets, poor weather, little foot traffic in certain locations and non-response rates over 50%.

Sampling for the summer survey was varied by location according to crowd size of the towns. The sampling method was set upon arrival to the site after observation of the amount of foot traffic through the survey area locations. When a sampling location was not crowded, every second party was engaged and the adult with the closest upcoming birthday was asked to respond to the survey questions. With more crowded areas when engaging every second party was not possible the intercepting pattern would be reduced to every fourth or fifth party depending on the researcher's judgement.

Sampling many different locations was vital to rounding out sample groups. Some locations were strongly populated with only locals or visitors with limited amounts of the other. Varying locations to sample in areas that were more and less affluent brought in different types of locals. Sampling near post offices was an effective way of intercepting more "from here's". On the ES

many people prefer to have their mail delivered to Post Office Boxes compared to maintaining a

mail box at their home.

Table 3. Summer 2016 survey responses by date surveyed

Date	Surveys	Date	Surveys
6/10/2016	7	7/11/2016	9
6/11/2016	13	7/12/2016	25
6/12/2016	13	7/13/2016	15
6/13/2016	19	7/14/2016	9
6/14/2016	19	7/15/2016	10
6/15/2016	18	7/16/2016	11
6/16/2016	13	7/18/2016	15
6/17/2016	14	7/19/2016	12
6/18/2016	13	7/20/2016	16
6/20/2016	7	7/21/2016	9
6/21/2016	14	7/22/2016	9
6/22/2016	13	7/23/2016	19
6/23/2016	8	7/26/2016	25
6/24/2016	5	7/27/2016	9
6/27/2016	11	7/28/2016	8
6/28/2016	10	7/29/2016	21
6/29/2016	22	7/30/2016	14
7/1/2016	18	7/31/2016	1
7/2/2016	19	8/1/2016	13
7/4/2016	6	8/2/2016	10
7/6/2016	12	8/3/2016	7
7/7/2016	11	8/4/2016	19
7/8/2016	7	8/5/2016	18
7/9/2016	16	8/6/2016	14
7/10/2016	7		
		Grand Total	633

Location was varied daily as to not sample at the same location on the same day of the week and to prevent against sampling the same visitors during their stay. Farm markets were the lone exception to this rule as they had set days and times when they were open. To prevent overlap sampling, farmers markets were not sampled in successive weeks. Despite varying the days at different locations it is possible that survey time was biased towards groups who were more likely to be out during the middle of the weekday. This possibly biased survey respondents on average to be older, more likely unemployed, or visitors then the true population of the Eastern Shore.

Because all intercepts occurred outdoors, daily sampling location was influenced based on the weather. The researcher would work to sample in locations where the weather was the best that had not been recently sampled. Good weather was observed to cause more people to be out across all locations and tended to make people more willing to stop and talk for the several minutes required to administer the survey allowing sampling to be more productive.

4.2 Final Survey Implementation

After the summer sampling the final sample size of individuals willing to be contacted for the final survey was 560 individuals. This group was made up of 285 residents and 275 visitors to the Eastern Shore.

Prior to the official survey being sent out, a focus group and a mailed pretest survey were used to refine the final survey. "Focus groups are an exploratory or diagnostic technique" (Chilton and Hutchinson 1999) and one was used to check for question clarity and choice experiment

explanation clarity and validity of attribute levels. The focus group consisted of staff within the College of Agriculture and Life Sciences at Virginia Tech. Using a list of staff (non- faculty), names were randomly selected and contacted to participate in the focus group. Out of 60 individuals selected and contacted only 6 (10%) were available to be a part of the focus group. None of the focus group participants had ever lived on the Eastern Shore but most of them had visited previously.

After the focus group, the survey was edited to reflect the concerns and misinterpretations of respondents prior to a pretest mailing of the survey. The pretest mailing consisted of 35 residents and 25 visitors randomly selected who had provided mailing addresses. Sampling more residents was important because there were none in our focus group. The pretest left a final sample size of 500 individuals with 250 each of residents and visitors for the final survey. Each pretest individual was sent a cover letter, a copy of the survey, and a prepaid return envelope by Priority Express Mail. A reminder postcard was mailed out a week afterwards to help encourage responses. Pretest respondents were asked to take the survey and make questions or comments on items they did not understand. Respondents were asked to provide their phone number if they would be willing to be followed up with.

Of the 60 express mailed pretest surveys, 22 were returned completed. 4 were returned because of incorrect addresses leaving us with a 39% response rate. All respondents who provided a telephone number were followed up with to ask about any difficulties or confusions they may have encountered in filling out the survey.

Results were used to create Ngene code for designing choice sets (Appendix B). Ngene is a software package used for developing experimental design choice sets. D-errors were used to check the experimental design and prior coefficients from the pretest were used to improve the D-efficiency (minimized determinant of the variance covariance matrix) of the experimental design (Rose et al. 2008). Prior coefficient values from the pretest were used in the choice set design in addition to the attributes, attribute levels, and number of choices which had been determined previously by the greater research team.

An experimental design of sixteen choice sets with four choice blocks was chosen (Appendix B) with each choice set consistency of an alternative (pollination area program option) and a status quo (no program) option. Respondents were randomized into four choice block groups with each respondent being presented with the four choice sets of that block on the survey.

Following the pretest, few changes were made and the survey was transferred onto an online format for distribution using the Qualtrics platform. The final survey was distributed using email delivery of the survey according to Dillman's tailored design (Dillman et al 2009, 2014). This consisted of a three email contact strategy with a survey link included in the cover letter and subsequent reminder email letters. All but 20 of the remaining contacts had previously provided an email address in the Summer 2016 intercept survey so they were dropped and a final survey group consisted of 480 individuals. Individuals were not offered a token gift or other type of incentive for filling out the survey.

Chapter 5: Results

This chapter details the results of the Pollination Area Program survey. Of the 480 individuals the survey was sent to, 214 surveys were submitted during the testing period for a response rate of 44.6%. Of these submitted surveys, 201 (93.9%) were completed and suitable for analysis.

5.1 Descriptive Statistics and Demographics

The socio-demographic information for the survey respondents with completed surveys is found in Table 4. Of these respondents, 51% were women and the average age was 55 years old. 93% of respondents were white and approximately 72% had earned a Bachelor's degree or higher degree. The average income for the respondents was within the $50,000 to $74,999 range in accordance with U.S. Census income levels.

Table 4 also contains the descriptive statistics for residents and visitors to the Eastern Shore, two important groups within our population. Residents were considered individuals who indicated they were currently residing on the Eastern Shore. Visitors were considered any individual who did not meet this criterion and included respondents who were summer residents, former residents who have moved away and tourists among others. More residents were born on the Eastern Shore than visitors, 31% compared to 4%. Visitors were more educated and have higher household incomes compared to Eastern Shore residents. 79% of visitors have a Bachelor's or higher degree compared to 63% of residents. The average resident makes between $35,000 and $49,999 in income compared to between $50,000 and $74,999 for visitors.

Table 4. Descriptive statistics for survey respondents

Variable	Residents Total	Residents %	Visitors Total	Visitors %	Total Total	Total %
Current Residency	94	46.8	107	53.2	201	100
Age (std dev)	52.58	-15.56	56.91	-14.58	54.64	-15.17
Gender (# of Males)	51	54.3	48	44.9	99	49.3
Born on Eastern Shore	29	30.9	4	3.7	33	16.4
Education						
Master's degree	16	17	29	27.1	45	22.4
Professional degree	6	6.4	4	3.7	10	5
Doctorate degree	5	5.3	8	7.5	13	6.5
Race						
White	89	95.7	96	90.6	185	93
Black or African American	2	2.2	1	0.9	3	1.5
Asian	0	0	5	4.7	5	2.5
Other	2	2.2	4	3.8	6	3
Household Income						
Less than $15,000	2	2.7	1	1.3	3	2
$15,000 to $24,999	6	8.2	2	2.5	8	5.3
$25,000 to $34,999	4	5.5	2	2.5	6	4
$35,000 to $49,999	5	6.9	10	12.7	15	9.7
$50,000 to $74,999	19	26	10	12.7	29	19.1
$75,000 to $99,999	14	19.2	16	20.3	30	19.7
$100,000 to $149,999	12	16.4	18	22.8	30	19.7
$150,000 or more	11	15.1	20	25.3	31	20.4
Did not answer	21	22.3	28	26.2	49	24.4

Separate questions were posed to visitors and residents to understand their connections to the ES. 13 of our visitors were former residents of the ES who had moved away but were back visiting at the time they were interviewed in the summer of 2016. 89% of residents were full-time residents with the other 11% being part time residents. Full time residents had lived on the ES an average of 26.6 years and part time residents reported an average of 19.3 years living on the ES.

Questions were used to understand when during their lives residents and former residents had lived on the Eastern Shore. 56% of residents reported never having lived on the ES during their childhood (before age 18). 34% reported living on ES their entire childhood. 53% of current residents reported that they have lived on the ES less than half of their adult life. 26% said they had spent their entire adult life on the ES and an additional 16% said that more than half of their adult life they have lived on the ES.

Questions were asked to visitors to understand their recent trip history including trip frequency, visit length, and if they visited family or friends on the ES. 48% of visitors make more than 2 visits a year to the ES. For 9% of visitor respondents, the visit when they were surveyed was their first ever to the ES. Only 38% of visitors never visit family or friends when they come to the ES. For 19% of them visiting people is "always" a part of their trip.

Both groups were asked about their family connections and the places on the Eastern Shore where they spend the most time. The two groups differed in their familial connections on the ES. 78% of residents reported having family currently living there compared to 32% of visitors. The places where respondents spend the most time on the ES are very different depending on if they

were residents or visitors. The top 4 places for visitors were "small waterside towns"(33%), "coastal beach towns"(24%), "shoreline of Chesapeake Bay"(13%), and Ocean City, MD (10%). For residents, the top 4 places were "small rural towns"(29%), "farms and other rural areas"(16%), "small waterside towns"(33%), and ES cities like Salisbury or Easton (14%).

5.2 Econometric Results

In this portion of chapter 5 the results of the econometric models defined within the conceptual framework section will be detailed. This analysis allows us to understand the preferences for a Pollination Area Program on the Eastern Shore. These models were run to test the null hypothesis that pollinator and quail coefficients would be positive and significant because we hypothesized that individuals will have positive preferences for these attributes because they provide use and non-use values to them on the ES. All economic models were run with 1568 observations, made up of 196 survey respondents. 5 responses were dropped from the original set because the respondent skipped all or a portion of the choice questions.

5.2.1 Conditional Logit

A conditional logit model was used to analyze the results of the choice experiment within the survey. This was used to see how conditional indirect utility for choice regarding a Pollination Area Program was affected by attributes of the program. The results of the conditional logit model containing only the program attributes are displayed in table 5.

Table 5. Basic Conditional Logit Model

Variable	Coefficient (β)
# of Pollination Areas	0.001
	(0.002)
Inc Pol Abundance	-0.043 ***
	(0.011)
Inc Quail Abundance	0.876 ***
	(0.184)
Payment	-0.007 ***
	(0.001)
Log likelihood	-448.5696

***p<0.01 , **p<0.05 , *p<0.1   Standard errors in parentheses

The results of the conditional logit reveal a negative significant effect of increasing program

payment and pollinator abundance on choosing a Pollination Area Program. The negative effect

of cost is in line with tradition economic thinking as people prefer to pay less than more for the

same item given an option. The negative significant effect of pollinator abundance causes us to

reject our null hypothesis, that people would have positive preferences for increasing the number

of pollinators on the ES and would support a program to counter the current decline trend.

Increasing quail abundance had a positive significant effect on choosing a program over the

status quo/"No Program" option. This reflects positive preferences for a program design that

favors quail increases. The size of the program was not statistically significant in effecting

program choices.

Additional conditional logit models found in Table 6 look at effects of ES residency and

demographic variables respectively on choice to support a Pollination Area Program on the ES.

Interactions were made between the resident dummy variable and all choice attributes for the resident model were used to check for an effect of permanent habitation on the ES as a factor in choosing a program. These interacted variables were all not statistically significant allowing us to reject the null that residency was a factor in attribute preference.

Table 6. Conditional Logit models for resident and demographic effects on program choice

Variable	Resident Model	Demographics
Payment	-0.007 ***	-0.007 ***
	-0.001	-0.001
# of Pollination Areas	0.001	0.001
	-0.002	-0.002
Inc Pollinator Abundance	-0.053 ***	-0.041 ***
	-0.016	-0.012
Inc Quail Abundance	0.984 ***	0.882 ***
	-0.272	-0.185
Resident x Payment	0.001	
	-0.002	
Resident x # of Pollination Areas	-0.001	
	-0.003	
Resident x Inc Pollinator Abundance	-0.176	
	-0.372	
Resident x Inc Quail Abundance	0.016	
	-0.022	
ASC x Resident		-0.198
		-0.165
ASC x Education		-0.042
		-0.041
ASC x Age		0.162 **
		-0.065
ASC x Male		-0.378 **
		-0.169

***p<0.01 , **p<0.05 , *p<0.1   Standard errors in parentheses

Residency, age, income, gender and education were looked at to identify any effects on choice in the demographics model found in Table 6. These variables were interacted with the ASC (where ASC=1 for status quo) when added to the model. Age and being a male were found to be statistically significant in affecting likelihood of selecting a program. Being older decreased the likelihood of choosing a program and being a male increased the likelihood of choosing a Pollination Area Program.

5.2.2 Random Parameters Mixed Logit

A random parameters model was used to explore possible heterogeneity in the conditional logit coefficient results. This was performed using the mixlogit Stata command. Cost (payment) was set as a fixed parameter with the remaining three attributes of the choice experiment set as random parameters each with an assumed normal distribution. A mixed logit model was tested under the null hypothesis that the pollinator abundance parameter is homogeneous and its distribution is less than 0.

The model was estimated with 5000 Halton draws in order reduce the error of estimate. Models that are not reported estimated the mixlogit model with 50, 100, 250, 500, and 1000 draws, with all reporting consistent results in terms of statistically significant means and standard deviations. Based on the work of Train 2003 (Chapter 9) and Train 2000, the first 10 Halton draws were dropped to remove the correlation from our 3 dimensions of random parameters estimation. The results of this are displayed in Table 7.

Table 7. Random Parameters Model

Variable	Mean of Coefficient	Std. Dev.
# of Pollination Areas	0.020 ***	0.000
	(0.004)	(0.024)
Inc Pollinator Abundance	-0.325 ***	0.440 ***
	(0.066)	(0.075)
Inc Quail Abundance	4.159***	0.003
	(0.766)	(1.602)
Payment	-0.025 ***	
	(0.005)	
Log likelihood	-314.908	

***p<0.01 , **p<0.05 , *p<0.1   Standard errors in parentheses

Table 7 displays the result of the random parameters model estimated with mixed logit. Under the random parameters model all attributes of the choice experiment became significant. The sign of all coefficients remained consistent between this model and the conditional logit base model. The random parameters model returns a mean coefficient value and standard deviation of the coefficient through its simulation using Halton draws. This allows for closer inspection of the preference parameters for the choice experiment.

The result of the pollinator abundance parameter is the most important result of the random parameters mixed logit model. The interpretation of the other parameters remains the same as under the conditional logit models. While the attribute of the number of pollination areas becomes significant and positive with this model it is still extremely close to zero and hard to interpret given our sample size.

The pollinator abundance parameter coefficient has an estimated mean of -0.325 and an estimated standard deviation of 0.440 under this model. We can use this result to interpret the distribution of the parameter which was assumed to be normal. This model returns a mean and standard deviation of the variables after simulation. We can use this to make conclusions about the distribution. Going one standard deviation (or 0.44) above the mean preference level for increasing pollinator abundance reveals individuals with positive preferences for the program (i.e. coefficient mean values greater than 0). This shows heterogeneous preferences exist amongst respondents for this attribute.

Figure 5 graphs the distribution of the pollinator abundance parameter reflecting the mean and standard deviation recovered from the mixed logit result. The shaded region reflects the portion of the sample population with positive preferences for this program attribute. Using what we know about normal distributions we can compute the area of this region of positive preferences. For our sample, the distribution of people who have positive preferences is 23% of the population or almost one quarter. This result implies that the attribute of improving pollinator abundance is a draw to choosing a Pollination Area Program for about one quarter of respondents but a negative factor for the remaining three quarters.

