

ABSTRACT

GOLDEN, KATHERINE ELIZABETH. North Carolina Private Landowner Engagement in Wildlife Related Fee Access and Wildlife Management. (Under the direction of Dr. Christopher S. DePerno and Dr. Christopher E. Moorman).

Wildlife related fee access can provide supplemental income to private landowners, potentially improving habitat conditions for wildlife by keeping land undeveloped. We mailed a survey to 8,234 private landowners in North Carolina to determine socio-demographic factors influencing landowner participation and interest in offering wildlife related activities. Few landowners allowed access for fee-hunting (5%). A total of 28% of landowners allowed non-hunting access, but <1% of the 28% earned income from these activities. Ten and 16% of landowners were interested in offering future leases for hunting and non-hunting access, respectively. Absentee landowners whose land was used to earn income were more likely to offer fee-hunting, while resident landowners who hunted were more apt to offer free access for non-hunting wildlife related activities. Landowners living farther from cities were interested in offering leases for hunting and non-hunting recreation in the future. Although few landowners offered leases, results indicate landowners are interested in the opportunity, thus providing potential to enhance wildlife habitat on private land through incentives benefiting wildlife and the landowner. We also determined factors predicting participation in a variety of wildlife management practices from the aforementioned survey.

Ex-urban migrants, including affluent professionals, retirees, and young families, are moving to rural areas seeking land with abundant natural amenities. The changing character of rural landowners resulting from this migration has the potential to affect wildlife management on private land. Landowners most commonly provided supplemental feed, erected nesting boxes, mowed to improve habitat, and planted food plots. More holistic management approaches such as prescribed burning were among the least practiced management activities. Landowners that hunted or had a family member that hunted were more likely to participate in wildlife management. Residency status, gender, and age were additional key factors predicting participation. Our results suggest resident landowners, especially those that hunt, will be the most receptive to outreach efforts aimed at educating private landowners about wildlife habitat management.

North Carolina Private Landowner Engagement in Wildlife Related Fee Access and Wildlife
Management

by
Katherine Elizabeth Golden

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APPROVED BY:

Dr. Christopher S. DePerno
Committee Co-Chair

Dr. Christopher E. Moorman
Committee Co-Chair

Dr. M. Nils Peterson

Dr. Robert Bardon

DEDICATION

This work is dedicated to my mom, my dad, and my brother for their unconditional love and support.

BIOGRAPHY

Katherine was born in Honolulu Hawaii on April 20th, 1983. She grew up in Woodbridge, Virginia, a suburb of Washington D.C. Many childhood experiences, such as watching developments and urban sprawl take over the landscape, as well as her parents encouragement to care for the natural world, helped shape her interest in wildlife conservation. Katherine attended C.D. Hylton High school and was a graduate of the class of 2001. From there, she received her bachelor's of arts degree from George Mason University in 2005.

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Predicting Private Landowner Participation and Interest in Wildlife Related Fee Access

Katherine E. Golden, Fisheries, Wildlife, & Conservation Biology, North Carolina State

University, Raleigh, NC 27695, USA. kegolden@ncsu.edu. 703.801.2138

Christopher S. DePerno, Fisheries, Wildlife, & Conservation Biology, North Carolina State

University, Raleigh, NC 27695, USA. chris_dePerno@ncsu.edu. 919.513-7559. Fax:

919.515.5110

Christopher E. Moorman, Fisheries, Wildlife, & Conservation Biology, North Carolina State

University, Raleigh, NC 27695, USA

M. Nils Peterson, Fisheries, Wildlife, & Conservation Biology, North Carolina State

University, Raleigh, NC 27695, USA

Robert E. Bardon, Forestry & Environmental Resources, North Carolina State University,

Raleigh, NC 27695, USA

RH: Wildlife Related Fee Access

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Abstract

Wildlife related fee access can provide supplemental income to private landowners, potentially improving habitat conditions for wildlife by keeping land undeveloped. We mailed a survey to 8,234 private landowners in North Carolina to determine the factors influencing landowner participation and interest in offering wildlife related activities. Few landowners allowed access for fee-hunting (5%). A total of 28% of landowners allowed non-hunting access, but <1% of the 28% earned income from these activities. Ten and 16% of landowners were interested in offering future leases for hunting and non-hunting access, respectively. Absentee landowners whose land was used to earn income were more likely to offer fee-hunting, while resident landowners who hunted were more apt to offer free access for non-hunting wildlife related activities. Landowners living farther from cities were interested in offering leases for hunting and non-hunting recreation in the future. Although few landowners offered leases, results indicate landowners are interested in the opportunity, thus providing potential to enhance wildlife habitat on private land through incentives benefiting wildlife and the landowner.

Introduction

Human population growth and urban development are leading factors causing habitat loss, degradation, fragmentation, and associated wildlife population declines (Fahrig, 1997; Hess, 1996; White, Morzillo, & Alig, 2009; Wilcove, Rothstein, Dubow, Phillips, & Losos, 1998). Under these pressures, private land becomes essential for wildlife conservation (Langholz & Lassoie, 2001; Oldfield, Smith, Harrop, & Leader-Williams, 2003; Rasker, Martin, & Johnson, 1992) and economic incentives are needed to make land and wildlife habitat conservation a practical alternative to development (Williams & Lathbury, 1996). Wildlife related fee access can address these challenges by supplementing landowner incomes, promoting sustainable land use, and maintaining habitat diversity (Jones, Jones, Munn, & Grado, 2004; Noonan & Zagata, 1982).

