

ABSTRACT

RODRIGUEZ, SHARI LYNN. The Use of Financial Incentives, Stewardship, and Public Information to Promote Wildlife Habitat Conservation on Private Lands. (Under the direction of M. Nils Peterson.)

In the US, most wildlife species rely on private lands for habitat, which makes private lands critical for wildlife conservation. Despite this, efforts to conserve wildlife habitat in have historically focused on public lands. My dissertation explores three methods used to motivate private landowners to conserve habitat for wildlife on their land: financial incentives (Chapter 1), stewardship (Chapter 2) and public information (Chapter 3).

Chapter 1: Conservation incentive programs promote private lands conservation with financial assistance to landowners in exchange for specific land management activities.

While many conservation incentive programs exist, few focus on endangered species.

Consequently, little information exists regarding landowner interest in programs focused on endangered species. To address this issue, we conducted a case study of North Carolina Farm Bureau (NCFB) county board members in all 100 counties in North Carolina (NC) with an in-person survey administration between March and October, 2009. Our objectives were to:

1) compare respondent interest in conservation easements versus contracts; 2) gauge respondent interest in a endangered species habitat conservation contract to restore and maintain endangered species habitat; 3) assess respondent preferences for agreement durations and enrollment acreage; and 4) determine socio-demographic predictors of interest in PES contracts for endangered species habitat conservation. In total, 735 NCFB county board members participated in the study (78% compliance rate). Results show preferences for contracts (57%) over easements (39%), and preferences for shorter-term conservation contracts and permanent easements. About half of respondents (45%) indicated they would

place two-thirds of their land (91 acres) in a contract to restore and maintain endangered species habitat, and indicated preference for 10 year contracts. Younger landowners who had previously participated in conservation programs, who perceived endangered species conservation as important, and who individual property rights orientations were more likely to be interested in endangered species habitat contracts. These results have been published in the *Wildlife Society Bulletin*.

Chapter 2: Although payments are often used to promote conservation, there simply is not enough funding available to pay all private landowners to conserve wildlife. Thus, it is critical to find alternatives to PES for motivating habitat conservation on private land. Private land stewardship is thought to influence landowner willingness to adopt environmentally sustainable land management practices without financial incentives, and therefore may represent a viable alternative to payments. To be effective at persuading private landowners to conserve without payments, conservationists must first understand landowner views of stewardship. We used the aforementioned survey to address three objectives: 1) determine if respondents self-identify as stewards of the land; 2) determine what motivates respondents to be stewards of the land; 3) determine what activities/behaviors respondents associate with private land stewardship; and 4) determine what socio-demographic characteristics predict stewardship motivations and activities/behaviors. Nearly all of our respondents self-identified as stewards of the land (97%). Respondents associated stewardship with maintaining property (87%) and indicated that their responsibility to act as a steward was owed to future generations (87%) and family (77%). The importance of soil conservation and past participation in conservation programs were found to be important predictors of stewardship activities and motivations.

Chapter 3: Providing the public with information regarding the benefits of native plant landscaping may influence wildlife habitat conservation in urban areas. Although residential landscapes typically consist of maintained lawns with some exotic trees, and shrubs, alternative designs that benefit wildlife are possible. Literature suggests public information may influence landowners' preferences for landscaping choices. We used case study of Raleigh, North Carolina residents to 1) determine how much landowners will change their landscaping preferences after learning of the benefits of native landscaping to birds, and 2) what socio-demographic variables predict their landscaping preferences for native landscaping. One hundred seventy-nine surveys were administered in-person in 4 randomly selected census blocks in Raleigh between February and March, 2010. A total of 179 responses to the survey were received (40% response rate). Prior to being given information on the benefits of wildlife-friendly native plant landscaping (treatment), residents showed preference for 0% and 50% native plant landscaping coverage. After providing information regarding the benefits of native plant landscaping to birds, preferences shifted to the 50% and 75% coverages. Regression analysis showed that home ownership and ethnicity were the only predictors of change in landscaping preferences.

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The Use of Financial Incentives, Stewardship, and Public Information to Promote Wildlife
Habitat Conservation on Private Lands

by
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A dissertation submitted to the Graduate Faculty of
North Carolina State University
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

Fisheries, Wildlife, and Conservation Biology

Raleigh, North Carolina

2012

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DEDICATION

To my mother for her endless supply of love and support, and to my father who I miss.

BIOGRAPHY

Shari Lynn Rodriguez was born in the San Francisco Bay Area, and raised on the north end of Lake Tahoe. Immediately after graduating from High School, Shari began her undergraduate career, first at a community college and subsequently at Whitman College in Walla Walla, WA, where she received a Bachelor's degree in Biology. It was at Whitman where Shari realized her interest in wildlife, and where she conducted her first wildlife research which was on the inter- and intra-species competition between microtine rodent and insectivore species in a riparian habitat in northeast Oregon.

After graduating from Whitman, Shari returned to the Bay Area and worked in biotech for a year before landing a job as a support scientist at NASA Ames Research Center, working on two space shuttle life science payloads as a NASA contractor. After completing work on these payloads, Shari returned to biotech for several years during which time she had the opportunity to take her first trip to Africa and discovered that her passion for different cultures was as strong as her passion for wildlife.

Set on finding a way to make a difference in the lives of African people, Shari entered into a Master's program in sustainable development at the School for International Training (SIT) in Brattleboro, VT. While at SIT Shari found herself gravitating towards wildlife issues in her courses, rather than solely focusing on human issues. It was during that time at SIT that made her realize she could study both wildlife and people as a researcher of the human dimensions of wildlife conservation. To satisfy the SIT requirements for a practicum, Shari secured a position at a wildlife reserve in South Africa, and subsequently another in Kenya conducting research on human-wildlife conflict

surrounding a wildlife damage compensation program run in the Chyulu Hills of Kenya.

Shari spent nearly a year working, living, and traveling on the continent.

After returning from East Africa in late 2005, Shari wrote her thesis and began applying for jobs that might take her back to Africa. After several unsuccessful attempts at getting another position in Africa, Shari decided it was time to pursue a Ph.D. Shari began doctoral studies at North Carolina State University in the fall semester 2008. During her time at NCSU, Shari has participated in several research collaborations with faculty and students from NCSU and beyond, and also in several professional development programs. In 2011, Shari completed the Certificate of Accomplishment in Teaching, and the Preparing the Professoriate program in 2012, and has co-taught several courses at NCSU including Urban Wildlife Management and Conservation Biology in Practice. Shari plans to continue her research in the human dimensions and teaching in conservation biology at an academic institution, and ultimately hopes to become a professor. In her spare time, Shari continues to travel, practice yoga, swim, read, watch zombie movies, visit museums and walk her dog.

ACKNOWLEDGMENTS

First and foremost, I would like to thank my advisor, Nils Peterson, for the opportunity to work with him, for all of the opportunities he provided for me during my time in his lab, and for his patience and mentorship. I would not be the researcher and teacher I am today without him. My other committee members, Fred Cabbage, Erin Sills and Howard Bondell also deserve my sincere thanks for their time, instruction, and support. I would also like to give special thanks to George Hess and Beth Gardener for their friendship, support and advice over the last couple years of my Ph.D. I would also like to thank Chris Moorman, and Barry Goldfarb for their advice and support, and Cindy Burke and Sarah Slover for being soooo good at their jobs, and always having the answers to my questions about funding and degree requirements. Last, I would like to thank my family and friends for their support and encouragement over the past 4 years - I am a lucky girl indeed to have so many wonderful people in my life!

Chapter 1 and 2:

I would like to thank the Office of the Secretary of Defense, Texas A&M University, The Dean's Office of the College of Natural Resources at North Carolina State University, and the North Carolina Farm Bureau for their financial and logistical support for this research. In particular, I thank the North Carolina Farm Bureau staff, especially Chester Lowder, for their invaluable assistance with implementing our survey and North Carolina Farm Bureau county advisory board members for the generosity of their time in participating in this study. I would also like to thank Tim Jones and Susan Woodall of the

USDA Farm Service Agency, and Don Riley of the USDA Natural Resources Conservation Service, for providing information about Farm Bill programs in North Carolina.

Chapter 3:

Chapter 3 would not have been possible had it not been for the Spring 2010 undergraduate and graduate students in Human Dimensions of Fisheries and Wildlife Management class at North Carolina State University. Also, thank you to the urban residents in Raleigh, NC who participated in this study, and Kevin Bigsby who provided the tree cover data for PRIZM 12 and 62.

LIST OF TABLES

Table 1.1 Average scores, with standard errors, for the extent to which respondents disagree or agree that 2 state, 2 federal, and 2 nonprofit organizations would be best to oversee conservation contracts using a 7-point Likert scale where 1 = strongly disagree and 7 = strongly agree, from a survey of North Carolina Farm Bureau county advisory board members in 93 North Carolina counties, USA (Mar–Oct 2009)	30
Table 1.2. Estimated coefficients, odds ratios, and standard errors of a model predicting respondent interest in endangered species habitat conservation contracts ($n = 372$) from a survey of North Carolina Farm Bureau county advisory board members from 93 North Carolina counties, USA (Mar–Oct 2009)	31
Table 2.1 Summary of independent variables used in logistic regression to predict stewardship motivations and activities from a survey of North Carolina Farm Bureau county advisory board members in 93 North Carolina counties, USA (Mar–Oct 2009).	53
Table 2.2 Estimated coefficients, odds ratios and standardized odds ratios of logistic regression models predicting who or what respondents believe they owe their stewardship to (motivations; sample size for each model = 346) from a survey of North Carolina Farm Bureau county advisory board members from 93 North Carolina counties (Mar-Oct, 2009).	54
Table 2.3 Estimated coefficients, odds ratios and standardized odds ratios of logistic regression models predicting what activities respondents associate with stewardship (sample size for each model = 350) from a survey of North Carolina Farm Bureau county advisory board members from 93 North Carolina counties (Mar-Oct, 2009)	55
Table 3.1 Comparison of baseline and post-treatment mean resident preference scores for four native plant landscaping coverages from a survey of urban residents in Raleigh, NC, USA. Group comparisons were made using Wilcoxon Signed Rank Test where all group differences were highly significant ($p < 0.001$). Bolded text indicates significant differences between individual preferences for a given landscaping coverage in the baseline and post-treatment measurements where all group differences were significant at a $\alpha \leq 0.001$	77
Table 3.2 Percent of respondents ranking each native plant landscaping coverage type in each rank position from a survey of urban residents in Raleigh, NC, USA	78
Table 3.3. Estimated coefficients and standardized coefficients of a linear regression models predicting respondent preferences for native plant landscaping in the baseline measurement and after being informed of its benefits to birds, and in overall chance of preferences from a survey of urban residents in Raleigh, NC, USA	79

LIST OF FIGURES

Figure 1.1 Percent (%) interest in conservation easements, conservation contracts to restrict real estate development, and conservation contracts to restore and maintain endangered species habitat among North Carolina Farm Bureau county advisory board members in 93 North Carolina counties, USA (Mar–Oct 2009)	28
Figure 1.2 Importance of conservation objectives among North Carolina Farm Bureau county advisory board members in 93 North Carolina counties, USA (mean response, with standard errors, on a 7-point Likert scale where 1 = not important at all, 4 = neutral, and 7 = extremely important; Mar–Oct 2009).....	29
Figure 3.1 Sampling flow chart for study of urban residents’ preferences for native landscaping in Raleigh, NC.....	75
Figure 3.2 Four native plant landscaping designs ranging from 0% native plant coverage to 100% native plant coverage	76

INTRODUCTION

In the US, most wildlife species rely on private lands for habitat (Lockwood 1998, Turner and Rylander 1998), which makes private lands critical for wildlife conservation. Despite this, efforts to conserve wildlife habitat in have historically focused on public lands (Knight 1999, Male 2005). My dissertation explores three methods used to promote private landowners to conserve habitat for wildlife on their land: financial incentives (Chapter 1), stewardship (Chapter 2) and public information (Chapter 3).

Chapter 1: Conservation incentive programs promote private lands conservation with financial assistance to landowners in exchange for specific land management activities. Such programs include the Conservation Reserve Program which provides cost share and rental payments to agricultural landowners in exchange for conservation management practices. While many incentive programs like Conservation Reserve Program exist, few focus on endangered species. The FWS' Landowner Incentive Program is one of the few economic incentive programs for that exists for endangered species conservation on private lands (U.S. Fish and Wildlife Service 2011). Consequently, little information exists regarding landowner interest in programs focused on endangered species. One of the few studies that focuses on incentive programs for endangered species in North Carolina found that 46% of farmers in a control county were interested in payments for ecosystem services programs that emphasize wildlife conservation, but only 13% of landowners in a 5-county area where an endangered species recovery program was being conducted indicated an interest (Kramer and Jenkins 2009). My first chapter examines private landowner interest in incentive programs

for endangered species using a case study of North Carolina Farm Bureau county advisory board members statewide.

Chapter 2: Although payments are often used to promote conservation, there simply is not enough funding available to pay all private landowners to conserve wildlife habitat. Thus, it is critical to find alternatives to financial incentive programs for promoting wildlife habitat conservation on private land. Private land stewardship is thought to influence landowner willingness to adopt environmentally sustainable land management practices without financial incentives, and therefore may represent a viable alternative to payments (Kreuter, Nair, Jackson-Smith, Conner, and Johnston, 2006) (Kreuter, Nair, Jackson-Smith, Conner, and Johnston, 2006). To be effective at persuading private landowners to conserve without payments, conservationists must first understand landowner views of stewardship. As such, my second chapter examines what activities private landowners associate with stewardship and who or what motivates them to be stewards of the land.

Chapter 3: Residential landscaping in the United States (U.S.) typically consist of turf grass lawns with some specimen plantings of trees and shrubs (Helfand, Park, Nassauer, and Kosek 2006; Tallamy 2009). Turf grass dominated landscaping contributes to environmental degradation, and provide poor wildlife habitat. Native plant landscaping provides a more sustainable and wildlife-friendly alternative to turf grass landscaping because native plants require external inputs, may help reduce air and water pollution, and moderate urban microclimates (Bijoor, Czimczik, Pataki and Billings 2008; Morris and Bagby 2008). Since urban residents make management decisions for large portions of urban landscapes, their

decisions dictate whether wildlife-friendly native plant landscaping is used (Breuste, 2004; Grimm, Faeth and Golubiewski 2009). My third chapter examines urban residents' landscaping preferences and how much residents will change their landscaping preferences to improve habitat for urban wildlife.

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CHAPTER 1 - Private Landowner Interest in Market-based Incentive Programs for Endangered Species Habitat Conservation

ABSTRACT

More than 75% of endangered species in the United States rely on private lands for habitat. Although this habitat has long been regulated under the Endangered Species Act, there is now broad agreement that economic incentives are also needed for effective protection on private land. Many different mechanisms for incentive programs have been proposed and tested. For example, recovery credit systems use term-duration market-based contracts to engage landowners in endangered species conservation. We examined how market-mechanism design influences interest in endangered species habitat conservation using a survey of North Carolina Farm Bureau county advisory board members in 93 of the 100 North Carolina counties ($n = 735$) in 2009. Respondents preferred contracts (57% were interested) over easements (39% were interested). Endangered species conservation ranked low in importance relative to other conservation issues, but 45% of respondents were interested in contracts to conserve endangered species habitat on their property. The preferred contract duration was 10 years, and respondents preferred state- and agricultural-related organizations over federal and wildlife conservation-related organizations for managing contracts. Younger respondents, respondents who had previously participated in conservation programs, respondents who perceived endangered species conservation as important, and respondents who had lower property-rights orientation scores, were most likely to be interested in contracts to restore and maintain endangered species habitat on their

lands. Our results suggest that market mechanisms could drive down costs and drive up durations for endangered species habitat conservation contracts. Further, term contracts may prove critical for endangered species conservation efforts that require high levels of landowner support and spatial flexibility within relatively short time frames.

KEY WORDS contracts, easements, endangered species, market-based incentives, North Carolina, participation, private land, recovery credit system.

INTRODUCTION

In the United States [U.S.], more than 60% of the land is privately owned. Although efforts to conserve endangered species in the U.S. have historically focused on public lands (Knight 1999, Male 2005), >75% of endangered species rely on private lands for habitat (Lockwood 1998, Turner and Rylander 1998). Wilcove et al. (1998) noted that conversion of land to development was responsible for harming hundreds of threatened and endangered species. Similarly, human population growth and suburban sprawl have led to a loss of wildlife habitat and an increase in number of species considered to be rare, threatened, and endangered (Peterson et al. 2007).

Conservation challenges posed by population growth and development are compounded by disincentives associated with the Endangered Species Act [ESA] of 1973 (Brook et al. 2003). Despite its achievements, many have criticized ESA restrictions on private lands (Sax 1997), especially when the endangered species in question is not in residence (Raymond and Olive 2008). Critics suggest the ESA generates an anti-

conservation attitude among private landowners and leads some landowners to take preemptive actions against endangered species to avoid potential regulation (Wilcove et al. 1996, Innes et al. 1998, Bonnie 1999, Main et al. 1999, Bean 2002). For instance, Lueck and Michael (2003) found North Carolina [NC] landowners whose lands were closer to red-cockaded woodpecker (*Picoides borealis*) populations used shorter growth rotations and prematurely harvested trees more often than other landowners, thus preventing red-cockaded woodpeckers from occupying their lands.

Efforts to reduce the ESA's disincentives include: 1) increasing land-use flexibility, 2) providing economic incentives (paying landowners to manage land in ways that benefit wildlife), and 3) providing conservation markets (mechanisms that facilitate commerce in endangered species habitat). The U.S. Congress attempted to increase land-use flexibility by amending the ESA in 1982 to authorize the U.S. Fish and Wildlife Service [FWS] to grant incidental take permits. An incidental take permit allows private, nonfederal entities to conduct otherwise prohibited activities on private land that might result in the taking of a protected species if take is minimized and mitigated. Efforts to remove disincentives were extended in 1999 with the adoption of Safe Harbor Agreements in which landowners agree to manage their land for the benefit of endangered species in exchange for assurance that their voluntary management actions will not result in additional regulatory restrictions.

The FWS' Landowner Incentive Program typifies an economic incentive program for endangered species conservation on private lands (U.S. Fish and Wildlife Service 2011). In this program the FWS provides funding to state wildlife agencies that, in turn, pay private landowners to create and improve habitat for at-risk species. This type of program typically

uses short-term contracts that include annual incentive payments and technical assistance. Such programs can be improved by including collaborative processes rooted in local social norms (Sorice et al. 2011).

Habitat Conservation Banking represents a market-based incentive approach to endangered species conservation on private lands with permanent habitat protection. In its current format, Habitat Conservation Banking allows landowners, who would like to conduct activities harmful to a given species habitat, to purchase credits from other landowners (i.e., bankers) who have either conserved or restored habitat for that species elsewhere using a permanent easement (Bonnie 1999). Conservation banking, however, has been shown to reduce the pressure on landowners and developers to avoid harm to existing habitat (Roberts 1993). It has also been suggested that banks offer little to recovery efforts because they fail to fulfill the same ecological functions of the impact areas they are replacing (Roberts 1993, Bonnie 1999), and that the high cost of restoring some habitats can result in the bank itself being cost-prohibitive.

The Recovery Credit System [RCS] represents another market-based incentive approach for promoting endangered species habitat conservation on private lands, which can be distinguished from conservation banking by using landowner contracts in lieu of permanent easements. The RCS allows contract funders to exchange credits, purchased from private landowners, to offset temporary habitat damage. Because RCS utilizes contract law, implementation is faster and less difficult than for programs involving liens on property deeds, making rapid response to landscape change associated with climate change or urban sprawl more feasible. Programs rooted in the RCS concept have been developed for golden-

cheeked warbler (*Dendroica chrysoparia*; Wilkins et al. 2008), prairie dog (*Cynomys parvidens*), gopher tortoise (*Gopherus polyphemus*), and sage grouse (*Centrocercus urophasianus*).

The emergence of market-based conservation programs for rare, threatened, or endangered species, particularly those based on contracts, makes questions about landowner preferences for contracts over easements more important. Kramer and Jenkins' (2009) study of Eastern NC farmers found that 46% of farmers in Bertie County, a control county, were interested in payments for ecosystem services programs that emphasize wildlife conservation, while only 13% of landowners in a 5-county Red Wolf Recovery Program area indicated an interest. They also found that contract length and program administration by a conservation organization were negatively correlated to willingness to participate in a proposed payment for ecosystem services program.

We contribute to this literature with a case study of North Carolina Farm Bureau [NCFB] county advisory board members. Our study objectives were to 1) determine respondent views on the relative importance of endangered species conservation; 2) compare respondent interest in conservation easements versus contracts; 3) gauge respondent interest in a contract to restore and maintain endangered species habitat on their land; 4) assess respondent preferences for contract and easement durations, enrollment acreage, and managing organizations; and 5) determine what variables (socio-demographic, land characteristics, perceptions, and experiences) predict interest in endangered species habitat conservation contracts. NC provides a good case study because 80% of NC is privately owned (NC Wildlife Resources Commission 2005), and rapid population growth and

suburban sprawl threatens wildlife habitat, environmental health, farm lands, and rural economies. Private landowners, therefore, play a critical role in determining the fate of NC's rare, threatened, and endangered species.

METHODS

To better understand interest in incentive programs and preferences across program attributes, we conducted a survey of NCFB county advisory board members in all 100 counties in NC. County advisory board members represent farming landowners in the state, and are elected by NCFB members, who accounted for 86% of all owners of farm land in NC at the time of this study (C. Lowder, NCFB, personal communication). Accordingly, this purposive sample targeted elected representatives of owners of farm lands in NC who were actively engaged in both state-level policy-making related to farm lands and responses to federal policies addressing the same suite of issues. Thus, the sample literally represented farm landowners, rather than representing them demographically. This approach provided the valuable ability to evaluate views among specific landowners who determine the direction of farm land policy in NC. However, this approach is limited in that we cannot draw inference about the opinions of average owners of farm lands. A questionnaire was administered in person to NCFB county advisory board members by NCFB staff or the principal investigator between March and October, 2009. We promoted design validity with reviews by experts from NC State University and the NC Cooperative Extension, and by using a pretest involving interviews with landowners in 7 counties in NC ($n = 61$).

We asked several questions about the respondent's land characteristics: total number of acres owned in NC, acreage of their largest tract of NC property, how long this largest tract of property had been in their extended family, percent of income generated from their land, and whether they had participated in programs that paid them for land conservation in the past 5 years and, if so, which program(s) they participated in. We also collected socio-demographic data for: gender, race, marital status, primary occupation, highest level of education completed, year of birth, and 2008 gross total household income level. We also asked respondents: "What plans do you have for your property upon your death?" Answer options included the following: 1) transfer it to relatives, 2) sell it, 3) donate it to a land trust, and 4) unsure. For the purposes of analysis, we created a binary variable to indicate whether respondents planned to transfer their land to relatives. We addressed objective 1 by asking respondents to estimate the importance of conservation of endangered species, game species, open space, soil, and wetlands using a 7-point Likert scale, where 1 = not important at all, 4 = neutral, and 7 = extremely important.