Having identified that there are heterogeneous preferences for pollinators, I computed individual respondent preferences for increasing pollinator abundance to find group means using the mixlbeta Stata command. Average preferences for those with and without positive preferences were computed and displayed in Table 8.

Table 8. Heterogeneous preferences for the Increasing Pollinator Abundance attribute

Inc Pollinator Abundance	Mean Coefficient Estimate (Std Dev)	Implicit Price	% of Distribution
Positive Coefficient Estimate	0.325	$13.00	23
	(0.129)		
Negative Coefficient Estimate	-0.467	-$18.76	77
	(0.232)		

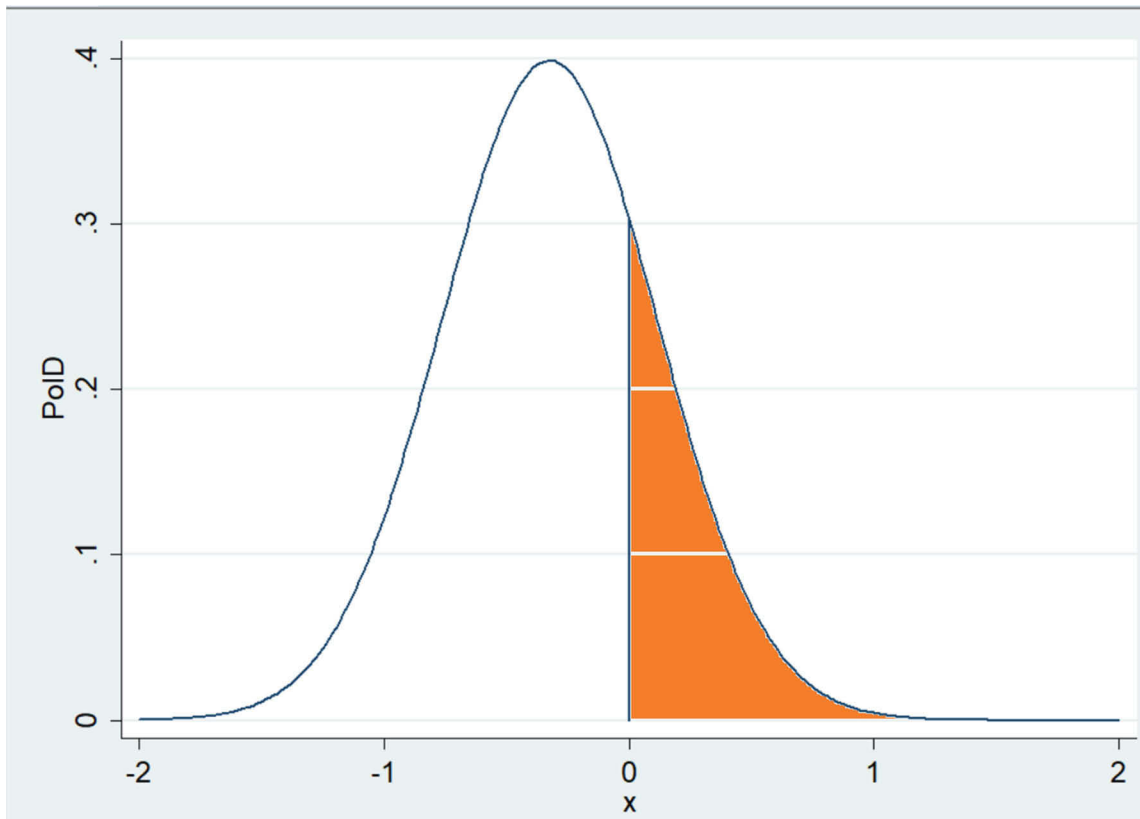Figure 5. Distribution of preferences for pollinator abundance parameter under the mixed logit model

5.3 Willingness to Pay

The results of the conditional logit model and random parameters mixed logit models were used

to estimate marginal willingness to pay (MWTP) for the attributes in the stated preference

experiment. WTP provides a common metric for each program attribute which can allow for

comparisons between attributes. Both models produced estimations of the attribute preferences

with the same signs and all were significant except the number of Pollination Areas for the

conditional logit model. Willingness to pay was calculated using the wtp command in STATA

and results were estimated with 90% confidence intervals using the Krinsky-Robb method with

the results presented in Table 9. Because the models are parameterized differently direct

comparison of parameter estimates is not useful (Greene & Hensher 2003).

It is evident based on the results that respondents are willing to pay for increasing Bobwhite-

quail abundance on the ES. This is in contrast to the other two program elements which

respondents do not appear willing to pay for. The low WTP value for program size is likely an

indicator that the scope of the program was not an important a factor in respondent's decision

making. In comparison, the ability of the program to impact quail abundance was an attribute

that drove respondent support for the program.

Table 9. Willingness- to- pay implicit prices and confidence intervals for program attributes
        under Conditional and Mixed Logit models

	Conditional Logit		Mixed Logit	
	Mean WTP	90% Confidence Interval	Mean WTP	90% Confidence Interval
# of Pollination Areas	$0.16 *	-$0.27 to $0.51	$0.81	$0.61 to $1.05
Inc Pollinator Abundance	-$6.54	-$10.28 to -$3.71	-$12.80	-$19.35 to -$8.45
Inc Quail Abundance	$132.59	$85.54 to $191.76	$164.66	$113.18 to $235.33

*this attribute was not statistically significant in this model.

Respondent means for positive and negative preference groups for increasing pollinator abundance were also calculated using Equation 10 and the sample group means displayed in Table 8. The implicit prices for individuals with positive and negative preferences for this attribute were $13.00 and -$18.76 respectively. While the majority of individuals were not WTP for pollinators, determining the positive WTP for the smaller subset is still useful in concluding if a Pollination Area Program could be funded on the Eastern Shore.

A willingness to pay scenario was calculated using the implicit prices under the random parameters model in Table 9 and max levels of CE attributes for the Pollination Area Program. This scenario would have the Program establish 200 Pollination Areas across the Eastern Shore, increase pollinator abundance by 30% and increase quail abundance. The willingness to pay for this scenario can be calculated by the equation

$$(12) \qquad V_i = \beta_1 numPAs * (numPAs) + \beta_2 polabundinc * (polabundinc)$$

$$+ \beta_3 quabundinc * (quabundinc)$$

$$V_i = (\$0.81) numPAs * (200) + (-\$12.80) polabundinc * (30\%)$$

$$+ (\$164.66) quabundinc * (1)$$

Using the mean implicit prices from the model, the WTP for the scenario is -$57.34. The negative value is the result of the majority of respondents possessing negative preferences for increasing pollinator abundance. To understand WTP for individuals with positive or negative preferences for pollinators, the implicit prices from Table 8 were used. Individuals with positive preferences were willing-to-pay $716.66 for the Pollination Area Program described by this

scenario. In contrast, those with negative preferences for pollinators would have a willingness-to- pay of -$236.14.

5.4 Sense of Place Results

The next section of the results pertains to the Sense of Place on the Eastern Shore evaluation. Sense of Place was estimated using different scales to measure place meanings, place attachment, and place satisfaction on the Eastern Shore.

Place meanings were measured with a 14 question scale. The 14 question scale had an alpha of 0.84. Agreement (shown in Table 10) varied greatly depending on meaning statement (from 85% agreeing with meaning "place to relax" to 27% agreeing with "place to make my living") suggesting that there are many different types of meanings people have for the Eastern Shore and that some meanings are more universally held than others. The most agreed upon meanings were those that concerned the general status and amenities of the ES. These included the ES being a place to relax (85%), being a place to escape urban areas (73%), and being a place where wildlife flourishes (71%). Discerning groupings of latent factors affecting meanings was explored with Exploratory Factor Analysis (results in Table 13 and discussed in 5.4.1)

Place attachment was measured with 6 items prominent in previous attachment and Sense of Place studies in the literature. The mean response and level agreement with each item is found in Table 11. The attachment scale returned an alpha of 0.943 for ES attachment. Respondents had a high level of agreement with all items with more than 68% agreement on each item. Consistent

with (Jorgensen and Stedman 2001 & Stedman 2002) factor analysis revealed all items loading

onto a single factor.

Five characteristics of the ES were used for the place satisfaction scale. The level of satisfaction

with each ES characteristic is listed in Table 12. The scale returns an alpha of 0.702.

Respondents were highly satisfied with the "natural scenery", "opportunities for solitude" and

"observing wildlife" available to them on the Eastern Shore, with each having more than 88%

satisfaction. The remaining two scale items were perceived with less satisfaction. Less than half

of respondents were satisfied with the "level of development" and "number of users" on the ES.

Table 10. Place Meaning Results (alpha= 0.8441) (5 point scale)

Item #	Meaning: "The Eastern Shore is a place…"	Agree (%)	Item Mean	SD
1	to experience nature.	58.71	4.050	1.004
2	to enjoy time with friends and family.	60.70	4.249	0.974
3	to do the recreation I enjoy.	57.71	4.109	0.921
4	known for being rural.	54.73	3.505	1.252
5	that is important to my way of life.	61.19	3.677	1.323
6	with a welcoming community.	64.18	3.831	1.059
7	where wildlife flourishes.	70.65	3.935	1.025
8	to make my living.	27.36	2.249	1.612
9	that represents my personal family history.	29.85	2.507	1.594
10	of high environmental quality.	66.17	3.746	1.136
11	to escape from urban areas.	73.63	4.005	1.231
12	with friendly neighbors.	60.20	3.552	1.276
13	to relax.	85.07	4.413	0.833
14	to put down roots.	32.34	2.652	1.561

Table 11. Place Attachment Results (alpha= 0.9432) (7 point likert scale)

Statement	Mean	SD	Agree (%)
The Eastern Shore is my favorite place to be	5.41	1.686	71.64
I really miss the Eastern Shore when I am away	5.37	1.724	74.13
The Eastern Shore is the best place for me to do things I enjoy	5.31	1.666	69.65
I am very attached to the Eastern Shore	5.59	1.698	78.11
No other place can give me the types of experiences I have on the Eastern Shore	5.08	1.884	68.16
I identify strongly with the Eastern Shore	5.20	1.847	73.13

Table 12. Place Satisfaction Results (0.7021= alpha) (5 point likert scale)

Satisfaction with Eastern Shore characteristics	Percentage Satisfied
Natural scenery	94.03
Opportunities for solitude/peacefulness	90.05
Observing wildlife	88.06
Level of development	43.78
Number of visitors/tourists	44.28

(Note: percentage satisfied is percentage of responses with a score of 4 or 5)

5.5 SOP Connections

A variety of models were run to look at the predictive power of the personal connections and SOP elements in determining place attachment and WTP, which represents a place protective behavior. Figure 6 helps illustrate the connections established in the conceptual framework that were tested revealing the subsequent results in this section.
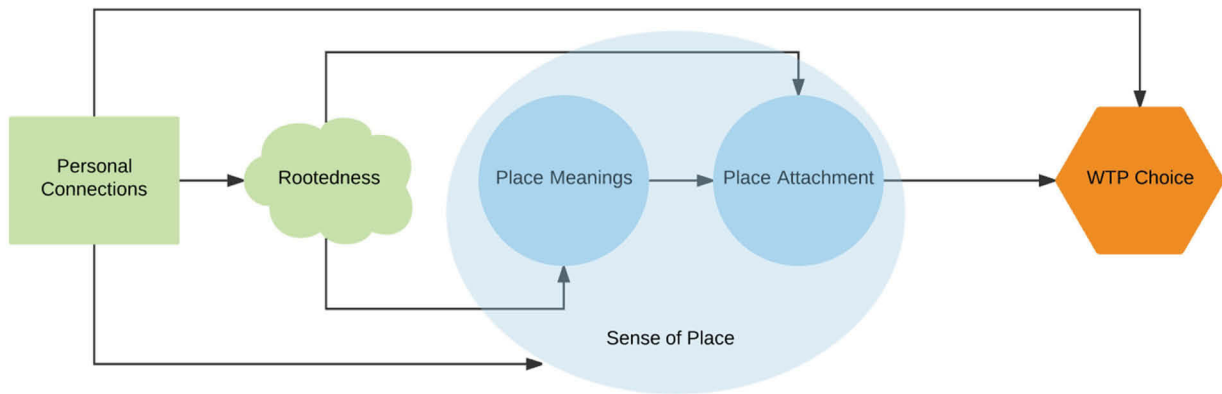
Figure 6. Connections of concepts investigated from conceptual framework

Exploratory factor analysis and cluster analysis were performed with the SOP and rootedness covariate data to help test the following null hypotheses regarding the connections between the different SOP elements and rootedness that has been shown to influence SOP results in previous studies (Moore Graefe 1994; Hay 1998; Graefe & Dawson 2014):

- H1: There are groups of place meanings on the ES

- H2: Place meanings have an effect on level of PA

- H3: Rootedness types have an effect on levels of PA

- H4: Rootedness types will have different PM factors

5.5.1 Exploratory Factor Analysis and Place Meanings

In preparation for exploring these hypotheses, an exploratory factor analysis was used to look at the latent groups of meanings. Exploratory factor analysis (EFA) was used to identify certain latent factors that influenced the ES place meanings possessed by survey respondents. Place meanings loaded on to three factors renamed: scenic, relax, and from-here meanings shown in Table 13. Place meaning items that did not load onto the 3 factors were removed during

successive EFA runs. Despite low eigenvalues for Factor 2 and Factor 3, they were retained after comparing the EFA results with a parallel factor analysis which revealed there were 3 significant factors to be retained (a graph of this result is shown in Appendix C). EFA showed that there were 9 meaning items that were significant into loading onto the 3 factors. This result causes us to fail to reject our null hypothesis H1, because we found groups of meanings. An oblique rotation using promax rotation was employed in STATA to better fit the relationship between the place meaning items and 3 significant factors.

The three factors generated with the EFA were used with the other place meanings to investigate how place meanings explain place attachment on the ES for survey respondents. Ordinary least squares (OLS) regressions were used to investigate the relationships between place meanings and place attachment.

The hypothesis tested was that there would be an effect of place meanings in explaining attachment (H2). Based on the results of the OLS model (results in Table 14) we fail to reject this hypothesis. The results show that many place meanings have an impact on the level of place attachment ($R^2 = .55$). No meaning had a negative effect on place attachment. Certain meanings were statistically significant in their effect of increasing place attachment on the ES. The scenic and relax factors were both significant although (scenic was marginally significant at 0.10 level). Additional significant meanings on level of place attachment were: the ES in a place "important to my way of life" and the ES is a place "to put down roots".

Table 13. Place Meaning Exploratory Factor Analysis Results

Item #	Meaning "The ES is a place …"	Factor 1 Scenic	Factor 2 Relax	Factor 3 Fromhere
2	to enjoy time with friends and family.		0.629	
4	known for being rural.			0.545
6	with a welcoming community	0.424		
7	where wildlife flourishes.	0.550		
8	to make my living.			0.545
9	that represents my personal family history.			0.367
10	of high environmental quality.	0.522		
11	to escape from urban areas.	0.546		
13	to relax.		0.626	

Factor	Eigenvalue	Alpha
Scenic	2.210	0.7020
Relax	0.726	0.6682
Fromhere	0.368	0.5219

Note: Factor loadings under 0.3 have been suppressed

Table 14. OLS model testing place meaning effects on place attachment scores

Place Meanings regressed on Place Attachment	coefficient (std error)
scenic	0.255 *
	(0.144)
relax	0.360 **
	(0.112)
fromhere	0.102
	(0.093)
to experience nature.	0.100
	(0.094)
to do the recreation I enjoy.	0.056
	(0.101)
that is important to my way of life.	0.420 ***
	(0.080)
with friendly neighbors.	0.061
	(0.082)
to put down roots.	0.133 **
	(0.067)
constant	-0.247
	(0.495)
R-square= 0.567	

***$p<0.01$, **$p<0.05$, *$p<0.1$ Standard errors in parentheses

5.5.2 Cluster Analysis and Rootedness groups on the Eastern Shore

A cluster analysis was performed to identify rootedness clusters among the survey respondents. This analysis allowed for the grouping of respondents based on personal connection variables that explained the period of time, period of life, connection to ES area and other variables that were predicted to possibly effect individual's preferences for the Pollination Area Program. The cluster analysis grouped respondents into four different groups based on their survey responses. Four groups were determined after analyzing different numbers of clusters and how well they separated respondents into unique groups of sizeable proportions of the sample population. The variables used in the cluster analysis and their possible values between current residents, former residents and visitors are found in Table 15. Variables that were not dummy variables were standardized prior to cluster analysis in order to reduce the effects of higher scores on the groupings.