In the southeastern United States, over 75% of forest and agricultural land is held by private landowners who might benefit from income related to wildlife fee access (Alig, Plantinga, Ahn, & Kline, 2003; Hoppe, 2006; Wear & Greis, 2002). During 2006, fishing, hunting, and wildlife watching expenditures reached \$2.7 billion in North Carolina, and \$122.3 billion was spent on wildlife related recreation activities across the United States (United States Department of the Interior & U.S. Department of Commerce, 2006). Increases in the human population coupled with the desire for outdoor experiences have expanded the potential market available for wildlife related recreation. Additionally, because the presence of wildlife on properties can increase land values and provide recreation opportunities, there is considerable incentive for private landowners to conserve, manage,

and improve wildlife habitat on their properties (Henderson & Moore, 2005; Jones et al., 2006).

Although several studies have addressed the economics of hunting leases (Mozumder, Starbuck, Berrens, & Alexander, 2007; Zhang, Hussain, & Armstrong, 2006), few have addressed the opportunities and constraints associated with alternative forms of wildlife related fee access opportunities. Hence, our objectives were to determine: 1) the proportion of landowners participating in leasing for hunting and non-hunting access and the proportion interested in offering either hunting or non-hunting access in the future; 2) factors predicting participation and interest in fee-hunting and non-hunting fee access; 3) if they did not engage in leasing for either hunting or non-hunting activities, why landowners did not offer wildlife related fee access opportunities. We defined fee-hunting as a landowner leasing property rights to a hunter or hunters for a designated period of time (Thomas, Adams, & Thigpen, 1994; Kilgore, Snyder, Schertz, & Taff, 2008). Non-hunting fee access is defined as paid public access to private property for the purpose of engaging in any wildlife related activity (e.g., wildlife/bird watching, nature photography, fishing, and outdoor recreation [hiking, primitive camping, etc.]) other than hunting. However, because such a small percentage of landowners actually earned income from non-hunting fee access, throughout this paper we refer to this activity as non-hunting access.

Methods

In March 2008, self-administered surveys were mailed to 8,234 non-industrial private landowners owning ≥ 10 acres in North Carolina. We randomly selected four counties from each of the seven, 2006 North Carolina Cooperative Extension Service Districts to stratify

the sample across the state (Figure 1). We acquired landowner mailing addresses from county tax rolls and we removed duplicate listings to reduce oversampling landowners with multiple tracts. Industrial businesses, real estate developments, contracting businesses, and timber companies were omitted, but we retained limited liability corporations to prevent excluding hunt clubs and farms (Cecil, Ciccotello, & Grant, 1995). Three hundred landowners were randomly selected from each of the 28 counties except Dare and Jackson counties, where only 202 and 232 landowners, respectively, owned the minimum acreage required for inclusion in the sample.

A pre-test of the survey was completed with a convenience sample of landowners who were asked to complete a preliminary version of the survey and provide comments on how to improve clarity of questions. Surveys were printed with pre-paid postage and a business reply address. Each envelope included a cover letter explaining the project, a survey, and sticker to seal the survey for return mailing. A reminder postcard was mailed to all landowners after the initial survey mailing. Budget constraints prevented a second questionnaire mailing, but a second survey was mailed if a landowner lost or misplaced the initial survey and requested another. We randomly selected 43 non-respondents who were asked a shortened version of the survey over the phone to detect potential bias between respondent and non-respondent populations (Chaves, Gese, & Krannich, 2005). We attempted contacting each non-respondent six times before excluding them from the sample. The survey instrument and protocol were approved by the North Carolina State University Institutional Review Board for the Protection of Human Subjects in Research (IRB #268-07-6, June 2007).

We used two sample z-tests to detect potential bias between respondents and non-respondents. Variables tested for non-respondent bias included whether the landowner resided on their property, the distance to their property if they did not reside on the property, acreage of their largest tract of land, distance to closest city, whether the landowner or an immediate family member hunted, if they participated in leasing for fee-hunting, whether landowners were interested in allowing future wildlife access, if landowners were interested in offering future fee-hunting leases, gender, age, level of education achieved, and average annual household income. We achieved a 69% response rate from the non-respondent sample and no significant difference was detected between respondents and non-respondents, suggesting that our sample was representative of North Carolina landowners owning ten or more acres.

We modeled participation and interest in selling hunting and non-hunting access rights using binary logistic regression. The dependent variables in these models were coded as binary variables (no = 0, yes = 1). We used linear regression to model variables predicting the reasons landowners did not lease their property for any type of fee access. Landowners who leased for hunting were asked to indicate the top three reasons they chose to lease and landowners who did not lease were asked to indicate the importance of reasons they did not do so by ranking the importance of the reason on a Likert scale (1 = unimportant, 2 = somewhat unimportant, 3 = neutral, 4 = somewhat important, 5 = important). Data was analyzed using SPSS software (SPSS Inc., 2008).