We compared landowner interest in conservation easements and contracts (objective 2) by asking respondents whether they would apply for them. We gave respondents a brief definition of a conservation easement ("In a conservation easement, a landowner sells development rights for their property. This creates a legally enforceable agreement between the landowner and the easement holder that restricts real-estate development for the length of the easement. Landowners cannot remove the development restrictions from their property deed."), and then asked: "Would you place your property in a conservation easement?" Subsequently, we asked respondents to indicate what easement lengths they would consider

(1, 5, 10, 15, 20, 25, 30, and 50 years, and permanent), and how many acres they would consider placing in the easement. Next, we gave respondents a brief definition of a conservation contract ("In a conservation contract, a landowner agrees to implement specific conservation actions on their property in return for payment. Landowners can choose to terminate the contract at any time by returning all payment"), which differed from a conservation easement in 2 key ways: 1) legal basis of the agreement (contract law instead of property law); and 2) agreement termination process (the return of all payments to terminate a contract versus not allowing termination of an easement). To assess interest in conservation contracts, we asked respondents: "Would you apply for a conservation contract to restrict real estate development on your property?" As with the easement, we asked respondents to indicate their preference for contract lengths and how many acres they would consider placing in the contract. Additionally, we asked respondents to indicate the extent to which they agreed or disagreed that several organizations would be best to oversee the contract (7-point Likert scale where 1 = strongly disagree, 4 = neutral, and 7 = strongly agree; objective 4). We chose organizations to include one agriculture-related and one wildlife-related agency from state and federal governments and nonprofit organizations in NC: NC Cooperative Extension, U.S. Department of Agriculture [USDA], NC Wildlife Resources Commission, FWS, NCFB, and The Nature Conservancy, respectively.

We used the same approach to gauge respondent interest in a conservation contract to restore and maintain endangered species habitat (objective 3), but we changed the conservation action from restricting real estate development to restoring and maintaining endangered species habitat. We asked: "Would you apply for a conservation contract that

paid you to restore and maintain habitat for endangered species on your property?", and asked respondents to indicate their preferences for contract duration, acreage enrollment, and managing organizations (objective 4). The question of whether respondents would apply for an endangered species habitat conservation contract served as our dependent variable in the model identifying predictors of interest in this type of contract (objective 5). We examined factors influencing interest by using multiple logistic regression. We attempted to predict landowner interest in an endangered species habitat conservation contract by using 6 independent variables: total ACRES OWNED in NC; total household INCOME; AGE; PAST PARTICIPATION in conservation programs; property-rights orientation [PRO] (Jackson-Smith et al. 2005); and IMPORTANCE of endangered species conservation.

We hypothesized a positive relationship between ACRES OWNED and interest in an endangered species habitat conservation contract. Due to economies of scale, large properties may be more likely to qualify for programs and landowners with larger land holdings may make a greater effort to participate in incentive programs when more acreage is at stake. These landowners may also be in a better position to invest in their property, and more able to afford program-related cost-share requirements (Gan et al. 2005). We hypothesized that INCOME would be positively correlated with interest in endangered species habitat conservation contracts because wealthier landowners are more likely to be able to afford costs associated with incentive programs (Arano et al. 2004) and better able to access program information sources (Nagubadi et al. 1996). AGE was hypothesized to be negatively related to interest in an endangered species habitat conservation contact because older landowners may be less inclined to place their property in conservation programs

(Langpap 2004). Further, older landowners might believe it would be more difficult to sell enrolled land or transfer it to the next generation (Esseks and Kraft 1986). PAST PARTICIPATION was hypothesized to be positively correlated with interest in endangered species habitat conservation contracts because landowners who have previously participated in other programs were already familiar with the general format of conservation programs. Also, positive experiences with participation in one incentive program may encourage participation in other programs (Gan et al. 2005), and landowners are more likely to receive information about new programs in their dealings with program managers (Kauneckis and York 2009).

We measured property rights orientation using a scale from Jackson-Smith et al. (2005). The scale was designed to measure individual rights and social responsibility value orientations. Conserving habitat for endangered species provides a social benefit; therefore, we hypothesized that landowners whose property rights orientation scores leaned toward social responsibility would be more likely to be interested in this type of contract than those with individual rights value orientations who might fear the loss of their property rights associated with a contract (Jackson-Smith et al. 2005). We hypothesized that those who ranked the IMPORTANCE of endangered species conservation high would be more interested in a contract to conserve habitat for endangered species than those who rank IMPORTANCE low. We used the Statistical Package for Social Sciences 17.0.0 (SPSS 2008) to calculate all means, measures of variance, and regression statistics (Vaske 2008).

RESULTS

In total, 735 county advisory board members participated in the study, resulting in a 78.3% compliance rate. Seven county boards (Camden, Cherokee, Chowan, Durham, Graham, Lee, Madison) refused to participate in the study at the board level, and were not included in the overall compliance rate. Mean respondent age was 59 (SD = 12.88), and most respondents were male (93.2%), white (96.4%), and married (88.3%). Over half of respondents had some college-level education (58.2%) and worked primarily in a farming–agricultural-related industry (77.3%). Median household income was US\$87,500 (SD = \$53,467). The median total acreage owned in NC was 150 (SD = 359.97). The median acreage of the largest tract of land owned in NC was 97 acres (SD = 272.24), and this largest property had been in the respondents' extended family for an average of 64 years (SD = 55.21). Respondents earned an average of 56.9% of their total household income from activities on their land. Most respondents (76.2%) indicated that they planned to own their property for ≥ 25 years, or would maintain it "forever," "until death," or "as long as possible." Ninety percent of respondents indicated that they would transfer their land to relatives upon their death, and 70.5% indicated that they had a will or living trust in place that described plans for their property.

Interest in conservation contracts to restrict real estate development (56.6%) was higher than interest in conservation easements (38.6%). On average, respondents indicated they would place more of their land (144.6 acres; SD = 168.29; median = 93) in a conservation contract versus a conservation easement (133.8 acres; SD = 157.01; median = 80). A comparison of easement and contract duration preferences revealed a preference for

shorter term conservation contracts and permanent easements (Fig. 1.1). The NCFB received the highest rating as an organization to oversee contracts to restrict real estate development (Table 1).

Respondents rated endangered species conservation lowest in conservation importance ($\bar{x} = 4.0$; $SD = 1.71$) relative to game species, open space, soil, and wetlands conservation (Fig. 1.2). Less than half of respondents (45.1%) indicated that they would place their land in a contract to restore and maintain endangered species habitat. The average number of acres respondents indicated that they would place into such a contract was 91.2 acres ($SD = 137.37$; median = 50). The preferred duration for an endangered species habitat conservation contract was 10 years (Fig. 1.1). The NCFB and NC Wildlife Resource Commission received the highest ratings as organizations to oversee this type of contract, whereas The Nature Conservancy received the lowest ratings (Table 1.1).

PRO, PAST PARTICIPATION, IMPORTANCE, INCOME and AGE predicted interest in a conservation contract to restore and maintain endangered species habitat (Table 1.2). PRO was negatively related to interest in the contract. The mean PRO score was 7.8 ($SD = 6.89$; min. = -21 [social responsibilities], max. = 21 [individual rights]). PAST PARTICIPATION in conservation programs and IMPORTANCE of endangered species conservation had positive relationships with interest in a contract. Over one-third of respondents (40.9%) indicated that they had participated in a land conservation program in the past 5 years, with the highest participation rates being in the Environmental Quality Incentive Program (36.0%), Conservation Reserve Program (CRP; 36.4%), and state agricultural cost-share programs for soil and water conservation (57.2%). Past participation

in land conservation programs increased the odds of a landowner being interested in an endangered species habitat contract by 2.1. Similarly, the odds of respondents who ranked endangered species conservation high in importance being interested in endangered species habitat conservation contracts were 1.5 times higher than other respondents. Last, AGE was negatively related to interest in a contract for conserving endangered species habitat, whereas INCOME was positively related.

DISCUSSION

Although previous research suggests landowners may take preemptive action against endangered species to avoid ESA-related land-use restrictions (Bonnie 1999, Main et al. 1999, Bean 2002, Brook et al. 2003, Lueck and Michael 2003), we found that nearly half of our respondents would promote endangered species habitat by applying for a contract to conserve endangered species habitat, when they were given the opportunity to do so without facing economic disincentives. Our results suggest landowner interest in contracts for conserving endangered species habitat in NC is high enough that competition between landowners could drive down contract costs. Enrolling 45% of the 52,400 NC farm land operations (USDA National Agriculture Statistics Service 2010) in an endangered species habitat conservation contract at rates similar to those associated with the Wildlife Habitat Incentive Program (WHIP; US\$37.17/acre), would cost approximately 224 times what is currently allocated for WHIP in NC (US\$588,000; D. Riley, USDA - Natural Resources Conservation Service, personal communication). The use of a reverse auction format could allow program administrators to further capitalize on demands that exceed supply. When this

approach was used in the Fort Hood RCS, contract prices decreased and contract durations increased from 10 years for most contracts (the same duration preferred in this study) to 25 years once landowners realized longer durations increased chances of receiving a contract (B. Hayes, Texas A&M Institute of Renewable Natural Resources, personal communication).

The low importance attributed to endangered species conservation combined with landowners being more interested in real estate restriction contracts than endangered species habitat contracts, suggests future conservation contracts aimed at wildlife conservation may be more effective if the contracts focus on protecting endangered ecosystems rather than endangered species. Our finding is supported by research from Kramer and Jenkins (2009), who found that farm operators in a Red Wolf Recovery Program area in Eastern NC showed significantly lower levels of interest in future payments for ecosystem services programs related to endangered species conservation than did operators in a non-Red Wolf Recovery Program county. The inclusion of Safe Harbor Agreements within an endangered species habitat conservation program might help to lessen landowner fears of ESA regulation by providing private landowners with the option of returning habitat to baseline conditions (Bonnie 1999).

Preference for contracts over easements may relate to respondent familiarity with contracts, and the average age of landowners in NC. Agricultural and forest landowners commonly participate in contracts for commodity production and land management programs. This familiarity may explain why respondents were more interested in contracts than easements. Most respondents intended to transfer their property to the next generation to use or sell as needed. Given that nearly half of our respondents were nearing or had

passed retirement age (65 years old in the U.S.), landowners may not view easements as a practical option for their land. Although easements do not prevent a landowner from transferring landownership, easements usually include a permanent deed restriction associated with sale of the property's development rights to another party (Lassner 1998); thus, easements can negatively affect economic returns (Main et al. 1999), property values, and the ability of the current or future landowner to sell the land (Stockford 1990). Short-term conservation contracts, therefore, may be a more favorable option for today's landowners needs because they do not involve deed restrictions and may have less of an impact on intergenerational land transfers.

Demographic changes in landownership associated with intergenerational land transfers (Best 2002) may suggest increased interest in conservation contracts for endangered species in the future. Interest in contracts for conserving endangered species habitat may increase as land transfers create a new generation of landowners in NC, because landowner age is negatively related to interest in conservation incentive programs to protect endangered species (Langpap 2004, this study). Furthermore, contracts for conserving endangered species habitat may provide enough incentive to encourage the next generation, who might prefer to sell inherited land, to maintain ownership while earning income from it, particularly when real estate markets are depressed.

Our results suggest respondents trust state agencies and agricultural-related organizations over federal agencies and wildlife conservation-related organizations for managing conservation contracts. The nature of these relationships was clearly demonstrated by preferences for real estate restriction contracts, where state agencies were preferred over

federal agencies, and where agriculture groups were preferred over wildlife conservation groups. Relationships, however, were more complex for endangered species habitat conservation contracts, where only the preferences for state agencies over federal agencies persisted. Respondent recognition of wildlife-related subject expertise may explain why preferences for the NC Wildlife Resource Commission and FWS were higher for managing endangered species habitat contracts than for managing contracts protecting open space. Opposition to management by The Nature Conservancy in our findings supports previous research suggesting landowner opposition to "conservation organization" management, which could reflect their preferences for working with organizations they are more familiar or have previously worked with (Kramer and Jenkins 2009). Strong support for NCFB as a management organization suggests opposition to conservation organizations does not extend to agricultural organizations. Notably, NCFB is known to represent the interests of agricultural landowners and operators and therefore may be trusted by them.

Our findings provide the first empirical evidence (that we are aware of) to show a positive relationship between PRO and interest in an incentive program promoting endangered species conservation. Our findings build upon previous research that suggests property-rights orientations are a significant predictor of interest in conservation initiatives (Kreuter et al. 2006). The weak relationship between PRO and interest in endangered species habitat conservation contracts suggests that future studies using different psychological models are needed to contextualize the relationship between property-rights orientations and interest in conservation incentives for endangered species habitat. Future efforts to link

landowner interest with property-rights orientations should consider mediating relationships associated with attitudes, norms, and values (Peterson and Rodriguez 2012).

Positive relationships between PAST PARTICIPATION in conservation programs and IMPORTANCE of endangered species conservation, and interest in endangered species habitat conservation contracts provide face validity for this study. Previous research suggests current or past experience with conservation programs were important determinants of interest. Arano et al. (2004) found that nonindustrial private forest landowners who had participated in landowner assistance programs were more interested in participating in a proposed reforestation program for encouraging reforestation after harvest than were other landowners. Kramer and Jenkins (2009) found that farmers who were currently enrolled in a payment for ecosystem services program were more likely to be interested in future-payment-for-ecosystem-services programs. Gyawali et al. (2003), however, found that limited-resource farmers were less likely to be interested in CRP if they had previously participated in other government programs. Although we are aware of no previous research on program participation behavior that included variables related to the importance of a conservation objectives, it is logical to expect those who rank an objective higher, compared to others, would be more likely to support a conservation initiative that addresses the objective.

Our research has helped to extend the knowledge of probable responses to conservation programs in NC. Our results suggest contracts may provide a viable alternative to easements for endangered species habitat conservation on private lands, especially in contexts where large areas must be protected quickly and where land management flexibility

is needed. Findings from our study also extend the knowledge about preferences for types of conservation incentives and legal instruments employed, as well as about beliefs concerning property rights and commitment to endangered species.

MANAGEMENT IMPLICATIONS

Our results suggest market-based incentive program managers may be able to drive down costs and drive up durations for endangered species habitat conservation contracts with the use of market mechanisms (e.g., reverse auctions). Findings from our study and the proof of concept for the Fort Hood RCS (TX; Wilkins et al. 2008) suggest that program managers should expect preferences for endangered species habitat conservation contract duration to be near 10 years unless competition is used to drive the duration higher. Further, using contracts longer than 10 years will help avoid prohibitively high transaction costs. Program managers seeking higher participation rates and more competition for contracts should target state-level organizations with agricultural and forestry interests to manage conservation contracts. Framing contracts as protecting ecosystem services or threatened habitat (without the association with the endangered species label or a specific species) may increase landowner interest. Short-term contracts may be particularly valuable for efforts requiring engagement from older landowners who are concerned about intergenerational land transfers. Although term contracts may be frowned upon by some interest groups precisely because they have a fixed duration, they may prove critical for wildlife conservation efforts requiring high levels of landowner support within relatively short time scales.

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Note: This paper has been published in the Wildlife Society Bulletin (Rodriguez, S. L., M. N. Peterson, F. W. Cabbage, H. D. Bondell, E. O. Sills. 2012. Private landowner interest in market-based incentive programs for endangered species habitat conservation. *Wildlife Society Bulletin*, 36(3):469-476), and is part of a larger study that was conducted for the US Department of Defense. The full report for the larger study can be found in Appendix B.

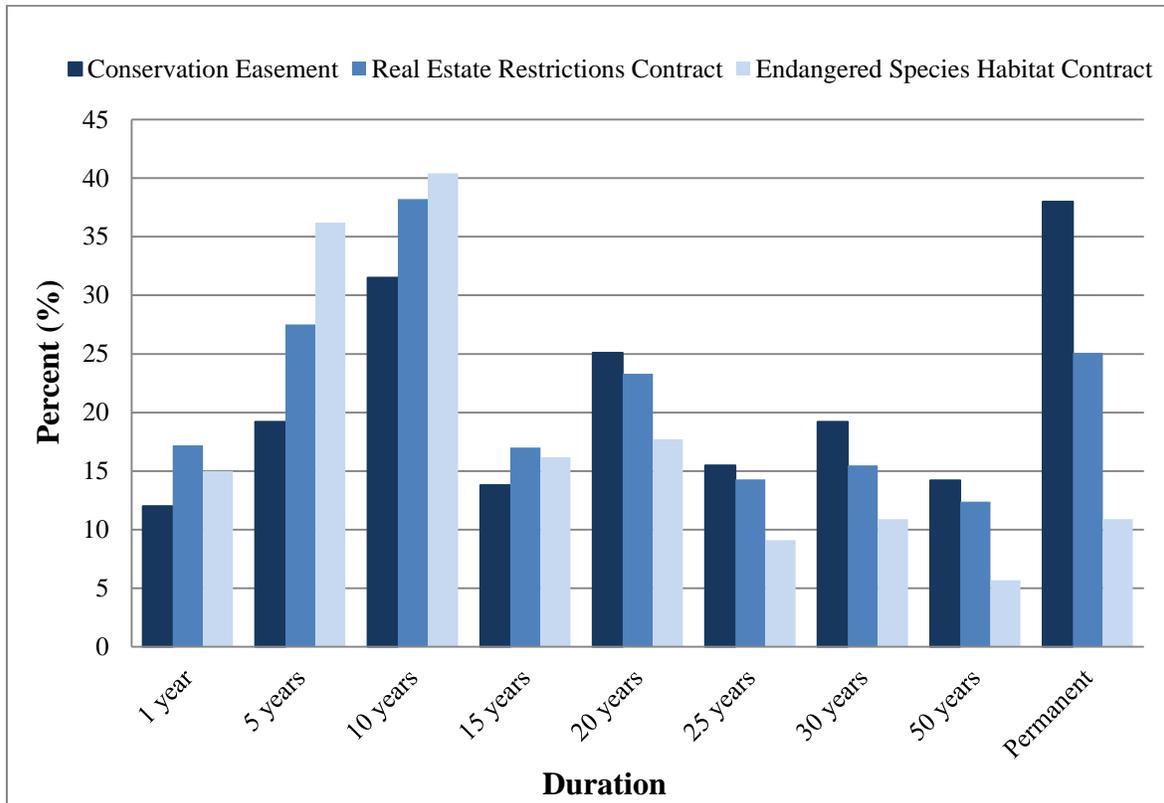


Figure 1.1 Percent (%) interest in conservation easements, conservation contracts to restrict real estate development, and conservation contracts to restore and maintain endangered species habitat among North Carolina Farm Bureau county advisory board members in 93 North Carolina counties, USA (Mar–Oct 2009).

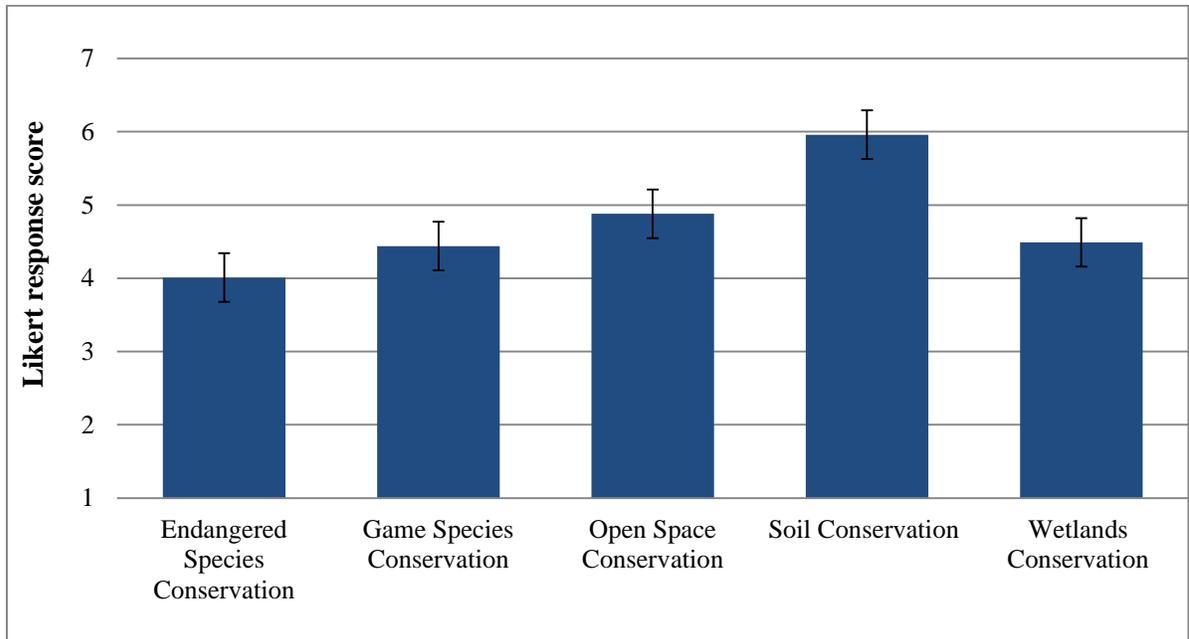


Figure 1.2 Importance of conservation objectives among North Carolina Farm Bureau county advisory board members in 93 North Carolina counties, USA (mean response, with standard errors, on a 7-point Likert scale where 1 = not important at all, 4 = neutral, and 7 = extremely important; Mar–Oct 2009).

Table 1.1 Average scores, with standard errors, for the extent to which respondents disagree or agree that 2 state, 2 federal, and 2 nonprofit organizations would be best to oversee conservation contracts using a 7-point Likert scale where 1 = strongly disagree and 7 = strongly agree, from a survey of North Carolina Farm Bureau county advisory board members in 93 North Carolina counties, USA (Mar–Oct 2009).

Organization	Endangered species habitat conservation contracts		Real-estate restrictions contract	
	\bar{x} score	SE	\bar{x} score	SE
	North Carolina Cooperative Extension	4.41	0.105	4.73
U.S. Department of Agriculture	4.03	0.111	4.22	0.098
North Carolina Wildlife Resources Commission	4.53	0.109	3.47	0.090
U.S. Fish and Wildlife Service	3.78	0.117	2.97	0.091
North Carolina Farm Bureau	4.55	0.105	4.80	0.094
The Nature Conservancy	3.10	0.016	3.06	0.095

Table 1.2. Estimated coefficients, odds ratios, and standard errors of a model predicting respondent interest in endangered species habitat conservation contracts ($n = 372$) from a survey of North Carolina Farm Bureau county advisory board members from 93 North Carolina counties, USA (Mar–Oct 2009).

Variable	Coeff.	Odds	
		ratio	SE
ACRES OWNED ^a	−0.012	0.988	0.041
PRO ^b	−0.044**	0.957	0.017
PAST PARTICIPATION ^c	0.762***	2.142	0.238
IMPORTANCE ^d	0.426***	1.531	0.074
INCOME ^e	0.004*	1.004	0.002
AGE	−0.209**	0.812	0.097
Constant		−2.238	
Nagelkerke <i>R</i> -squared ^f		0.215	

^aTotal no. of acres owned in North Carolina / 100.

^bProperty-Rights Orientation—scores ranged from −21 to 21, where −21 = social responsibility orientation and 21 = individual rights orientation.

^cParticipation in land conservation programs in the previous 5 yr; Yes = 1 and No = 0.

^dImportance of endangered species—7-point Likert-scale format where 1 = extremely unimportant and 7 = extremely important.

^e2008 gross total household income level in thousands of dollars (US\$).

^fCameron and Windmeijer (1997).

* $P < 0.10$; ** $P < 0.05$; *** $P < 0.01$.

CHAPTER 2 - Perceptions of Private Land Stewardship among Agricultural Opinion Leaders in North Carolina

ABSTRACT: In the United States, development of private lands is a significant conservation concern, because over 60% of the land is privately owned. In order to conserve the environmental services, amenities, and values associated with private lands, conservation professionals must understand landowner conceptions of stewardship and the role it plays in decisions about land and natural resource management. We begin addressing this need with a survey of North Carolina Farm Bureau county advisory board members in 100 North Carolina counties ($n = 735$). Nearly all of our respondents self-identified as stewards of the land (97%). More respondents indicated that their responsibility to act as stewards was owed to *future generations* (87%) and *family* (77%), than *community* (41%) and *society* (26%). Similarly, more respondents associated stewardship most with *using natural resources wisely* (conservation; 78%) than *leaving natural resources untouched* (preservation; 31%). Plans to transfer land to relatives, perceived importance of soil conservation, and past participation in conservation programs were the most consistent predictors of stewardship motivations and activities. Our results suggest that the stewardship construct will be more effective when framed as a benefit to family and future generations rather than when framed as a benefit to society and community. Similarly, stewardship will be more effective for achieving conservation of natural resources rather than preservation of natural resources.