Table 16 describes the summary statistics of each cluster. Using these statistics we can describe the way each cluster was defined and detail the characteristics of an average individual in each cluster. Cluster 1 is best defined as ES residents who were born on the ES and spent most of their childhood living on the Eastern Shore. This cluster is the "from here" group and as such all have family living on the ES and have the longest length of relation to the ES; 41.6 years on average.

Cluster 4 had the shortest length of relation to the ES of all clusters; only 15.9 years. 63% of them have family living on the ES and only 14% have lived on the ES more than half of their adulthood. 93% of the group members are residents but none were born on the ES. This group represents the "come here" group that exists on the ES. This group is comprised of people

without extensive family history but who have moved to the ES. Interestingly, this group had average higher place importance scores than "the from" here group, even amongst the rural towns and farms and other rural areas places on the ES places less inhabited by "come heres".

Cluster 2 and cluster 3 were made up of mostly of ES visitors (91% and 100% respectively). The clusters were very similar in family and friend connections and in average years of length of relation to the ES. Cluster 2 had the highest percentage of second home owners on the ES of any group (21%). Cluster 3 members had the shortest average length of visit, with 51% staying for a weekend or less on an average trip. Cluster 2 members were most likely to spend about a week or two on the ES when they visited. Cluster 3 individuals had higher average levels of importance to places for their experiences on the ES across all locations on the ES than cluster 2. They also averaged higher levels of importance of places to ES experiences than all clusters for locations that were more tourist type of locations like "ocean beaches" and "coastal beach towns".

The groups from the rootedness cluster analysis were used to test other hypothesis about how a person's level of rootedness affected their level of SOP and predicted their WTP for the Pollination Area Program. OLS regressions were used for this hypothesis testing. Cluster 2 was set as the base for all regressions as this group was arguably the least rooted on the ES based the fact that they were visitors and they had the lowest levels of importance for areas across the ES.

Table 15. Variables and scores used in computing rootedness clusters. Non-dummy variables were standardized for cluster analysis.

Rootedness Variable	Resident	Former Resident	Visitor
Eastern Shore Resident	1	0	0
Born on Eastern Shore	0 or 1	0 or 1	0
Portion of Childhood lived on ES	1 to 5	1 to 5	1
Portion of Living on ES as Adult	1 to 5	1 to 5	1
Family			
# of types of family members	1 to 7	1 to 7	1 to 7
Any family	0 or 1	0 or 1	0 or 1
Recent ES visit frequency			
Few visits	0	0 or 1	0 or 1
Some visits	0	0 or 1	0 or 1
Permanent visit	1	0 or 1	0 or 1
How long do you visit			
Weekend	0	0 or 1	0 or 1
Week or two	0	0 or 1	0 or 1
Two plus weeks	1	0 or 1	0 or 1
Visit friends or family on ES	5	1 to 5	1 to 5
Length of ES relation	# of years	# of years	# of years
Eastern Shore Ownership			
Home	0 or 1	0 or 1	0 or 1
2nd Home	0 or 1	0 or 1	0 or 1
Place importance for ES places	1 to 4	1 to 4	1 to 4

Table 16. Description of Clusters delineated through cluster analysis

Variable	Cluster1 "from here's"	Cluster2 "Visitor second home owners"	Cluster3 "Short trip visitors"	Cluster4 "come here's"
Percent of Respondents	19%	29%	23%	29%
Eastern Shore Resident (% yes)	92	9	0	93
Born on Eastern Shore (% yes)	82	2	0	0
Portion of Childhood lived on ES				
average (out of 5)	4.8	1	1.1	1.1
% living more than half	97	0	0	0
Portion of Living on ES as Adult				
average (out of 5)	4.3	1.1	1.1	2.3
% living more than half	82	0	2	14
Family				
Any family (%)	100	29	31	63
Avg # of family types	4.3	0.4	0.4	0.9
Recent ES visit frequency (%)				
Few visits	0	33	38	2
Some visits	5	48	53	4
Permanent visit	95	19	9	95
How long do you visit (%)				
Weekend	3	33	51	2
Week or two	5	53	42	2
Two plus weeks	92	14	7	96
Visit friends or family on ES	5	2.6	2.5	4.9
Length of ES relation	41.6 yrs	23.1 yrs	24.8 yrs	15.9 yrs
(st dev)	-20.5	-18.6	-17.8	-14.2
Eastern Shore Ownership (% ownership)				
Home	74	4	0	68
Second Home	5	21	13	12
Place importance for ES places				
Ocean Beaches	2.816	2.897	3.6	3.035
Chesapeake Bay	3.105	2.241	3.511	3.351
National or State parks or refuges	2.895	1.759	2.8	2.579
Small Waterside towns	2.974	2.569	3.8	3.316
Ocean City, MD	2.079	2.017	2.422	1.825
Other Eastern Shore Cities	2.789	2.776	3.644	3.386
Coastal Beach towns	2.368	2.759	3.089	2.088
Small rural towns	2.947	1.672	2.778	3.263
Farms and other rural areas	3.026	1.776	2.756	3.316

Table 17. Effect of rootedness on place attachment

Cluster	Coefficient (Std. Error)
cluster1- "from here's"	0.813 **
	(0.319)
cluster2- "visit second home owners"	base
cluster3- "short term visitors"	0.366
	(0.303)
cluster4- "come here's"	0.645 **
	(0.285)
Intercept	4.871 ***
	(0.201)
R-square= 0.043	

***p<0.01 , **p<0.05 , *p<0.1   Standard errors in parentheses

The hypothesis (H3) rootedness types have an effect on levels of PA was tested with the clusters

formed from the cluster analysis. Table 17 shows the results of this hypothesis tested with an

OLS regression. The results indicated that being in cluster 1 or cluster 4 was positively related to

an individual's level of place attachment. As a result I fail to reject the null hypothesis that

rootedness types have an effect on levels of place attachment. Being in cluster 1, which we can

call the "fromhere" group, had the biggest effect. This supports the literature (Hay 1998) that

rootedness is an important covariate and indicator of attachment. Despite this finding, the model

was very ineffective in explaining the variation in place attachment ($R^2 = 0.04$). Therefore,

cluster estimators are not very accurate in predicting score change for place attachment.

A multivariate regression was used to look at the effect of cluster group on all ES place

meanings simultaneously. The results of the regression are found in Table 18. Based on the

results I fail to reject the null hypothesis (H4) that rootedness effects place meanings. Of the

meanings tested, only 2 meanings had R^2 values over 0.3. These were the fromhere factor from the place meanings factor analysis and the ES is a place "to put down roots" (item 14) meaning.

All clusters were significant in affecting the fromhere factor of place meanings. The scale items were scored on a 5 point likert scale with individuals having to score 4 or 5 to agree with the meaning. Based on the intercept value (1.96), only being in cluster 1, the "from here" cluster would cause individuals to agree with possessing the meanings within this factor (score more than 4). Other clusters increased score over the base cluster but not in a matter that caused them to agree with this group of meanings.

Looking at the "put down roots" meaning (place meaning item 14), being in cluster 1 or 4 was significant in increasing the levels of agreement for the meaning. Both clusters 1 and 4 had coefficients that would increase respondent scores to greater than 3, meaning the average group member would agree with the meaning.

Even without high R-squared values for the scenic factor, "experience nature", and "friendly neighbors" meanings we can still learn from these model results. While the estimators are not particularly precise, it is evident that having higher rootedness levels than the base cluster (cluster 2) influenced individuals in clusters 1,3, 4 to have higher levels of these meanings on average.

Table 18a. Rootedness clusters effect on place meanings, model statistics

Meaning	"The Eastern Shore is a place…"	RMSE	R^2	P	Significance
scenic		0.779	0.077	0.001	***
relax		0.780	0.031	0.105	
fromhere		0.747	0.518	0.000	***
pm1	to experience nature.	0.983	0.062	0.006	***
pm3	to do the recreation I enjoy.	0.923	0.009	0.614	
pm5	that is important to my way of life.	1.248	0.110	0.000	***
pm12	with friendly neighbors.	1.192	0.128	0.000	***
pm14	to put down roots.	1.253	0.363	0.000	***

Table 18b. Rootedness clusters effect on place meanings model results

cluster	Coef.	Std. Err.	P-value	cluster	Coef.	Std. Err.	P-value
Meanings in bold							
scenic				**pm3**			
cluster1	0.340	0.163	**	cluster1	-0.175	0.193	
cluster3	0.413	0.155	***	cluster3	0.025	0.184	
cluster4	0.570	0.146	***	cluster4	-0.158	0.173	
_cons	3.548	0.103	***	_cons	4.175	0.122	***
relax				**pm5**			
cluster1	-0.031	0.163		cluster1	0.842	0.261	***
cluster3	0.211	0.156		cluster3	0.101	0.249	
cluster4	-0.175	0.146		cluster4	0.947	0.234	***
_cons	4.333	0.103	***	_cons	3.211	0.165	***
fromhere				**pm12**			
cluster1	2.129	0.156	***	cluster1	0.772	0.250	***
cluster3	0.352	0.149	**	cluster3	0.643	0.238	***
cluster4	1.029	0.140	***	cluster4	1.175	0.223	***
_cons	1.959	0.099	***	_cons	2.912	0.158	***
pm1				**pm14**			
cluster1	0.482	0.206	**	cluster1	2.237	0.263	***
cluster3	0.618	0.196	**	cluster3	0.205	0.250	
cluster4	0.526	0.184	***	cluster4	1.719	0.235	***
_cons	3.649	0.130	***	_cons	1.684	0.166	***

***p<0.01 , **p<0.05 , *p<0.1

5.6 Place attachment as a predictor of WTP

One key aspect of this research was to look at the possible integration of SOP into economic valuation studies to increase the understanding of preferences and values that impact environmental values. The behavior of an individual to pay for a pollination area program could be influenced by the individual's attachment to the place. If individuals are attached to a place and they enjoy the services provided by the environment there, then behavior to stop decline of those services or increase the level of these services stands to benefit the individual.

To test this, place attachment was incorporated into each economic model used for finding value to identify if it was a suitable predictor or covariate in explaining preferences and ultimately the value for our ecosystem services of interest. Place attachment was interacted with the alternative specific constant or ASC to look at its effect on respondent choice decisions for a pollination area program.

Place attachment was not a significant variable in effecting choice in either the random parameter or conditional logit (results not shown) models. Table 19 displays the results of the random parameters mixed logit model with the place attachment measure included as an interacted individual specific variable. As a result we reject the hypothesis that place attachment has a positive effect on increasing the likelihood of respondents being willing to pay for Pollination Area Program. This suggests it is not a useful measure to consider when valuing ecosystem services.

Despite a lack of statistical significance, place attachment may have still helped explain some

uncaptured preferences for a Pollination Area Program. Comparing the results of the original

model (repeated from Table 7) with the PA interaction model there were some shifts in

coefficient estimates. For example, the mean value for payment was twice the magnitude as the

original random parameters model, while number of pollination areas was half as large and both

quail and pollinator coefficients increased although not by significant magnitudes.

Table 19. Random Parameters Mixed Logit Model incorporating Place Attachment

Variable	Original Model		Adding Place Attachment	
	Mean of Coefficient	Std. Dev.	Mean of Coefficient	Std. Dev.
Payment	-0.025 ***		-0.054 ***	
	(0.005)		(0.017)	
# of Pollination Areas	0.020 ***	0.000	0.013 *	0.014
	(0.004)	(0.024)	(0.007)	(0.014)
Inc Pollinator Abundance	-0.325 ***	0.440 ***	-0.254 **	0.376 ***
	(0.066)	(0.075)	(0.099)	(0.123)
Inc Quail Abundance	4.159***	0.003	4.785 ***	1.051
	(0.766)	(1.602)	(1.544)	(1.368)
ASC x Place Attachment			-0.171	1.403 ***
			(0.208)	(0.456)
log likelihood	-314.91		-302.18	

Note: The results from Table 7 are replicated in this table under the Original Model label for comparison

***p<0.01 , **p<0.05 , *p<0.1   Standard errors in parentheses

Chapter 6: Discussion of Results

6.1 Economic Models and Program Preferences

The results of the Stated Preference experiment show that respondents prefer to increase quail abundance on the Eastern Shore but the majority of respondents do not prefer to increase pollinator abundance through a Pollination Area Program. This leads to the rejection of our hypothesis that individuals are WTP for increasing pollination services on the Eastern Shore. This result was provided through our conditional logit models and reinforced with the use of random parameters mixed logit estimation.

Using a random parameter mixed logit model I discovered that there are heterogeneous preferences for increasing pollinator abundance. The model results identified heterogeneous preferences for increasing pollinator abundance as the normal distribution of estimates crossed 0 and extended into positive preferences. While the majority of respondents did not have positive preferences for increasing pollinator abundance, 23% of respondents did possess positive preferences. This result is significant and suggests the need to investigate the causes of these two groups of preference holders and the factors that influence these difference preferences.

The WTP results from this study found only one attribute of the program that respondents had a positive and significant value for. Respondents indicated in both conditional logit and random parameters mixed logit models that they were willing to pay for increasing quail abundance on the Eastern Shore. Based on the conditional logit results, respondents were willing to pay a mean value of $132.59 for these birds.

My results show that on average individuals are not WTP for pollinators. The lack of WTP for increasing pollinator abundance was contrary to predicted results. Despite this result, the finding is significant as no previous study has ever valued pollinators. Interpreting this result in the context of my payment vehicle is also important. I used a crowdfunding campaign as the payment vehicle in my CE for funding a Pollination Area Program on the ES. For crowdfunding projects to be successful they must meet a threshold level of funding, not garner a specific percentage level of public support like a referendum. It is therefore possible to conclude that funding a Pollination Area Program to increase abundance of pollinators on the ES may be effective if the 23% of individuals with positive preferences will pay amounts to meet the threshold amount.

6.2 Sense of Place findings

The methods used for measuring Sense of Place on the ES were successful in measuring place meanings, place satisfaction, and place attachment. The scales for all three measures returned strong alpha measures. Single dimension scales for all three SOP measures all yielded comparable reliability to previous SOP studies (Stedman 2002, Stedman 2003). The success of these measures increases the robustness of these scales as they were effective in measuring SOP in a new location and among a population greatly varied in terms of residency, length of ES connection, familial connections, and places frequented within the study area.

Different connections between SOP elements were also explored. The results show that meanings can help explain attachment. This result is consistent with Stedman 2002 and his findings that meanings can be "crucial determinants of attachment".

Clustering different groups of people based on rootedness on the ES revealed 4 distinct clusters. Using these clusters, OLS models were used to test hypotheses regarding rootedness and place meanings and place attachment. Rootedness group was found to influence place attachment score for the resident clusters (1 and 4). These clusters had higher attachment levels than the base cluster which was made of primary visitors. The result is consistent with my hypothesis that residents would have higher levels of attachment. All groups had positive attachment which is consistent with the literature that visitors or those with limited time spent in a place can experience attachment to a place (Kelly & Hosking 2008; Gross & Brown 2008; Halpenny 2010).

The clusters were also used to identify if different groups of rooted individuals had different place meanings for the ES. Based on the results we also failed to reject this hypothesis, meaning that rootedness groups have different meanings for the ES. The two meaning models with higher R-square values both were found to be highly meaningful of cluster 1, the "from here's". Being in different groups affected agreement with these meanings, but being from the ES caused high agreement with the fromhere factor and ES is a place to put down roots meaning. These specific meanings performed better under the multivariate regression. Based on the low R-squared values of some of the other meaning models we cannot interpret the cluster estimators with a high degree of confidence.

6.3 Place attachment as a tool for Economic Valuation

Place attachment was not found to be significant in effecting respondent choice to pay for a Pollination Area Program. However, changes in CE coefficients for program attributes with the addition of a place attachment interaction term might support that this covariate does explain some of the variation in preferences. The lack of a significant estimate could be the result of the ecosystem services impacted with a program not being directly linked to why individual's experience place attachment on the ES. If individual's experience attachment based on factors like family time or access to recreation activities not directly linked to the environmental amenities impacted by a Pollination Area Program, then individuals who are attached to the ES may not benefit much from the program.

More variation of place attachment scores or more observations could impact my results or bring greater clarity to a link between PA and preferences. Without statistical significance there is not support for the premise that SOP measures can be used for better understanding why individuals value their environment. SOP is an effective technique for helping understand how important a place is (i.e. understanding part of value) but may be limited in its explanatory power of for WTP estimates and preference decisions.