Based on literature and hypotheses, we selected nine independent variables to include in the models as predictors of participation and future interest in offering fee access and

reasons not to lease land (Table 1). Income can be a positive predictor of participation in wildlife related recreation (Rockel & Kealy, 1991; Zhang, Hussain, & Armstrong, 2006). Zhang, Hussain, and Armstrong (2006) demonstrated that tract size influenced participation in leasing for hunting access by landowners in Alabama. We included the acreage variable, surmising the amount of land available to lease had the potential to affect a landowner's decision to lease and could deter them from future leases if they believed they did not own enough land to have a leasing operation. We used a log10 transformation to normalize tract size data. We included age and gender, because both variables are known to influence beliefs regarding wildlife (Bowman, Leopold, Vilella, & Gill, 2004). We included 'distance to city' because landowners closer to a city would be more likely to participate or be interested in leasing because they are closer to populations of potential lessees. The distance to city variable was normalized with a square root transformation. Lastly, we included whether or not the landowner lived on the property as a predictor because residency status is likely to influence a landowner's willingness to allow certain activities (e.g. discharge of firearms on the property).

Results

Of the 8,234 surveys mailed, 234 (3%) were undeliverable and 1,368 usable surveys were returned for an overall response rate of 17%. The socio-demographic characteristics of landowners (e.g., landowner age, annual household income, and education levels achieved) were similar to other studies conducted in the Southeast (e.g., Daley, Cobb, Bromley, & Sorenson, 2004; Jarrett, Gan, Johnson, & Munn, 2009; Measells et al., 2005). The mean age of respondents was 60.9 years old and 68% were male. Median household income was

between \$65,001 and \$85,000. Seventy-seven percent of respondents had more than a high school degree and 80% owned less than 100 acres.

Landowners that sold hunting leases indicated the top three reasons for leasing were economic diversification (46%), management and enhancement of wildlife populations (19%), and reduction of trespassing (19%). Landowners leasing for hunting (n= 68; 5%) predominantly offered annual leases (60%) and seasonal leases (25%) with an average annual lease rate of \$6.65 per acre. Most (70%) landowners who sold leases for fee-hunting did not live on the property, 94% used the land to earn income other than through fee-hunting, and 47% hunted or had a family member that hunted. Properties further from a city were more likely to be leased for hunting than those closer to a metropolitan area, and landowners that used their land to earn income were more likely to offer hunting leases than landowners who did not use their land to earn income. As tract size increased, landowners were more likely to offer hunting leases (Table 2, Model 1). Landowners not participating in leasing, but interested in leasing for hunting (10%) owned rural lands further from a city, did not live on their property, hunted or had a family member that hunted, and owned larger properties (Table 2, Model 2).

Overall, 28% of landowners allowed non-hunting activities, including fishing, wildlife watching, and other forms of outdoor recreation (e.g., hiking). However, less than 1% of these landowners earned income from the activities. Fifty-nine percent of landowners allowing non-hunting access resided on their property and 57% hunted or had a family member who hunted. Landowners allowing non-hunting access were well educated and lived on their property. Landowners that hunted or had a family member that hunted were

more likely to allow non-hunting access on their properties than landowners that did not hunt (Table 2, Model 3). Also, landowners were more likely to allow non-hunting activities and more likely to be interested in non-hunting fee access as the size of the property owned increased. Sixteen percent of non-participating landowners were interested in non-hunting fee access. Interest in non-hunting fee access was higher further from a city, on property used to earn income, and for younger and better educated landowners when compared to those not interested (Table 2, Model 4).

Landowners that did not offer leases for hunting or non-hunting activities (69%) noted that accident liability (4.7 on a five point scale), trespassing (4.6), property damage (4.5), loss of privacy (4.4), and the cost of liability insurance (4.4) were primary disincentives for leasing. Landowners residing on their property were more likely to be concerned with loss of privacy, safety, and property damage than absentee landowners (Table 3). Also, resident landowners were concerned about loss of their own outdoor recreation opportunities and had more worries about hunting, but perceived fewer roadblocks in terms of understanding the leasing process than non-resident landowners. Landowners whose land was used to earn income considered compatibility with current land use practices to be an important reason for not leasing (Table 3).

Being female predicted opposition to hunting, concern with over-harvest and disturbance of wildlife, and concern about the introduction of pest species (Table 3). Younger landowners were more likely to find privacy, trespassing, and safety to be important reasons for not leasing their lands for wildlife related activities, and as landowners aged, they

were more likely to be opposed to hunting. Well educated landowners tended to not worry about accident liability, lack of financing, and having enough knowledge regarding leases.

Discussion

Fluctuations in rural economies leave landowners residing farther from a city needing another source of income, resulting in interest in offering leasing opportunities for wildlife related recreation. Economies of rural areas tend to be more distressed and residents often lack opportunities to advance within the social structure (McLaughlin, 2002; Tickamyer & Duncan, 1990). The dependence of landowners on income from agricultural and timber related products is more prevalent in the southern United States, and these lands often are located away from urban centers (Butler & Leatherberry, 2004). Also, rural landowners tend to have less education, resulting in lower incomes than their urban counterparts, further exacerbating the inability to move up the ladder of economic success (United States Census Bureau, 2009; United States Department of Agriculture, Economic Research Service, 2003). Our results support the concept that rural landowners are interested in fee access as a means to earn additional income because they are looking for additional economic opportunities. However, the majority of the public participating in wildlife recreation resides in more urban areas (Walsh, Kun, McKean & Hof, 1992), which creates a geographic barrier between supply and demand for wildlife related recreation opportunities. Overcoming this barrier likely will require engaging landowners in the urban-rural interface in a manner that highlights economic opportunities, alleviates concerns (e.g., safety concerns of younger landowners who have children or resident landowners who are worried about trespassing), and addresses logistics associated with offering wildlife related leases.