INTRODUCTION

In the United States (U.S.), privately owned lands provide 99% of the nation's croplands, 61% of grasslands and pasture, and 56% of forests (U.S. Department of Agriculture [USDA], 2002) and provide habitat for more than 75% of endangered species (Lockwood, 1998; Turner and Rylander, 1998). Historically, conservation efforts have focused on public lands, leaving the private lands that dominate the landscape at risk to commercial and residential development. Prior to the economic downturn of 2008, development of private lands was taking place at rates rarely seen in history (Knight, 1999; Male, 2005). Between 1982 and 2007, 41 million acres of U.S. rural land was converted to development, 23 million of which were agricultural lands (USDA Natural Resource Conservation Service 2007). As the economy improves, it is expected that rates of development will pick up where they left off.

Most efforts to conserve private lands and their associated natural resources and ecosystem services have been in the form of government conservation incentive programs, such as the Conservation Reserve Program (CRP), whereby private landowners are paid to implement the specific conservation requirements of the program. CRP has a continuing established presence as a land stewardship program (Karlen, Gardner and Rosek, 1998) in most states in the U.S. In total, CRP has enrolled over 24 million acres of land in the U.S. between 1986 and 2012 (USDA Farm Service Agency, 2012). While such programs have provided incentives for private landowners to implement conservation practices such as forest and wetlands restoration, and installation of conservation buffers and enhanced wildlife habitat (USDA Farm Service Agency, 2012), a major limitation is that there simply

is not enough money to pay all landowners to conserve their land. As such, it is critical to find ways other than direct payments to persuade private landowners to conserve. One way may be to appeal to landowners' sense of stewardship.

Private Land Stewardship (PLS) plays a vital role in natural resource management, including through its effects on the future of our nation's food supplies, the health of our agricultural workers (Carson, 1962) and access to and quality of drinking water (Wagner, Kaiser, Kreuter, and Wilkins, 2007). Research by Jackson-Smith, Kreuter, and Krannich (2005) suggests PLS constitutes a critical element of property rights value orientations and can influence landowner willingness to adopt socially desirable land management practices without financial incentives (Kreuter, Nair, Jackson-Smith, Conner, and Johnston, 2006).

Despite the essential role it plays in conservation, PLS is not often defined in literature, and when it is, is still used loosely as a term (Worrell and Appleby, 2000). Definitions of PLS vary widely but most include conservation of natural resources with consideration of both the future and society at large. Some definitions of stewardship include: "managing private property to protect long-term environmental sustainability" (Jackson-Smith et al., 2005, p. 591); appreciation of and respect for the land as a basis for prosperity and quality of life (Roberts, 1992); knowing, restoring, protecting and connecting to the land (Davis, 2005, p. 72); promoting and maintaining sustainable fisheries (Milich, 1999); and conserving wildlife populations (Mburu and Birner, 2007). Worrell and Appleby (2000, p. 263) describe stewardship as "the responsible use (including conservation) of natural resources in a way that takes full and balanced account of the interests of society, future generations, and other species, as well as of private needs, and accepts significant

answerability to society.” One of few governmental descriptions of stewardship states that it is a “concept that helps define appropriate human interactions with the natural world” (President's Council on Sustainable Development, 1999, pp. 1, Chapter 5).

Given the loose use of the term, little information exists regarding how private landowners view the concept of PLS. Peterson and Horton's (1995) study of landowner perspectives identified PLS as a central theme in their informant-directed research of Texas ranchers and their continued disputes with the U.S. Fish and Wildlife Service over golden-cheeked warbler habitat. Peterson, Peterson, Lopez and Liu (2009) found Latinos in the Lower Rio Grande Valley of Texas self-identified as stewards of the land, associated stewardship with property maintenance and felt that stewardship was owed to their families rather than to a larger community. In a study of residents living near New Mexico's Los Alamos National Laboratory, the wise use of natural resources and preservation of natural resources were among the activities most associated with stewardship (Burger, 2002). A study conducted in the UK (Davies and Hodge, 2007) found five landowner perspectives on stewardship: ecosystem focused, managerial and technological centered, goods maximizing, community tradition protecting, and lifestyle focused. Only respondents with tendencies towards ecosystem or lifestyle focused views demonstrated a clear sense of responsibility to others. Both groups felt responsible to future generations, and the ecosystem focused group felt responsible to nature itself for conservation.

To be effective at persuading private landowners to conserve natural resources without payments, conservationists must understand landowner views of stewardship. To better understand conceptions of stewardship, we conducted a case study of North Carolina

Farm Bureau (NCFB) county board members throughout the state. North Carolina has approximately 80% of land in the state as privately owned (North Carolina Wildlife Resources Commission, 2005), 25% of it is agricultural farm land (USDA National Agriculture Statistics Service 2010), and 33% is nonindustrial private forest land (Brown and New, 2012). Further, rapid population growth and suburban sprawl threaten the state's wildlife habitat, environmental health, farm land and rural economies. A large portion of farm land in North Carolina has been enrolled in conservation programs such as CRP. Between 1995 and 2010, CRP payments to farm operators and landowners totaled nearly \$8 million to enroll 111,677 acres of farm land managed by 26% of the 52,400 farm operations in the state (USDA Farm Service Agency 2012; USDA National Agriculture Statistics Service 2010). Farm operators and private landowners, therefore, play a critical role in determining the fate of the state's natural resources, and many have participated in, and even more are familiar with, incentive programs designed to promote stewardship (Straka, Kilgore, Jacobson, Greene and Daniels, 2007).

The objectives of this study were to determine: 1) if NCFB county advisory board members consider themselves to be stewards of the land; 2) what motivates them to be stewards of the land; 3) what activities do they associate with PLS (i.e., stewardship definitions); 4) if they feel payments for conservation practices would make them better stewards of the land; and 5) what variables (socio-demographics, land tenure and use, perceptions, and experiences) predict stewardship motivations and definitions.

METHODS

Our survey population was all members of NCFB county advisory boards throughout North Carolina. The NCFB is the state's largest farm organization; with more than 500,000 members statewide, NCFB has more members than any other state Farm Bureau organization nationwide, and is dedicated to supporting farm communities throughout the state (North Carolina Farm Bureau, 2012). County board members are member-elected and are key opinion leaders and decision-makers on farm issues at the county level. As such, this purposive sample represented farm landowners literally, in addition to demographically, making them an important population in and of themselves.

A self-administered questionnaire (Appendix A) was delivered to a monthly meeting of each county board by NCFB staff or a principal investigator between March and October, 2009. We promoted design validity by obtaining reviews by experts from North Carolina State University and the North Carolina Cooperative Extension, and by pretesting NCFB county advisory board members in 7 counties ($n = 61$; no significant changes to the questionnaire resulted from the pretest, thus these responses were used in in the sample).

The main areas of inquiry in our questionnaire included PLS, property rights value orientations, land use and characteristics, land ownership information and socio-demographic information. We drew from previous literature to develop answer categories for both stewardship motivations and activities (Peterson et al., 2009; Jackson-Smith et al., 2005). To learn if respondents considered themselves to be stewards, we asked: "Do you consider yourself to be a steward of the land?" (objective 1). If respondents answered "yes", they were then asked for more information on motivating factors of their stewardship: "what

motivates you to be a steward of the land?” (objective 2). Answer options for stewardship motivations were: *future generations, God, society, the land, yourself, your community, and your family*. We assessed activities respondents associated with stewardship (i.e., stewardship definitions) by asking: “What does being a steward of the land mean to you?” (objective 3). Answer options for activities associated with stewardship were: *controlling pollution, implementing conservation farming practices, maintaining your property, maintaining high crop production, using natural resources wisely, and leaving natural resources untouched*. For both the questions respondents were asked to indicate all motivations and activities that applied. To assess how payments for conservation practices might affect their stewardship, we asked: “would payments for conservation practices help you be a better steward of the land?” (objective 4), with answer options yes, no and maybe.

We addressed objective 5 using multiple logistic regression. Each of the 7 stewardship motivations and 6 stewardship activities were used as dependent variables. We attempted to predict respondents’ stewardship motivations and activities using 8 independent variables (summarized in Table 2.1). We included PAST PARTICIPATION in conservation programs and IMPORTANCE of soil conservation (7 point Likert scale where 1 = not at all important and 7 = extremely important) because many conservation programs promote stewardship, and many do so with a focus on soil conservation. To assess respondents’ plans for their land after their death, we asked respondents, “What plans do you have for your property upon your death?” Answer options included: 1) transfer it to relatives, 2) sell it, 3) donate it to a land trust, and 4) unsure. We included respondent’s plans for their land upon death as a variable for its representation of how respondents view responsibility to family and

future generations. As such, for the purposes of analysis, we created a binary variable based on respondents' plans to transfer their land to relatives (TRANSFER TO RELATIVES).

The property rights orientation (PRO) variable was included because we expected those with individual rights orientations would believe they owed stewardship to themselves, whereas respondents who were orientated towards social responsibilities would believe they owed their stewardship to community and society. To measure property rights orientations, we used a scale designed to capture the respondents' orientation towards individual rights and social responsibilities (Jackson-Smith, et al., 2005). The questionnaire included 7 statements that address transfer of land ownership, exclusive use of natural resources, absolute rights to use natural resources, threats to civil liberties, sensitivity to society, obligations to society, and natural resource ownership. For each statement, we asked respondents to indicate their level of agreements on a 7 point Likert-type scales ranging from -3 (strong disagreement) to 3 (strong agreement). Among these 7 statements, 4 are positively narrated statements (individual rights) and 3 are negatively narrated statements (social responsibilities). We summed Likert scale responses to the 7 statements, resulting in cumulative scores ranging from -21 (social responsibilities) to 21 (individual rights). Responses from respondents that did not complete all 7 scales were not included in the analysis. We included total ACRES OWNED in North Carolina, percent of acres owned dedicated to ROW CROPS, INCOME (divided by 1,000 and using the midpoint of the respondent's 2008 income bracket); and AGE (centered and divided by 10) as controls.

We also collected data on socio-demographic and land characteristics including gender, race, marital status, occupation, acreage of respondents' largest tract of property in

North Carolina, how long they had owned their largest tract of property, percent of income generated from their land, how long they planned to maintain land ownership, and if they had a will or living trust in place that described their plans for their land. We used the Statistical Package for Social Sciences (SPSS; 17.0.0, Chicago, Illinois) to calculate all descriptive and inferential statistics.

RESULTS

A total of 735 NCFB county board members participated in our study (78.3% compliance rate). Seven county boards (Camden, Cherokee, Chowan, Durham, Graham, Lee and Madison) refused to participate in the study at the board level, and thus were not included in the overall compliance rate. Mean respondent age was 59, and most respondents were male (93.2%), white (96.4%) and married (88.3%). Over half of respondents had some college-level education (58.2%) and primarily worked in a farming/agricultural-related industry (77.3%). Median¹ household income was \$87,500. Mean area owned was 252 acres. The average area of the largest tract of land owned was 148.5 acres, and this land had been in respondents' extended family for 64 years. Respondents earned an average of 56.9% of their total household income from activities on their land. More than 75% of respondents (76.2%) indicated they planned to own their property for 25 years or longer or would maintain it "forever", "until death" or "as long as possible." Ninety percent of respondents indicated they would transfer their land to relatives upon their death, and 70.5% indicated they had a will or living trust in place that described their plans for their property. Forty-one

¹ Means were used when distributions were normal, while medians were used when distributions were skewed.

percent of respondents indicated they had participated in a land conservation program in the past 5 years; the highest participation rates were in the Environmental Quality Incentive Program (EQIP; 36.0%), CRP (36.4%), and state agricultural cost share programs for soil and water (57.2%). Respondents' average PRO scale score was 7.8 (SD = 6.89), leaning towards the individual rights orientation. The NCFB sample reflected general farm operators in the state in terms of age, gender and race, but as one might expect given their leadership roles, the NCFB respondents were slightly more likely to work primarily in a farming/agricultural-related industry (77.3% vs. 45.8%) and owned more land in North Carolina (252 acres vs. 160 acres; U.S. Department of Agriculture Census of Agriculture, 2007).

Most respondents (97.4%) self-identified as stewards of the land (objective 1). Respondents identified *future generations* (86.6%) as the strongest motivations of stewardship (objective 2), followed by *your family* (76.6%), *God* (70.5%), *the land* (68.3%), *yourself* (68.0%), *your community* (41.0%) and *society* (25.9%). *Maintaining your property* was the most common behavior/activity associated with stewardship (86.5%; objective 3), followed by *using natural resources wisely* (i.e., conservation; 78.2%), *implementing conservation farming practices* (78.0%), *controlling pollution* (64.8%), *maintaining high crop production* (53.4%) and *leaving natural resources untouched* (i.e., preservation; 30.6%). The majority of respondents (62.7%) indicated they felt payment for conservation practices would make them better stewards of the land (objective 4).

Demographics, land tenure, past experiences and opinions predicted respondent beliefs about whom or what stewardship was owed to and what activities define stewardship

(objective 5). PAST PARTICIPATION in conservation programs was positively related to considering stewardship a responsibility to *future generations, the land, yourself* and *your community* (Table 2.2). It is important to note that PAST PARTICIPATION is the only variable that predicted respondents being motivated for stewardship by *future generations*. IMPORTANCE of soil conservation was positively related to considering stewardship a responsibility to *God, society, the land, yourself*, and *your family*. Respondents who rated the IMPORTANCE of soil conservation as important (indicated 5, 6, or 7 on a 7 point Likert scale; 74.0%), were more likely to provide their own motivation for stewardship (*yourself*) than respondents who rated the IMPORTANCE of soil conservation as not important (indicated 1, 2, or 3 on a 7 point Likert scale 42.9%). TRANSFER TO RELATIVES was positively related to considering stewardship a responsibility to *God, society, yourself, your community* and *your family*. Respondents who planned to transfer their land to relatives upon their death were more likely to consider stewardship a responsibility to family (*your family*; 79.3%) than respondents who did not plan to leave their land to relatives (57.6%). The PRO variable was negatively related to considering societal benefits (*society*) a stewardship motivation. It is worth noting that IMPORTANCE, TRANSFER TO RELATIVES and PRO were the variables that had strong explanatory power for responsibility to *society*.

ACRES OWNED was negatively related to the belief that stewardship was owed to *God*. ROW CROPS was negatively related to the view that community (*your community*) motivated stewardship. INCOME was positively related to *the land, yourself*, and *your family*. Respondents who earned the median household income or more (\$87,000 or more) were more likely to consider stewardship a responsibility to themselves (73.4%) than

respondents earning less than the median income (less than \$87,500; 49.7%). AGE was negatively related to considering stewardship something respondents owed themselves (*yourself*).

PAST PARTICIPATION in conservation programs was positively related to *implementing conservation farming practices* and *using natural resources wisely* (Table 2.3). IMPORTANCE of soil conservation was positively related with defining stewardship as *controlling pollution, implementing conservation farming practices, maintaining property* and *using natural resources wisely*. Respondents who rated the IMPORTANCE of soil conservation as important (indicated 5, 6, or 7 on a 7 point Likert scale) were more likely to associate stewardship with *controlling pollution* (70.0%) and *implementing conservation farming practices* (83.7%) than respondents who rated it as not important (indicated 1, 2, or 3 on a 7 point Likert scale; 47.2% and 61.1%, respectively).

TRANSFER TO RELATIVES was positively related to defining stewardship as *implementing conservation farming practices*. ACRES OWNED was positively related to the belief that stewardship is defined as *maintaining a high crop yield* and *using natural resources wisely*. ROW CROPS was positively related to associating stewardship with *maintaining a high crop yield*. INCOME was positively related to *leaving natural resources untouched*. Respondents who earned the median household income or more (\$87,000 or more) were more likely to associate stewardship with *leaving natural resources untouched* (37.4%) than respondents earning less than the median income (less than \$87,500; 27.8%). AGE was positively related to *leaving natural resources untouched*.

DISCUSSION

Almost all of the respondents to our survey considered themselves to be stewards of the land, but the nature of that stewardship was generally internally focused rather than externally focused. Despite the NCFB being an organization dedicated to supporting farm communities (North Carolina Farm Bureau, 2012), we found respondents rarely attributed their stewardship responsibility to their community or society. Most respondents indicated their stewardship was owed to future generations and family. This finding is consistent with three previous studies that found respondents felt they owed their stewardship responsibility to future generations (Tyson et al., 1998; Davies and Hodge, 2007) and family (Peterson, et al., 2009). Although some demographic groups (e.g., Hispanics; Peterson et al., 2009) may be more likely than others to view PLS as something owed to society or the public, public responsibility still seems relatively unimportant relative to family. These findings seem intuitive, particularly if respondents interpret questions about future generations as referring to their own progeny.

Despite the popularity of future generations and family, respondents who plan to transfer their land to relatives upon their death felt they owed their stewardship responsibility to community and society, as well as to family. The negative relationship between PRO and *society*, the only significant relationship found for the PRO variable, provides evidence that the PRO scale is useful for assessing property rights orientations regarding social responsibilities. Given that PLS can influence landowner willingness to adopt socially desirable land management practices without financial incentives (Kreuter, Nair, Jackson-Smith, Conner, and Johnston, 2006), future research should address the extent to which

perceived responsibility to future generations also reflects a sense of responsibility to society at large and explore ways to promote individual, familial and public responsibility simultaneously as part of stewardship.

The relationship between AGE and *yourself* suggests changing land ownership demographics related to intergenerational land transfers (Best, 2002) may have major implications for the role of PLS in conservation. AGE was negatively related to viewing stewardship as something owed to self, which may be explained by the possibility that as landowners age they begin to make plans for their land upon their death, and begin to think of their land in terms of others rather than themselves. Our results suggest that as intergenerational land transfers occur, the new generation of landowners will likely be focused on stewardship for their own benefit rather than for others. Our research suggests in addition to being younger in age, respondents who owe stewardship to themselves are more likely to have a higher income, have plans to transfer their land to relatives, believe that soil conservation is important, and have participated in conservation programs in the past 5 years.

Our finding that *maintaining property* was the behavior most associated with stewardship (87%) may be explained by the body of literature finding that landowners believe a clean and neat farm is a good farm, and thus the sign of a good steward. Egoz, Bowring, and Perkins (2006) suggest traditional stewardship ideals in New Zealand include maintaining a tidy and efficient farming landscape, while Nassauer (1997) found similar ideals prevailed in North America. Furthermore, landowners may earn respect in the farming community by demonstrating that their farm is maintained and successful through keeping it tidy (Egoz, Bowring, and Perkins 2006).

Respondents may have been more likely to associate stewardship with conservation (i.e., *using natural resources wisely*; 78%) than preservation (i.e., *leaving natural resources untouched*; 31%), because, on average, a large portion of their total household income depends on active use of land for agriculture. On average, over half of respondents' total household income came from activities conducted on the land, thus the livelihoods of respondents were tied to the use of the land. Of the 197 respondents who indicated 75-100% of their household income came from activities on the land, 87% associated stewardship with conservation while only 36% associated it with preservation. This finding suggests respondents identify stewardship with actively manipulating the land (conservation) versus setting land aside (preservation). Conservation efforts aimed at sustaining working lands, rural character, and agriculture would benefit from framing their efforts in terms of actively conserving lands through stewardship versus passively setting them aside. The positive relationship between *income* and viewing PLS as *leaving natural resources untouched*, and between *income* and owing stewardship to *the land*, may suggest respondents with the median income or higher maybe be more motivated by preservation than conservation; 60.7% and 62.2% of respondents who were motivated for stewardship by the land and who considered preservation a stewardship activity, respectively, earned the median income or higher. This suggests that preservation of the land for the sake of the land may be a useful way to frame conservation initiatives in contexts involving high income landowners

The prevalence of conservation programs that focus on soil conservation may explain why IMPORTANCE of soil conservation and PAST PARTICIPATION in conservation programs were two of the most consistent predictors of stewardship responsibilities and

definitions (based on the number of motivations and activities each significantly predicted), and why respondents associated payment with stewardship. Soil conservation practices are considered to be one of several indicators of land stewardship (Norris, Deaton and Foley 2003). Contracts for soil conservation from state agriculture cost share programs, which share the cost of best management practices with the landowner, and federal programs such as CRP, which pay landowners to retire lands that have a high erosion risk, may have encouraged private landowners to associate stewardship with soil conservation and payments for conservation practices. Our data suggests such programs are common enough that even respondents who indicated they had not participated in a conservation program within the previous 5 years associated stewardship with payments; 53.3% of respondents who had not recently participated in a program said payments would make them better stewards. This finding has implications for the rapidly emerging attempts to pay landowners for diverse ecosystem services including endangered species habitat (Rodriguez, Peterson, Cubbage, Bondell and Sills, 2012), ground water management (Turpie, Marais and Blignaut, 2008), and soil erosion control (Jack, Leimona and Ferraro, 2009). Alternatively, landowners may have been thinking about the cost of conservation practices that they believe would be beneficial for future generations and society, and could have indicated they thought payments would make them better stewards based on their assessment that these practices are too costly for them to voluntarily implement, regardless of their prior experience with cost-share or other conservation incentive programs.

Although conservation incentive programs may be essential tools for protecting and securing ecosystem services on private lands, it is important to remember that the use of such

programs comes with risks. Such programs may create expectations that stewardship should only be provided if it is paid for (Redford and Adams, 2009), and research in related fields suggests that once payments are started, organizations may become trapped in payment systems in order to maintain the link between management practices and the conservation objective (Wagner et al., 1997; Ferraro and Kiss, 2002; Karanth and Madhusudan, 2002).

MANAGEMENT IMPLICATIONS

In order to use the stewardship framework to communicate effectively with private landowners and farm operators and successfully engage them in conservation without direct payments, conservation professionals must approach landowners using a framework with broad appeal. Our results suggest there may be a sub-population of landowners and farm operators in North Carolina open to implementing conservation practices without payment. The most simple and straightforward approach would be to frame PLS as service to future generations and family, which would likely appeal to and be effective with a variety of landowners and farm operators. However, we acknowledge that the one-size-fits all approach may not perform as expected. Thus, the use of conservation incentive programs that offer monetary payments might further increase landowner receptivity to conservation initiatives, particularly with farmers, however, we should be cautious with their use so as not to institutionalize the idea that stewardship must be paid for.

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Table 2.1 Summary of independent variables used in logistic regression to predict stewardship motivations and activities from a survey of North Carolina Farm Bureau county advisory board members from 93 North Carolina counties (Mar-Oct, 2009).