The place attachment scale itself could be a reason for this finding. The types of statements used to measure place attachment do not lend too much variation in terms of answers (Figure 7 demonstrates place attachment scores). Attachment statements are overwhelming worded in ways which make it easy for most individuals to agree with them. Because of this, not much

variation in terms of scores occurs in the variable between respondents. This gives it little statistical variation to be used to explain differences in behavior.

Place meanings may be able to explain with more depth how people develop attitudes of attachment or satisfaction with a place but meanings do not measure a single concept like place attachment does. Therefore, despite what may be a limitation of using place attachment with valuation studies, it is the most logical SOP measure to be combined with economic valuation techniques. Further studies of this possible combination are needed before ruling out the usefulness of SOP in valuation studies.
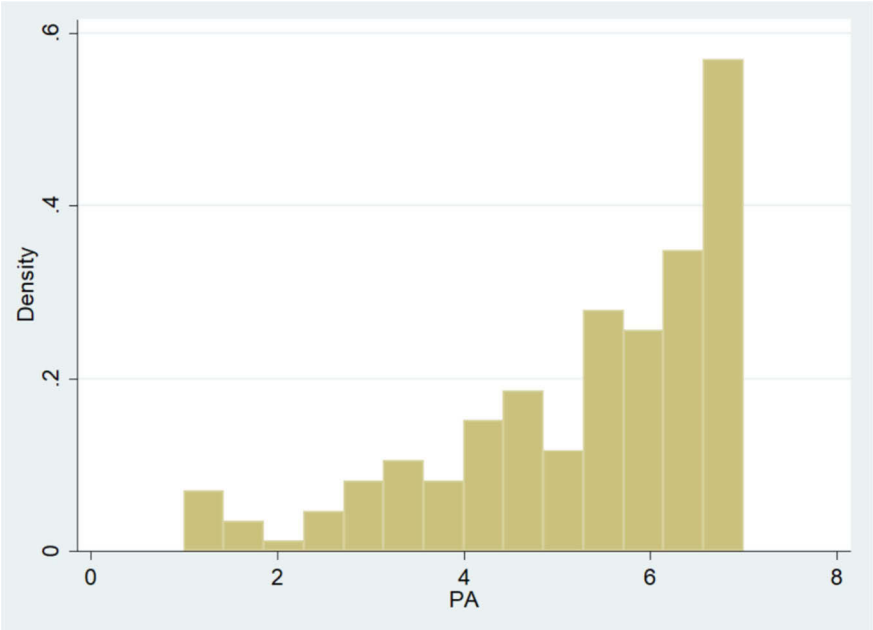
Figure 7. Histogram of Place Attachment Scores

6.4 Implications of Pollinator Preferences

My result of clear preferences for increasing quail abundance on the ES but heterogeneous preferences for increasing pollinator abundance was counter to my hypothesis that individuals would have positive preferences for increasing both quail and pollinator abundance. Analyses of demographic factors, residency and rootedness characteristics, as well as SOP measures were looked at to try and explain these results. None of these variables or factors significantly characterized the group of people who were WTP for improving pollinator abundance. As the decline of pollinators is an important social issue, understanding who does not have positive preferences for these species and why they do not are important questions for researchers and policy makers studying this decline.

What could have caused preferences for pollinators to not be homogeneously positive? A possible explanation could come down simply to a lack of education, awareness, or understanding about pollinator decline. While 77% of survey respondents indicated that they had heard of a decline in bees and other pollinators, this knowledge did not cause them to have positive preferences for a program designed to alleviate this decline. For advocates of the pollinator decline issue, particularly scientists and those working in the food industry, work remains to educate the public. More effort is needed to inform the 23% of people who had never heard about issues surrounding pollinating insects.

More work is also necessary to understand what must be done to more effectively communicate the importance of the issue to the people who are already aware. While the public has heard of the bee problem through the news and social media, my results indicate that their preferences

were not changed with the information they received regarding this environmental issue. With greater education or at least more effective communication of the decline and threat to these insects, a different preference result would be very likely. From an economic perspective people have positive preferences for goods which provide them with more utility. Food represents a very common good that provides this positive utility as people require both its sustenance and enjoy its taste. A service like pollination that facilitates the direct production of foods that bring individuals utility, should, with economic intuition, be positively valued if not highly positively valued.

A limitation of this postulation is that my survey did not ask more specific questions about pollinator decline knowledge or education of the issue. I also did not ask questions about legitimate reasons why people may not have positive preferences for pollinators, such as they are scared of or dislike insects or are allergic to bees. These other logical reasons for negative preference towards pollinators could also be driving the results found in this study. Subsequent research of pollinator value should investigate these variables as they are likely to better explain preference results and provide a means of controlling for specific knowledge or preferences likely to impact choice for a Pollination Area Program.

6.5 Limitations

My results are not without some limitations. The key limitation is the inability of my study to explain the heterogeneity in preferences for increasing pollinator abundance. With a full survey necessary to collect all the personal connection information and SOP measures as well as the stated preference experiment, there was not adequate space to include more questions about

pollinator background knowledge, attitudes, or allergies. Future studies exploring the value of bees and other pollinators should take these possible covariates into consideration in their study design.

A larger sample size could have generated more statistically significant results allowing more conclusions to be made especially concerning heterogeneous preferences. With only 201 survey responses and 1560 observations for the choice experiment estimation statistical power of the random parameters mixed logit models were limited.

My sample is one of convenience based on how it was constructed. Despite the best efforts of summer intercept survey there exist some groups of people who may have been underrepresented. This only gives me ability to make assumptions of preferences of a population that looks like my sample. Possible underrepresented groups include those who worked during normal weekday daytime hours when most surveying occurred. Farmers who were busy harvesting during survey months were also less likely to be intercepted. Some groups, like non-English speakers who work on the ES did not wish to take the survey or were prevented from doing so because no Spanish version of the intercept survey existed.

An example of my sample not perfectly matching population characteristics is the racial make-up of respondents. My sample did not provide racially representative results for the ES as 93% of respondents were white. Even less diverse were resident respondents, of which 96% were white. While some ES counties have white populations as high as 83%, many are in the 60 percent range (US Census 2016). The preferences of other racial groups are missing from analysis. This

is particularly problematic for African Americans who represent large portions of the populace particularly in the counties on the Virginia portion to the ES. (US Census Bureau)

6.6 Conclusion

Through this research I quantified the previously uninvestigated societal preference for increasing pollination services. I measured these preferences with a choice experiment for a Pollination Area Program which had the ability to increase the abundance of pollinators. The study results suggest that the majority of individuals who live on or visit the Eastern Shore are not willing to pay to increase pollinator abundance but are willing to pay to increase Northern Bobwhite quail abundance. Sense of place of Eastern Shore individuals was successfully measured using a three dimension measurement of place attachment, place satisfaction, and place meanings. SOP was found to not provide better understanding of respondent preferences for the Pollination Area Program. More research is needed to verify these results and more public education is advised to change societal preferences for pollinators.

7. References

(March 31, 2015). "Crowdfunding Market Grows 167% in 2014: Crowdfunding Platforms Raise $16.2 Billion, Finds Research Firm Massolution." Retrieved September 5, 2017, from http://www.marketwired.com/press-release/crowdfunding-market-grows-167-2014-crowdfunding-platforms-raise-162-billion-finds-research-2005299.htm.

(2012). Crowdfunding Industry Report: Market Trends, Composition and Crowdfunding Platforms. crowdsourcing.org, Crowdsourcing LLC.

Adamowicz, W., et al. (1998). "Stated preference approaches for measuring passive use values: choice experiments and contingent valuation." American journal of agricultural economics **80**(1): 64-75.

Adamowicz, W., et al. (1994). "Combining revealed and stated preference methods for valuing environmental amenities." Journal of environmental economics and management **26**(3): 271-292.

Allsopp, M. H., et al. (2008). "Valuing insect pollination services with cost of replacement." PloS one 3(9): e3128.

Amsden, B. L., et al. (2010). "The creation and maintenance of sense of place in a tourism-dependent community." Leisure sciences **33**(1): 32-51.

Ardoin, N. M. (2014). "Exploring sense of place and environmental behavior at an ecoregional scale in three sites." Human ecology **42**(3): 425-441.

Barkmann, J., et al. (2008). "Confronting unfamiliarity with ecosystem functions: the case for an ecosystem service approach to environmental valuation with stated preference methods." Ecological economics **65**(1): 48-62.

Benson, B., et al. Farmscaping Techniques for Managing Insect Pests, Virginia Polytechnic Institute and State University.

Bhat, C. R. (2001). "Quasi-random maximum simulated likelihood estimation of the mixed multinomial logit model." Transportation Research Part B: Methodological **35**(7): 677-693.

Blaauw, B. R. and R. Isaacs (2014). "Flower plantings increase wild bee abundance and the pollination services provided to a pollination-dependent crop." Journal of Applied Ecology **51**(4): 890-898.

Boxall, P. C., et al. (1996). "A comparison of stated preference methods for environmental valuation." Ecological economics **18**(3): 243-253.

Boyd, J. and S. Banzhaf (2007). "What are ecosystem services? The need for standardized environmental accounting units." Ecological economics **63**(2): 616-626.

Calderone, N. W. (2012). "Insect pollinated crops, insect pollinators and US agriculture: trend analysis of aggregate data for the period 1992–2009." PloS one **7**(5): e37235.

Cameron, S. A., et al. (2011). "Patterns of widespread decline in North American bumble bees." Proceedings of the National Academy of Sciences **108**(2): 662-667.

Carson, R. T., et al. (1999). "The theory and measurement of passive-use value." Valuing environmental preferences: Theory and practice of the contingent valuation method in the US, EU, and developing countries: 97-130.

Carson, R. T. and T. Groves (2007). "Incentive and informational properties of preference questions." Environmental and resource economics **37**(1): 181-210.

Champ, P. A. and R. C. Bishop (2001). "Donation payment mechanisms and contingent valuation: an empirical study of hypothetical bias." Environmental and resource economics **19**(4): 383-402.

Chen, W. Y. and J. Hua (2015). "Citizens' distrust of government and their protest responses in a contingent valuation study of urban heritage trees in Guangzhou, China." Journal of environmental management **155**: 40-48.

Chilton, S. M. and W. G. Hutchinson (1999). "Do focus groups contribute anything to the contingent valuation process?" Journal of Economic Psychology **20**(4): 465-484.

Council, N. R. (2007). Status of pollinators in North America, National Academies Press.

Cundill, G., et al. (2017). "Beyond benefit sharing: Place attachment and the importance of access to protected areas for surrounding communities." Ecosystem Services.

Cusser, S. and K. Goodell (2013). "Diversity and distribution of floral resources influence the restoration of plant–pollinator networks on a reclaimed strip mine." Restoration Ecology **21**(6): 713-721.

Davis, J. L., et al. (2009). "Interdependence with the environment: Commitment, interconnectedness, and environmental behavior." Journal of environmental psychology **29**(2): 173-180.

Dillman, D. A., et al. (2009). Internet, Mail, and Mixed-Mode Surveys: The Tailored Design Method, John Wiley & Sons, Inc.

Dillman, D. A., et al. (2014). Internet, Mail, and Mixed-Mode Surveys: The Tailored Design Method, John Wiley & Sons, Inc.

Donatuto, J. and M. R. Poe (2015). "EVALUATING SENSE OF PLACE AS A DOMAIN OF HUMAN WELL--BEING FOR PUGET SOUND RESTORATION." Final Report, Puget Sound Institute, Tacoma, WA.

Fisher, B. and R. K. Turner (2008). "Ecosystem services: classification for valuation." Biological conservation **141**(5): 1167-1169.

Fisher, B., et al. (2009). "Defining and classifying ecosystem services for decision making." Ecological economics 68(3): 643-653.

Ford, B., et al. The State of the Birds United States of America 2009, U.S. Department of Interior.

Foster, V. and S. Mourato (2003). "Elicitation format and sensitivity to scope." Environmental and resource economics **24**(2): 141-160.

Goulson, D., et al. (2015). "Bee declines driven by combined stress from parasites, pesticides, and lack of flowers." Science **347**(6229): 1255957.

Graefe, D. A. and C. P. Dawson (2013). "Rooted in place: Understanding camper substitution preferences." Leisure sciences **35**(4): 365-381.

Greene, W. H. and D. A. Hensher (2003). "A latent class model for discrete choice analysis: contrasts with mixlogit." Transportation Research Part B **37**: 681-698.

Gross, M. J. and G. Brown (2008). "An empirical structural model of tourists and places: Progressing involvement and place attachment into tourism." Tourism management **29**(6): 1141-1151.

Gunderson, K. and A. Watson (2007). "Understanding place meanings on the bitterroot national forest, Montana." Society and Natural Resources **20**(8): 705-721.

Hanemann, W. M. (1984). "Welfare evaluations in contingent valuation experiments with discrete responses." American journal of agricultural economics 66(3): 332-341.

Halpenny, E. A. (2010). "Pro-environmental behaviours and park visitors: The effect of place attachment." Journal of environmental psychology **30**(4): 409-421.

Hanley, N., et al. (1998). "Contingent valuation versus choice experiments: estimating the benefits of environmentally sensitive areas in Scotland." Journal of agricultural economics **49**(1): 1-15.

Hanley, N., et al. (2001). "Choice modelling approaches: a superior alternative for environmental valuatioin?" Journal of economic surveys **15**(3): 435-462.

Hay, R. (1998). "Sense of place in developmental context." Journal of environmental psychology **18**(1): 5-29.

Hensher, D. A. and W. H. Greene (2003). "The Mixed Logit model: The state of practive." Transportation **30**: 133-176.

Hörisch, J. (2015). "Crowdfunding for environmental ventures: an empirical analysis of the influence of environmental orientation on the success of crowdfunding initiatives." Journal of cleaner production **107**: 636-645.

Howley, P. (2011). "Landscape aesthetics: Assessing the general publics' preferences towards rural landscapes." Ecological economics **72**: 161-169.

Jenkins, A., et al. (2016). "Crowdsourcing a collective sense of place." PloS one **11**(4): e0152932.

Johnston, R. J. and M. Russell (2011). "An operational structure for clarity in ecosystem service values." Ecological economics **70**(12): 2243-2249.

Jorgensen, B. S. and R. C. Stedman (2001). "Sense of place as an attitude: Lakeshore owners attitudes toward their properties." Journal of environmental psychology **21**(3): 233-248.

Jorgensen, B. S. and R. C. Stedman (2006). "A comparative analysis of predictors of sense of place dimensions: Attachment to, dependence on, and identification with lakeshore properties." Journal of environmental management **79**(3): 316-327.

Jorgensen, B. S., et al. (1999). "Protest responses in contingent valuation." Environmental and resource economics **14**(1): 131-150.

Kelly, G. and K. Hosking (2008). "Nonpermanent residents, place attachment, and "sea change" communities." Environment and behavior **40**(4): 575-594.

Kennedy, M. (2016). Report: More Pollinator Species In Jeopardy, Threatening World Food Supply. NPR. http://www.npr.org/sections/thetwo-way/2016/02/26/468241649/report-more-pollinators-species-in-jeopardy-threatening-world-food-supply.

Kil, N., et al. (2015). "Experiential Benefits, Place Meanings, and Environmental Setting Preferences Between Proximate and Distant Visitors to a National Scenic Trail." Environmental management **55**(5): 1109-1123.

Krutilla, J. V. (1967). "Conservation reconsidered." The American Economic Review **57**(4): 777-786.

Kyle, G., et al. (2004). "Effects of place attachment on users' perceptions of social and environmental conditions in a natural setting." Journal of environmental psychology **24**(2): 213-225.

Lin, C.-C. and M. Lockwood (2014). "Assessing sense of place in natural settings: a mixed-method approach." Journal of Environmental Planning and Management **57**(10): 1441-1464.

Lincoln, N. K. and N. M. Ardoin (2016). "Cultivating values: environmental values and sense of place as correlates of sustainable agricultural practices." Agriculture and human values **33**(2): 389-401.

Loomis, J. (1988). "Broadening the concept and measurement of existence value." Northeastern Journal of Agricultural and Resource Economics **17**(1): 23-29.

Lu, J. and M. A. Schuett (2014). "Examining the relationship between motivation, enduring involvement and volunteer experience: The case of outdoor recreation voluntary associations." Leisure sciences **36**(1): 68-87.