Landowners face challenges in establishing non-hunting fee access operations because the public is not accustomed to paying for non-consumptive wildlife related activities and do not believe that non-hunting access is a commodity. Accordingly, landowners may need to connect the recreation opportunity to a value-added experience, making the opportunity more enticing to the public.

Our results indicate that absentee landowners are most interested in offering hunting leases, which is similar to other studies showing non-resident landowners were more likely to offer hunting leases than resident landowners (Hussain et al., 2007; Kilgore, Snyder, Schertz, & Taff, 2008). Leasing to hunters and hunt clubs provides many benefits to the landowner, which is mirrored in many of the reasons landowners in our study chose to lease for hunting. First, leasing generates additional income to help support wildlife management and minimize the tax burden. Second, leasing can increase communication between the landowner and their lessees about the status and condition of the property. Third, lessees often monitor trespassing and help keep an eye on the land (Guynn & Schmidt, 1984). Lastly, lessees often help with management and maintenance activities on the property (Lynch & Robinson, 1998). Conversely, a growing number of affluent people look to reside on rural land with natural amenities and/or recreation opportunities and are interested only in using the land for their own and family enjoyment; this might explain why resident landowners allowed free non-hunting access, possibly to friends and family, but lacked interest in leasing (Brown, Johnson, Loveland, & Theobald, 2005; Hussain et al., 2007; Nelson & Dueker, 1990).

Changes in the educational system, social values, and population demographics may explain why education level influenced landowner interest and participation in non-hunting

access, but had no impact on hunting access. The average education level of the public is rising throughout the United States, but disparity still exists as urban residents tend to achieve higher levels of education (Crissey, 2009; United States Department of Agriculture, Economic Research Service, 2003). As educational attainment levels increase, support of hunting decreases (Teel, Krannich, & Schmidt, 2002). The current education system in urban areas does not advocate or teach hunting as a wildlife management strategy; rather, there has been a shift towards focusing education on conservation of non-game and endangered species (Inouye & Brewer, 2003; Wyner & DeSalle, 2010). Similarly, a societal shift away from utilitarian values to a more protectionist attitude towards wildlife could reduce public support for hunting (Manfredo, Teel, & Bright, 2003; Zinn, Manfredo, & Barro, 2002). Educated, urban residents will bring their orientations and values associated with wildlife as they immigrate into rural areas, exacerbating the general shift away from the acceptance of hunting (Manfredo, Teel, & Bright, 2003; Manfredo & Zinn, 1996). Hence, the option of offering hunting leases for income may be more suited to absentee landowners, but an opportunity to work with more educated landowners on developing non-hunting access programs may be available.

Tract size was a key predictor in landowner participation and interest in offering both fee-hunting and non-hunting access. Similarly, landowners with larger property sizes tend to be more aware of and participate in government incentive programs (Sun, Sun, Munn & Hussain, 2008; Mehmood & Zhang, 2005). Also, many hunters perceive a better experience with more acreage to hunt and thus less crowded conditions (Hammit, McDonald, & Patterson, 1990).

Although 19% of respondents were interested in leasing for either non-hunting or fee-hunting access, there are several impediments that prevent landowners from engaging in offering leases. Non-resident landowners face logistical hurdles because they are physically removed from the property. Because the landowner does not live on the land, they often are absent from the social interactions of the community, limiting their exposure to hunters to whom they could possibly lease (Kendra & Hull, 2005). Liability is a well documented reason landowners do not open their lands to the public for recreation (Mozumder, et al., 2007; Snyder, Kilgore, Taff, & Schertz, 2008; Wright, Kaiser, & Nicholls, 2002). Also, safety, privacy, and trespassing were among the top concerns influencing landowner decisions not to lease in our study. Landowners have the right to be concerned about the safety of their family and themselves, particularly with the discharge of firearms near the home. Concerns may stem from the reputation of hunters as being dangerous and disrespectful (Jagnow et al., 2006; Wright & Fesenmaier, 1990).

Many landowners choose not to lease, not because they are opposed to hunters, but because they are opposed to hunting. Women have traditionally shown a moralistic view of wildlife, resulting in opposition to lethal control of animals, which could explain their opposition to hunting as sport and their position against leasing for fee-hunting (Dougherty, Fulton, & Anderson, 2003; Kellert & Berry, 1987; Teel, Krannich, & Schmidt, 2002). Future research should explore why older landowners were more averse to hunting.

Additional research should focus on why landowners offer free access for hunting and non-hunting wildlife recreation. While outdoor recreationists have been shown to behave in environmentally conscious ways (Theodori, Luloff, & Willits, 1998), compared to people

who do not engage in outdoor recreation, behavior of hunters with pro-environmental attitudes has varied from anti-stewardship views to moderate support of environmental concepts (Burger & Sanchez, 1999; Holsman, 2000). Hunters (or landowners with family members who hunt) may have allowed free access for non-hunting activities and showed no interest in charging a fee for access in the future because they did not want to disrupt existing outdoor recreation activities. In our study, potential disruption of their own hunting opportunities was a significant reason hunting landowners were against offering leases, which is supported by Hussain et al. (2007) and Snyder et al. (2008).