Variable	Variable Type	Description	Mean	SD
PAST PARTICIPATION in conservation programs	Binary	0 = No prior participation in a conservation program; 1 = Participation in conservation program in past 5 years	0.41	0.49
IMPORTANCE of soil conservation	Categorical	7 point likert scale; 1 = extremely unimportant, 4 = neutral and 7 = extremely important	5.96	1.50
TRANSFER TO RELATIVES	Binary	0 = No, 1 = Yes	0.90	0.30
PRO ¹	Categorical	7 point likert scale where 1 = Strongly disagree, 4 = neutral and 7 = Strongly agree	7.77	6.89
ACRES OWNED	Continuous	Acres owned in North Carolina	251.85	359.97
ROW CROPS	Continuous	Percent of owned land in North Carolina dedicated to row crops	30.77	31.05
INCOME	Continuous	Total household income (in thousands of dollars); midpoint of respondent's 2008 income bracket	93.71	53.47
AGE	Continuous	Age (mean centered and ÷ 10)	58.89	12.88

¹ Sum of Likert scale responses to 7 statements measuring property rights and social responsibilities (Jackson-Smith et al. 2005)

Table 2.2 Estimated coefficients, odds ratios and standardized odds ratios of logistic regression models predicting who or what respondents believe they owe their stewardship to (motivations; sample size for each model = 346) from a survey of North Carolina Farm Bureau county advisory board members from 93 North Carolina counties (Mar-Oct, 2009)

Variable	Coefficient (Odds Ratio) [Standardized Odds Ratio]						
	<i>future generations</i>	<i>God</i>	<i>society</i>	<i>the land</i>	<i>yourself</i>	<i>your community</i>	<i>your family</i>
PAST PARTICIPATION ¹	1.261*** (3.529) [1.855]	0.269 (1.308) [1.141]	0.087 (1.091) [1.044]	0.450* (1.569) [1.247]	0.530** (1.699) [1.297]	0.404* (1.498) [1.219]	-0.047 (0.955) [0.977]
IMPORTANCE ²	-0.067 (0.935) [0.904]	0.164* (1.178) [1.279]	0.441*** (1.554) [1.938]	0.302*** (1.353) [1.573]	0.173* (1.188) [1.296]	0.096 (1.101) [1.155]	0.282*** (1.325) [1.527]
TRANSFER TO RELATIVES ¹	0.851 (2.341) [1.291]	1.023** (2.782) [1.359]	2.379** (10.795) [2.042]	0.224 (1.251) [1.070]	0.770* (2.159) [1.260]	1.441*** (4.223) [1.541]	1.047** (2.848) [1.369]
PRO ³	-0.012 (0.988) [0.921]	-0.004 (0.996) [0.973]	-0.047** (0.954) [0.723]	-0.006 (0.994) [0.960]	0.001 (1.001) [1.007]	-0.018 (0.982) [0.883]	-0.019 (0.981) [0.877]
ACRES OWNED	0.030 (1.030) [1.114]	-0.083** (0.920) [0.742]	-0.012 (0.988) [0.958]	-0.061 (0.941) [0.803]	-0.067 (0.936) [0.786]	0.040 (1.041) [1.155]	-0.062 (0.940) [0.800]
ROW CROPS	-0.511 (0.600) [0.853]	0.145 (1.156) [1.046]	-0.112 (0.894) [0.966]	0.576 (1.779) [1.195]	0.090 (1.094) [1.028]	-0.873** (0.418) [0.763]	-0.702 (0.496) [0.804]
INCOME ⁴	0.004 (1.004) [1.239]	0.003 (1.003) [1.174]	0.001 (1.001) [1.055]	0.007*** (1.007) [1.454]	0.004* (1.004) [1.239]	0.002 (1.002) [1.113]	0.006** (1.006) [1.379]
AGE	-0.134 (0.874) [0.841]	-0.106 (0.900) [0.872]	-0.192 (0.825) [0.781]	0.026 (1.026) [1.034]	-0.273** (0.761) [0.703]	0.079 (1.082) [1.107]	0.113 (1.120) [1.157]
Constant	1.217	-1.065	-5.756***	-1.743**	-1.303*	-2.195***	-1.235*
Nagelkerke R-squared ⁵	0.099	0.068	0.137	0.112	0.110	0.082	0.098

*significance at 0.10; **significance at 0.05; ***significance at 0.01

¹ Yes = 1 and No = 0

² Soil conservation importance ranked using a 7 point likert scale format where 1 = extremely unimportant and 7 = extremely important

³ PRO scale questions were in 7 point likert scale format where -3 = strongly disagree and 3 = strongly agree

⁴ Income scale midpoint ranges from \$10,000 to \$187,500

⁵ Cameron and Windmeijer (1997)

Table 2.3 Estimated coefficients, odds ratios and standardized odds ratios of logistic regression models predicting what activities respondents associate with stewardship (sample size for each model = 350) from a survey of North Carolina Farm Bureau county advisory board members from 93 North Carolina counties (Mar-Oct, 2009)

Variable	Coefficient (Odds Ratio) [Standardized Odds Ratio]					
	<i>controlling pollution</i>	<i>Implementing conservation farming practices</i>	<i>maintaining property</i>	<i>maintaining high crop yield</i>	<i>using natural resources wisely</i>	<i>leaving natural resources untouched</i>
PAST PARTICIPATION ¹	-0.020 (0.981) [0.990]	0.680** (1.974) [1.395]	0.047 (1.049) [1.023]	0.142 (1.153) [1.072]	0.850** (2.339) [1.517]	0.165 (1.179) [1.084]
IMPORTANCE ²	0.233*** (1.262) [1.418]	0.290*** (1.337) [1.545]	0.247** (1.280) [1.443]	-0.025 (0.975) [0.963]	0.168* (1.182) [1.287]	-0.033 (0.967) [0.952]
TRANSFER TO RELATIVES ¹	0.399 (1.491) [1.127]	0.790* (2.203) [1.267]	-0.576 (0.562) [0.841]	-0.340 (0.712) [0.903]	-0.239 (0.787) [0.931]	0.655 (1.925) [1.217]
PRO ³	-0.003 (0.997) [0.980]	-0.011 (0.989) [0.927]	-0.018 (0.982) [0.883]	0.004 (1.004) [1.028]	-0.011 (0.990) [0.927]	-0.012 (0.988) [0.921]
ACRES OWNED	0.044 (1.045) [1.172]	-0.005 (0.995) [0.982]	0.049 (1.050) [1.193]	0.098** (1.103) [1.423]	0.154* (1.167) [1.714]	0.002 (1.002) [1.007]
ROW CROPS	-0.276 (0.759) [0.918]	0.312 (1.366) [1.102]	-0.443 (0.642) [0.872]	0.945** (2.572) [1.340]	-0.742 (0.476) [0.795]	-0.476 (0.621) [0.863]
INCOME ⁴	0.001 (1.001) [1.055]	0.003 (1.003) [1.174]	-0.003 (0.997) [0.852]	0.002 (1.002) [1.113]	0.002 (1.002) [1.113]	0.006*** (1.006) [1.379]
AGE	0.017 (1.017) [1.022]	0.154 (1.166) [1.220]	-0.116 (0.890) [0.861]	-0.069 (0.933) [0.915]	0.158 (1.171) [1.226]	0.172* (1.188) [1.248]
Constant	-1.075	-1.298*	1.585	-0.179	0.411	-1.525**
Nagelkerke R-squared ⁵	0.047	0.099	0.044	0.082	0.106	0.051

*significance at 0.10; **significance at 0.05; ***significance at 0.01

¹ Yes = 1 and No = 0

² Soil conservation importance ranked using a 7 point likert scale format where 1 = extremely unimportant and 7 = extremely important

³ PRO scale questions were in 7 point likert scale format where -3 = strongly disagree and 3 = strongly agree

⁴ Income scale midpoint ranges from \$10,000 to \$187,500

⁵ Cameron and Windmeijer (1997)

CHAPTER 3 – Does Public Information Influence Wildlife Friendly Landscaping Preferences?

ABSTRACT

Urban sprawl is making residential landscaping a major concern with respect to wildlife conservation. In the United States, residential landscaping typically consists of maintained lawns with specimen plantings of exotic trees, and shrubs; such designs provide poor wildlife habitat. We conducted a study of Raleigh, North Carolina residents to determine how providing public information about the benefits of native plant landscaping to bird species influenced urban residents landscaping preferences (treatment). We used Wilcoxon Signed Rank tests to determine if respondent preferences for 0, 50, 75 and 100% native plant landscaping coverages changed after they were informed about the benefits native plants provide for birds. Prior to being given this information (baseline), respondents most preferred the 50% native plant landscaping coverage. Preferences for all 4 landscaping coverages were significantly different after the informational treatment. Neutrality changed to opposition for the 0% native plant landscaping design, while opposition changed to support and neutrality for the 75% and 100% designs, respectively. After the informational treatment, the 50% and 75% native plant landscaping coverages had the highest mean preference levels, but the 100% design was ranked first more than any other design. These findings suggest support for native plant landscaping is already much higher than is reflected by typical residential landscaping, and that public information efforts regarding the benefits

of native plant landscaping to birds can dramatically alter public preferences for native plant landscaping.

INTRODUCTION

Western urbanization is largely defined by sprawling suburban areas (Owen, 2009). The rate at which these suburban areas are growing makes residential landscaping a critical issue for biodiversity conservation because urban development is responsible for more species endangerment than any other direct anthropogenic cause (Czech 2000). Residential landscaping in the United States (U.S.) typically consists of turf grass lawns with some specimen plantings of trees and shrubs (Helfand, Park, Nassauer, and Kosek 2006; Tallamy 2009). More than 16,380,000 hectares of land are dedicated to turf grass in the U.S., which is an area three times larger than what is dedicated to corn (Milesi, Elvidge, Dietz, Tuttle, and Nemani 2005). Furthermore, between 1982 and 1997 the U.S. experienced a 34% increase in urban and built up land, resulting largely from conversion of agricultural and forest lands (U.S. Department of Agriculture [USDA] Natural Resource Conservation Service, 2001).

Turf grass dominated landscaping contributes to environmental degradation, and provides poor wildlife habitat. Although turf grass benefits urban landscapes by helping to mitigate urban heat islands (Spronken-Smith, Oke and Lowry 2000), and increasing infiltration of stormwater runoff (Brabec, Schulte and Richards 2002), the external inputs required for turf grass maintenance (e.g., fuel, chemicals, and frequent irrigation), can reduce water and air quality, and increase water consumption (Priest, Williams, and Parton 2000, Robbins and Birkenholtz 2003, Milesi et al. 2005). Furthermore, turf grass landscaping also

does not provide the vertical and horizontal structure required by wildlife for food, cover and reproduction (Adam and Lindsey 2010).

Native plant landscaping provides a more sustainable and wildlife-friendly alternative to turf grass landscaping. Native plants require less water, fossil fuel, and chemicals, may help reduce air and water pollution, and moderate urban microclimates (Bijoor, Czimczik, Pataki and Billings 2008; Morris and Bagby 2008). Native plants also offer several ecosystem services, including providing habitat for urban wildlife and attracting such wildlife as small mammals and birds (Bormann, Balmori, and Geballe 1993; Helfand et al. 2006). Unlike turf grass, native plant landscaping provides the vertical and horizontal structure required by wildlife (Adams and Lindsey 2010).

Since urban residents make management decisions for large portions of urban landscapes, their decisions dictate whether wildlife-friendly native plant landscaping is used (Breuste, 2004; Grimm, Faeth and Golubiewski 2009). Research suggests residential landscaping plays a significant role in urban ecosystems by influencing landscaping decisions for vegetation cover used on adjacent public lands (Zhou, Troy, Grove, and Jenkins 2009). As such, urban residents' decisions regarding urban landscaping help drive biodiversity conservation in urban areas.

Some research has addressed urban residents' landscaping preferences and the role of social norms in landscaping preferences. A study by Yue, Hurley and Anderson (2010) found consumers were willing to pay more for plants labeled as native, versus those labeled invasive. Education level has also been found to be related to preferences for native plant landscaping (Kirkpatrick, Daniels, and Zagorski 2007; Buijs, Elands, and Langers 2009).

Martin, Warren, and Kinzig (2004) found a correlation between socio-economic status and vegetation richness. Larson and Harlan (2006) found that preferences for landscaping varied with income category, with low, middle and high income classes having different preferences and only the middle class preferring native plant landscaping. Other research suggests neighborhood norms influence landscaping preferences independently from socio-demographic differences among residents (Zmyslony and Gagnon 1998). A computer aided simulation study of suburban Michigan residents suggested the existing landscaping in a hypothetical neighborhood predicted personal preferences for landscaping better than broad cultural norms (Nassauer, Wang and Dayrell 2009). In addition to income and ownership status being weakly related to landscaping preferences, Peterson, Thurmond, McHale, Rodriguez, Bondell, and Cook (2012) found the best predictors of landscaping preferences were ethnicity and perceptions of neighbors' preferences.

Although there is an abundance of literature related to attitudes towards wildlife, in general (Kellert, 1976; Williams, Ericsson and Heberlein 2002), and urban wildlife, in particular (Decker and Gavin 1987; Bjerke, Ostdahl and Kleiven 2003), little, if any, research addresses how much people will change their landscaping preferences to benefit wildlife. We address this question with a case study in Raleigh, North Carolina (NC). Raleigh is the third fastest sprawling metropolitan region in the USA, after Greensboro, NC and Riverside, California (Ewing, Pendall, and Chen 2010), and therefore is a good place to study landscaping preferences. Sprawl centers are critical areas for understanding landscaping preferences because sprawl regions have rapid population growth, bring larger than average geographic areas into household landscaping per capita, and typify new development

patterns. In this study, we set out to answer two specific questions: 1) how much will residents change their landscaping preferences to improve habitat for birds, and 2) what variables predict their willingness to change landscaping preferences for the benefit of birds.

METHODS

To address our research objectives, we conducted a survey of residents in Raleigh, NC. To increase socio-economic diversity, we used a stratified random sample based on PRIZM classifications, a marketing tool which uses census block groupings to cluster neighborhoods using socio-demographics, market surveys and purchasing records (Peterson et al. 2012). We used a random number generator to select four census blocks (out of a possible 123) within U.S. highway 440 in Raleigh, NC. Two PRIZM classifications were represented in the four census blocks; two were PRIZM 12 and two were PRIZM 62. PRIZM 12 is characterized by middle-aged Caucasians who participate in high tech online purchasing, while PRIZM 62, is characterized by older individuals of mixed ethnicity who order items by mail. Home ownership (versus renting) in both PRIZM 12 and 62 census blocks was relatively high; homes in the PRIZM 12 were 58 years old, on average, with construction dates ranging from 1923 to 2008, while the homes in PRIZM 62 were 30 years old, on average, with construction dates ranging from 1930 to 2007. Tree cover in PRIZM 12 is 62.0%, while tree cover in PRIZM 62 was 57.4%.

Hawth's Analysis Tools for ArcGIS was used to generate random addresses within each block group. The census blocks for PRIZM 12 were composed of 491 addresses, of which 100 were selected for inclusion in our study. Of the 100 selected, 11 were post office

boxes or not residential dwellings, thus the remaining 89 residences constituted the PRIZM 12 sample. The census blocks for PRIZM 62 included 457 addresses, of which 100 were selected. Of the 100 selected, 10 were post office boxes or not residential dwellings, leaving 90 residences as the PRIZM 62 sample (Figure 3.1).

We conducted an in person survey using a questionnaire (Appendix C) between February and March, 2010. Interviewers, upper class undergraduate and graduate student workers, went door to door in an attempt to contact a household member at each residence in the sample. After the third unsuccessful attempt to contact someone in the household, interviewers marked the address as unavailable and moved on to the nearest address that was not already included in the sample frame.

The survey included socio-demographic information including gender, ethnicity, 2009 total household income (before taxes), and education level. Residents were also asked whether they rented or owned the property on which they lived. Residential preferences for native landscaping designs were evaluated by having residents examine photos of different proportions of native plant coverage in four front yard landscaping designs (0, 50, 75, and 100%; Figure 3.2) while answering questions about their native plant landscaping preferences. We then asked respondents to imagine they had the opportunity to install new front yard landscaping and to indicate their preference for each design on a 7 point Likert scale, where 1 was “strongly do not prefer” and 7 was “strongly prefer” (question 1). The treatment entailed explaining to respondents that “birds use native plant gardens to hide from predators and find food”. Residents were then asked again to indicate their preference for each of the four designs shown in the photos (question 2).

The photos used in the study were adapted from Nassauer et al. (2009). Each photo included a caption stating the percent of native plant coverage depicted (Figure 3.2; Peterson et al. 2012), and interviewers were instructed to explain to respondents that all of the plants portrayed in the photos, except the turf grass and perennial evergreens, were native. Previous research suggests color can influence preferences (Nassauer 1983), thus we used grey scale photos to avoid confounding the effects of color and percentage cover for native plants. The photos were printed on a single 8.5 by 11 inch piece of paper so that all four landscaping designs were visible to respondents simultaneously.

In order to understand the effects of the socio-demographic variables on the change in preference scores for native plant coverage versus turf grass, we converted each respondent's ratings, both the baseline ratings and the post-treatment ratings, into an overall score to quantify their preferences towards native plant coverage. We created the overall preference score by first ranking each of the four levels of native plant coverages (0%, 50%, 75%, and 100%) by preference (i.e., most preferred to least preferred). Subsequently, points were assigned based on coverage preference. The most preferred design was given 4 points, the next preferred 3 points, and so on to 1 point for the least preferred coverage; when ties occurred the ranks were averaged. The percent coverage (0, .5, .75, 1) was then multiplied by the points given to that coverage level, and then totaled. This resulted in each respondent receiving an overall score between 4 and 7.25, with lower scores indicating that the respondent tended to favor the less native plant coverages.

We used respondents' baseline preferences for native plant landscaping and their preferences after being informed of its benefits to birds (post-treatment) to calculate the

change in preference scores. We used the baseline, post-treatment and change in respondents' preference scores as our dependent variables (question 2). We used ETHNICITY, highest EDUCATION level completed, total household INCOME, home OWNERSHIP (whether the respondent owned the property in which they resided) and whether respondents owned a BIRDFEEDER as independent variables to predict preference scores and the change in preference scores for native plant landscaping. We excluded those respondents who did not identify themselves as African American or Caucasian (6%) from our regression models. In addition to regressions and descriptive statistics, we compared preferences for each landscaping design using pairwise Wilcoxon Signed Rank tests. Statistical Package for Social Sciences (SPSS; 19.0.0, Chicago, Illinois) was used for all analyses.

RESULTS

We received a total of 179 responses to our survey. Seventy-two responses came from residences that were part of our original sample (40% response rate) and another 107 came from proximate addresses. Compliance rate among respondents who answered the door was 100%. The majority of respondents were male (52.8%), had a Bachelor's degree (27.9%), and owned the residence they lived in (58.1 %). The ethnic majority of our sample was Caucasian (56.8%), with another 37.5% and 5.7% being African-American and other, respectively. The median income was \$37,500. The PRIZM 12 and 62 samples were demographically similar in terms of gender (PRIZM 12 = 43% female, PRIZM 62 = 53% female), home ownership rates (PRIZM 12 = 61%, PRIZM 62 = 55%), and income levels

(median category = \$37,500), but slightly more respondents from PRIZM 12 were owners (61%) than PRIZM 62 respondents (55%), and PRIZM 12 had a higher percentage of Caucasians (85%) than PRIZM 62 (7%). The 50% native plant coverage received the highest mean preference score for the baseline measurement (Table 3.1). The preference scores for the 0% and 75% native plant coverage were the 2nd and 3rd most preferred, but were not significantly different from each other. The 100% native plant coverage was the least preferred coverage.

The post-treatment preference scores for all native plant coverages were different than their respective baseline scores. Despite a small decrease in the mean preference score for the 50% native plant coverage, it shared the highest post-treatment mean preference levels with the 75% coverage (Table 3.1). The 75% coverage mean preference score increased significantly. The 100% coverage also increased significantly, moving up in preference past the 0% coverage design. Post-treatment preference scores for the 0% coverage decreased significantly, making it the least preferred coverage post-treatment. Comparison of respondent ranking of native plant coverage in the baseline and post-informed measurements show that the 50% native plant coverage remained relatively stable, minor changes were documented for the 75% coverage and 0% coverage, and major changes occurred for the 100% coverage (Table 3.2). Most notably, the percent of people ranking 100% native plant coverage first nearly tripled post-treatment.

Linear regression analysis predicting the baseline preferences scores resulted in three significant relationships (Table 3.3). INCOME and ETHNICITY were negatively related to the baseline preference scores where respondents with lower income levels and Caucasians,

more than African Americans, preferred native plant landscaping. OWNERSHIP was positively related to the baseline preference scores where homeowners preferred native landscaping less than renters. Baseline preference scores were higher for Caucasians ($\bar{x} = 5.70$, $SE = 0.12$) than for African Americans ($\bar{x} = 4.61$, $SE = 0.12$), and lower for homeowners ($\bar{x} = 5.03$, $SE = 0.12$) than for renters ($\bar{x} = 5.42$, $SE = 0.12$). Analysis of the post-treatment preference scores produced only one significant relationship; ETHNICITY was negatively related to the post-treatment scores where Caucasians, more than African Americans, preferred native plant landscaping. Post-treatment preference scores were higher for Caucasians ($\bar{x} = 6.23$, $SE = 0.11$) than for African Americans ($\bar{x} = 5.40$, $SE = 0.13$).

Analysis of the change in preference scores from baseline to post-treatment resulted in two significant relationships. OWNERSHIP was negatively related to the change in preference scores, while ETHNICITY was positively related, where renters and Caucasians were more likely to prefer native plants than homeowners and African Americans, respectively. Renters' preference scores changed more ($\bar{x} = 8.61$, $SE = 0.15$) post-treatment than owners' post-treatment preferences scores ($\bar{x} = 5.38$, $SE = 0.11$). Preference scores changed more for African Americans ($\bar{x} = 0.85$, $SE = 0.19$) than for Caucasians ($\bar{x} = 0.58$, $SE = 0.10$).

The bigger picture for the three analyses show that while respondents with lower incomes preferred native plant landscaping in the baseline measurement, their preferences did not change post-treatment. Likewise, owners were more likely to prefer native plants in the baseline measurement, but their preferences did not change post-treatment. Renter's preferences for native plant landscaping, however, did show an effect from treatment.

Lastly, Caucasians preferences for native plant landscaping in the baseline and post-treatment were much stronger than African Americans' preferences for native plants, but it was the African Americans preferences that showed a change between the two measurements.

DISCUSSION

Our results suggest that public information efforts regarding the benefits of native plant landscaping to birds could have a large and positive impact on residential preferences for native landscaping. Residents were willing to make substantial changes to their landscaping to benefit urban birds. This information is important given that it demonstrates that people's preferences for landscaping are malleable, and that benefits to birds can weigh heavily on how preferences change. While the preference for 50% native plant coverage remained relatively stable, the effects of treatment were seen in the overall shift of preferences from the lower percentage native plant coverages in the baseline measurement towards the higher percentage native plant coverages in the post-treatment measurements. One potential explanation for these results is a recent shift in people's value orientations towards wildlife from the more traditional use-oriented perspectives to protection-oriented ones (Fulton, Manfredo and Lipscomb 1996; Manfredo, Teel and Bright 2003). Thus, respondents' post-treatment preferences for landscaping may have been influenced by their desire to protect birds. Another plausible explanation for these findings may be found in E. O. Wilson's Biophilia hypothesis which suggests humans have an instinctive bond with biodiversity and urge to be connected to it (Wilson 1984; Peterson and Rodriguez 2012). Social desirability bias among respondents who potentially thought interviewers wanted to

protect birds may also have contributed to the large and strong effects identified in the study. Future research should explore these potential explanations.

Residents' landscaping preferences leaned towards bird-friendly designs, even in the baseline measurement, suggesting they are amenable to native plant landscaping; however our findings show residents' preferences are not reflected in the turf grass landscaping that is prevalent in Raleigh, NC. These results suggest residential landowners may not be making initial landscaping decisions. New residential property landscaping choices are likely made by developers prior to property sales; developers likely choose turf grass landscaping because they assume it improves the curb appeal of a property, and therefore may increase the likelihood of sale, and turf grass may be relatively easy and inexpensive to install and maintain compared to alternative landscaping types (Helfand et al. 2006). Similarly, residents who re-landscape are likely to choose landscaping that reflects neighborhood trends. Previous literature suggests neighborhood social norms, behavioral expectations within a neighborhood, play a significant role in residents' landscaping choices (Nassauer et al. 2009; Peterson et al. 2012). Thus, residents' landscaping choices may be biased towards the type of landscaping that is prevalent in their neighborhood. In other words, having turf grass is the normative landscaping practice in most U.S. residential neighborhoods, and "lawn conformists" perpetuate this prevailing neighborhood norm (Kaufman and Lohr 2002, pg. 294). Last, given the expense and effort related to re-landscaping (Helfand et al 2006), residents who have the option of re-landscaping may not want to spend the money or do the work required to replace the turf grass that is already in place.