McAndrew, F. T. (1998). "THE MEASUREMENT OF 'ROOTEDNESS' AND THE PREDICTION OF ATTACHMENT TO HOME-TOWNS IN COLLEGE STUDENTS." Journal of environmental psychology **18**(4): 409-417.

McFadden, D. (1973). "Conditional logit analysis of qualitative choice behavior."

McFadden, D. (1986). "The choice theory approach to market research." Marketing science **5**(4): 275-297.

McFadden, D. and K. Train (2000). "Mixed MNL models for discrete response." Journal of applied Econometrics: 447-470.

Meyerhoff, J. and U. Liebe (2008). "Do protest responses to a contingent valuation question and a choice experiment differ?" Environmental and resource economics **39**(4): 433-446.

Meyerhoff, J. and U. Liebe (2009). "Status quo effect in choice experiments: empirical evidence on attitudes and choice task complexity." Land Economics **85**(3): 515-528.

Millennium Ecosystem Assessment, 2005. Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC.

Moore, R. L. and A. R. Graefe (1994). "Attachments to recreation settings: The case of rail-trail users." Leisure sciences **16**(1): 17-31.

Moran, E. F. and M. C. Lopez (2016). "Future directions in human-environment research." Environmental research **144**: 1-7.

Morrison, M., et al. (1999). "Valuing improved wetland quality using choice modeling." Water Resources Research **35**(9): 2805-2814.

Morrison, M. and D. J. Dowell (2015). "Sense of Place and Willingness to Pay: Complementary Concepts When Evaluating Contributions of Cultural Resources to Regional Communities." Regional Studies **49**(8): 1374-1386.

Morse, R. A. and N. W. Calderone (2000). "The value of honey bees as pollinators of US crops in 2000." Bee culture **128**(3): 1-15.

Murphy, J. J., et al. (2005). "Is cheap talk effective at eliminating hypothetical bias in a provision point mechanism?" Environmental and resource economics **30**(3): 327-343.

Opaluch, J. J., et al. (1993). "Evaluating impacts from noxious facilities: including public preferences in current siting mechanisms." Journal of environmental economics and management 24(1): 41-59.

Othman, J., et al. (2004). "Environmental values and resource management options: a choice modelling experience in Malaysia." Environment and Development Economics **9**(6): 803-824.

Paris, C. (2009). "Re-positioning second homes within housing studies: Household investment, gentrification, multiple residence, mobility and Hyper-consumption." Housing, Theory and Society **26**(4): 292-310.

Pasari, J. R., et al. (2013). "Several scales of biodiversity affect ecosystem multifunctionality." Proceedings of the National Academy of Sciences **110**(25): 10219-10222.

Poe, G. L., et al. (2002). "Provision point mechanisms and field validity tests of contingent valuation." Environmental and resource economics **23**(1): 105-131.

Potts, S. G., et al. (2010). "Global pollinator declines: trends, impacts and drivers." Trends in ecology & evolution **25**(6): 345-353.

Randall, A. (1987). "Total economic value as a basis for policy." Transactions of the American Fisheries Society **116**(3): 325-335.

Randall, A. and J. R. Stoll (1983). "Existence value in a total valuation framework." Managing air quality and scenic resources at national parks and wilderness areas: 265-274.

Relph, E. (1976). Place and placelessness, Pion.

Rickard, L. N. and R. C. Stedman (2015). "From ranger talks to radio stations: the role of communication in sense of place." Journal of Leisure Research **47**(1): 15.

Roesch-McNally, G. E. and S. S. Rabotyagov (2016). "Paying for forest ecosystem services: voluntary versus mandatory payments." Environmental management **57**(3): 585-600.

Rolfe, J., et al. (2000). "Choice modelling and its potential application to tropical rainforest preservation." Ecological economics 35(2): 289-302.

Rondeau, D., et al. (1999). "Voluntary revelation of the demand for public goods using a provision point mechanism." Journal of public Economics **72**(3): 455-470.

Rose, J. M., et al. (2008). "Designing efficient stated choice experiments in the presence of reference alternatives." Transportation Research Part B: Methodological 42(4): 395-406.

Sauer, J. R., D. K. Niven, J. E. Hines, D. J. Ziolkowski, Jr, K. L. Pardieck, J. E. Fallon, and W. A. Link (2017). "The North American Breeding Bird Survey, Results and Analysis 1966 - 2015." Retrieved 9/4/17, from https://www.mbr-pwrc.usgs.gov/bbs/.

Scannell, L. and R. Gifford (2010). "The relations between natural and civic place attachment and pro-environmental behavior." Journal of environmental psychology 30(3): 289-297.

Scholte, S. S., et al. (2015). "Integrating socio-cultural perspectives into ecosystem service valuation: a review of concepts and methods." Ecological economics 114: 67-78.

Schwartz, J. (2016). Decline of Pollinators Poses Threat to World Food Supply, Report Says. The New York Times. www.nytimes.com. https://www.nytimes.com/2016/02/27/science/decline-of-species-that-pollinate-poses-a-threat-to-global-food-supply-report-warns.html .

Secretary, T. W. H. O. o. t. P. (2014). Fact Sheet: THe Economic Challenge Posed by Declining Pollinator Populations. President Barack Obama White House Archives. https://obamawhitehouse.archives.gov/the-press-office/2014/06/20/fact-sheet-economic-challenge-posed-declining-pollinator-populations.

Shamai, S. (1991). "Sense of place: An empirical measurement." Geoforum 22(3): 347-358.

Smith, J. W., et al. (2011). "Place meanings and desired management outcomes." Landscape and Urban Planning 101(4): 359-370.

Stedman, R. C. (2002). "Toward a social psychology of place: Predicting behavior from place-based cognitions, attitude, and identity." Environment and behavior 34(5): 561-581.

Stedman, R. C. (2003). "Is it really just a social construction?: The contribution of the physical environment to sense of place." Society &Natural Resources 16(8): 671-685.

Stedman, R. C. (2006). "Understanding place attachment among second home owners." American behavioral scientist 50(2): 187-205.

Swallow, S. K. (2013). "Demand-side value for ecosystem services and implications for innovative markets: experimental perspectives on the possibility of private markets for public goods." Agricultural and Resource Economics Review 42(1): 33-56.

Tonge, J., et al. (2015). "The effect of place attachment on pro-environment behavioral intentions of visitors to coastal natural area tourist destinations." Journal of Travel Research 54(6): 730-743.

Train, K. (2000). "Halton sequences for mixed logit." Department of Economics, UCB.

Train, K. (2003). <u>Discrete Choice Methods with Simulation,</u> Cambridge University Press.

Tuan, Y.-F. (1979). Space and place: humanistic perspective. <u>Philosophy in geography,</u> Springer**:** 387-427.

Tuan, Y.-F. (1980). "Rootedness and sense of place." Landscape 24: 3-8.

Ujang, N. and K. Zakariya (2015). "The notion of place, place meaning and identity in urban regeneration." <u>Procedia-Social and Behavioral Sciences</u> **170**: 709-717.

U.S. Census Bureau. https://www.census.gov/quickfacts/fact/map/VA,DE,US/RHI225216#viewtop

Urquhart, J. and T. Acott (2014). "A sense of place in cultural ecosystem services: The case of Cornish fishing communities." <u>Society & Natural Resources</u> **27**(1): 3-19.

Van Houtven, G., et al. (2014). "Combining expert elicitation and stated preference methods to value ecosystem services from improved lake water quality." <u>Ecological economics</u> **99**: 40-52.

Vaughn, C. (2017). Tourism brings millions to Virginia Shore economy. USA Today. https://www.usatoday.com/story/news/local/virginia/2017/02/16/virginia-eastern-shore-tourism/97939196/

Venkatachalam, L. (2004). "The contingent valuation method: a review." <u>Environmental impact assessment review</u> **24**(1): 89-124.

Vorkinn, M. and H. Riese (2001). "Environmental concern in a local context: The significance of place attachment." <u>Environment and behavior</u> **33**(2): 249-263.

Vossler, C. A. and M. F. Evans (2009). "Bridging the gap between the field and the lab: Environmental goods, policy maker input, and consequentiality." <u>Journal of environmental economics and management</u> **58**(3): 338-345.

Walker, M. (2015). Pollinators in decline around the world. BBC. http://www.bbc.com/earth/story/20150304-global-pollinators-in-decline

Weisbrod, B. A. (1964). "Collective-consumption services of individual-consumption goods." <u>The Quarterly Journal of Economics</u> **78**(3): 471-477.

Williams, N. M. (2011). "Restoration of nontarget species: bee communities and pollination function in riparian forests." <u>Restoration Ecology</u> **19**(4): 450-459.

Winfree, R., et al. (2011). "Valuing pollination services to agriculture." Ecological economics 71: 80-88.

Wynveen, C. J. and G. T. Kyle (2015). "A place meaning scale for tropical marine settings." Environmental management **55**(1): 128-142.

Zeng, T. (2016). "Using halton sequences in random parameters logit models."

8. Appendices:

Appendix A: Supplementary Tables

Table 20. Place Meaning Categories and survey items for each category

Meaning Category	Meaning Items: "The Eastern Shore is a place…"
Nature and Wildlife	to experience nature. where wildlife flourishes. of high environmental quality.
Family and Friends	to enjoy time with friends and family. that represents my personal family history.
Activities and Recreation	to do the recreation I enjoy.
Escape from cities and day-to-day	known for being rural. to escape from urban areas. to relax.
Community	with a welcoming community. with friendly neighbors.
Live and work	that is important to my way of life. to make my living. to put down roots.

Respondent Reasons for choosing a Pollination Area Program and not choosing a Pollination Area Program

Table 21. Reasons Respondents indicated for why they did not choose a Pollination Area Program

Reasons for not choosing a Pollination Area Program	# agreeing
"I support improving ecosystem services, but cannot afford to pay the program amounts"	87
"I support improving ecosystem services, but I object to paying for this program"	49
"The program is too expensive for the amount of improvement"	25
"I did not have enough information to choose a program"	22
"I disagree with the payment method"	12
"I do not agree with the program"	5
"I prefer to keep the current situation"	4
Other	16

Table 22. Reasons Respondents indicated for why they choose to choose a Pollination Areas Program

Reasons for choosing a Pollination Area Program	# agreeing
"I want to improve the current condition"	70
"I feel a responsibility to protect the environment"	70
"I will pay to do this because improving pollinator populations is important"	61
"I think the program will benefit my experiences on the Eastern Shore"	51
"I like quail and want to improve their numbers"	8
Other	2

Table 23. Summary Statistics of Other Survey Variables not reported in results

Variable	Visitors		Residents		Total	
	Count	%	Count	%	Count	%
Full-time Resident	NA		84	89.36	84	41.79
Part-time Resident	NA		10	10.64	10	0.05
Aware of Quail Decline	16	14.95	30	31.91	46	22.89
Aware of Pollinator Decline	77	71.96	78	82.98	155	77.11
Knowledge of Crowdfunding	79	73.83	54	57.45	133	66.17
Choice Block						
Block 1	24	22.43	26	27.66	50	24.88
Block 2	34	31.78	24	25.53	58	28.86
Block 3	22	20.56	21	22.34	43	21.39
Block 4	27	25.23	23	24.47	50	24.88
State Interviewed						
Virginia	58	54.206	51	54.26	109	54.23
Maryland	23	21.495	31	32.98	54	26.87
Delaware	26	24.299	12	12.77	38	18.91
Success of Program for improving... (1-4 scale)	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Pollinator Abundance	2.832	0.775	2.728	0.827	2.782	0.800
Quail Abundance	2.590	0.830	2.467	0.818	2.531	0.824
Scenic Beauty	2.950	0.821	2.837	0.842	2.896	0.831
Water Quality	2.693	0.857	2.663	0.905	2.679	0.878

Appendix B: Choice Experiment Design and Ngene code

Ngene Code

<u>Model</u>
```
Design
;alts= A, B
;rows= 16
;eff= (mnl,d)
;block= 4
;alg= swap(random=500, swap=1, swaponimprov=40, reset=10000, resetinc=500,
stop=total(200000 iterations))
;model:
U(A)= b1+b2[.035]*X1[50,60,75,100,150,200]+b3[.406]*X2[5,10,15,20,25,30]
+b4[5.077]*X3[0,1]+b5[-.015]*X4[29,59,108,185,224]$
```

<u>Results</u>
MNL efficiency measures

D error	0.005652
A error	2.956566
B estimate	58.332946
S estimate	2.282089

Prior	b2	b3	b4	b5
Fixed prior value	0.035	-0.406	5.077	-0.015
Sp estimates	1.632036	1.571195	1.752421	2.282089
Sp t-ratios	1.534233	1.563655	1.480597	1.297447

<u>Where:</u>
X1: Number of Pollination Areas
X2: Increase in Pollinator Abundance
X3: Increase in Quail Abundance
X4: One-time payment to establish program

Table 24. Choice Experiment Choice Blocks and attribute levels for the non- status quo
alternative

Block	Question	# Pol Areas	Inc Pol Abundance	Inc Quail Abundance	Payment
1	1	200	30	1	29
1	2	60	25	0	108
1	3	50	5	0	29
1	4	75	10	0	59
2	1	150	20	1	224
2	2	50	10	1	224
2	3	100	5	0	185
2	4	150	15	1	224
3	1	50	15	1	29
3	2	75	30	0	185
3	3	100	15	1	59
3	4	60	20	1	108
4	1	100	5	0	29
4	2	75	25	0	108
4	3	60	20	1	59
4	4	200	10	0	185

Appendix C: Parallel Factor Analysis Graph
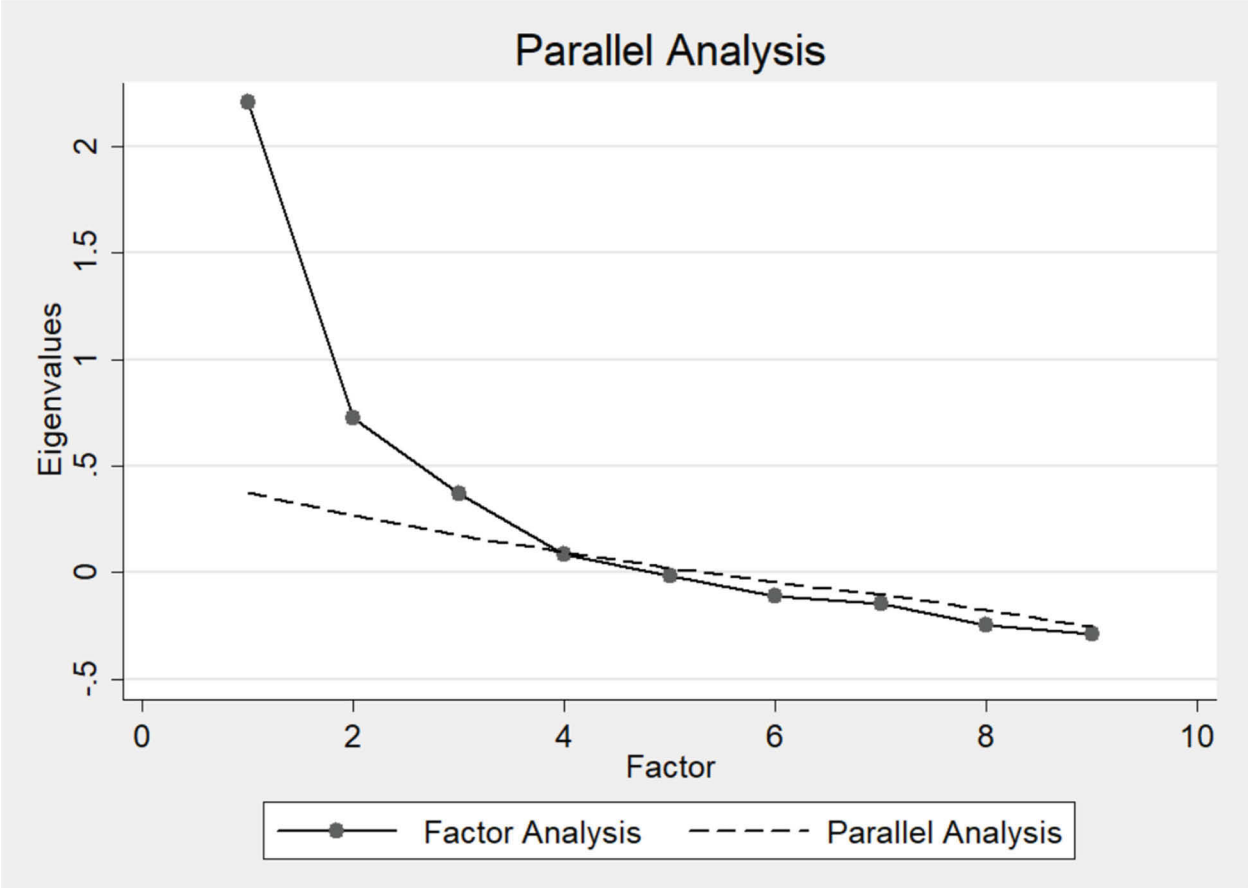
Figure 8. Graph of Parallel Factor Analysis Results. Parallel Analysis shows 3 factors should be

kept in exploratory factor analysis

Appendix D: Stata Code for running models

Stata Econometric Do File
import excel using "C:\Users\Wesley\Documents\Thesis\Long Final Raw Data.xls", firstrow
do "Thesis Raw data prepare"