Hunters gave permission for others to access their property free of charge for non-hunting wildlife activities; a possible explanation is that North Carolina hunters act as ambassadors of the outdoors by encouraging others to participate in wildlife recreation on their property free of charge. Hunting creates the opportunity to connect people to nature (Peterson, 2004), and sportsmen may have the desire to share the experiences of nature and the connection with wildlife with others. Participating in one form of outdoor recreation does not negate participating in another as hunters often engage in consumptive and non-consumptive wildlife activities. Many people associate themselves with hunting or hunters, although they may not hunt themselves (Enck, Decker, & Brown, 2000; Stedman & Decker, 1996). Hunting associates may participate in non-hunting activities with hunters because they share a similar interest in wildlife and have an analogous appreciation of the outdoors. The ability to participate and share wildlife experiences with family, friends, and associates may be what the hunting landowner desires as their way of sharing nature with others.

Absentee landowners would benefit from outreach programs that address specific aspects of leasing, such as defining the landowner's legal responsibilities. Technical extension information on how to develop a lease agreement and develop a customer base would aid the establishment of new fee-hunting enterprises among landowners who are interested, but not currently leasing. Encouraging resident landowners to develop non-hunting fee access may be more productive than promoting hunting access given resident landowner's concerns about safety, interruption of personal recreation, and intrusions of privacy. However, there is a disconnect between landowners interested in leasing and the general public who would benefit from the increased opportunities for recreation. Additional research should focus on determining if urban residents are likely to travel to more rural areas where landowners are more interested in leasing, understanding the distance they are willing to travel, and their preferred activities.

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Table 1. Independent variables used as predictors of participation and future interest in offering fee access and reasons not to lease land, North Carolina, 2007.

Variable	Description	Mean	Std. Dev.
Acreage	Log10 of acreage of landowner's largest tract of land owned in North Carolina	1.6	0.5
Distance to City	Landowners selected from a list of cities and driving distance was estimated in miles from their largest tract of land to the selected city; square root of the distance to nearest city was used	5.8	1.8
Age	Age in years	60.9	12.7
Education	Highest level of education completed (1 = did not complete high school; 2 = high school; 3 = associates degree or some college; 4 = four year college degree; 5 = graduate degree)	3.4	1.1
Household Income	Annual household income in 2007 (1 = < \$25,000; 2 = \$25,001 - \$45,000; 3 = \$45,001 - \$65,000; 4 = \$65,001 - \$85,000; 5 = \$85,001 - \$125,000; 6 = \$125,001 - \$175,000; 7 = > \$175,001)	3.9	1.8
		Proportion of Positive Responses	
Live on Land	Landowner resided on their largest tract of land owned (0 = No, 1 = Yes)	0.47	
Land Income	Landowner used the land to generate income (e.g., agriculture or forestry practice) (0 = No, 1 = Yes)	0.46	
Hunt	The landowner or family member (e.g., spouse, child, relative) hunts (0 = No, 1 = Yes)	0.47	
Gender	Gender of the respondent (0 = Male, 1 = female)	0.32	

Table 2. *Odds ratios from logistic regression models used to predict participation and future interest in wildlife related fee access, North Carolina, 2007.*

Independent Variables	Coefficients (odds ratios) [standardized odds ratios]			
	Model 1	Model 2	Model 3	Model 4
	Participates in Leasing for Hunting	Interest in Leasing for Hunting	Participates in Allowing Non-hunting Access	Interest in Leasing for Non-hunting Fee Access
Acreage	1.98*** (7.20) [2.62]	.78** (2.18) [1.46]	.72*** (2.06) [1.42]	.61** (1.85) [1.35]
Distance to City	.19* (1.21) [1.41]	.16** (1.18) [1.34]	.00 (1.00) [1.00]	.11* (1.12) [1.22]
Live on Land	-.54 (.58) [.76]	-.80*** (.45) [.67]	.96*** (2.61) [1.62]	-.01 (.99) [1.00]
Land Income	1.75*** (5.76) [2.39]	.38 (1.47) [1.21]	-.07 (.94) [.97]	.21 (1.23) [1.11]
Hunt	-.64 (.53) [.73]	.60* (1.83) [1.35]	.58*** (1.79) [1.34]	-.07 (.93) [.97]
Age	.02 (1.02) [1.24]	-.01 (.99) [.89]	-.01 (.99) [.89]	-.03*** (.98) [.72]
Gender	-.49 (.61) [.80]	-.05 (.96) [.98]	-.13 (.88) [.94]	.37 (1.44) [1.19]
Education	.09 (1.10) [1.11]	-.11 (.90) [.89]	.22** (1.24) [1.27]	.26** (1.29) [1.33]
Household Income	-.09 (.91) [.84]	.02 (1.02) [1.04]	.02 (1.02) [1.04]	-.02 (.98) [.96]

$p \leq .05^*$; $p \leq .01^{**}$; $p \leq .001^{***}$

Table 3. *Coefficients from linear regression models used to predict reasons landowners chose not to lease their property for wildlife related fee access, North Carolina, 2007.*