Because the changes in landscaping preferences were observed among all socio-demographic groups, few variables predicted the magnitude of change in landscaping preferences. The relatively small changes related to homeownership and ethnicity may have several possible explanations. Owners may be less inclined than other respondents to change their landscaping for the benefit of birds due to concerns about property values. Native plant landscaping is often perceived as messy and unappealing (Nassauer 1995), and such perceptions could lead to declines in property values. Also, owners of messy properties may be perceived as bad stewards (Nassauer 1997), and as in the farming community, respect as a home owner may be linked to how well the owner's yard is maintained (Egoz, Bowring, and Perkins 2006). Though little, if any, research has been conducted on the effect of landscaping on property values, research on the effect of community gardens (Voicu and Been 2008) and trees (Anderson and Cordell 1988; Orland, Vining and Ebreo 1992) on neighborhood property values do exist. Such literature shows that gardens, which may also be perceived as messy, have a positive effect on neighboring property values, with higher quality gardens having the greatest effect, while trees have also been shown to have a positive effect. Thus correcting assumptions about the effect of messy landscapes on residential property values is a key step to encouraging the use of native plants in residential landscaping.

Neighborhood norms may also be more important to homeowners who have longer tenure, on average, than renters (DiPasquale and Glaeser 1999). Thus stronger neighborhood norms against native plant landscaping among homeowners may temper their willingness to make landscaping changes that benefit wildlife. Ironically, previous research suggests our

respondents' neighbors preferred native plant landscaping despite assumptions otherwise (Peterson et al. 2012). If these erroneous assumptions about neighborhood norms are corrected, homeowners may actually be the most likely to implement landscaping changes to benefit wildlife, because pressure to make the changes associated with neighborhood norms would promote wildlife-friendly landscaping.

Caucasians were more likely to prefer native plant landscaping in the baseline measurement and the post-treatment. African Americans may have been less swayed by purported benefits of native plant landscaping for bird than Caucasians due to lack of interest or less favorable attitudes toward wildlife. Several studies have suggested that African heritage, ancestral history of slavery, and racial discrimination are responsible for the lower concerns for the environment, in general (Cleaver 1969; Taylor 1989), and wildlife in particular (Van Velsor and Nilon, 2006), among African Americans. Other literature attributes the disinterest, dislike or fear of wildlife among African Americans to their more urban upbringings (Kellert 1976; Van Velsor and Nilon 2006). This explanation makes sense given that African Americans account for 20% of US urban populations, but less than 10% in exurban areas, while Caucasians constitute more than 80% of exurban populations (Frey 2010).

Public information efforts regarding the benefit of native plant landscaping to birds offers a viable strategy for making urban areas more wildlife-friendly. Given the decision-making power urban residents have over major portions of urban areas, promoting the benefits of native plant landscaping to birds through public information could help reduce environmental degradation, increase ecosystem services associated with landscaping, and

provide critical habitat for urban wildlife (Breuste, 2004; Grimm et al. 2009). Most residential areas in the US which utilize turf grass as the primary form of ground cover are relatively sterile in terms of habitat for wildlife (Adams and Lindsey 2010), however it is possible that once native plant landscaping becomes common, it could be supported by the same powerful neighborhood norms that currently make wildlife-friendly landscaping difficult. If the same urban native plant landscaping attracts less charismatic species (e.g., rodents or snakes), which humans tend to have negative attitudes towards (Pagani, Robustelli, and Ascione, 2007; Prokop, Ozel and Usak 2009), urban residents might be less amenable to replacing turf grass. Further research should attempt to determine if broad willingness to adopt native plant based landscaping to benefit birds extends to other species. Furthermore, while understanding residents' preferences for native plant landscaping are very important, future research must focus on homeowner behavior surrounding landscaping decisions to understand whether preferences serve as a true proxy for behaviors. Research and public information must also extend to developers in order to gain a better understanding the motivations behind their landscaping decisions and to determine if public information about urban residents' preferences for landscaping and the benefits of native plant landscaping to birds would influence their landscaping decisions.

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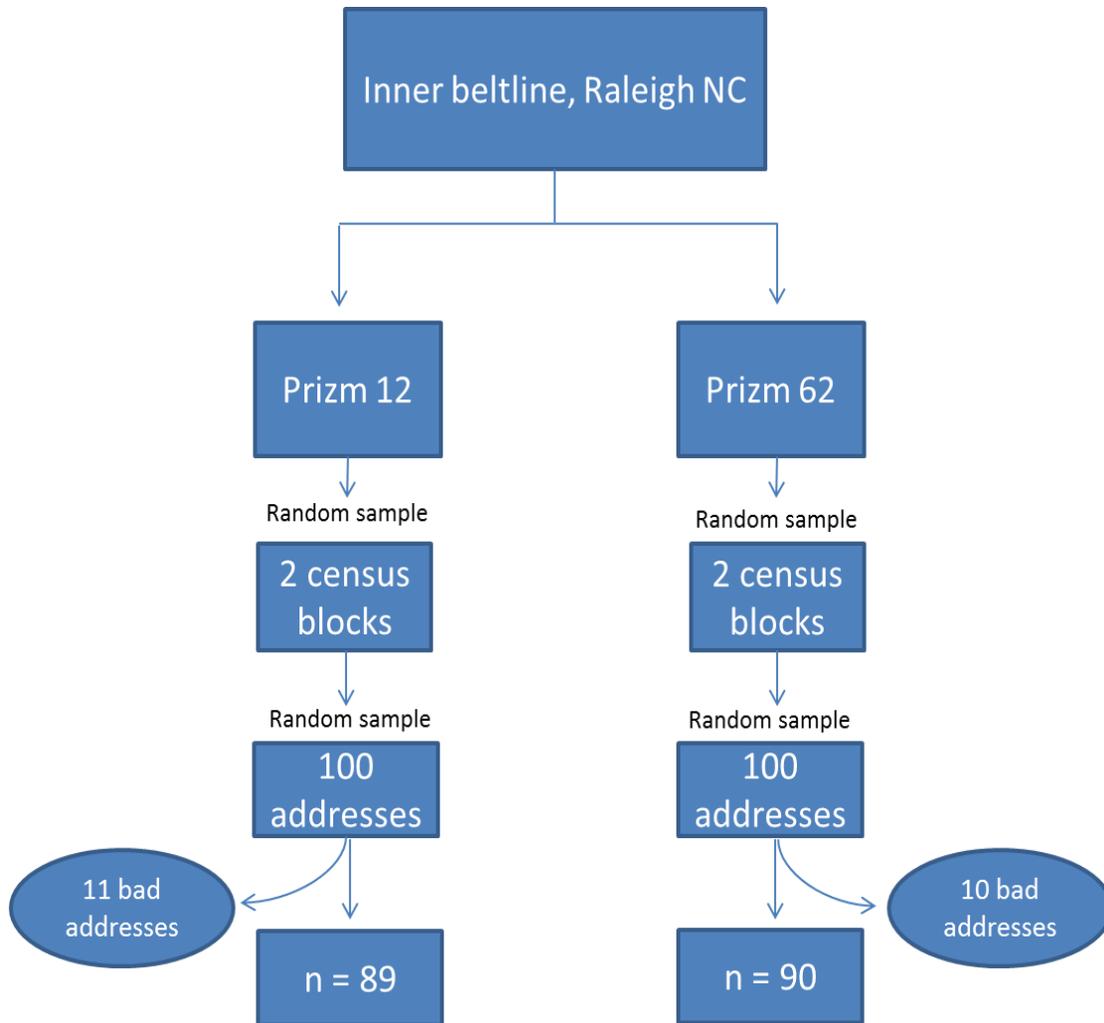


Figure 3.1 Sampling flow chart for study of urban residents' preferences for native landscaping in Raleigh, NC.

a) 0 % Native Plant Gardens



b) 50% Native Plant Gardens



c) 75% Native Plant Gardens



d) 100 % Native Plant Gardens



Figure 3.2 Four native plant landscaping designs ranging from 0% native plant coverage to 100% native plant coverage. Adapted from Nassauer et al. 2009.

Table 3.1. Comparison of baseline and post-treatment mean resident preference scores for four native plant landscaping coverages from a survey of urban residents in Raleigh, NC, USA. Group comparisons were made using Wilcoxon Signed Rank Test where all group differences were highly significant ($p < 0.001$). Bolded text indicates significant differences between individual preferences for a given landscaping coverage in the baseline and post-treatment measurements where all group differences were significant at a $\alpha \leq 0.001$.

Percent native plant coverage	Mean preference score	Percent of respondents ranking each landscaping coverage in each category from 1 = strongly do not prefer to 7 = strongly prefer						
		1	2	3	4	5	6	7
0	4.08 (B)*	28.1	6.7	6.1	11.7	11.7	6.1	29.2
50	5.11 (A)	4.5	5.1	6.7	15.7	21.9	19.9	27
75	3.66 (B)*	18.1	15.8	16.9	13.6	13.6	10.7	11.3
100	2.82 (C)	45	11.9	11.4	5.7	7.4	4.5	13.1
	Mean preference after being informed about birds	Percent of respondents ranking each landscaping coverage in each category from 1 = strongly do not prefer to 7 = strongly prefer after being informed about birds						
		1	2	3	4	5	6	7
0	3.51 (C)	29.4	17.6	4.7	13.5	10	5.3	19.4
50	4.71 (A)**	6.5	4.1	11.2	21.2	22.9	15.3	18.8
75	4.63 (A)**	10	5.9	8.2	16.5	20.6	24.1	14.7
100	4.21 (B)	21.8	11.8	6.5	11.2	10.6	9.4	28.8

* $p = 0.12$, ** $p = 0.73$

Table 3.2. Percent of respondents ranking each native plant landscaping coverage type in each rank position from a survey of urban residents in Raleigh, NC, USA.

Ranking of native plant landscaping coverages	Baseline	Post-treatment
	Measurement (%)	Measurement (%)
0% coverage		
1 ^{rst}	36.7	32.0
2 nd	23.2	10.7
3 rd	13.6	14.8
4 th	26.6	42.6
50% coverage		
1 ^{rst}	44.1	39.6
2 nd	40.1	23.7
3 rd	15.8	36.7
4 th	0	0
75% coverage		
1 ^{rst}	20.3	34.3
2 nd	29.4	40.8
3 rd	49.7	24.9
4 th	0.6	0
100% coverage		
1 ^{rst}	16.9	48.5
2 nd	13.0	9.5
3 rd	31.1	18.3
4 th	38.4	23.4

Table 3.3. Estimated coefficients and standardized coefficients of a linear regression models predicting respondent preferences for native plant landscaping in the baseline measurement and after being informed of its benefits to birds, and in overall chance of preferences from a survey of urban residents in Raleigh, NC, USA

	<i>B (standardized B)</i>		
	Baseline	Post-treatment	Change
INCOME ^a	-0.400 (-0.208)**	-0.002 (-0.101)	0.002 (0.100)
OWNERSHIP ^b	0.505 (0.213)**	-0.028 (-0.011)	-0.550 (-0.241)*
EDUCATION ^c	-0.033 (-0.065)	0.015 (0.027)	0.052 (0.105)
ETHNICITY ^d	-1.361 (-0.549)***	-0.830 (0.315)***	0.494 (0.205)*
BIRDFEEDER ^e	0.009 (0.004)	0.133 (0.052)	0.073 (0.031)
Intercept	5.872***	6.315***	0.494
R ² (adjusted R ²)	0.300 (0.271)	0.113 (0.075)	0.070 (0.030)

^a Income (in thousands) after taking midpoint

^b Ownership (0=non-owner, 1=owner)

^c Education (1= high school/GED, 2=vocational/technical/trade school certificate, 3=some college course work, 4=undergraduate degree, 5=graduate degree)

^d Ethnicity (0=Caucasian, 1=African American)

^e Birdfeeder (0=no bird feeders, 1=bird feeders)

*significance at 0.10; **significance at 0.05; ***significance at 0.01

FINAL CONCLUSION

The conservation of wildlife and their habitat on private lands depends on private landowners' willingness to manage and conserve their land for wildlife. Several methods exist for promoting wildlife conservation among private landowners, and the purpose of the studies discussed in this dissertation was to explore three such methods: financial incentives, stewardship and public information. To accomplish this, we determined the feasibility of implementing a conservation incentive program aimed at conserving endangered species on private lands and examined conceptions of stewardship as a potential alternative to incentive payments using a case study of NCFB county advisory board members. We also explored the impact of public information efforts towards promoting habitat for birds in urban areas in Raleigh, NC. Together, these three studies provide information that may be used to design payment, non-monetary and public information programs aimed at promoting wildlife conservation on private lands in the future.

Overall we saw evidence that all three methods have potential to promote conservation on private lands. Chapter 1 extends available knowledge regarding probable responses to conservation programs in NC, as well as knowledge about preferences for types of conservation incentives and legal instruments employed, and beliefs concerning property rights and commitment to endangered species. Results from Chapter 1 suggest interest in an incentive program focusing on threatened habitat conservation, rather than endangered species conservation, on private lands that utilizes 10 year contracts would likely exceed available funding. Furthermore, market mechanisms (e.g., reverse auctions) could drive

down costs and drive up durations for conservation contracts. Although term contracts may be frowned upon by some interest groups precisely because they have a fixed duration, they may prove critical for wildlife conservation efforts requiring high levels of landowner support within relatively short time scales.

Chapter 2 extends the limited knowledge available regarding private landowner conceptions of stewardship and demonstrates that if the stewardship framework is to be effective and successful at engaging private landowners and farm operators in conservation without direct payments, conservation professionals must approach landowners using a framework with broad appeal. These results suggest that the stewardship construct will be more effective when framed as a benefit to family and future generations rather than when framed as a benefit to society and community. Similarly, stewardship will be more effective for achieving conservation of natural resources rather than preservation of natural resources.

The Chapter 3 results show that residents' landscaping preferences leaned towards bird-friendly designs, even in the baseline measurement, suggesting residents are amenable to native plant landscaping, but that their' preferences are not reflected the current landscaping practices in Raleigh, NC. These results also suggest that residents' preferences are flexible and that public information efforts regarding the benefit of native plant landscaping to birds offers a viable strategy for making urban areas more wildlife-friendly.

As the world becomes progressively more developed and urbanized, the role of private landowners will become more important to the future of wildlife conservation. Market-based conservation incentive programs and non-monetary conservation methods will become more important as government and other entities funding conservation efforts

become scarce. Urban areas will likely see a rise in human-wildlife conflicts as more and more wildlife are displaced from their native habitats due to development and sprawl. It is my hope that this collection of research will provide some direction to conservation practitioners in the coming years as they attempt to find ways engage private landowners in efforts to conserve wildlife species.

APPENDICES

Appendix A



North Carolina Private Landowner Conservation Programs Questionnaire



Your participation in this study is needed and appreciated no matter how you use your land. Your opinions and the information you provide are critical to help make private lands more profitable for landowners in North Carolina.

Questions in this survey refer to your property ownership in North Carolina. Please answer them to the best of your ability.

1. How many acres of property did you **OWN in total** in North Carolina in 2008?
(Fill in the blank; **do not** include property owned in other states)
Number of acres OWNED: _____ acres
2. Of the acres listed in question 1, what is the acreage for which you are a **primary decision maker**? (Fill in the blank)
Number of acres: _____ acres
3. How many acres of your North Carolina property did you **lease out** in 2008?
(Fill in the blank)
Number of acres LEASED OUT: _____ acres
4. Was your property used to generate income in 2008? (Check no or yes)
 No - (if "No", please skip to question 8 on the next page)
 Yes - (if "Yes", please continue to question 5)
5. Was the income generated from your property the **primary source** of your income in 2008? (Check no or yes)
 No
 Yes
6. What percent of your total household income was generated from activities on your property in 2008? (Fill in the blank) _____%
7. Did you have a hunting lease arrangement on your property in 2008?
(Check no or yes)
 No
 Yes

For all remaining questions, please think about the **LARGEST TRACT** of your property in **NORTH CAROLINA** for which you were a **PRIMARY DECISION MAKER in 2008**

8. What is the **acreage** of your **largest tract** of **North Carolina property**?

(Fill in the blank) _____ acres

9. **How long** has your **largest tract** of North Carolina property been in your extended family?

(Fill in the blank) _____ years

10. In what **county** is your largest tract of property located?

(Fill in the blank) _____

11. In what **zip code** is your largest tract of property located?

(Fill in the blank) _____

12. Approximately **how many acres** of your **largest tract** of property is taken up in the following land types: (Fill in an **acre** amount for each land type; the **total should be the same amount you listed in question 8**; if a type does not apply, please enter 0; please do not give percentages)

_____ Planted forests (planted pine and/or hardwood trees)

_____ Natural forests (unplanted pine and/or hardwood trees)

_____ Cutover (recent timber harvest where most trees have been removed)

_____ Row crops, orchards and vineyards

_____ Pasture and/or hay fields (lands for livestock grazing and/or hay crops)

_____ Fallow fields, abandoned fields and natural grassland/shrubs

_____ Reservoirs, water impoundments, ponds, lakes, rivers, streams and wetlands

_____ Residences and/or structures (houses, yards, out-buildings, production facilities and/or other structures)

_____ Other land use type (please specify) _____

_____ **TOTAL (your total should equal the number of acres you indicated in question 8)**

The following questions concern your views about stewardship and landowner rights.

13. Do you consider yourself to be a steward of the land? (Check no or yes)

- Yes - (if "Yes", please continue to question 14)
 No - (if "No" please use the lines below to tell us why, then skip to question 15):



14. What motivates you to be a steward of the land? (Check all that apply)

- Future generations
 God
 Society
 The land
 Yourself
 Your community
 Your family
 Other (please specify) _____

15. What does being a steward of the land mean to you? (Check all that apply)

- Controlling pollution
 Implementing conservation farming practices
 Maintaining your property
 Maintaining high crop production
 Using natural resources wisely
 Leaving natural resources untouched
 Other (please specify) _____

16. Would payments for conservation practices help you be a better steward of the land?
 (Check one)

- No
 Yes
 Unsure

17. Please indicate the extent to which you agree or disagree with each of the following statements: (Circle one choice per statement; 1 = Strongly Disagree, 4 = Neutral, 7 = Strongly Agree)

	Strongly Disagree		Neutral				Strongly Agree
	1	2	3	4	5	6	7
	←—————→						
a) My landowner rights include the <i>right to exclude others</i> from access to my land	1	2	3	4	5	6	7
b) My landowner rights include the <i>right to transfer ownership</i> of my land to others without restriction	1	2	3	4	5	6	7
c) My landowner rights allow me the <i>exclusive use</i> of the natural resources provided by the land	1	2	3	4	5	6	7
d) My landowner rights include the <i>absolute right</i> to do whatever I want with my land without regard for what others prefer	1	2	3	4	5	6	7
e) Restrictions on my rights as a landowner are a <i>threat to my civil liberty</i>	1	2	3	4	5	6	7
f) My rights as a landowner have become <i>increasingly restricted</i> over time	1	2	3	4	5	6	7
g) My landowner rights obligate me to be a <i>good steward of my land</i> and to maintain it in good condition for future generations	1	2	3	4	5	6	7
h) My landowner rights should obligate me to <i>leave the land in better shape</i> than when I acquired it	1	2	3	4	5	6	7
i) My landowner rights must be sensitive to <i>values and interests of society at large</i>	1	2	3	4	5	6	7
j) My landowner rights should obligate me to <i>take into account the values and interests of society at large</i>	1	2	3	4	5	6	7
k) My landowner rights place <i>no obligations on me</i>	1	2	3	4	5	6	7
l) Natural resources on my land <i>belong to society</i> , which allows the public to restrict land uses that cause resource damage	1	2	3	4	5	6	7
m) My landowner rights allow me to do anything with my land so long as my actions <i>do not infringe upon my neighbors' rights</i>	1	2	3	4	5	6	7
n) My landowner rights allow me to do anything with my land so long as my actions <i>do not conflict with the interests and values of the local community</i>	1	2	3	4	5	6	7

The following questions concern your experience with and interest in conservation programs.

18. In the past 5 years, have you participated in a program that paid you for land conservation? (Check no or yes)

- No - (if “No”, please continue to question 19)
- Yes - If “Yes”, which program(s)? (Check all that apply)
 - Conservation Reserve Program (CRP)
 - Conservation Reserve Enhancement Program (CREP)
 - Environmental Quality Incentive Program (EQIP)
 - Forest Land Enhancement Program (FLEP)
 - Partners for Fish and Wildlife Program
 - Wetland Reserve Program (WRP)
 - Wildlife Habitat Incentives Program (WHIP)
 - A conservation or mitigation banking program
 - A state agricultural cost share program for soil and water
 - A state forestry cost share program
 - A conservation easement with a land trust
 - I have participated in a program, but I don’t know which program
 - Other (please specify) _____

19. In a **conservation easement**, a landowner sells development rights for their property. This creates a legally enforceable agreement between the landowner and the easement holder that restricts real estate development for the length of the easement. Landowners cannot remove the development restrictions from their property deed.