*Install program
ssc install wtp

*Generate new group and ID names
gen newID = int((_n-1)/8)+1
gen groupset = int((_n-1)/2)+1
order groupset, after(questset)
order newID, after(RespondentID)

gen ASC=1
replace ASC=0 if asc==1

gen ieduc=ASC*education
gen iMale= ASC*Male
gen iage=ASC*age
gen iinc= ASC*inc
gen ires= ASC* resident
gen iPA= ASC* PA //place attachment interaction

*resident interacted variables
gen rnumPAs= resident*numPAs
gen rCost= Cost*resident
gen rQuAB= resident*QuAB
gen rPolAb= resident*PolAb

*Generate variable to capture only completed choice sets
by questset (choice), sort: gen diff1=1 if (choice[1] ! = choice[_N])
replace diff1=0 if missing(diff1)
bysort RespondentID: egen z= min(diff1)

*Basic Conditional Logit Model
clogit choice numPAs PolAb QuAB Cost if (z==1), group(groupset)
wtp Cost numPAs PolAb QuAB, krinsky reps(15000) level(90)

*Conditional Logit Model with resident and demographic interactions
clogit choice Cost numPAs PolAb QuAB rCost rnumPAs rPolAb rQuAB ires ieduc iage iMale
if (z==1) , group(groupset)

*Mixed Logit Model
mixlogit choice Cost if (z==1) , rand(numPAs PolAb QuAB) group(groupset) id(newID)
nrep(5000) burn(10)
wtp Cost numPAs PolAb QuAB, krinsky reps(15000) level(90)

**Individual WTP for increasing pollinator abundance
mixlogit choice Cost if (z==1) , rand(numPAs PolAb QuAB) group(groupset) id(newID)
nrep(5000) burn(10)
mixlbeta PolAb if (z==1), nrep(500) saving(PolAb_data) replace
use PolAb_data, clear

gen PosPolAb= 0
replace PosPolAb=1 if PolAb>0
sort PosPolAb
by PosPolAb: sum PolAb
gen WTP= -(PolAb)/ -0.025   /// denominator is payment attribute coefficient from mixlogit
by PosPolAb: sum WTP

** Conditional Logit Model with Place Attachment
clogit choice numPAs PolAb QuAB Cost iPA if (z==1), group(groupset)

** Mixed Logit Model with Place Attachment
mixlogit choice Cost if (z==1) , rand(numPAs PolAb QuAB iPA) group(groupset) id(newID)
nrep(5000) burn(10)

Stata Sense of Place Do File

```
** Exploratory Factor Analysis**
*final factors generation
factor pm2 pm4 pm6 pm7 pm8 pm9 pm10 pm11 pm13, factor(3)  //other pm's already factored
out
estat anti  // all anti corr over 0.6
fapara, reps(100)  // we see that we should have 3 factors
rotate, promax blanks(0.3)  // best rotation
estat kmo   // .72
predict factor1 factor2 factor3

//name factors
gen scenic= (pm6+pm7+pm10+pm11)/4  // factor 1
gen relax= (pm2+pm13)/2                  // factor 2
gen fromhere= (pm4+pm8+pm9)/3         // factor 3

//regress pm's and factors on PA
reg PA scenic relax fromhere pm1 pm3 pm5 pm12 pm14


**Rootedness Variable Transformation**
replace livechild=1 if missing(livechild)  // makes every missing value "none of my childhood"
replace liveadult= 1 if missing(liveadult)  //makes every missing value "none of my adult life"

gen tot_fam=fam_parent+ fam_sib+ fam_grand+ fam_aunt+ fam_inlaws+ fam_child+
fam_spouse
replace tot_fam=0 if fam_none==1

gen fam_dummy=1
replace fam_dummy=0 if fam_none==1

replace visits=6 if missing(visits) // highest visits for residents
replace stayvisit=8 if missing(stayvisit) // stay more than 6 months for residents
replace pplvisit=5 if missing(pplvisit) //residents visit friends always

//new dummies for stayvisit length
gen weekend=0
replace weekend=1 if stayvisit==1
replace weekend=1 if stayvisit==2
replace weekend=1 if stayvisit==3

gen week=0
replace week=1 if stayvisit==4
replace week=1 if stayvisit==5
```

```
gen twoplusweek=0
replace twoplusweek=1 if stayvisit==6
replace twoplusweek=1 if stayvisit==7
replace twoplusweek=1 if stayvisit==8

gen fewvisits=0
replace fewvisits=1 if visits<4
gen somevisits=0
replace somevisits=1 if visits==4
replace somevisits=1 if visits==5
gen permvisit=0
replace permvisit=1 if visits==6

//single years of relation measure
gen yrsvisit= 2017-firstvisit
replace yrsvisit=0 if missing(yrsvisit)
gen fulllive= 2017-livyrfull
replace fulllive=0 if missing(fulllive)
gen partlive= 2017 - livyrpart
replace partlive=0 if missing(partlive)
gen ESyears= yrsvisit +fulllive+ partlive




*standardized non- dummy variables pre clustering
egen zlivechild= std(livechild)
egen zliveadult= std(liveadult)
egen ztot_fam= std(tot_fam)
egen zpplvisit= std(pplvisit)
egen zESyears= std(ESyears)

egen zpi_beach= std(pi_beach)  //standardize place importance scales
egen zpi_bay= std(pi_bay)
egen zpi_park= std(pi_park)
egen zpi_waterside= std(pi_waterside)
egen zpi_oc= std(pi_oc)
egen zpi_city= std(pi_city)
egen zpi_coast= std(pi_coast)
egen zpi_town= std(pi_town)
egen zpi_farm= std(pi_farm)
```

Generate 4 clusters based on rootedness
cluster kmeans Born zlivechild zliveadult ztot_fam weekend week twoplusweek fewvisits somevisits permvisit zpplvisit zESyears fam_dummy resident own_house own_2ndhome zpi_beach zpi_bay zpi_park zpi_waterside zpi_oc zpi_city zpi_coast zpi_town zpi_farm, k(4) name(std4) iterate(1000) start(random(5))
tab std4 , gen(cluster)

**OLS regression of clusters on Place Attachment
reg PA cluster1 cluster3 cluster4 //have cluster2 as base

**Multivariate Regression of Clusters on Place Meanings
manova scenic relax fromhere pm1 pm3 pm5 pm12 pm14= cluster1 cluster3 cluster4
mvreg

UNDERSTANDING YOUR CONNECTION TO THE EASTERN SHORE

INTRODUCTION

Whether you live on the Eastern Shore, occasionally visit, or have even visited one time, we would like to learn about the connections you have with this area. This survey asks about your relationship to the Eastern Shore and your opinions about enhancing the natural environment of the Eastern Shore.

The survey will take approximately 20 minutes to complete. Please answer all questions as best as you can. All of your answers will remain confidential.

If for some reason you prefer not to complete the survey, please send an email to shoresurvey@vt.edu and we will remove you from the list.

What do we mean by the Eastern Shore?
When answering questions please consider the Eastern Shore to be the area in the black oval in the map below. This includes portions of Delaware, Virginia, and Maryland.

Thanks for your help!

1. Have you ever lived on the Eastern Shore? (Select one)
   - ❑ No, I never have → **Skip to Question 6**
   - ❑ Yes, I used to live on the Eastern Shore → **Skip to Question 3**
   - ❑ Yes, I currently live on the Eastern Shore

2. Are you a full-time or part-time resident of the Eastern Shore? (Select one)
   - ❑ Full-time resident
   - ❑ Part-time resident

3. What year did you first live on the Eastern Shore?
   (Please fill in the blanks)

   ___ ___ ___ ___

4. What portion of your childhood (Before age 18) did you live on the Eastern Shore? (Select one)
   - ❑ None
   - ❑ Less than half
   - ❑ About half
   - ❑ More than half
   - ❑ My entire childhood

5. What portion of your adult life (Age 18 or older) have you lived on the Eastern Shore? (Select one)
   - ❑ None
   - ❑ Less than half
   - ❑ About half
   - ❑ More than half
   - ❑ My entire adult life

> **CURRENT** RESIDENTS PLEASE **SKIP** TO **QUESTION 10.**
> **FORMER** RESIDENTS AND **VISITORS** PLEASE **CONTINUE** TO **QUESTION 6.**

6. How many times did you visit the Eastern Shore in the last five years (from 2012 to 2016)? (Select all that apply)
   - ❑ One visit
   - ❑ A couple of visits
   - ❑ About one visit per year
   - ❑ A couple visits per year
   - ❑ More than two visits per year
   - ❑ I lived there for part of the last five years

7. During a typical visit how long do you stay? (Select one)
   - ❑ Day trip
   - ❑ Overnight
   - ❑ A few days / long weekend
   - ❑ Up to a week
   - ❑ 1 to 2 weeks
   - ❑ 2 to 4 weeks
   - ❑ 2-5 months
   - ❑ 6 months or more

8. How frequently do you visit someone you know well (friends or family) when you visit the Eastern Shore? (Select one)
   - ❑ Always
   - ❑ Often
   - ❑ Sometimes
   - ❑ Rarely
   - ❑ Never

FORMER RESIDENTS PLEASE SKIP TO QUESTION 10.

9. In what year did you first visit the Eastern Shore?
   (Please fill in the blanks)

   ___ ___ ___ ___

10. Do you have family members that **live** or **have lived** on the Eastern Shore
(Select all that apply)

❑ No
❑ Yes, Parents
❑ Yes, Sisters or Brothers
❑ Yes, Grandparents
❑ Yes, Aunts, Uncles, or Cousins
❑ Yes, In-laws
❑ Yes, Children
❑ Yes, Others (Please specify): _____

11. Whether it's living, working, recreation or another activity, please mark all the places you have spent time on the Eastern Shore.

____ A. Beaches along the Atlantic Ocean

____ B. The shoreline of the Chesapeake Bay

____ C. Cities like Salisbury, MD or Easton, MD and their surrounding areas

____ D. National wildlife refuges, national parks/seashores or state parks

____ E. Ocean City, MD

____ F. Small waterside towns like Chincoteague, VA or St. Michaels, MD

____ G. Coastal beach towns like Rehoboth Beach, DE

____ H. Small rural towns like Exmore, VA or Princess Anne, MD

____ I. Farms and other rural areas

____ J. Other (please explain): _____

12. Of the places listed above, which one have you spent the most time?

(Please write letter representing the choice from above)

_____

13. There are many places on the Eastern Shore where people spend their time. For each place listed below, please tell us how important it is to your experience living on or visiting the Eastern Shore. (Check one box for each place)

Place	Not at all Important	Slightly Important	Moderately Important	Very Important
Beaches along the Atlantic Ocean	❑	❑	❑	❑
The shoreline of the Chesapeake Bay	❑	❑	❑	❑
Cities like Salisbury, MD or Easton, MD and their surrounding areas	❑	❑	❑	❑
National wildlife refuges, national parks/seashores or state parks	❑	❑	❑	❑
Ocean City, MD	❑	❑	❑	❑
Small waterside towns like Chincoteague, VA or St. Michaels, MD	❑	❑	❑	❑
Coastal beach towns like Rehoboth Beach, DE	❑	❑	❑	❑
Small rural towns like Exmore, VA or Princess Anne, MD	❑	❑	❑	❑
Farms or other rural areas	❑	❑	❑	❑

14. Below are a number of recreation activities people may engage in on the Eastern Shore. Please indicate how frequently you participate in each activity. (Check one box for each activity)

Recreation Activities	Never	Rarely	Sometimes	Often	Very Often
Visiting farmer markets or farm stands	❑	❑	❑	❑	❑
Fishing	❑	❑	❑	❑	❑
Boating	❑	❑	❑	❑	❑
Watching wildlife	❑	❑	❑	❑	❑
Visiting a beach	❑	❑	❑	❑	❑
Hunting	❑	❑	❑	❑	❑

PART 3. IN THIS SECTION, WE WOULD LIKE TO KNOW WHAT THE EASTERN SHORE MEANS TO YOU.

15. People have a number of experiences on the Eastern Shore. Based on your experiences, please indicate the degree that you agree or disagree the following statements. (Check one box for each statement)

For me, the Eastern Shore is a place…	Not true at all for me	Slightly true for me	Moderately true for me	Mostly true for me	Completely true for me
to experience nature.	❑	❑	❑	❑	❑
to enjoy time with friends and family.	❑	❑	❑	❑	❑
to do the recreation I enjoy.	❑	❑	❑	❑	❑
known for being rural.	❑	❑	❑	❑	❑
that is important to my way of life.	❑	❑	❑	❑	❑
with a welcoming community.	❑	❑	❑	❑	❑
where wildlife flourishes.	❑	❑	❑	❑	❑
to make my living.	❑	❑	❑	❑	❑
that represents my personal family history.	❑	❑	❑	❑	❑
of high environmental quality.	❑	❑	❑	❑	❑
to escape from urban areas.	❑	❑	❑	❑	❑
with friendly neighbors.	❑	❑	❑	❑	❑
to relax.	❑	❑	❑	❑	❑
to put down roots.	❑	❑	❑	❑	❑

16. People may have a number of different feelings about the Eastern Shore. Please tell us your level of agreement with each statement below. (Check one box for each statement)

Statement	Strongly Disagree	Somewhat Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Somewhat Agree	Strongly Agree
The Eastern Shore is my favorite place to be	❏	❏	❏	❏	❏	❏	❏
I really miss the Eastern Shore when I am away	❏	❏	❏	❏	❏	❏	❏
The Eastern Shore is the best place for me to do things I enjoy	❏	❏	❏	❏	❏	❏	❏
I am very attached to the Eastern Shore	❏	❏	❏	❏	❏	❏	❏
No other place can give me the types of experiences I have on the Eastern Shore	❏	❏	❏	❏	❏	❏	❏
I identify strongly with the Eastern Shore	❏	❏	❏	❏	❏	❏	❏

17. Please indicate your satisfaction with the current levels of the following characteristics on the Eastern Shore. (Check one box for each statement)

Characteristic	Extremely Dissatisfied	Dissatisfied	Neither Satisfied or dissatisfied	Satisfied	Extremely Satisfied
Natural scenery	❏	❏	❏	❏	❏
Opportunities for solitude/peacefulness	❏	❏	❏	❏	❏
Observing wildlife	❏	❏	❏	❏	❏
Level of development	❏	❏	❏	❏	❏
Number of visitors/tourists	❏	❏	❏	❏	❏

The natural environment provides many services. Examples include: helping pollinate food crops, protecting water quality, and providing natural scenery. Here, we ask about a program to increase services by planting areas of native plants.

- The program focuses on pollination, an important service that bees, butterflies and other insects provide for agricultural crops and other plants. We will refer to these insects as **Pollinators**.

Pollinating insect on a native flower

- The program will plant areas of native plants to provide important habitat for bees, butterflies and other insects. We will refer to these as **pollination areas**.

- The areas of native plants will provide habitat for wildlife like **bobwhite quail**. Bobwhite quail have a popular whistling call, people enjoy viewing them, and are a game species.
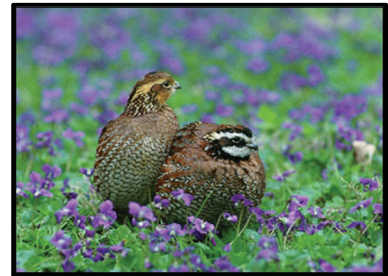
A pair of bobwhite quail

WHY IS A PROGRAM TO PLANT POLLINATION AREAS NEEDED?

- University scientists have found that losses of natural habitat are contributing to the decline in pollinator and quail populations.