Dependent Variables	Coefficients (standardized coefficients)								
	Independent Variables								Household Income
	Acreage	Distance to City	Live on Land	Land Income	Hunt	Age	Gender	Education	
Accident Liability	-.01 (.00)	-.00 (-.01)	.01 (.01)	.09 (.06)	-.05 (-.03)	-.00 (-.06)	-4.94E ⁻⁵ (.00)	-.06* (-.08)	.01 (.01)
Believe Property Too Small	-1.31*** (-.43)	-.03 (-.04)	.16 (.06)	.125 (.05)	.05 (.02)	.01*** (.11)	-.04 (-.02)	-.02 (-.01)	-.02 (-.02)
Disrupts Outdoor Recreation	-.06 (-.02)	.03 (.04)	.61*** (.23)	-.00 (-.00)	.32*** (.12)	-.01 (-.06)	.18 (.06)	-.03 (-.02)	.02 (.02)
Do Not Know Enough Hunters	-.08 (-.02)	-.02 (-.03)	-.34*** (-.12)	-.03 (-.01)	-.38*** (-.14)	.01* (.08)	.07 (.02)	-.09 (-.09)	-.05 (-.06)
Do Not Know Who To Contact for Leasing	-.03 (-.01)	-.03 (-.04)	-.47*** (-.17)	.12 (.04)	-.24* (-.09)	.01 (.07)	.05 (.02)	-.06 (-.04)	-.05 (-.07)
Do Not Understand Leases	.02 (.01)	-.04 (-.05)	-.25** (-.09)	-.19 (-.07)	-.34*** (-.13)	-.00 (-.01)	.17 (.06)	-.10* (-.09)	-.06* (-.08)
Inconvenient	-.13 (-.05)	-.03 (-.04)	.19* (.07)	.06 (.02)	-.15 (-.06)	.00 (.03)	.04 (.02)	-.02 (-.02)	-.02 (-.02)
Lack of Financing	-.15 (-.05)	.03 (.05)	-.03 (-.01)	-.02 (-.01)	-.08 (-.03)	-.00 (-.03)	.13 (.04)	-.12* (-.09)	-.12*** (-.16)
Land Use Compatibility	-.18 (-.07)	.01 (.01)	.16 (.06)	.29** (.12)	-.03 (-.01)	.00 (.00)	.21* (.08)	.00 (.00)	-.01 (-.01)
Liability Insurance Cost	-.02 (-.01)	-.01 (-.02)	-.12 (-.06)	.08 (.04)	.03 (.01)	-.00 (-.03)	.13 (.06)	-.06 (-.06)	-.03 (-.05)
No Hunting on Land	-.17 (-.05)	-.00 (-.00)	.23* (.077)	-.20 (-.06)	-.87*** (-.28)	.02*** (.14)	.42*** (.13)	-.05 (-.03)	.04 (.05)

$p \leq .05^*$; $p \leq .01^{**}$; $p \leq .001^{***}$

Table 3. *Continued*

Dependent Variables	Coefficients (standardized coefficients)								
	Independent Variables								Household Income
	Acreage	Distance to City	Live on Land	Land Income	Hunt	Age	Gender	Education	
Opposed to Hunting	.03 (.01)	-.05 (-.06)	.14 (.05)	-.05 (-.02)	-1.18*** (-.40)	.01*** (.12)	.62*** (.19)	-.00 (.00)	-.05 (-.06)
Pest Species Introduction	.01 (.00)	.02 (.03)	.04 (.02)	.04 (.01)	-.14 (-.05)	.01 (.05)	.46*** (.16)	-.12* (-.10)	-.07* (-.09)
Privacy	.16 (.06)	.00 (.00)	.66*** (.29)	-.15 (-.07)	.12 (.05)	-.01** (-.10)	.06 (0.2)	.03 (.02)	-.02 (-.03)
Property Damage	.08 (.04)	.01 (.02)	.13* (.08)	.01 (.00)	.05 (.03)	-.00 (-.04)	.04 (.02)	-.05 (-.06)	.00 (.00)
Safety	-.11 (-.05)	-.01 (-.02)	.57*** (.25)	.07 (.03)	.10 (.04)	-.01** (-.08)	.05 (.02)	-.04 (-.04)	-.04 (-.07)
Trespassing	.14 (.07)	-.01 (-.01)	.21*** (.11)	-.02 (-.01)	-.04 (-.02)	-.01** (-.09)	-.05 (-.02)	.02 (.03)	-.00 (-.01)
Wildlife Disturbance	.25* (.08)	-.02 (-.02)	.06 (.02)	-.17 (-.06)	-.21* (-.08)	.00 (.03)	.46*** (.15)	-.05 (-.04)	-.07* (-.09)

$p \leq .05^*$; $p \leq .01^{**}$; $p \leq .001^{***}$



Figure 1. The 28 North Carolina counties sampled in 2007.

Factors Shaping Private Landowner Engagement in Wildlife Management

Introduction

Private lands constitute a significant portion of landholdings (73%) in the United States and represent significant potential to protect and improve wildlife habitat (Birch 1996, Alig et al. 2003). Rural America is experiencing rapid population growth, driven by exurbanites looking for a relaxed lifestyle (Davis and Nelson 1994, Deller et al. 2001). These exurban migrants are purchasing land with abundant natural amenities such as aesthetic views and recreation opportunities, and affluent professionals, young families, and urban retirees are most representative of this new conglomeration of landowners (Davis and Nelson 1994, Johnson and Beale 1998, Kendra and Hull 2005). This composition of landowners is functionally unique because it often has a more protective rather than utilitarian view of wildlife (Manfredo and Zinn 1996).

Along with the shift in values, the new landowners are driving parcelization of land in rural settings. Currently, 90% of landowners in the United States own property less than 100 acres, and intergenerational transfer of land could continue to accelerate parcelization (Birch 1996, Sampson and DeCoster 2000, Mehmood and Zhang 2001). The average age of private landowners is above the national average, and as landowners continue to age, they may sell or subdivide land for income or pass the land onto heirs who have different plans for the property (Mehmood and Zhang 2001, Best 2002, Alig et al. 2003). These major demographic shifts may indicate corresponding changes in wildlife management on private

land. Because of the anticipated changes in demographics, there is a critical need to understand wildlife management activities on private land, a little researched topic (Joshi and Arano 2009, Poudyal and Hodges 2009). We begin to address this research need by identifying socio-demographic factors that influence private landowner participation in wildlife management practices in North Carolina.