Would you place your property in a **conservation easement**? (Check yes or no)

- Yes - (If “Yes”, please continue to question 20)
 - No - (if “No” please use the lines below to tell us why, then skip to question 22 on the next page):
- _____
- _____
- _____



20. Please check the boxes below **all** the easement lengths (in years) you would consider:

1	5	10	15	20	25	30	50	Permanent
<input type="checkbox"/>								

←—————→
easement length in years

21. How many acres of your property would you place in an easement?
(Fill in the blank) _____ acres

22. In a **conservation contract**, a landowner agrees to implement specific conservation actions on their property in return for payment. Landowners can choose to terminate the contract at any time by returning all payment. **We want to know if you would apply for various types of conservation contracts.**

Would you apply for a conservation contract that paid you to **restrict real estate development** on your property? (Check yes or no)



- Yes - (if “Yes”, please continue to question 23)
- No - (if “No” please use the lines below to tell us why, then skip to question 26 on the next page):

23. Please check the boxes below **all** the contract lengths (in years) you would consider:

1	5	10	15	20	25	30	50	Permanent
<input type="checkbox"/>								

←—————→
conservation contract length in years

24. How many acres of your property would you include in the conservation contract that **restricts real estate development**?
(Fill in the blank) _____ acres

25. Please indicate the extent to which you agree or disagree that each of the following organizations **would be best to oversee** this type of conservation contract on private property: (Circle one choice per line; 1 = Strongly Disagree, 4 = Neutral, 7 = Strongly Agree)

	Strongly Disagree		Neutral			Strongly Agree	
	1	2	3	4	5	6	7
a) N.C. Cooperative Extension Service (County Extension Agents)	1	2	3	4	5	6	7
b) N.C. Wildlife Resources Commission	1	2	3	4	5	6	7
c) U.S. Department of Defense	1	2	3	4	5	6	7
d) U.S. Fish and Wildlife Service	1	2	3	4	5	6	7
e) U.S. Department of Agriculture	1	2	3	4	5	6	7
f) The Nature Conservancy	1	2	3	4	5	6	7
g) N.C. Farm Bureau	1	2	3	4	5	6	7
h) Other (specify)_____	1	2	3	4	5	6	7

26. Would you apply for a conservation contract to be paid to **restore and maintain habitat for endangered wildlife** on your property? (Check yes or no)



- Yes - (if “Yes”, please continue to question 27)
- No - (if “No” please use the lines below to tell us why, then skip to question 30 on the next page):

27. Please check the boxes below **all** the contract lengths (in years) you would consider:

1	5	10	15	20	25	30	50	Permanent
<input type="checkbox"/>								

←—————→

conservation contract length in years

28. How many acres of your property would you include in the conservation contract to **restore and maintain habitat for endangered wildlife**? (Fill in the blank) _____ acres

29. Please indicate the extent to which you agree or disagree that each of the following organizations **would be best to oversee** this type of conservation contract on private property: (Circle one choice per line; 1 = Strongly Disagree, 4 = Neutral, 7 = Strongly Agree)

	Strongly Disagree	Neutral					Strongly Agree
	1	2	3	4	5	6	7
a) N.C. Cooperative Extension Service (County Extension Agents)	1	2	3	4	5	6	7
b) N.C. Wildlife Resources Commission	1	2	3	4	5	6	7
c) U.S. Department of Defense	1	2	3	4	5	6	7
d) U.S. Fish and Wildlife Service	1	2	3	4	5	6	7
e) U.S. Department of Agriculture	1	2	3	4	5	6	7
f) The Nature Conservancy	1	2	3	4	5	6	7
g) N.C. Farm Bureau	1	2	3	4	5	6	7
h) Other (specify)_____	1	2	3	4	5	6	7

30. Would you apply for a conservation contract to be paid for **energy crops grown on your property**? (Check yes or no)



- Yes - (if “Yes”, please continue to question 31)
- No - (if “No” please use the lines below to tell us why, then skip to question 34 on the next page):

31. Please check the boxes below **all** the contract lengths (in years) you would consider:

1	5	10	15	20	25	30	50	Permanent
<input type="checkbox"/>								

←————— conservation contract length in years —————→

32. How many acres of your property would you include in the conservation contract for **energy crops grown on your property**? (Fill in the blank) _____ acres

33. Please indicate the extent to which you agree or disagree that each of the following organizations **would be best to oversee** this type of conservation contract on private property: (Circle one choice per line; 1 = Strongly Disagree, 4 = Neutral, 7 = Strongly Agree)

	Strongly Disagree	Neutral					Strongly Agree
	1	2	3	4	5	6	7
a) N.C. Cooperative Extension Service (County Extension Agents)	1	2	3	4	5	6	7
b) N.C. Wildlife Resources Commission	1	2	3	4	5	6	7
c) U.S. Department of Defense	1	2	3	4	5	6	7
d) U.S. Fish and Wildlife Service	1	2	3	4	5	6	7
e) U.S. Department of Agriculture	1	2	3	4	5	6	7
f) The Nature Conservancy	1	2	3	4	5	6	7
g) N.C. Farm Bureau	1	2	3	4	5	6	7
h) Other (specify)_____	1	2	3	4	5	6	7

34. Would you apply for a conservation contract to be paid to **reduce greenhouse gases by planting and growing trees** on your property? (Check yes or no)



- Yes - (if “Yes”, please continue to question 35)
- No - (if “No” please use the lines below to tell us why, then skip to question 38 on the next page):

35. Please check the boxes below **all** the contract lengths (in years) you would consider:

1	5	10	15	20	25	30	50	Permanent
<input type="checkbox"/>								

←————— conservation contract length in years —————→

36. How many acres of your property would you include in the conservation contract to **reduce greenhouse gases by planting and growing trees** on your property? (Fill in the blank) _____ acres

37. Please indicate the extent to which you agree or disagree that each of the following organizations **would be best to oversee** this type of conservation contract on private property: (Circle one choice per line; 1 = Strongly Disagree, 4 = Neutral, 7 = Strongly Agree)

	Strongly Disagree		Neutral			Strongly Agree	
	1	2	3	4	5	6	7
a) N.C. Cooperative Extension Service (County Extension Agents)	1	2	3	4	5	6	7
b) N.C. Wildlife Resources Commission	1	2	3	4	5	6	7
c) U.S. Department of Defense	1	2	3	4	5	6	7
d) U.S. Fish and Wildlife Service	1	2	3	4	5	6	7
e) U.S. Department of Agriculture	1	2	3	4	5	6	7
f) The Nature Conservancy	1	2	3	4	5	6	7
g) N.C. Farm Bureau	1	2	3	4	5	6	7
h) Other (specify)_____	1	2	3	4	5	6	7

38. Would you apply for a contract to be paid to allow the U.S. Department of Defense to conduct **military training** on your property? (Check yes or no)



- Yes - (if “Yes”, please continue to question 39)
- No - (if “No” please use the lines below to tell us why, then skip to question 42 on the next page):

39. Please indicate which types of **military training** you would allow the U.S. Department of Defense to conduct on your property (Check yes or no for each line)

	Yes	No
a) Personnel Maneuvers - soldiers patrol the property on foot	<input type="checkbox"/>	<input type="checkbox"/>
b) Bivouac - soldiers set up tents and stay overnight on the property	<input type="checkbox"/>	<input type="checkbox"/>
c) Vehicle Maneuvers - wheeled vehicles travel on and off road within the property	<input type="checkbox"/>	<input type="checkbox"/>
d) Helicopter Landing Zones – helicopter landing on the property in a rectangular area of 1000 ft x 1000 ft with vegetation reduced to no more than 1 ft high	<input type="checkbox"/>	<input type="checkbox"/>

40. Please check the boxes below **all** the contract lengths (in years) you would consider:

1 5 10 15 20 25 30 50 Permanent

←————— contract length in years —————→

41. How many acres of your property would you include in the contract to allow the U.S. Department of Defense to conduct **military training** on your property? (Fill in the blank) _____ acres

42. Please indicate the extent to which you think that each of the following issues is important: (Circle one choice per line; 1 = Not Important At All, 4 = Neutral, 7 = Extremely Important.)

	Not Important At All		Neutral			Extremely Important	
	1	2	3	4	5	6	7
	←—————→						
a) Endangered species conservation	1	2	3	4	5	6	7
b) Game species conservation	1	2	3	4	5	6	7
c) Open space conservation	1	2	3	4	5	6	7
d) Soil conservation	1	2	3	4	5	6	7
e) Wetlands conservation	1	2	3	4	5	6	7
f) New plant-based energy sources	1	2	3	4	5	6	7
g) Climate change	1	2	3	4	5	6	7
h) Military preparedness	1	2	3	4	5	6	7

The following questions concern the plans you may have for your property & your retirement.

43. What plans do you have for your property upon your retirement? (Check all that apply)

- I have already retired
- Maintain ownership
- Transfer it to a relative(s)
- Sell it
- Donate it to a land trust
- Unsure
- Other (please specify) _____

44. What plans do you have for your property upon your death? (Check all that apply)

- Transfer it to a relative(s)
- Sell it
- Donate it to a land trust
- Unsure
- Other (please specify) _____

45. Do you have a will or living trust in place that describes your plans for your property?
(Check no or yes)

No

Yes

46. Please indicate the extent to which you agree or disagree with each of the following statements: (Circle one choice per statement; 1 = Strongly Disagree, 4 = Neutral, 7 = Strongly Agree)

	Strongly Disagree	Neutral			Strongly Agree		
	1	2	3	4	5	6	7
							
a) I plan to sell or transfer my land before I retire	1	2	3	4	5	6	7
b) It is important to me that my land stay in my family	1	2	3	4	5	6	7
c) I would never consider selling the development rights to my land	1	2	3	4	5	6	7
d) The price I could get from selling my land would be more important than who I sold it to	1	2	3	4	5	6	7
e) I would sell the development rights to my land before I would sell my land	1	2	3	4	5	6	7
f) I would do whatever it takes to maintain ownership of my land	1	2	3	4	5	6	7
g) Nothing could influence or change the plans I have for my land	1	2	3	4	5	6	7

In order for us to more fully understand your responses to the previous questions, we need to know a few things about your background. Remember that your responses are *completely confidential* and that neither your name nor your address will be directly linked to your responses in any way.

47. Are you male or female? (Check **one**)

Male

Female

48. Do you or any members of your household hunt? (Check no or yes)

No

Yes

49. What is your employment status now? (Check all that apply)

- Self-employed
- Full-time
- Part-time
- Unemployed
- Disabled, unable to work
- Retired

50. What is your main occupation? (Fill in blank; if you are currently retired or unemployed, please write your last occupation) _____

51. How long to do you plan to maintain ownership of your property: (Check one)

- Less than a year
- 1-2 years
- 3-5 years
- 6-9 years
- 10-14 years
- 15-19 years
- 20-25 years
- 25+ years
- Other (please specify) _____

52. Have you, your spouse or your children ever served in the United States military?
(Check no or yes)

- No
- Yes - If "Yes", what branch(s)? (Check all that apply)
 - U.S. Air Force
 - U.S. Army
 - U.S. Coast Guard
 - U.S. Marine Corps
 - U.S. Navy

53. What is the highest level of schooling/education you have completed? (Check **one**)

- Elementary school
- Middle school
- High school or GED
- Vocational, technical, trade school or certificate program
- Some college course work (no degree)
- Associates degree (2 year degree)
- Bachelors degree (4 year degree)
- Some graduate study (no degree)
- Masters degree
- Doctoral degree
- Professional degree

54. What is your marital status? (Check one)

- Divorced
- Married
- Separated
- Single
- Widowed/Widower
- Other (please specify)_____

55. Including yourself, how many adults (18 years old or older) live in your household?
(Fill in the blank): _____ adults

56. How many children (under 18 years old) live in your household?
(Fill in the blank; if none, please enter "0"): _____ children

57. In what year were you born? (Fill in the blank) 19_____

58. What is your political affiliation? (Check **one**)

- Republican
- Independent
- Democrat
- Other (please specify) _____

59. What is your race/ethnicity? (Check all that apply)

- White/Caucasian
- Hispanic/Latino American
- African American/Black
- Indian/Alaska Native
- Asian
- Native Hawaiian or Other Pacific Islander
- Other (please specify) _____

60. What was your total household income in 2008, from all sources, before taxes?
(Check one)

- \$14,999 or less
- \$15,000 - 24,999
- \$25,000 - 34,999
- \$35,000 - 44,999
- \$45,000 - 54,999
- \$55,000 - \$64,999
- \$65,000 - \$74,999
- \$75,000 - \$99,999
- \$100,000 - \$124,999
- \$125,000 - \$149,999
- \$150,000 - \$174,999
- \$175,000 or more

Please use the remaining space to share any additional comment with us.

Please return your completed survey to your NCFB Representative.

Questions and comments should be directed to Shari Rodriguez at slrodrig@ncsu.edu or by phone at (919) 515-7587 at the Fisheries and Wildlife Sciences office at NC State.

THANK YOU for your participation!

Appendix B

**Assessing Private Landowner Interest in
Conservation Incentive Programs:
A Report for Marine Corps Installations East and
the North Carolina Farm Bureau**



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July 2010



Executive Summary

Rapid population growth and suburban sprawl in Eastern North Carolina (NC), in particular, threatens not only environmental health and ecosystem services, but rural working lands and their associated economies, and the U.S. Department of Defense's (US DOD) ability to maintain military readiness. To begin addressing these issues, we conducted a study to: gauge landowner interest in conservation incentive programs designed to pay landowners for protecting ecosystem services; compare levels of interest based on program type, agreement duration and enrollment acreage; assess landowner preferences for which organizations might manage the programs; and determine socio-demographic predictors of landowner interest in incentive programs.

We used a survey questionnaire to sample North Carolina Farm Bureau (NCFB) county board members in all 100 counties in the state (referred to as "NCFB"), and a random selection of private landowners in 18 counties in Eastern NC (referred to as "Lejeune 18"). We received 735 responses from the NCFB survey administration for a response rate of 78.3% (margin of error = 1.69%). We received 921 responses to the Lejeune 18 mail survey, for a response rate of 31.0% (margin of error = 2.66%). The typical respondent among both respondent groups was: male, white, married, employed in the farm/agriculture industry and owned an average of 263 (NCFB) and 339 (Lejeune 18) acres.

More than 30% of landowners in both surveys indicated they would be interested in placing approximately 2/3 of their land in a conservation easement prohibiting development. The majority of respondents indicated they would apply for a conservation contract that would restrict real estate development (NCFB = 57.1%; Lejeune 18 = 53.3%). The most popular conservation contract length for this type of contract was 10 years for both groups and average number of acres respondents indicated they would place into a contract for real estate restrictions were 145 (NCFB) and 205 (Lejeune 18) acres. NCFB respondents gave the NCFB the highest average rating at (4.83 out of 7) for the preferred managing organization, while the Lejeune 18 group rated the NC Cooperative Extension Service highest (4.54).

Nearly half of NCFB (45.1%) and just over half of the Lejeune 18 (50.3%) respondents indicated they would apply for a conservation contract for developing endangered species habitat. Both groups showed preference for the 10 year contract length and the average number of acres respondents indicated they would place into an endangered species habitat contract was 92 (NCFB) and 161 (Lejeune 18). NCFB respondents gave the highest average rating to the NCFB (4.55 out of 7) as the organization to oversee an endangered species habitat contract, while the Lejeune 18 group gave the highest rating to the NC Wildlife Resources Commission (5.06).

Most respondents (NCFB = 57.2%; Lejeune 18 = 51.3%) indicated they would apply for a contract to grow energy crops on their land. The most popular conservation contract length for this type of contract was 5 years in both groups (NCFB = 45.2%; Lejeune 18 = 47.7%). The average number of acres respondents indicated they would place into a contract for growing energy crops was 86 (NCFB) and 146 (Lejeune 18). The NC Cooperative Extension Service received the highest average rating for the organization to oversee an energy crops contract from both groups (NCFB = 5.01; Lejeune 18 = 4.87).

Approximately half of the respondents from both groups (NCFB = 47.9%; Lejeune 18 = 51.3%) indicated they would apply for a contract to grow trees on their property to reduce greenhouse gases. Both groups showed preference for the 20 year contract, however, the Lejeune 18 respondents also showed interest in the 10 year contract. The average number of acres respondents indicated they would place into a contract for planting and growing trees was 83 (NCFB) and 161 (Lejeune 18). Both groups gave the highest average rating to the NC Cooperative Extension Service as the organization to oversee a contract for reducing greenhouse gases.

Respondents who were interested in conservation easements indicated they would place more than 50% of their land into an easement (NCFB = 50.1%, Lejeune 18 = 64.2%). A relatively small portion of respondents (NCFB = 15.7%; Lejeune 18 = 25.5%) were interested contracts for allowing the US DOD to conduct military training on their land. The most popular contract length for both groups was 5 years (NCFB = 48.9%, Lejeune 18 = 46.3%).

We used regression analyses to predict which landowners might be more likely to be interested in the incentive programs we studied. Our findings show that as the age of our respondent increased, they were progressively less likely to be interested in incentive programs. Respondents who had participated in the Natural Resources Conservation Service's Conservation Reserve Program in the past were more likely to be interested than those who had not. Lastly, respondents who ranked endangered species conservation as an important issue were likely to be interested not only in endangered species habitat contracts, but several other programs as well.

Study findings indicate sufficient landowner interest to develop conservation contract programs in Eastern NC involving prohibiting real estate development, restoring and maintaining endangered species habitat, growing energy crops, and growing trees to reduce greenhouse gases. Study results also indicate private landowners are interested in providing military training opportunities on their land. In most cases, landowner interest surpasses potential supply for contracts so competition will likely be stiff for contracts and drive down costs. Competition will also allow funding entities to encourage contract attributes of interest (e.g., longer durations).

The successful implementation of conservation incentive programs for private landowners would be a positive step towards maintaining and/or increasing NC's environmental health, ecosystem services, rural working lands and their associated economies, as well as a positive step towards keeping human encroachment around our military bases at bay so that the US DOD can maintain military readiness.

Section 1: Introduction

In the United States, over 60% of the land is privately owned. These lands provide 99% of the nation's croplands, 61% of grasslands and pasture, and 56% of forest-use land. Moreover, over 75% of endangered species in the U.S. rely on private lands for habitat (Lockwood, 1998; Turner & Rylander, 1998). Although private lands dominate the U.S. landscape, conservation efforts have historically focused largely on public lands (Knight, 1999). Private working lands are being lost to commercial and residential development at rates rarely seen in history (Knight, 1999). Wilcove et al (1998) noted that conversion of land to commercial development was responsible for harming over 400 federally listed or proposed species of plants and animals. Similarly, population growth and suburban sprawl have led to loss of habitat and ecosystem services, as well as an increase in endangered species, while declines in economic profitability for small and medium size farms make the loss of working lands to suburban sprawl more problematic.

In North Carolina (NC), approximately 84% of the land is privately owned (North Carolina Wildlife Resources Commission, 2005) and rapid population growth and suburban sprawl threatens wildlife habitat, environmental health, ecosystem services, working lands, rural economies and the U.S. Department of Defense's (US DOD) ability to maintain military readiness. Private landowners, therefore, play a critical role in determining the fate of NC's natural resources and the nation's ability to defend our people and protect our resources (Natural Resources Conservation Service (NRCS), 2000). To help begin addressing these issues, we conducted a study to: 1) gain a better understanding of private landowners statewide and in particular in Eastern NC where there is a greater risk for working land loss to development; 2) gauge landowner interest in incentive programs for a variety of programs designed to pay landowners for protecting ecosystem services; 3) compare levels of interest based on program type, agreement duration, and enrollment acreage; 4) assess landowner preferences for which organizations might manage the programs; and 5) determine socio-demographic predictors of landowner interest in incentive programs for a variety of program types and ecosystem services.

This study represents one of the first assessments of private landowner interest in ecosystem service markets in NC, and the first such study to address interest at a state level and with a random sample of landowners. One notable study addresses landowner interest in incentives to conserve red wolf habitat in NC (Kramer & Jenkins, 2009), and should provide additional information relevant to market-based conservation solutions in Eastern NC. The results of this study can be used to design incentive programs for private landowners in NC.

In their continual effort to promote sustainable working lands and to ensure the farmer's voice is heard, the North Carolina Farm Bureau (NCFB) supported the survey of NCFB county board members. Similarly, Marine Corp Installations East (MCIEast) supported the survey of private landowners in the 18 county study area as a part of their effort to promote regional solutions for maintaining military readiness, particularly those involving natural resource conservation, open space conservation and compatible land use.

Section 2: Methods

To better understand private landowners in NC and their level of interest in incentive programs, we conducted a two part study using a survey questionnaire to sample: 1) North Carolina Farm Bureau (NCFB) county board members in all 100 counties in NC, and 2) private landowners in 18 counties in Eastern NC (Figure 1). We promoted design validity using a pretest involving interviews with landowners in 7 NC counties ($n = 61$) and with review by experts from NC State University, NC State Cooperative Extension Service, NCFB and MCIEast.



Figure 1: NCFB and Lejeune 18 study areas

For the first part of our study, a survey questionnaire was administered in person to NCFB county board members in 100 counties in the state. For the purposes of this report, we refer to this survey administration as “NCFB”. NCFB field agents, or the principal investigator, administered the surveys at county board meeting with the first and last survey administrations occurring on March 19, 2009 and October 22, 2009, respectively. With 500,000 members state-wide, NCFB has more members than any other state Farm Bureau organization and is the state’s largest farm organization. Board members are member-elected and serve as decision makers, key opinion leaders and representatives on farm and rural issues at the county level.

Seven county boards (Camden, Cherokee, Chowan, Durham, Graham, Lee and Madison) refused the survey administration at the board level, and thus were not included in the overall response rate. Of the remaining 93 county boards to which the survey was administered, the board members of 4 counties (Alleghany, Currituck, Tyrrell and Washington) chose not to participate in the survey at an individual level; however, since the survey was administered to those 4 boards, their numbers are included in the overall response rate of the survey.

For the second part of our study, a survey questionnaire was administered by mail to 3,000 private landowners in 18 counties in eastern NC (i.e., Beaufort, Brunswick, Carteret, Columbus, Craven, Dare, Duplin, Edgecombe, Halifax, Onslow, Hyde, Jones, Lenoir, Nash, Pamlico, Pender, Tyrrell, Washington). For the purposes of this report, we refer to this survey administration as “Lejeune 18” or “L18”. Tax rolls were obtained from the county tax assessor office for each of the 18 counties. We removed all non-private landowners (e.g., corporations, development companies and mobile home park companies) from the list of landowners. We targeted large properties by removing private landowners owning properties smaller than 50 acres. For private landowners owing multiple properties throughout the 18 county study area, we removed all but the largest property (over 50 acres). The remaining list of approximately 10,000 landowners was our Lejeune 18 sample frame.

We then randomly selected 3,000 private landowners to survey. We used a mailing procedure modified from Dillman (2000). Each landowner was mailed a pre-notification letter followed by a questionnaire packet (an envelope containing: a cover letter explaining the purpose of the study, a return-ready questionnaire booklet with prepaid return postage and a sticker to seal the booklet for return). Subsequent mailings included a thank you/reminder postcard, a 2nd questionnaire packet and a 3rd questionnaire packet. However, to prevent unnecessary mailings, respondents were removed from the sample once we received their returned survey. All Lejeune 18 mailings were done between August 7, 2009 and December 7, 2009.

Section 3: Survey Design

The survey instrument included 60 questions for the NCFB survey and 61 questions for the Lejeune 18 survey (a question on urban background was added to the Lejeune 18 survey administration). The areas of inquiry in the surveys included land ownership, land use and characteristics, conservation issues, private land stewardship, property rights orientations, hypothetical incentive programs and socio-demographic information.

Questions involving 6 hypothetical incentive programs accounted for more than a third of the survey (questions 19-41). Respondents were given a brief definition of a conservation easement and asked if they would place their property in a conservation easement, what easement lengths they would consider (1, 5, 10, 15, 20, 25, 30, 50 years and permanent) and how many acres they would consider placing in the easement. Respondents were then given a brief definition of a conservation contract. For each of 4 conservation contract types (i.e., real estate restriction, endangered species habitat, energy crops and greenhouse gas reduction) the respondents were asked if they would apply for the conservation contract, what contract lengths they would consider (1, 5, 10, 15, 20, 25, 30, 50 years and permanent), how many acres they would include in the contract and their preference for managing organizations (7 point likert scales asking respondents to agree or disagree that the listed organizations would be best to oversee the given contract, where 1 = strongly disagree and 7 = strongly agree). Lastly, respondents were asked if they would apply for a contract to allow the US DOD to conduct military training on their property, what types of military training they would allow on their property, what contract lengths they

would consider (1, 5, 10, 15, 20, 25, 30, 50 years and permanent) and how many acres they would include in the contract.

To measure respondents' property rights orientations, we used 14 attitudinal statements (7 point likert scales where 1 = strong disagreement, and 7 = strong agreement) designed to capture the landowner's orientation towards individual rights and social responsibilities orientations (Jackson-Smith, Kreuter, & Krannich, 2005). Jackson-Smith et al (2005) used a principle-components factor analysis of 7 of these questions to create an omnibus property rights orientation (PRO) attitudinal scale to measure the variation in property rights orientations.

Finally, we included questions designed to assess the respondent's views on the importance of several conservation and public issues (7 point likert scales where 1 = not important at all, and 7 = extremely important) including military preparedness and endangered species and game species conservation.

Section 4: Data Analysis

All data were coded and entered twice into M.S. Excel, the second time to identify and eliminate errors made during the first entry. We used the Statistical Package for Social Sciences (SPSS) Windows version 16.0 to run all statistical analyses that were not run in Excel.

Section 5: Results

5.1 NCFB Survey

5.1.1 NCFB Survey Response, Land Characteristics and Demographics

We received 735 responses from county board members from 93 counties in the NCFB survey administration. We were able to use 668 of the returned surveys (Table 1). Our response rate was 78.3% with a margin of error of 1.69%.