- For example, honeybee populations have declined by nearly 60% over the last 50 years in the U.S.

- The decline in pollinators leads to reduced pollination that can have negative impacts on agricultural crops and native plants that people enjoy.

- Bobwhite quail have declined by about 70% since the 1960s in the U.S.

- This has reduced opportunities for people to see and hear quail.

- University scientists, farmers, and residents have noticed these declines in pollinators and quail on the Eastern Shore.

- Enhancing areas of native plants will provide habitat that can help to stop these declines.

18. Were you aware of these declines before reading this survey?
(Select all that apply)
❑ Yes, I was aware of the decline in quail
❑ Yes, I was aware of the decline in bees
❑ No, this is new to me
❑ Not sure

A **solution** developed by university scientists to increase pollinator and quail populations is planting strips of land with native plants.

A **pollination area** with wildflowers and native grasses

Pollination areas provide a number of important services.

- They provide homes and food for pollinators that are important for pollination of crops and other plants.

- They provide homes and food for quail and other types of wildlife.

- They also help to protect water quality by filtering storm water runoff.

- They contribute to scenic beauty.

PROGRAM IMPLEMENTATION

The Virginia Native Plant Society is considering a program to plant and maintain pollination areas on the entire Eastern Shore.

Some important details:

- **The program focuses on farmers and rural landowners on the Eastern Shore** – Landowners voluntarily apply to have a pollination area planted on their land.

- **The *Virginia Native Plant Society* will work with landowners** – They will identify pollination area sites, coordinate planting, assist with maintenance of planted areas, and monitor pollinator and wildlife use.

- **The pollination areas will be small and diverse** – They will consist of native wildflowers and grasses. The size will range from a half acre to two acres.

- **The agreement**
  - Participation is voluntary.

  - Landowners agree to maintain the pollination area for 8 years.

  - After 8 years, landowners can agree to continue in the program or not.

  - If landowners agree to continue, the pollination areas will be replanted to maintain the services for another 8 years.

  - If landowners leave the program, a new site will be identified.

- **Funding the program**
  - Funds will be raised using crowdfunding.

  - Crowdfunding is used when people benefit, but there is not a way to pay.

  - Crowdfunding is used to fund new products, social causes and scientific research.

  - You may have heard of crowdfunding websites like Kickstarter or GoFundMe.

  - The money raised will pay for the pollination area planting, maintenance, and monitoring.

  - The pollination area program will only be implemented if enough money is raised to pay for planting, maintenance and monitoring.

  - If enough money is not raised, all money collected will be returned to the people who made payments and the program will not be implemented.

19. Had you heard of crowdfunding before reading this? (Select one)
    - ❑ Yes
    - ❑ No
    - ❑ Not sure

Your Preferences for Pollination Area Programs

We are going to ask if you would pay a specific amount to help fund the pollination area program on the Eastern Shore. Your responses will help inform the *Virginia Native Plant Society* if the Pollination Area Program should be established.

In the following questions, we ask you to consider pollination area programs in terms of the number of pollination areas, improvements in pollinator and quail populations, and a one-time payment you would make to support the program.

Number of pollination areas – the number of properties on the Eastern Shore where a pollination area will be planted.

Pollinator Abundance - the change in the number of pollinators. For example, a "25% increase" in the current populations of pollinators.

Quail Abundance – the change in the number of quail. A specific increase in the quail population is difficult to predict so we talk in terms of "increased quail abundance".

Payment – the amount you would pay through crowdfunding to help establish the pollination area program.

Please answer the following Pollination Area Program questions (questions 20-23) as if the alternative presented are the only options for you to choose.

20. Please consider the options below for a Pollination Area Program on the Eastern Shore. Please choose either the Pollination Area Program or "No Program"

Please indicate which you would choose (select one)

	Pollination Area Program	**"No Program"**
Number of Pollination Areas	150	**I would not choose the Program**
Pollinator Abundance	25% Increase in pollinator abundance	
Quail Abundance	Increased presence of quail	
One-time Payment	$137	

❑ I would choose the Pollination Area Program and pay $137
❑ I would choose "No Program" and pay $0

21. Please consider the options below for a Pollination Area Program on the Eastern Shore. Please choose either the Pollination Area Program or "No Program"

Please indicate which you would choose (select one)

	Pollination Area Program	**"No Program"**
Number of Pollination Areas	50	**I would not choose the Program**
Pollinator Abundance	5% Increase in pollinator abundance	
Quail Abundance	No increased presence	
One-time Payment	$29	

❑ I would choose the Pollination Area Program and pay $29
❑ I would choose "No Program" and pay $0

22. Please consider the options below for a Pollination Area Program on the Eastern Shore. Please choose either the Pollination Area Program or "No Program"

Please indicate which you would choose (select one)

	Pollination Area Program	**"No Program"**
Number of Pollination Areas	75	**I would not choose the Program**
Pollinator Abundance	10% Increase in pollinator abundance	
Quail Abundance	No increased presence	
One-time Payment	$108	

❑ I would choose the Pollination Area Program and pay $108
❑ I would choose "No Program" and pay $0

23. Please consider the options below for a Pollination Area Program on the Eastern Shore. Please choose either the Pollination Area Program or "No Program"

Please indicate which you would choose (select one)

	Pollination Area Program	**"No Program"**
Number of Pollination Areas	60	
Pollinator Abundance	20% Increase in pollinator abundance	**I would not choose the Program**
Quail Abundance	Increased presence of quail	
One-time Payment	$59	

❑ I would choose the Pollination Area Program and pay $59
❑ I would choose "No Program" and pay $0

24. If you chose the "No Program" option to answer Questions 20, 21, 22 or 23, what were your reasons? (Select all that apply)
    ❑ I prefer to keep the current situation
    ❑ I disagree with the method of payment
    ❑ I support improving ecosystem services, but cannot afford to pay the program amounts
    ❑ I do not agree with the program
    ❑ I support improving ecosystem services, but I object to paying for this program
    ❑ I did not have enough information to choose a program
    ❑ Other, please explain: _____

25. If you chose the Pollination Area Program option for an answer to Questions 20, 21, 22 or 23, what were your reasons? (Select all that apply)
    ❑ I want to improve the current condition
    ❑ I will pay to do this because improving pollinator populations is important
    ❑ I think the program will benefit my experiences on the Eastern Shore
    ❑ I feel a responsibility to protect the environment
    ❑ I like quail and want to improve their numbers
    ❑ Other, please explain: _____

26. How successful do you think the Pollination Area Program will be in improving the following on the Eastern Shore? (Check one box for each statement)

Characteristic	Not successful	Somewhat successful	Successful	Very successful
Increasing pollinator abundance	❑	❑	❑	❑
Increasing quail abundance	❑	❑	❑	❑
Enhancing scenic beauty	❑	❑	❑	❑
Protecting water quality	❑	❑	❑	❑

PART 5. INFORMATION ABOUT YOU – YOUR RESPONSES ARE CONFIDENTIAL AND WILL HELP US TO UNDERSTAND MORE ABOUT PEOPLE WHO LIVE ON AND VISIT THE EASTERN SHORE.

27. What is the zip code of your primary residence?
(Fill in the blanks)

___ ___ ___ ___ ___

28. What year were you born?
(Fill in the blanks)

___ ___ ___ ___

29. Were you born on the Eastern Shore? (Select one)
❑ Yes
❑ No

30. Do you currently own any of the following on the Eastern Shore?
(Select all that apply)
- ❑ Land (a parcel without a house)
- ❑ Primary place of residence
- ❑ Timeshare or some other partial ownership
- ❑ Second home
- ❑ Other (Please specify): _____
- ❑ None

31. What is the highest level of education you have completed?   (Select one)
- ❑ Less than 9th grade
- ❑ High School, no diploma
- ❑ High School graduate (or equivalent)
- ❑ Some College, no degree
- ❑ Associate degree
- ❑ Bachelor's degree
- ❑ Master's degree
- ❑ Professional degree
- ❑ Doctorate degree

32. What is your gender?
(Select one)
- ❑ Male
- ❑ Female

33. What is your race?   (Select all that apply)

- ❑ White
- ❑ Hispanic
- ❑ Black or African American
- ❑ American Indian or Alaska Native
- ❑ Asian
- ❑ Native Hawaiian or Other Pacific Islander
- ❑ Other: (Please specify) _____

34. To the best of your knowledge what was your household's income before taxes in 2016?   (Select one)
   ❑ Less than 15,000
   ❑ 15,000 to 24,999
   ❑ 25,000 to 34,999
   ❑ 35,000 to 49,999
   ❑ 50,000 to 74,999
   ❑ 75,000 to 99,999
   ❑ 100,000 to 149,999
   ❑ 150,000 or more
   ❑ Prefer not to answer

YOU HAVE COMPLETED THE SURVEY!

I know that you are busy, and I am very grateful for the time you took to provide your opinions about the Eastern Shore.

Have a nice summer!

-Wesley

Appendix F: Permission to use Virginia Native Plant Society name and logo

Email communication

Hello Nancy,

My name is Wesley and I am a Masters student at Virginia Tech. I am currently involved in a project that is working to measure people's preferences for improving pollinator populations by establishing native plant areas on properties on the Eastern Shore of Virginia.

I am emailing you because my research team is constructing a survey to ask people how important ecosystem services are to them by asking their opinions about a program designed to plant native flowers in strips on the Eastern Shore. The goal of the program is to improve pollinator populations as well as wildlife habitat on farms and other larger properties. This is a study to understand public opinions about a possible future project but it could gain credibility in the eyes of survey respondents with the sponsorship of a credible organization. Would Virginia Native Plant Society be willing to consider being a sponsor for this project? We want people to consider the program to be as real and credible as possible so their responses will reflect their true preferences.

Being a sponsor wouldn't require any work or funding on your behalf. We are looking for an endorsement of sorts and simply would like to use your name and place your logo on the survey. I believe the survey results might also be interesting to your organization as well. While the study is designed for a specific portion of Virginia its core purpose and methods can translate to other portions of the state.

Thank you for your time. Please email me any questions or concerns you may have. I'd be happy to set up a phone meeting as well to better explain things.

Best,
Wesley

Reply:

Hi Wesley,

Yes, the VNPS would certainly like to be a sponsor of such a project and would be proud to add our logo. I only wish that we had a local chapter on the Eastern Shore.

Are you aware of the Plant Eastern Shore Natives campaign? This effort is coordinated by Dot Field with Virginia's Natural Heritage Program (in the Department of Conservation and Recreation) and Virginia Witmer of the Coastal Zone Management Program within the Virginia Department of Environmental Quality. It is part of a statewide native plant social marketing effort. May I share your email with them?

I have attached our logo. I look forward to seeing the survey and its results.

Good luck!

Nancy

Nancy Vehrs, President
Virginia Native Plant Society
www.vnps.org

Appendix G: Recruitment Documents for Survey Focus Group, Pretest trial, and Final implementation

Part A: Focus Group Email Contact

Dear <CALS staff member name>,

Hello my name is Wesley Johnson and I am a graduate student in the Agricultural and Applied Economics department.

I am contacting you to ask for your assistance with my Master's thesis research. I am writing to ask if you would be willing to participate in a focus group to provide feedback on a survey I am designing. We will meet on this Thursday, April 27th from 4:40- 6:00 pm in Room 423 in Bishop Favrao Hall.

There are no requirements for participation. Additionally, there are no risks with choosing to participate in the focus group.

Snacks will be provided during the session.

Please RSVP to this e-mail.
I will follow this email with a phone call in case you have any questions.

Thank you,
Wesley Johnson

Part B: Focus Group Information Sheet

INFORMATION SHEET

Connections to the Eastern Shore

You have been asked to participate in a focus group to provide feedback on a survey we are designing. The survey is designed to ask about the connections you have with the natural environment on the Eastern Shore and for you preferences for a program to enhance environmental services.

This focus group will take approximately an hour and a half. Participation is completely voluntary and your comments and feedback will remain confidential. You can choose not to answer any question and leave the focus group at any time. There is no penalty if you choose not to participate, nor are there any tangible benefits for participating. All results from this group session will not be published and only be viewed by the researchers.

If you have questions about the focus group or need any clarification regarding the study, please contact Dr. Kevin Boyle by email at kjboyle@vt.edu , Dr. Michael Sorice by email at msorice@vt.edu or by phone (540) 231-8303, or Wesley Johnson, Research Assistant, at shoresurvey@vt.edu .

This study is being conducted by researchers form Virginia Tech. It has been reviewed by the Institutional Review Board at Virginia Tech. If you have any problems or questions regarding your rights as human subject research participants contact the Institutional Review Board Chair, Dr. David M. Moore by phone +1 (540) 231-4991 or email moored@vt.edu .

Thank you for your participation,

Wesley Johnson
Research Assistant, Virginia Tech
Dr. Michael Sorice
Assistant Professor, Virginia Tech
Dr. Kevin Boyle
Professor, Virginia Tech

Part C: Pretest Mailing Cover Letter

<Individual's Address>

Dear <name>,

I'm the student from Virginia Tech and met you briefly this past summer on the Eastern Shore near <location>. I spent last summer interviewing folks like you to understand more about your connections to the Eastern Shore. I would like to thank you again for your help. The summer portion of my research project was successful because of your participation.

I'm sending you this letter to ask for your continued help. Included in this envelope is a survey that is designed to help us understand your connection to the Eastern Shore and to gauge your interest in a program being developed to enhance environmental benefits in the region.

The survey is still in its test phase and I would like your feedback to make sure the questions are clear and the answer choices are complete. Please answer the survey questions and write any comments you have for improvement in the margins of the survey pages.

You are one of a small number of people I am asking to review the survey so your feedback is very important to the success of the study. The survey is short and should take less than 20 minutes to complete.

If you would be willing to answer any follow up questions to help improve the survey, please write your first name and a phone number on the cover of the survey. You will not be contacted for any other reason and you phone number will be kept confidential.

Once you finish, please return the survey in the enclosed postage paid envelope.

All your answers to the survey will be kept confidential. Your answers will never be associated with your name or mailing address. If you have any questions I will be happy to help. You can reach me at (540) 231-8303 or by email at shoresurvey@vt.edu.

This project has been reviewed and approved by the Virginia Tech Institutional Review Board, and if you have questions about your rights as a participant, please contact Dr. David M. Moore at (540) 231-4991.

I know that your time is valuable and I am hopeful that with your input we can improve the quality of the survey and the full study.

Many thanks,

Wesley Johnson
Research Assistant

Part D: Pretest Reminder Post Card

May 29th, 2017

Hello,

We sent you a survey from Virginia Tech last week. You were mailed the survey because you volunteered to participate in the study last summer. It was a pleasure to meet you at that time and we hope you are still willing to participate in the study.

If you have already completed and returned the survey, thank you! If not, we are hoping that you will be able to complete and return the survey.   Your response is critical to represent your opinions and other people who may have similar opinions.

If you did not receive a questionnaire, or if it was misplaced, please call 540-231-8303 and we will get another one in the mail for you today.

Thank you for your generous assistance.

Sincerely,

Wesley Johnson, Research Assistant, Virginia Tech

Part E: Final Survey First Email

Dear <name> ,

I am the student from Virginia Tech that you met briefly last summer on the Eastern Shore near <survey location>. I spent last summer interviewing folks like you and I would like to thank you again for your help. That portion of my research project was successful because of your participation.

I am writing you to ask for your help in the second part of the study. This part is a survey to understand your connection to the Eastern Shore and to gauge your support for a program to enhance environmental benefits in the region.

You are one of a small number of people being asked to participate in the survey so your feedback is critical to the success of the study. Your answers represent your opinions and the opinions of others like you.

The survey should take less than 20 minutes to complete. I am asking you to do the survey online to make it more convenient for you. Doing that is easy, just enter the web address below in your Internet browser or click on the link to go directly to the survey.

> http://

If you need help or would like a paper version of the survey please contact me by email at shoresurvey@vt.edu or through my advisor's office telephone at (540) 231-8303.

This survey is confidential. Your answers will never be associated with your name or email address. If you have any questions about the survey I will be happy to help.

This project has been reviewed and approved by the Virginia Tech Institutional Review Board, and if you have questions about your rights as a participant, please contact Dr. David M. Moore at (540) 231-4991.

I know that you are busy, but I am hopeful that with your input we will have a very successful survey that represents <residents of / visitors to> the Eastern Shore.