Methods

In March 2008, we mailed self-administered surveys to 8,234 non-industrial private landowners owning ≥ 10 acres in North Carolina. We randomly selected four counties from each of the seven 2006 North Carolina Cooperative Extension Service Districts to stratify the sample across the state. Landowner mailing addresses were acquired from county tax rolls and we removed duplicate listings to avoid oversampling landowners owning multiple tracts. Industrial businesses, real estate developments, contracting businesses, and timber companies were omitted, but we retained limited liability corporations to prevent excluding hunt clubs and farms (Cecil et al. 1995). We randomly selected 300 landowners from each of the 28 counties except Dare and Jackson counties, where only 202 and 232 landowners, respectively, owned the minimum acreage required for inclusion in the sample.

We conducted a pre-test with a convenience sample of landowners who were asked to complete a preliminary version of the survey and provide comments on how to improve clarity of questions. Surveys were printed with pre-paid postage and a business reply address. We sent each landowner a cover letter explaining the project, a survey, and sticker to seal the survey for return mailing. We mailed a reminder postcard to all landowners after the initial survey mailing. Budget constraints prevented a second questionnaire mailing, but

a second survey was mailed if a landowner lost or misplaced the initial survey and requested another. We randomly selected 43 non-respondents and asked a shortened version of the survey over the phone to detect potential bias between respondent and non-respondent populations (Chaves et al. 2005). The survey instrument and protocol were approved by the North Carolina State University Institutional Review Board for the Protection of Human Subjects in Research (IRB #268-07-6, June 2007).

Binary logistic regression was used to test the models that were developed to predict landowner participation in a variety of wildlife management practices. Population counts, prescribed burning, harvesting timber to create wildlife habitat, application of herbicides, and flooding during the winter for waterfowl were not modeled because of low participation by respondents. Participation in each activity was coded as a binary variable (no = 0, yes = 1). Independent variables considered in the models included: gender (male = 0, female = 1), age, annual household income (1 = < \$25,000; 2 = \$25,001 - \$45,000; 3 = \$45,001 - \$65,000; 4 = \$65,001 - \$85,000; 5 = \$85,001 - \$125,000; 6 = \$125,001 - \$175,000; 7 = > \$175,001), distance to nearest city (distance to city in miles; landowners were asked to select from a list of cities and estimate driving distance from their largest tract of land to the selected city), education level achieved (1 = did not complete high school; 2 = high school; 3 = associates degree or some college; 4 = four year college degree; 5 = graduate degree), if the land was used to earn income (no = 0, yes = 1), if the landowner lived on the land (no = 0, yes = 1), if the landowner or an immediate family member hunted (no = 0, yes = 1), and acreage of largest tract owned. A log₁₀ transformation was used to normalize acreage and a square root transformation was used to normalize distance to city.

Results

A total of 1,368 usable surveys were returned for an overall response rate of 17%. From the non-respondent sample we achieved a 69% response rate (n= 30) and we did not detect differences between the main sample and the sample of non-respondents. The socio-demographic characteristics of landowners (e.g., landowner age, annual household income, and education levels achieved) were similar to those reported in studies conducted in the Southeast (e.g., Daley et al. 2004, Measells et al. 2005, Jarrett et al. 2009). Landowners were educated (77% had at least an associate's degree or some college), averaged 61 years of age, and were primarily men (68%). The median tract size owned was 37 acres, with 80% of landowners having tracts under 100 acres.

Landowners most commonly provided supplemental feed (21.8%), mowed for wildlife (16.2%), provided nesting boxes (14.7%), and planted food plots (14.6%) (Table 1). Being a hunter or having a family member that hunted increased the likelihood that the landowner participated in all wildlife management activities except removing invasive plants (Table 2). Hunters had a greater predilection for keeping harvest records (11.4%) than non-hunters (0.8%). Hunters also had higher participation levels in planting food plots (27.8%) and disking (11.2%) than non-hunters, with 3.2% and 0.8% participating, respectively. Landowners residing on the property were more likely than non-resident landowners to participate in all activities except keeping animal harvest records and disking for habitat improvement (Table 2).

Landowner education level was positively correlated with participating in mowing and controlling invasive species. Males were more likely than females to participate in management activities such as mowing for wildlife, establishing food plots, disking, and leaving un-harvested crops in the field for wildlife. As landowners aged, the likelihood that they participated in any habitat management practice decreased (Table 2). As property size increased, landowners were more likely to conduct predator management, disk for habitat improvement, and leave un-harvested crops in fields for wildlife.

Discussion

Being a hunter or having a family member that hunted was the most important predictor of landowner participation in every type of wildlife management practice except controlling invasive plants. Hunters may believe they have an obligation to conserve wildlife as part of the role of being a good sportsman, or hunters may conduct management to improve their own hunting success (Geist et al. 2001). Conducting management may not only improve the likelihood of harvesting an animal, but also seeing wildlife or signs of it, which likely increases overall hunter satisfaction (Decker et al. 1980, Hammitt et al. 1990, Tynon 1997).