County	#	County	#	County	#	County	#
Alamance	14	Dare	3	Lincoln	3	Rowan	6
Alexander	2	Davidson	10	Macon	5	Rutherford	10
Alleghany	0	Davie	7	Martin	8	Sampson	8
Anson	7	Duplin	14	McDowell	1	Scotland	6
Ashe	9	Edgecombe	13	Mecklenburg	8	Stanly	12
Avery	4	Forsyth	6	Mitchell	6	Stokes	6
Beaufort	10	Franklin	11	Montgomery	10	Surry	1
Bertie	6	Gaston	9	Moore	8	Swain	2
Bladen	7	Gates	6	Nash	12	Transylvania	7
Brunswick	6	Granville	12	New Hanover	4	Tyrrell	0
Buncombe	10	Greene	6	Northampton	3	Union	10
Burke	8	Guilford	11	Onslow	6	Vance	9
Cabarrus	5	Halifax	9	Orange	9	Wake	7
Caldwell	5	Harnett	8	Pamlico	5	Warren	11
Carteret	9	Haywood	4	Pasquotank	4	Washington	0
Caswell	10	Henderson	1	Pender	4	Watauga	8
Catawba	11	Hertford	4	Perquimans	10	Wayne	8
Chatham	16	Hoke	6	Person	16	Wilkes	6
Clay	4	Hyde	6	Pitt	11	Wilson	13
Cleveland	14	Iredell	8	Polk	5	Yadkin	5
Columbus	4	Jackson	2	Randolph	10	Yancey	5
Craven	5	Johnston	22	Richmond	7	TOTAL	668
Cumberland	4	Jones	3	Robeson	3		
Currituck	0	Lenoir	9	Rockingham	10		

Table 1: Usable responses from each participating NCFB county advisory board

All but 10 respondents claimed to own land. The average number of acres owned was 236.17. Respondents reported being the primary decision maker of an average of 260.66 acres, and the average number of acres leased out was 42.60. The majority of respondents (92.1%) indicated their property was used to generate income in 2008, and 56.7% of those respondents indicated that income generated from their property was their primary source of income. The average percent of household income coming from activities on their property in 2008 was 52.3%. Only 20.0% of respondents indicated they had a hunting lease arrangement on their property in 2008. Nearly 42% of NCFB respondents had participated in a land conservation program in the past 5 years; the type of program respondents indicated the most past participation in was a state cost share program (58.4%). The majority of respondents (79.0%) indicated they planned to maintain ownership of their property for 25 years or more (this included respondents who indicated they would maintain ownership of their property ‘forever’, ‘until death’ or ‘as long as possible’). Most respondents planned to maintain ownership of their property (57.0%) or transfer it to relatives (56.0%) upon retirement, and nearly all respondents intended to transfer their land to relatives upon their death (90.0%). Seventy percent of respondents had a will or living trust describing their plans for their land upon their death in place.

The average size of the largest tract of property and number of years the largest tract had been in the respondents extended family was 141.86 acres and 63.79 years, respectively. Forest (planted, natural and cutover) and agriculture were the dominant land uses (Table 2).

	Acres (mean)
Planted forests (planted pine and/or hardwood trees)	35.19
Natural forests (unplanted pine and/or hardwood trees)	37.74
Cutover (recent timber harvest where most trees have been removed)	7.73
Row crops, orchards and vineyards	70.13
Pasture and/or hay fields (lands for livestock grazing and/or hay crops)	28.98
Fallow fields, abandoned fields and natural grassland/shrubs	1.67
Reservoirs, water impoundments, ponds, lakes, rivers, streams and wetlands	2.82
Residences and/or structures (houses, yards, out-buildings, production facilities and/or other structures)	3.57
Other land use type	3.80

Table 2: NCFB Respondent Land Use

The average respondent was: male, white, 58.41 years old, married, a democrat, self-employed, held a farm/agricultural-related occupation, had 2.09 adults (18 years old and over) and 0.44 children (under 18 years old) living in their household, had some college coursework without a degree and had a median annual household income of \$70,000 (Table 3).

Question	Demographic	Statistic
47	Gender	93.7% male
49	Employment Status	62.2% self-employed
50	Occupation	77.6% farm/agricultural-related
53	Education	some college level education (mean)
54	Marital Status	89.1% Married
55	Adults in household	2.09 (mean)
56	Children in household	0.44 (mean)
57	Age	58.41 years old (mean)
58	Political affiliation	50.0% Democrat
59	Race	96.6% white
60	Household income	\$70K (median)

Table 3: NCFB Respondent Demographics

5.1.2 NCFB Conservation Easements (Questions 19-21)

Respondents were given the following definition of a conservation easement: “In a conservation easement, a landowner sells development rights for their property. This creates a legally enforceable agreement between the landowners and the easement holder that restricts real estate development for the length of the easement. Landowners cannot remove the development restrictions from their property deed.” Respondents were then asked: “Would you place your property in a conservation easement?” Most respondents (60.8%) indicated they would not place their property in a conservation easement. Those who indicated interest in a conservation easement (39.2%) showed preference for a permanent conservation easement (Table 4). The average number of acres respondents indicated they would place in a conservation easement was 133.00.

Easement Length	Yes (%)	No (%)
1 year	12.1	87.9
5 years	19.2	80.8
10 years	31.4	68.6
15 years	13.9	86.1
20 years	25.2	74.8
25 years	15.5	84.5
30 years	19.3	80.7
50 years	14.3	85.7
Permanent	38.7	61.3

Table 4: Percent of NCFB respondents interested in conservation easements of various lengths

5.1.3 NCFB Real Estate Development Restrictions Contracts (questions 22-25)

Respondents were given the following definition of a conservation contract: “In a conservation contract, a landowner agrees to implement specific conservation actions on their property in return for payment. Landowners can choose to terminate the contract at any time by returning all payment”. Respondents were then asked: “Would you apply for a conservation contract that paid you to restrict real estate development on your property?” The majority of respondents indicated they would apply for a conservation contract that would restrict real estate development (57.1%). The most popular conservation contract length for this type of contract was 10 years (Table 5). The average number of acres respondents indicated they would place into a contract for real estate restrictions was 145.09. With regard to which organization respondents think would be best to oversee a real estate restriction contract, NCFB received the highest average rating at 4.83, with the NC Cooperative Extension Service (NC Coop Ext) receiving a similar yet slightly lower ranking (Table 6).

Contract Length	Yes (%)	No (%)
1 year	17.3	82.7
5 years	27.3	72.7
10 years	38.1	61.9
15 years	16.8	83.2
20 years	23.1	76.9
25 years	14.4	85.6
30 years	15.6	84.4
50 years	12.6	87.4
Permanent	25.2	74.8

Table 5: Percent of NCFB respondents interested in real estate restriction contracts of various lengths

Organization	Average score (7 point scale)
NC Cooperative Extension Service	4.73
NC Wildlife Resources Commission	3.48
U.S. Department of Defense	2.16
U.S. Fish and Wildlife Service	2.97
U.S. Department of Agriculture	4.23
The Nature Conservancy	3.05
NC Farm Bureau	4.83

Table 6: NCFB respondent ratings of organizations to oversee real estate restriction contracts

5.1.4 NCFB Endangered Species Habitat Contracts (questions 26-29)

Respondents were asked: “Would you apply for a conservation contract that paid you to restore and maintain habitat for endangered species on your property?” Nearly half of respondents (45.1%) indicated they would apply. Respondents showed preference for the 10 year contract length (Table 7). The average number of acres respondents indicated they would place into an endangered species habitat restoration contract was 91.46. Respondents gave the highest average rating to the NCFB as the organization to oversee the contract, with NC Coop Ext ranked as a close second (Table 8).

Contract Length	Yes (%)	No (%)
1 year	15.4	84.6
5 years	36.1	63.9
10 years	40.2	59.8
15 years	16.2	83.8
20 years	17.7	82.3
25 years	9.0	91.0
30 years	10.9	89.1
50 years	5.6	94.4
Permanent	10.9	89.1

Table 7: Percent of NCFB respondents interested in contracts for endangered species habitat of various lengths

Organization	Average score (7 point scale)
NC Cooperative Extension Service	4.41
NC Wildlife Resources Commission	4.53
U.S. Department of Defense	2.17
U.S. Fish and Wildlife Service	3.79
U.S. Department of Agriculture	4.04
The Nature Conservancy	3.09
NC Farm Bureau	4.55

Table 8: NCFB respondent ratings of organizations to oversee endangered species habitat contracts

5.1.5 NCFB Energy Crops Contracts (questions 30-33)

Respondents were asked: “Would you apply for a conservation contract to be paid for energy crops grown on your property?” Most respondents (57.2%) indicated they would apply for a contract to grow energy crops on their land. The most popular conservation contract length for this type of contract was 5 years (Table 9). The average number of acres respondents indicated they would place into a contract for growing energy crops was 85.72. The NC Coop Ext received the highest average rating for the organization to oversee an energy crops contract (Table 10).

Contract Length	Yes (%)	No (%)
1 year	20.1	79.9
5 years	45.2	54.8
10 years	37.5	62.5
15 years	11.4	88.6
20 years	14.1	85.9
25 years	7.8	92.2
30 years	8.1	91.9
50 years	2.7	97.3
Permanent	4.8	95.2

Table 9: Percent of NCFB respondents interested in contract lengths for energy crops

Organization	Average score (7 point scale)
NC Cooperative Extension Service	5.01
NC Wildlife Resources Commission	3.08
U.S. Department of Defense	2.21
U.S. Fish and Wildlife Service	2.67
U.S. Department of Agriculture	4.63
The Nature Conservancy	2.66
NC Farm Bureau	4.70

Table 10: NCFB respondent ratings of organizations to oversee energy crops contracts

5.1.6 NCFB Greenhouse Gas Reduction Contracts (questions 34-37)

Respondents were asked: “Would you apply for a conservation contract to be paid to reduce greenhouse gases by planting and growing trees on your property?” Just over half of the NCFB respondents (52.1%) indicated they would not apply for a contract to grow trees on their property for greenhouse gas reduction. Those who indicated they would apply for a contract to grow trees on their property for greenhouse gas reduction (47.9%) showed preference for the 20 year contract (Table 11). The average number of acres respondents indicated they would place into a contract for planting and growing trees was 82.64. Respondents gave the highest average rating to the NC Coop Ext as the organization to oversee a contract for reducing greenhouse gases (Table 12).

Contract Length	Yes (%)	No (%)
1 year	12.5	87.5
5 years	21.9	78.1
10 years	28.4	71.6
15 years	17.3	82.7
20 years	32.4	67.6
25 years	16.9	83.1
30 years	24.1	75.9
50 years	8.6	91.4
Permanent	6.5	93.5

Table 11: Percent of NCFB respondents interested in contracts for reducing greenhouse gases of various lengths

Organization	Average score (7 point scale)
NC Cooperative Extension Service	4.84
NC Wildlife Resources Commission	3.32
U.S. Department of Defense	2.11
U.S. Fish and Wildlife Service	2.82
U.S. Department of Agriculture	4.66
The Nature Conservancy	2.87
NC Farm Bureau	4.62

Table 12: NCFB respondent ratings of organizations to oversee greenhouse gas reduction contracts

5.1.7 NCFB Military Training Contracts (questions 38-41)

Respondents were asked: “Would you apply for a contract to be paid to allow the US DOD to conduct military training on your property?” The majority of respondents (84.3%) indicated they would not apply for a contract to allow the US DOD to conduct active training on their property. The respondents who indicated interest in this type of contract (15.7%) showed a high level of interest in personnel maneuvers, bivouac and helicopter landing activities. Though lower than the other activities, the support for vehicle maneuver activities was still 58.47% (Table 13). The most popular contract length for military training contracts

was 5 years (Table 14), and the average number of acres respondents indicated they would place into a contract for military training was 153.42

Type of Training	Yes (%)	No (%)
Personnel Maneuvers	92.3	7.7
Bivouac	94.9	5.1
Vehicle Maneuvers	58.4	41.6
Helicopter Landing Zones	86.9	13.1

Table 13: Percent of NCFB respondents interested in types of military training

Contract Length	Yes (%)	No (%)
1 year	26.1	73.9
5 years	48.9	51.1
10 years	25.0	75.0
15 years	9.1	90.9
20 years	8.0	92.0
25 years	6.8	93.2
30 years	11.4	88.6
50 years	3.4	96.6
Permanent	2.3	97.7

Table 14: Percent of NCFB respondents interested in contracts for military training of various lengths

5.1.8 NCFB Programs Summary

Over one-third of NCFB respondents were interested in enrolling in conservation easements and preferred permanent duration easements (Table 15). Respondents indicated they would place an average of half of their property in an easement. Interest in contracts for real estate restrictions, endangered species habitat, energy crops and greenhouse gas reduction contracts was 45% or better with contract duration preferences of 10 years for contracts for real estate restrictions and endangered species habitat, 5 years for energy crop contracts and 20 years for greenhouse gas reduction contracts. The amount of property respondents indicated they would put into a contract depended on the contract focus but was equivalent to 30-50% of their property. The preferred organization to manage real estate restrictions and endangered species habitat contracts was NCFB, while the NC Coop Ext ranked highest for the energy crop and greenhouse gas reduction contracts. Lastly, interest in military training contracts was the lowest of all contract types, yet the number of acres respondents would place into the military training contract was the highest at nearly 60% of their average holdings. The preferred duration for the military training contract was 5 years.

NCFB	Interest Level: Yes (%)	Length Preference (years)	Acres (average)	Organization to oversee
Conservation Easement	39.2	permanent	133.00	
Real Estate Restriction Contract	57.1	10	145.09	NCFB
Endangered Species Habitat Contract	45.1	10	91.46	NCFB
Energy Crops Contract	57.2	5	85.72	NC Coop Ext
Greenhouse Gas Reduction Contract	47.9	20	82.64	NC Coop Ext
Military Training Contract	15.7	5	153.42	

Table 15: Summary of NCFB respondents' interest levels in all programs

5.2 Lejeune 18 Survey

5.2.1 *Lejeune 18 Survey Response, Land Characteristics and Demographics*

We received 921 responses to our 18 county mail survey, 886 of which we were able to use. Our response rate was 31.0%, with a margin of error of 2.7%. The average number of acres owned was 338.82. Respondents claimed to be the primary decision maker of an average of 302.12 acres, and the average number of acres leased out was 124.18. The majority of respondents (78.5%) indicated their property was used to generate income in 2008, and 19.0% of those respondents indicated that income generated from their property was their primary source of income. The average percent of household income coming from activities on their property in 2008 was 21.5%. Only 22.0% of respondents indicated they had a hunting lease arrangement on their property in 2008. More than a quarter of the respondents (26.4%) indicated they had participated in a land conservation program in the past 5 years, Conservation Reserve Program being the program most had participated in (45.8%).

The majority of respondents (79.0%) indicated they planned to maintain ownership of their property for 25 years or more (this included respondents who indicated they would maintain ownership of their property 'forever', 'until death' or 'as long as possible'). Most respondents planned to maintain ownership of their property (65.9%) or transfer it to relatives (42.7%) upon retirement, and nearly all respondents intended to transfer their land to relatives upon their death (91.8%). Nearly three-quarters (73.5%) of respondents had a will or living trust describing their plans for their land upon their death in place.

The average size of the largest tract of property owned by the Lejeune 18 respondents and number of years the largest tract had been in the respondents extended family was 207.69 acres and 68.67 years, respectively. Forestry and agriculture were the dominant land uses (Table 16).

	Acres (mean)
Planted forests (planted pine and/or hardwood trees)	56.19
Natural forests (unplanted pine and/or hardwood trees)	67.62
Cutover (recent timber harvest where most trees have been removed)	15.27
Row crops, orchards and vineyards	75.43
Pasture and/or hay fields (lands for livestock grazing and/or hay crops)	10.50
Fallow fields, abandoned fields and natural grassland/shrubs	4.35
Reservoirs, water impoundments, ponds, lakes, rivers, streams and wetlands	12.76
Residences and/or structures (houses, yards, out-buildings, production facilities and/or other structures)	3.03
Other land use type	4.67

Table 16: Lejeune 18 Respondent Land Use

The average respondent was: male, white, 64.95 years old, married, a democrat, retired, held a farm/agricultural-related occupation, had 1.94 adults (18 years old and over) and 0.21 children (under 18 years old) living in their household, had some college coursework without a degree and had a median annual household income of \$87,500 (Table 17).

Question	Demographic	Statistic
47	Gender	71.7% male
49	Employment Status	47.5% retired
50	Occupation	80.0% farm/agricultural-related
53	Education	some college level education (mean)
54	Marital Status	74.7% married
55	Adults in household	1.94 (mean)
56	Children in household	0.21 (mean)
57	Age	64.95 years old (mean)
58	Political affiliation	78.3% Democrat
59	Race	98.5% white
60	Household income	\$87.5K (median)

Table 17: Lejeune 18 Respondent Demographics

5.2.2 Lejeune 18 Conservation Easements (Questions 19-21)

Respondents were given the following definition of a conservation easement: “In a conservation easement, a landowner sells development rights for their property. This creates a legally enforceable agreement between the landowners and the easement holder that restricts real estate development for the length of the easement. Landowners cannot remove the development restrictions from their property deed”. Respondents were then asked: “Would you place your property in a conservation easement?” Most respondents (65.6%) indicated they would not place their property in a conservation easement. Those who indicated interest in a conservation easement (34.4%) showed preference for the permanent conservation easement (Table 18). The average amount of acres respondents indicated they would place in a conservation easement was 217.64.

Easement Length	Yes (%)	No (%)
1 year	21.1	78.9
5 years	31.4	68.6
10 years	39.5	60.5
15 years	25.1	74.9
20 years	31.6	68.4
25 years	20.4	79.6
30 years	25.5	74.5
50 years	21.5	78.5
Permanent	38.2	61.8

Table 18: Percent of Lejeune 18 Respondents interested in conservation easements

5.2.3 Lejeune 18 Real Estate Development Restrictions Contracts (Questions 22-25)

Respondents were given the following definition of a conservation contract: “In a conservation contract, a landowner agrees to implement specific conservation actions on their property in return for payment. Landowners can choose to terminate the contract at any time by returning all payment”. Respondents were then asked: “Would you apply for a conservation contract that paid you to restrict real estate development on your property?” The majority of respondents indicated they would apply for a conservation contract that would restrict real estate development (53.3%). The most popular conservation contract length for this type of contract was 10 years (Table 19). The average number of acres respondents indicated they would place into a contract for real estate restrictions was 205.04. With regard to which organization respondents think would be best to oversee a real estate restriction contract, NC Coop Ext received the highest average rating at 4.54 out of 7 (Table 20).

Contract Length	Yes (%)	No (%)
1 year	21.8	78.2
5 years	35.0	65.0
10 years	45.1	54.9
15 years	25.0	75.0
20 years	27.4	72.6
25 years	15.0	85.0
30 years	18.0	82.0
50 years	13.3	86.7
Permanent	25.8	74.2

Table 19: Percent of Lejeune 18 Respondents interested in contracts to restrict real estate development

Organization	Average score (7 point scale)
NC Cooperative Extension Service	4.54
NC Wildlife Resources Commission	4.39
U.S. Department of Defense	2.29
U.S. Fish and Wildlife Service	3.67
U.S. Department of Agriculture	4.11
The Nature Conservancy	3.91
NC Farm Bureau	3.81

Table 20: Lejeune 18 Respondent ratings of organizations to oversee real estate restriction contracts

5.2.4 Lejeune 18 Endangered Species Habitat Contracts (Questions 26-29)

Respondents were asked: “Would you apply for a conservation contract that paid you to restore and maintain habitat for endangered species on your property?” More than half of respondents (50.3%) indicated they would apply for a conservation contract for endangered species habitat. The most popular contract length for this type of contract was 10 years (Table 21). The average number of acres respondents indicated they would place into an endangered species habitat contract was 161.38. Respondents gave the highest average rating (5.06 out of 7) to the NC Wildlife Resources Commission (WRC) as the organization to oversee an endangered species habitat contract (Table 22).

Contract Length	Yes (%)	No (%)
1 year	20.9	79.1
5 years	34.7	65.3
10 years	45.4	54.6
15 years	23.5	76.5
20 years	24.8	75.2
25 years	14.1	85.9
30 years	18.3	81.7
50 years	11.5	88.5
Permanent	21.5	78.5

Table 21: Percent of Lejeune 18 Respondents interested in contracts for endangered species habitat

Organization	Average score (7 point scale)
NC Cooperative Extension Service	4.24
NC Wildlife Resources Commission	5.06
U.S. Department of Defense	2.18
U.S. Fish and Wildlife Service	4.31
U.S. Department of Agriculture	3.83
The Nature Conservancy	3.99
NC Farm Bureau	3.61

Table 22: Lejeune 18 Respondent ratings of organizations to oversee endangered species habitat contracts

5.2.5 Lejeune 18 Energy Crops Contracts (Questions 30-33)

Respondents were asked: “Would you apply for a conservation contract to be paid for energy crops grown on your property?” Just over half of the Lejeune 18 respondents (51.3%) indicated they would apply for a contract to grow energy crops on their land. The most popular conservation contract length for this type of contract was 5 years (Table 23). The average number of acres respondents indicated they would place into a contract for growing energy crops was 145.60. Respondents gave the highest average rating (4.87 out of 7) to the NC Coop Ext as the organization to oversee an energy crop contract (Table 24).

Contract Length	Yes (%)	No (%)
1 year	24.7	75.3
5 years	47.7	52.3
10 years	44.8	55.2
15 years	21.1	78.9
20 years	21.4	78.6
25 years	12.0	88.0
30 years	14.8	85.2
50 years	9.1	90.9
Permanent	9.9	90.1

Table 23: Percent of Lejeune 18 Respondents interested in contracts for energy crops

Organization	Average score (7 point scale)
NC Cooperative Extension Service	4.87
NC Wildlife Resources Commission	3.80
U.S. Department of Defense	2.31
U.S. Fish and Wildlife Service	3.29
U.S. Department of Agriculture	4.56
The Nature Conservancy	3.34
NC Farm Bureau	4.05

Table 24: Lejeune 18 Respondent ratings of organizations to oversee energy crops contracts

5.2.6 Lejeune 18 Greenhouse Gas Reduction Contracts (Questions 34-37)

Respondents were asked: “Would you apply for a conservation contract to be paid to reduce greenhouse gases by planting and growing trees on your property?” Just over half of the Lejeune 18 respondents (51.3%) indicated they would apply for a contract to grow trees on their property for greenhouse gas reduction. Two contract lengths, 10 and 20 years, were equally popular with the Lejeune 18 respondents (Table 25). The average number of acres respondents indicated they would place into a contract for planting and growing trees to reduce greenhouse gases was 161.29. Respondents gave the highest average rating (4.87 out of 7) to the NC Coop Ext as the organization to oversee a greenhouse gas reduction contract (Table 26).

Contract Length	Yes (%)	No (%)
1 year	18.3	81.7
5 years	26.9	73.1
10 years	35.0	65.0
15 years	26.9	73.1
20 years	35.0	65.0
25 years	19.2	80.8
30 years	25.3	74.7
50 years	15.4	84.6
Permanent	16.7	83.3

Table 25: Percent of Lejeune 18 Respondents interested in contracts for reducing greenhouse gases

Organization	Average score (7 point scale)
NC Cooperative Extension Service	4.87
NC Wildlife Resources Commission	4.30
U.S. Department of Defense	2.26
U.S. Fish and Wildlife Service	3.59
U.S. Department of Agriculture	4.52
The Nature Conservancy	3.75
NC Farm Bureau	3.82

Table 26: Lejeune 18 Respondent ratings of organizations to oversee greenhouse gas reduction contracts

5.2.7 Lejeune 18 Military Training Contracts (Questions 38-41)

Respondents were asked: “Would you apply for a contract to be paid to allow the US DOD to conduct military training on your property?” The majority of respondents (74.5%) indicated they would not apply for a contract to allow the US DOD to conduct training on their property. The respondents who indicated interest (25.5%) in this type of contract showed a high level of interest in personnel maneuvers and bivouac activities (Table 27). Over two-thirds of the respondents showed interest in the helicopter landing activities while over half of the respondents were interested in the vehicle maneuvers (Table 27). The most popular contract length for this type of contract was 5 years (Table 28). The average number of acres respondents indicated they would place into a contract for military training was 241.37.