Many thanks,

Wesley Johnson
Research Assistant

Part F: Final Survey Reminder Email

Dear <name>,

About a week ago I sent you an email asking you to complete a survey about your connections to the Eastern Shore and to gauge your support for a program to enhance environmental benefits in the region. If you have already responded, thank you! If not, this is a friendly reminder to complete the survey.

You might recall that I am the student from Virginia Tech you helped with research by answering a quick survey last summer near <survey location>. I am asking for your help one final time.

You are one of a small number of people being asked to complete an on-line survey continuing with our research from last summer. The survey should take less than 20 minutes to complete. To do the survey, just enter this web address below in your Internet browser or click on the link below to go directly there.

   http://

If you need help or would like a mailed copy of the survey instead please contact me by email at shoresurvey@vt.edu or through my advisor's office by telephone at (540) 231-8303.

This survey is confidential. Your answers will never be associated with your name or email address.

This project has been reviewed and approved by the Virginia Tech Institutional Review Board, and if you have questions about your rights as a participant, please contact Dr. David M. Moore at (540) 231-4991.

I know that you are busy, but I am hopeful that with your input we will have a very successful survey that represents <residents of/visitors to> the Eastern Shore.

Sincerely,

Wesley Johnson
Research Assistant

Part H: Final Survey Final Reminder Email

Dear <first name>,

Summer is a busy time for people and we understand how valuable your time is. I am contacting you again in hopes that you would spend less than 20 minutes of your time completing a survey about your connections to the Eastern Shore and a program being developed to enhance environmental benefits in the region.

If you have already completed the survey after reading one of my previous emails, we greatly appreciate your participation! If you have not completed the survey, I would urge you to do so as your opinions are very important.

You might recall that I am the student from Virginia Tech you helped with research by answering a quick survey last summer near <survey location>. I am asking for your help one final time.

You are one of a small number of people being asked to complete an on-line survey continuing with our research from last summer. We will end the study next week and we need to hear from everyone before then.

To take the survey, just copy and paste this web address in your Internet browser or click on the link below to go directly there.

> http://

If you need help or would like a mailed copy of the survey instead please contact me by email at shoresurvey@vt.edu or through my advisor's office by telephone at (540) 231-8303.

This survey is confidential. Your answers will never be associated with your name or email address.

This project has been reviewed and approved by the Virginia Tech Institutional Review Board, and if you have questions about your rights as a participant, please contact Dr. David M. Moore at (540) 231-4991.

I know that you are busy, but I am hopeful that with your input we will have a very successful survey that represents <residents of/visitors to> the Eastern Shore.

Sincerely,

Wesley Johnson
Research Assistant

Appendix H: Summer Intercept Survey Pieces.

INFORMATION SHEET

Opinions about Environmental Health on the Eastern Shore

You have been asked to participate in a research study investigating your opinions on the health of the environment and agriculture on the Delmarva Peninsula also known as the Eastern Shore. You have been selected because you either live here or have come to visit. The overall purpose of this research is to measure the preferences of residents and visitors of the Eastern Shore for benefits provided by the environment. The purpose of speaking with me today is to help us understand a little bit about the people who work, live, and play on the Eastern Shore.

This interview will take 5 minutes or less. Participation is completely voluntary and your identity will remain confidential. You can choose not to answer any question and end the interview at any time. There is no penalty if you choose not to participate, nor are there any tangible benefits for participating. Results from this survey and a voluntary follow up survey may be published. Confidential information will only be viewed by researchers and you will not be identified with the answers you provide in any publication or presentation.

If you have questions about the interview or need any clarification regarding the study, please contact Dr. Michael Sorice by email at msorice@vt.edu or by phone (540) 231-8303. Or, you can reach me, Wesley Johnson, Research Assistant, at shoresurvey@vt.edu .

This study is being conducted by researchers form Virginia Tech. It has been reviewed by the Institutional Review Board at Virginia Tech. If you have any problems or questions regarding your rights as human subject research participants contact the Institutional Review Board Chair, Dr. David M. Moore by phone +1 (540) 231-4991 or email moored@vt.edu .

Thank you for your participation,

Wesley Johnson
Research Assistant, Virginia Tech
Dr. Michael Sorice
Assistant Professor, Virginia Tech
Dr. Kevin Boyle
Professor, Virginia Tech

Eastern Shore Intercept Survey Script

Hello (good afternoon/good morning), my name is Wesley Johnson and I am a student at Virginia Tech working on a project about how people are impacted by changes in agriculture and nature surrounding farms here on the Eastern Shore.

May I speak with you about our project?

- No — Thank you for stopping. Enjoy the rest of your day!
- Yes — Great! (continue)

My research is to ask people like you, about your opinions and perspectives about agriculture and nature to understand how environmental changes would affect you. Today, I just want to ask you a few questions about how you are connected to the Eastern Shore and agriculture and see if you would be interested in helping us out later on through an online survey. Would you mind if I ask you a few questions? It will take less than 5 minutes.

- Yes – Proceed to IRB explanation
- No — Thank you for your time! Enjoy the rest of your day.

(Hand IRB information sheet) This sheet provides you with information about the study. I want to highlight that:

- This study is completely voluntary.
- You can skip any question you don't want to answer.
- And you can end the interview at any time.

(Provide time for person to read info sheet here.)

Before we continue, do you have any questions? (Give time to ask a question)

Would you like to continue?

- Yes= (continue)
- No = Thank you, have a nice day.

Question 1: Great! Can I start by asking, are you a fulltime resident of the Eastern Shore?
- Yes-Local (counties & towns considered to be the Eastern Shore) (Go to 2)
- No- Non- local (area outside the Eastern Shore)   (Go to question 11)

Local Questions

Question 2: How long have you lived here? _____ years

Question 3: What is your zip code? _____ (5 digit zip)

Question 4: Did your parents or grandparents live on the Eastern Shore?
- No
- Yes, both
- Yes, Parents
- Yes, grandparents

Question 5: Have you ever visited a farm on the Eastern Shore for any reason?
- Yes
- No (Go to Question 19)
- I am a farmer (Go to question 8 after question 7)

Question 6: Do you ever shop at farm stands or farmer's markets?
- Yes (Continue to Question 7)
- No (Go to question 19)

Question 7: How often do you shop at farm stands or farmer's markets?

- Almost never;
- At least once a year
- At least once a month
- At least once a week
- This is my first time

(Go to Question 19)

Farmer Questions:

Question 8: (From Question 5 if a farmer) What kind of farm do you operate?

(Check all that apply)

- Vegetable
- Grain
- Poultry
- Beef
- Dairy
- Fruit
- Horticulture/landscape plants
- Other:_____

Question 9: Do you sell any products at farmer's markets or farm stands?

- Yes
- No

Question 10: Do you operate any agri-tourism business on your farm?

- Yes
- No

(Proceed to Question 19)

Nonlocal Questions:

Question 11: Is this your first visit to the Eastern Shore?

- Yes ("Welcome!")

- No

Question 12: Can I ask your zipcode? _____ (If it was their first time go to Question 16)

Question 13: About how often have you visited the Eastern Shore in the past 5 years?

- Once Every couple years (about 2 times)

- Once a year (about 5 times)

- A couple times per year (5-10)

- Many times a year (10+)

Question 14: How long do you typically stay when you visit the Eastern Shore?

- Daytrip

- Overnight

- Weekend

- Up to a week

- A couple weeks

- Longer than a couple weeks

Question 15: Do you have a second home or timeshare on the Eastern Shore?

- Yes

- No

Question 16: Have you ever visited a farm on the Eastern Shore for any reason?

- Yes

- No

Question 17: Do you ever shop at farm stands or farmers markets on the Eastern Shore?

- Yes

- No (Go to question 19)

Question 18: When you visit the Eastern Shore, how often do you visit farm stands or farmers markets?
- Never
- Once
- Sometimes
- Almost always

Okay only two questions left.

Question 19: Improving environmental quality often requires a source of funding to support it. This can occur in many ways. One relatively unexplored way is through crowdsourced funding. How familiar are you with crowdsourcing as a means to raise funds for projects?

- Very unfamiliar
- Somewhat unfamiliar
- Somewhat familiar
- Very familiar

Thank you for your help!

As I mentioned before, we'd like to get additional feedback from you using an online survey we're planning to send out this fall. It will focus more on people's opinions about the relationship between pollination on farms and in nature on the Eastern Shore. It is part of a larger project that is studying ways to improve pollination on the Eastern Shore to benefit nature and agriculture. Natural pollinations play a key role in over 150 food crops in the U.S., including fruits and grains, and they help keep nature healthy too. Biologists on our project are studying populations of pollinators, and crop yields, and I'm focusing on people's perceptions of the importance of improving pollination.

It's an opinion survey so you don't need to know anything special about pollination, agriculture, or the Eastern Shore to answer the survey questions. All the information you will need to complete the survey will be provided with the survey.

It would be really valuable to have your feedback. Like this survey, the follow up survey is also voluntary. Would you be interested in participating in the online survey?

•   Yes – Great. I'll just need to get your name, address and email?

o   If they ask, "Why do you need my address?" Answer: It's because we will send an email link and follow up with a mail survey. We find that it sometimes works to also send a questionnaire in the mail.

o   I can assure you that Virginia Tech has very strict rules against sharing personal information. All your personal contact information will be deleted after the survey is completed.

Thank you so much! We are very appreciative of your assistance in this research project.

Intercept Survey Sampling Notes

There are many challenges to surveying here:

- Every place is different. Different volumes of people, different proportions of locals, "come here"s, and visitors. Differences in county wealth. Downtown areas are run down or super nice.

- Not everyone visits the types of places I am sampling. Locals may not visit the nice places and visitors won't visit the not nice places. This is why we sample in so many locations to get this more even amount. However, time of day and types of shopping around may also influence who I see.

- Who I sample could be biased on the time of day. Who is out during the middle of the day? Old, poor, or unemployed people. Visitors also would be included here but the majority of farmers and working class are out at work.

- Each sampling location presents major challenges to interception. Many towns have ample street parking and people can park and run inside before they can be approached. Following them into a store is not an option. Heavier trafficked stores get biased to get the most people. The post office has been a great place to intercept because it has constant traffic during the day. You also get lots of local people.

- Sampling in the parking lot in Exmore is difficult because there is no one route people take to get to the store. People walk down multiple rows and cut through randomly. Predicting where there car is if they come out of the store is also impossible unless you saw them get out which is also hard to do if you're engaged in conversation or have your back to them.

- The pitch is less interesting to visitors at the beach who I'd argue have less attachment to the area they have driven through and don't connect to the area where they are going as much if they come infrequently or don't stay in a location consistently.

- Under-sampled groups are largely not English speakers because of their inability to understand or answer survey questions. Grain farmers are overloaded during the time period of the survey so it is difficult to find them. Homeless people or migrant workers have no address to send mail to or computers for emailing surveys.

    o I have spoken to people from Australia and New Mexico. I have talked to the homeless, the poor and yacht owners. I have interviewed local business workers and/or owners

Eastern Shore Intercept Survey Summary Statistics

Full Time Residents (51% of respondents)
Have lived on the Eastern Shore on average 28 years (sd=22yrs, med=25yrs,min=1,max=86)
44% have no family ties;For anotherr 44% their parents and grandparents grew up on The ES)
23 Farmers participated (about 3% of total sample)
Of locals who said they have visited a farmer'smarket/farm stand, 48% said they shop there at least once a week
Visitors (49% of respondents)
13% were First Time visitors
24% have second homes in the ES
Most stay for the weekend (23%) or for a week (48%)
43% reported visiting the ES 10+times in the past 5 years
70% said they Almost Always shop at a farmer's market/farm stand when they visit
51% said they have visited a farm

Appendix I: Sense of Place reference table (Table 25) of some previous studies of environmental entities and place concepts.

Authors	Year	Study Type	SOP, Attachment, or Meanings Study	Environmental Entity	Study Population	Specific Place Measures	Key Covariates Considered
Moore & Graefe	1994	Quantitative	Attachment	3 rail- trails in IA, FL, & CA	Trail users	PI, PD	Favorite part, user characteristics, activity related variables, frequency of use, length of association
Hay	1998	Qualitative	SOP	Banks Peninsula, New Zealand	Residents, transients, and tourists	SOP	Rootedness and community interaction, age stage, residency
Jorgensen & Stedman	2001	Quantitative	SOP	Lakes in Wisconsin	Lake shoreline property owners	PA, PI, PD	Recreation activity, development perceptions
Vorkinn & Riese	2001	Quantitative	Attachment	River affected by Hydro dam	Residents near dam	PA	User history, recreation activity
Stedman	2002	Quantitative	SOP	Lakes in Wisconsin	Property owners in Wisconsin	PA, PS, PM	Evaluative beliefs, time experience, social participation, lake protective behaviors
Stedman	2003	Quantitative	SOP	Lakes in Wisconsin	Property owners in Wisconsin	PA, PS , PM	Environmental specific attributes
Kyle et al.	2004	Quantitative	Attachment	Appalachian Trail	Trail users	PI, PD	Social and environmental conditions
Jorgensen & Stedman	2006	Quantitative	SOP	Lakes in Wisconsin	Homeowners on lakes with shoreline property	PA, PI, PD	Recreation activity, time spent in place, environmental quality and values, attitudes of shoreline vegetation and property development
Stedman	2006	Quantitative	Attachment	Lakes in Wisconsin	Second Home Owners	PA, PM	Residence patterns, years of ownership, period of interaction, recreation activity, social networks
Gunderson & Watson	2007	Qualitative	Place Meanings	National Forest in Montana	Residents of the valley	PM	Places you spend the most time, importance of places, impact of forest management on places
Kelly & Hosking	2008	Both	Attachment	River Region of Coastal Australia	Non-permanent coastal property owners	PA	Time spent in place, property ownership, plans to move to area, local expenditure
Gross & Brown	2008	Quantitative	Attachment	Southern Australia tourist places	South Australia Tourists	PI, PD	Consumer involvement, attributes of destination
Halpenny	2010	Quantitative	Attachment	Canadian national park	Visitors in last 4 yrs	PI, PD	Behavior intentions, place affect

KEY:
SOP: Sense of Place , PA: Place Attachment , PI: Place Identity , PD: Place Dependence , PS: Place Satisfaction , PM: Place or Symbolic Meaning

Authors	Year	Study Type	SOP, Attachment, or Meanings Study	Environmental Entity	Study Population	Specific Place Measures	Key Covariates Considered
Smith et al.	2011	Quantitative	SOP/Meanings	River Watersheds in Illinois	Local households	PM	Meanings, desired management outcomes
Amsden et al.	2011	Qualitative	Attachment	Gateway community to Alaskan outdoor recreation	Residents of Seward Alaska	PA	Meanings, experiences, community connections
Venables et al.	2012	Both	SOP	Nuclear Power plants	Community members in power plant areas	PD, PI	Proximity to disturbance, pro-environmental behavior,
Ardoin	2014	Both	SOP	Eco-regions	Ecoregional residents	PA, PI, PD	Scope of place connections, outdoor activities, environmental behavior
Lin & Lockwood	2014	Both	Attachment	Protected areas in Tasmania	Variety of stakeholders including locals, visitors, government	PA, PI, PD	Map places, experiences in area
Urquhart & Acott	2014	Qualitative	SOP	Marine Fishing industry	Stakeholders/community members of 10 fishing communities	SOP	SOP investigated through narrative created by community
Wynveen & Kyle	2015	Quantitative	Place Meanings	Tropical Marine Settings needing protection	Stakeholders/ informant interviews for nearby residents	PM	Place meaning importance with 10 key themes
Tonge et al.	2015	Quantitative	Attachment	Marine Park Australia	Park campers	PA, PI, PD	Social bonding, everyone's happy, pro-environmental behavior, visit frequency
Kil et al	2015	Quantitative	Place Meanings	National Scenic Trail network	Trail users	PM, PI, PD	Proximity to trail, visit frequency, environmental setting preferences and recreation choices
Donatuto & Poe	2015	Qualitative	SOP	Puget Sound	Local community members in two areas of the Sound	SOP	Heritage, activity in place, social ties, recreation and ecotourism
Lincoln & Ardoin	2016	Both	SOP	Island of Kona, Hawaii	Farmers	SOP	Environmental Values, farming practices
Cundill et al.	2017	Qualitative	Attachment	Land in protected areas in South Africa	Former landowners prior to protected area construction	PA	Relational values, life history

KEY:
SOP: Sense of Place , PA: Place Attachment , PI: Place Identity , PD: Place Dependence , PS: Place Satisfaction , PM: Place or Symbolic Meaning