Type of Training	Yes (%)	No (%)
Personnel Maneuvers	95.2	4.8
Bivouac	95.2	4.8
Vehicle Maneuvers	62.4	37.6
Helicopter Landing Zones	75.8	24.2

Table 27: Percent of Lejeune 18 Respondents interested in types of military training

Contract Length	Yes (%)	No (%)
1 year	32.0	68.0
5 years	46.3	53.7
10 years	39.8	60.2
15 years	15.4	84.6
20 years	14.9	85.1
25 years	8.5	91.5
30 years	9.5	90.5
50 years	7.5	92.5
Permanent	11.4	88.6

Table 28: Percent of Lejeune 18 Respondents interested in contracts for military training

5.2.8 Lejeune 18 Programs Summary

In summary, just over one-third of Lejeune 18 respondents were interested in enrolling in conservation easements (Table 29). Their easement duration of preference was for 10 years, although respondents exhibited similar interest levels for permanent easements. Interest in contracts for real estate restrictions, endangered species habitat, energy crops and greenhouse gas reduction contract was over 50%, with contract duration preferences of 10 years for contracts for real estate restrictions and endangered species habitat, 5 years for energy crop contracts and both 10 and 20 years for greenhouse gas reduction contracts. The amount of property respondents indicated they would put into a contract depended on the contract focus but ranged between 47-61% of their property. The preferred organization to manage real estate restrictions, energy crop and greenhouse gas reduction contracts was NC Coop Ext, while the NC WRC ranked highest for the endangered species habitat contracts. Lastly, interest in military training contracts was the lowest of all contract types, yet the number of acres respondents indicated they would place into the military training contract was the most at over 60% of their average holdings. The preferred duration for the military training contract was 5 years.

Lejeune 18	Interest Level: Yes (%)	Length Preference (years)	Acres (average)	Organization to oversee
Conservation Easement	34.4	10	217.64	
Real Estate Restriction Contract	53.3	10	205.04	NC Coop Ext
Endangered Species Habitat Contract	50.3	10	161.38	NC WRC
Energy Crops Contract	51.3	5	145.60	NC Coop Ext
Greenhouse Gas Reduction Contract	51.3	10 and 20	161.29	NC Coop Ext
Military Training Contract	25.5	5	214.37	

Table 29: Summary of Lejeune 18 respondents' interest levels in all programs

5.3 NCFB and Lejeune 18 Program Summaries – Side by Side Comparison

Interest levels among the NCFB and the Lejeune 18 respondents for all programs, length preferences, acres and organization preferences were similar with few exceptions (Table 30). Easement duration preference differed with the preference among the NCFB respondents being for the permanent duration and 10 years for the Lejeune 18 respondents. The Lejeune 18 respondents showed preference for both the 10 and 20 year contract durations for the greenhouse gas reduction contract versus just the 20 year contract preference of the NCFB respondents. NCFB respondents showed preference for NCFB to manage the real estate restrictions and endangered species habitat contract, however this preference may largely stem from the strong association they have with the NCFB. The amount of acreage the Lejeune 18 respondents indicated they would place in all of the programs was consistently more than that of their NCFB counterparts; this difference likely stems from the 50 acre minimum sampling method used in the Lejeune 18 survey and resulting larger property ownership among Lejeune 18 respondents.

	Interest Level: Yes (%)		Length Preference (years)		Acres (average)		Organization to oversee	
	NCFB	L18	NCFB	L18	NCFB	L18	NCFB	L18
Conservation Easement	39.2	34.4	perm	10	133.00	217.64		
Real Estate Restriction Contract	57.1	53.3	10	10	145.09	205.04	NCFB	NC Coop Ext
Endangered Species Habitat Contract	45.1	50.3	10	10	91.46	161.38	NCFB	NC WRC
Energy Crops Contract	57.2	51.3	5	5	85.72	145.60	NC Coop Ext	NC Coop Ext
Greenhouse Gas Reduction Contract	47.9	51.3	20	10 and 20	82.64	161.29	NC Coop Ext	NC Coop Ext
Military Training Contract	15.7	25.5	5	5	153.42	214.37		

Table 30: Side by side comparison of NCFB and Lejeune 18 respondents' interest levels in all programs

5.4 Multivariate Predictive Models

5.4.1 Variables

We used variables from our data to create regression models, one for each hypothetical incentive program from each data set, to better understand private landowners in NC and their interest levels in incentive programs. We used a backward stepwise binary logistic regression (0.10 significance level) to predict which landowners might be more likely to participate in the hypothetical incentive programs. We used the same 12 variables in the initial model for regressions, with the exception of the model predicting interest in the military training contract (Table 31). Variables were selected based on literature and theory.

Question	Variable	Data Type	Model
1 edited	Acres owned in NC (total/100)	Continuous	All
5	Land income primary source	Binary	All
9	How long owned largest tract	Continuous	All
17 edited	PRO scale	Continuous	All
18a	Past participation in land conservation program	Binary	All
42a	Endangered Species Importance	Ordinal	All but Military Contract
42b	Game Species Importance	Ordinal	All but Military Contract
42h	Military Training Importance	Ordinal	Military Contract Only
50	Occupation	Binary	All
52a	Military Service	Binary	Military Contract Only
53 edited	Education where 1 = grade, 2 = college, 3 = graduate	Categorical	All
57 edited	Age (mean centered)	Continuous	All
57 edited	Age (mean centered) squared	Continuous	All
60/61 edited	Income (range midpoints/1000)	Continuous	All

Table 31: Variables used in regression models

5.4.2 Conservation Easement (Question 19) Models

Stepwise regression results suggest the best fit model predicting interest in conservation easements among the NCFB respondents included 4 variables: income from land being their primary income source, endangered species importance, education and age (Table 32). For the NCFB respondents, gaining more income from activities on their land, higher rating for endangered species conservation importance, being more educated and being younger were all positively correlated with interest in conservation easements.

The Lejeune 18 best fit model included 3 variables: income from land being the primary source, participation in conservation programs within the past 5 years and age. For the Lejeune 18 respondents, earning more income from activities on their land, past participation in conservation programs and being younger were positively correlated with interest in conservation easements (Table 32).

Although R-squared values were low for the predictive models for conservation easements (Table 32) for a social science survey study such as this, an R-squared of 0.2 or higher provides an acceptable level of explanatory power (Matak et al., 2005).

Variable	NCFB			Lejeune 18		
	Beta	SE	P-value	Beta	SE	P-value
Q5 Land income primary source	0.460	0.207	0.026	-0.562	0.249	0.024
Q18a Past participation in land conservation program	-	-	-	0.659	0.198	0.001
Q42a Endangered Species Importance	0.146	0.061	0.016	-	-	-
Q53 Education (overall)	-	-	0.061	-	-	-
Q53 Education (1)	-0.553	0.376	0.141	-	-	-
Q53 Education (2)	-0.014	0.343	0.967	-	-	-
Q51 Age	-0.016	0.008	0.058	-0.047	0.008	<0.001
Number of observations	363			587		
Nagelkerke R-squared	0.200			0.123		
Predicted % correct	60.3			68.9		

Table 32: NCFB and Lejeune 18 best fit models for predicting interest in a conservation easement

5.4.3 Real Estate Restriction Conservation Contract (Question 22) Models

Regression results suggest an 8 variable model is the best fit for the predicting the NCFB respondents' interest in a contract to restrict real estate development: total land owned in NC, income from land being the primary source, past participation in a land conservation program, endangered species importance, game species importance, education, income and age (Table 33). Owning fewer acres, gaining more income from activities on their land, past participation in conservation programs, higher rating for endangered species conservation importance, lower rating of game species conservation importance, having a college or graduate education level, earning a larger household income and being younger were all correlated with interest in real estate development restriction contracts.

A 3 variable model was the best fit for predicting the Lejeune 18 respondents' interest in a contract to restrict real estate development and included: past participation in a land conservation program, education and age. Respondents who had past participation in

conservation programs, were more educated and were younger were more likely than other respondents to be interest in a contract for real estate development restriction (Table 33).

Variable	NCFB			Lejeune 18		
	Beta	SE	P-value	Beta	SE	P-value
Q1 Total acres owned in NC	-0.072	0.037	0.051	-	-	-
Q5 Land income primary source	0.807	0.267	0.002	-	-	-
Q18a Past participation in land conservation program	0.563	0.249	0.024	0.572	0.175	0.001
Q42a Endangered Species Importance	0.188	0.095	1.207	-	-	-
Q42b Game Species Importance	-0.169	0.100	0.093	-	-	-
Q53 Education (overall)	-	-	0.003	-	-	0.001
Q53 Education (1)	-0.572	0.450	0.204	-0.725	0.230	0.002
Q53 Education (2)	0.382	0.420	0.363	-0.653	0.187	<0.001
Q60/61 Income	0.005	0.002	0.042	-	-	-
Q51 Age	-0.023	0.011	0.027	-0.037	0.007	<0.001
Number of observations	363			769		
Nagelkerke R-squared	0.200			0.109		
Predicted % correct	70.2			61.9		

Table 33: NCFB and Lejeune 18 best fit models for predicting interest in a real estate restriction contract

5.4.4 Endangered Species Habitat Conservation Contract (Question 26) Models

The best fit model for the predicting the NCFB respondents' interest in a contract for endangered species habitat included: PRO scale, past participation in a land conservation program, endangered species importance, occupation, income and age; NCFB respondents whose PRO scale score leaned more toward social responsibilities than individual rights, who had participated in conservation programs in the past and were younger showed more interest in an endangered species habitat contract (Table 34).

The Lejeune 18 best fit model included: PRO scale, endangered species importance, occupation, income and age; Lejeune 18 respondents whose PRO scale score leaned more toward social responsibilities than individual rights, who had participated in conservation programs in the past, who did not work in the farm/agriculture industry, who earned a higher household income and were younger were more likely than other respondents to be interested in a contract to restore and maintain endangered species habitat.

Variable	NCFB			Lejeune 18		
	Beta	SE	P-value	Beta	SE	P-value
PRO scale	-0.040	0.016	0.009	-0.032	0.013	0.015
Q18a Past participation in land conservation program	0.658	0.213	0.002	-	-	-
Q42a Endangered Species Importance	0.420	0.067	<0.001	0.318	0.066	<0.001
Q50 Occupation	-	-	-	0.547	0.252	0.030
Q60/61 Income	-	-	-	0.005	0.002	0.009
Q51 Age	-0.025	0.009	0.022	-0.026	0.009	0.003
Number of observations	430			479		
Nagelkerke R-squared	0.191			0.203		
Predicted % correct	65.3			69.1		

Table 34: NCFB and Lejeune 18 best fit models for predicting interest in an endangered species habitat contract

5.4.5 Energy Crop Contract (Question 30) Models

Regression results suggest a 3 variable model as best fit for predicting the NCFB respondents' interest in a contract for energy crops grown on their land (Table 35). This model included: past participation in a land conservation program, occupation and income; past participation in conservation programs, employment in the farm/agriculture industry and earning a lower total household income were all related to interest in a contract for energy crops.

A 5 variable model was the best fit model for predicting the Lejeune18 respondents' interest in a contract for energy crops grown on their land: total land owned in NC, how long the largest tract of land had been owned, endangered species importance, occupation and age. Respondents with larger amounts of property, property that had been in his/her family for a longer time period, higher rating for endangered species conservation importance, employment in the farm/agriculture industry and who were younger were more interested in this type of contract.

Variable	NCFB			Lejeune 18		
	Beta	SE	P-value	Beta	SE	P-value
Q1 Total acres owned in NC	-	-	-	0.031	0.018	0.088
Q9 How long owned largest tract	-	-	-	0.004	0.002	0.013
Q18a Past participation in land conservation program	0.489	0.203	0.016	-	-	-
Q42a Endangered Species Importance	-	-	-	0.171	0.052	0.001
Q50 Occupation	-0.593	0.240	0.014	-0.525	0.224	0.019
Q60/61 Income	0.006	0.002	0.002	-	-	-
Q51 Age	-	-	-	-0.023	0.007	0.001
Number of observations	443			605		
Nagelkerke R-squared	0.080			0.072		
Predicted % correct	60.7			59.3		

Table 35: NCFB and Lejeune 18 best fit models for predicting interest in a contract for energy crops

5.4.6 Greenhouse Gas Reduction Contract (Question 34) Models

Regression results suggest the best fit model for the predicting the NCFB respondents' interest levels in a greenhouse gas reduction contract included: PRO scale, past participation in a land conservation program, endangered species importance and income (Table 36). PRO scale scores that leaned more toward social responsibilities than individual rights, past participation in conservation programs, higher rating endangered species conservation importance and earning a larger household income were all correlated with interest in this type of contract.

The best fit model for the predicting the Lejeune 18 respondents' interest in a greenhouse gas reduction contract included: total land owned in NC, endangered species importance, education and age; respondents who owned a larger amount of property, who felt endangered species conservation was important, who had more education and were younger were more likely than other respondents to be interested in a contract to grow trees for the purpose of reducing greenhouse gases.

Variable	NCFB			Lejeune 18		
	Beta	SE	P-value	Beta	SE	P-value
Q1 Total acres owned in NC	-	-	-	0.069	0.024	0.004
PRO scale	-0.028	0.015	0.075	-	-	-
Q18a Past participation in land conservation program	0.800	0.212	<0.001	-	-	-
Q42a Endangered Species Importance	0.127	0.063	0.045	0.229	0.048	<0.001
Q53 Education (overall)	-	-	-	-	-	0.052
Q53 Education (1)	-	-	-	-0.589	0.242	0.015
Q53 Education (2)	-	-	-	-0.239	0.195	0.221
Q60/61 Income	0.004	0.002	0.045	-	-	-
Q51 Age	-	-	-	-0.020	0.007	0.980
Number of observations	388			701		
Nagelkerke R-squared	0.089			0.118		
Predicted % correct	60.6			63.2		

Table 36: NCFB and Lejeune 18 best fit models for predicting interest in a contract for reducing greenhouse gases

5.4.7 Military Training Contract (Question 38) Models

For the NCFB Military Training Contract models, we replaced the endangered and game species importance variables with the military preparedness importance variable (Q42h) and the variable indicating whether they, their spouse or children had ever served in the military (Q52).

The regression results suggest the best fit model for predicting interest in a contract for military training activities included: PRO scale, past participation in a land conservation program, occupation, age and military preparedness importance (Table 37). Respondents whose PRO scale score leaned toward social responsibilities than individual rights, who had participated in conservation programs in the past, who held jobs in the farm/agriculture industry, were younger and felt that military preparedness was an important issue were be more likely to be interested in a contract to allow the US DOD conduct active training on their property.

The best fit model for the Lejeune 18 military training contract was a 2 variable model composed of: total land owned in NC and military preparedness importance; thus respondents who owned larger amounts of land and felt military preparedness was an important issue were more likely to be interested in a contract to allow the US DOD to conduct active training on their property than other respondents.

Variable	NCFB			Lejeune 18		
	Beta	SE	P-value	Beta	SE	P-value
Q1 Total acres owned in NC	-	-	-	0.021	0.009	0.016
PRO scale	-0.041	0.021	0.043	-	-	-
Q18a Past participation in land conservation program	0.734	0.311	0.018	-	-	-
Q50 Occupation	-0.873	0.505	0.084	-	-	-
Q51 Age	-0.026	0.013	0.054	-	-	-
Q42h military preparedness importance	0.527	0.104	<0.001	0.453	0.057	<0.001
Number of observations	406			730		
Nagelkerke R-squared	0.218			0.158		
Predicted % correct	86.8			73.0		

Table 37: NCFB and Lejeune 18 best fit models for predicting interest in a contract for allowing military activities on property

Section 6: Conclusions

Interest in conservation easements and all the conservation contracts considered in this study suggest funding, not interest levels, will constrain efforts to utilize conservation incentives and ecosystem service markets in NC. The preference for shorter duration conservation agreements, as well as the preference for conservation contracts over easements of the same duration, may stem from the landowners' desire to maintain land use flexibility and the stigma associated with deed restrictions compared to the relative familiarity with contracts for commodity production.

Though conservation easements were less preferred than contracts, our findings show that they are a viable tool for conserving natural resources on private lands if sufficient funding can be generated for payments. Our findings also indicate a subset of landowners would be interested in non-permanent easements. Significantly higher interest in contracts versus easements, and the relative ease of developing contracts versus easements, suggests economic and pragmatic support for using contracts in non-permanent contexts.

Because interest levels likely exceed foreseeable budgets for easements (39.2% were interested from the NCFB group and 34.4% from the Lejeune 18 group) and conservation contracts (interest levels of 50% or higher for all contracts except for military training in both groups), competition will likely drive down costs for both once markets are developed. Competition will likely promote any contract or easement attribute designed to make landowner bids more competitive (e.g., durations, management activities). In addition, the use of a reverse auction format can capitalize on the fact that demand far exceeds supply. When this approach was used in the Fort Hood recovery credit system (RCS) for golden cheeked warblers, contract prices decreased rapidly and contract durations increased from 10 years, the same preferred in this study for most contracts, to 25 years once landowners

realized longer durations increased chances of receiving a contract (Hayes, 2010; Wilkins, Wolfe, Campbell, & Baggett, 2008),

Though the majority of our respondents indicated their intention to hold on to their land as long as possible, the current economic downturn may be causing landowners to be more cautious regarding decisions involving their land. Additionally, many of our respondents are nearing retirement, or have retired already, and have begun to make plans for their land upon their death. The large portion of landowners making preparations to transfer their land to the next generation, the current climate of economic uncertainty and low real estate costs may create an environment ideal for leveraging limited funds through term duration contracts for conservation incentive programs. Such contracts could be used to promote worthy conservation goals (e.g., green energy, carbon sequestration), offset temporary disturbance to endangered species habitat, and buy time for large scale planning efforts.

The upcoming inter-generational land transfer may promote additional interest in conservation incentive programs. The regression model results suggest younger landowners were highly interested in conservation incentive programs, a finding reflecting other studies on participation in conservation programs (Esseks & Kraft, 1986; Langpap, 2004). This means that if land passes from the present generation to the next, versus being subdivided, interest levels in conservation programs to promote sustainable working lands will likely increase over time.

Past participation in conservation programs and the perceived importance of endangered species conservation also predicted interest in conservation easements and contracts. The usefulness of past participation in incentive programs as a predictor makes sense since landowners who have previously participated in conservation programs are familiar with the format and procedures of such programs. Perceived importance of endangered species importance also seems reasonable as a predictor since endangered species issues are often symbolic for government intervention and landowners willing to accept such intervention are likely more willing to accept government oversight associated with many conservation contracts.

Although this study suggests opportunity for increasing natural resource conservation responsibility on private lands as a means to increase training flexibility on military installations, these results also suggests the opposite approach is viable. Some landowners were interested in contracts allowing military training on their property. Interested landowners would allow all types of training, even those potentially considered a source of land disturbance such as vehicle maneuvers. As with promoting natural resource conservation on private lands, moving some training onto private lands allows for mutual gains among landowners, natural resources, and the military.

In conclusion, survey results suggest landowner interest is sufficient to support conservation easement programs and contracts focusing on real estate restrictions, endangered species habitat, energy crops, carbon sequestration, and military training. The successful implementation of such incentive programs would be a positive step in maintaining or increasing environmental health, rural working lands, ecosystem services, as well as protecting the US DOD's ability to maintain readiness.

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Appendix C

FW 411/511 Residential Perspectives of Urban Ecology Questionnaire

This section is for student use only:

House Number _____ Street Name _____

Unique ID # _____

Respondent Email (if interested in results) _____

Digital Photo of front yard: Yes No Photo Unique ID # _____

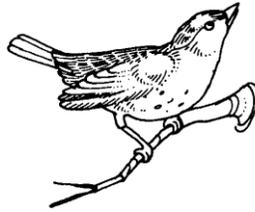
Questions in this survey refer to your preferences for front yards landscaping. Please answer them to the best of your ability. Thank you!

1. Do you own the property on which you currently live? (check one)

- Yes (if “Yes”, continue to question 2)
 No (if “No”, skip to question 3)

 2. How long do you plan to maintain ownership of your property? (check one)

- Less than a year
 1-5 years
 6-15 years
 16-30 years
 for the rest of my life



5. Birds use native plant gardens to hide from predators and find food. If you knew that having more native gardens would benefit birds, how much would you prefer or not prefer each of the four front yard designs (circle one choice per line; 1 = Strongly Do Not Prefer, 4 = Neutral, 7 = Strongly Prefer)

	Strongly Do Not Prefer			Neutral		Strongly Prefer	
	←—————→						
	1	2	3	4	5	6	7
a) 0% native plant garden	1	2	3	4	5	6	7
b) 50% native plant garden	1	2	3	4	5	6	7
c) 75% native plant garden	1	2	3	4	5	6	7
d) 100% native plant garden	1	2	3	4	5	6	7

6. Do you currently have a birdfeeder(s) on your property? (check one)
- Yes
- No
7. Do you currently do other things to attract birds to your property? (check one)
- Yes
- No

8. Please indicate how much you agree or disagree with each of the following statements.
(circle one choice per line; 1 = Strongly Disagree, 4 = Neutral, 7 = Strongly Agree)

	Strongly Disagree	Neutral			Strongly Agree		
	←—————→						
	1	2	3	4	5	6	7
1. I want my landscaping to look good to me	1	2	3	4	5	6	7
2. I want my landscaping to look good to my neighbors	1	2	3	4	5	6	7
3. I want my landscaping to protect the market value of my home	1	2	3	4	5	6	7
4. I want my landscaping to provide food and hiding places for urban wildlife	1	2	3	4	5	6	7
5. I want my landscaping to prevent fertilizer(s) from getting into streams	1	2	3	4	5	6	7
6. I want my landscaping to make my yard safe	1	2	3	4	5	6	7

The following questions concern wood, branches, leaves, grass clippings and other yard waste(s) from your property.

9. Do you know where your yard waste ends up when it is taken away? (please check one)
- Yes (Where? name or briefly describe _____)
- No
10. The following are three options for disposing of your yard waste(s). These options may or may not be available to you currently. Imagine that each of the options were made available to you. Please rank the following options from: your most preferred = 1 to your least preferred = 3.
- ____ Composted by city waste facility
- ____ Sent to a landfill
- ____ Burned for electricity production

11. Would you support your yard waste(s) being burned for electricity production if it meant you paid a monthly fee for collecting the yard waste? (check one)

- Yes (if “Yes”, continue to question 12)
 No (if “No”, skip to question 13)



12. How much would you be willing to pay each month?
(write a dollar amount) _____

To fully understand your responses to the previous questions, we need to know a few things about your background. Remember that information that could be used to identify you *will not* be made public.

13. Which of the following describes your marital status? (check one)

- Married
 Divorced
 Separated
 Single
 Widowed/Widower

14. How many children (under 18 years old) live in your household?

(Fill in the blank; if none, please enter “0”): _____ children

15. What is the highest level of schooling/education you have completed? (check one)

- High school or GED
 Vocational, technical, trade school or certificate program
 Some college course work (no degree)
 Associates degree (2 year degree)
 Bachelors degree (4 year degree)
 Some graduate study (no degree)
 Masters degree
 Doctoral degree
 Professional degree

16. Which of the following describes your race/ethnicity? (check all that apply)

- White/Caucasian
 Hispanic/Latino American
 African American/Black
 Indian/Alaska Native
 Asian
 Native Hawaiian or Other Pacific Islander
 Other (please specify) _____

17. Which of the following best describes your current employment status? (check all that apply)
- Self-employed
 - Full-time
 - Part-time
 - Unemployed
 - Disabled, unable to work
 - Retired
 - I do not currently work
18. What was your total household income in 2009, from all sources, before taxes? (check one)
- \$14,999 or less
 - \$15,000 – 24,999
 - \$25,000 – 49,999
 - \$50,000 – 74,999
 - \$75,000 – 99,999
 - \$100,000 – 149,999
 - \$150,000 – 199,999
 - \$200,000 or more
19. What is your gender?
- Female
 - Male