Mass media and some government agencies may influence hunters' perceptions of several key wildlife management practices. Hunters may provide supplemental feed and maintain food plots because advertising suggests it increases overall fitness of wildlife populations or improves the chance of harvesting an animal (Schultz and Johnson 1992, Gray et al. 2004). Food plots are promoted to hunters through hunting magazines and television shows as a way to improve quality and abundance of wildlife, regardless of the consequences

for wildlife populations (Madison et al. 2002, Moorman et al. 2006, Smith et al. 2007). Although hunters already conduct these popular wildlife management practices, there is opportunity for natural resource professionals to encourage hunters to implement additional practices, such as prescribed burning, which benefit a wide array of species. However, hunting participation has decreased over the last several years (Enck et al. 2000, U.S. Department of the Interior and Department of Commerce 2006). The decline in hunting participation, coupled with the increase in new landowners with urban backgrounds and values, may soon diminish the opportunity to work with hunter-landowners to conduct additional habitat improvements (Mankin et al. 1999, Stedman and Heberlein 2001).

Similar to other research (Kendra and Hull 2005, Feldpausch and Higginbotham 2006, Joshi and Arano 2009), non-resident landowners in our study were less likely to participate in wildlife management practices. However, our research adds to earlier work by identifying specific practices (e.g., disking to improve wildlife habitat, providing nesting boxes) that other studies did not explore. Not residing on the property could preclude landowners from conducting these types of management activities because they live too far away and do not have enough time to travel to and from the property. Resident landowners may be more apt to conduct wildlife management because they are directly involved with their land on a more consistent basis and may get to enjoy the benefits of the practices by viewing wildlife more regularly than non-resident landowners.

Absentee landowners have different objectives for owning land than resident landowners, resulting in different management regimes on private land. Rural real estate investments help protect against inflation, which has contributed to the accelerated demand

for land over the past several decades as the economy has gone in and out of recessions (Healy and Short 1979). This has increased the number of absentee ownerships, resulting in land left in idle condition. We suggest that government agencies and conservation organizations can increase participation in habitat management practices on private lands by informing non-resident landowners that wildlife habitat has the potential to improve property values (Jones et al. 2006, Bastian et al. 2007).

Women in our study were less likely to participate in wildlife management activities, which could be related to changing rural gender roles and women's general perspectives on wildlife. Women tend to have protectionist and moralistic views of wildlife and support species conservation more than men (Kellert and Berry 1987, Czech et al. 2001, Dougherty et al. 2003). However, our study predicted participation, but not interest or support for wildlife management. Women may have supported the management activities, but may not have conducted the practices themselves. In the past 40 years, women have entered the workforce to supplement incomes on small working farms, thus removing them from the actual implementation of wildlife practices (Bokemeier et al. 1983, Coughenour and Swanson 1983, Shortall 2006). An increasing percentage of acreage in the South and Midwest is owned by women, and women are more likely than men to have acquired land through inheritance (Effland et al. 1993). Additionally, women are outliving their husbands, and many daughters are inheriting property. For these reasons, women should be a primary target for future efforts to promote wildlife management practices on private lands.

We discovered that younger landowners were more likely to engage in management practices. Joshi and Arano (2009) also showed that younger landowners in West Virginia

were more likely to be involved in conducting wildlife management. Other studies have shown conservation attitudes to be more prevalent in younger people, providing a potential explanation for these findings (Corral-Verdugo et al. 2003, Langpap 2004). With aging landowners and the subsequent intergenerational transfer of land expected, opportunity may exist to work with younger landowners on implementing wildlife management practices on their newly acquired land. Many of the management activities included in our study may have been conducted as part of ongoing farming practices (e.g., disking, mowing). However, when older landowners retire they no longer maintain the land or participate in management as they did historically. Also, changes in physical ability may impair older landowners and prevent them from conducting management (Hootman et al. 2003). Research is needed to explore the reasons older landowners are less inclined to participate in wildlife management. A potential explanation is a changing perspective brought on by age, retirement, or lack of necessity.

The overall level of participation in wildlife management activities was low and the most commonly implemented practices, such as supplemental feeding, mowing, and maintaining food plots, resemble management activities on a typical farm. These practices, along with the provision of nest boxes, are promoted commonly in the popular media (e.g., hunting magazines, television shows, gardening magazines). Yet, these practices generally yield short-term results and likely benefit a narrower range of species than other practices such as prescribed fire (Moorman et al. 2006), which rarely was implemented by landowners in our study. Prescribed burns improve forage and cover for wildlife, and conservation of wildlife diversity in the southeastern United States is dependent upon maintaining prescribed

fire as a management practice on private lands (Brennan, et al. 1998, Harper 2007). Southern landowners may be hesitant to allow prescribed burns because of media portrayal of western wildfires, concern about liability, or fear of fire (Moorman et al. 2000).

The predicted demographic shifts and their potential effects on wildlife management on private lands will need to be considered by agencies hoping to improve wildlife education programs. Hunter recruitment programs also will likely need to play a role, particularly because landowner participation in hunting was the most important predictor of whether wildlife management occurred.

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Table 1. Participation by North Carolina private landowners in wildlife management practices, 2007.

Wildlife Management Practice	% Participating
Supplemental feeding (e.g., feeders)	21.8
Mowing to maintain wildlife habitat	16.2
Erecting nesting boxes (e.g., wood ducks, blue birds)	14.7
Wildlife food plot establishment/maintenance	14.6
Kept records of the number of animals harvest on the property	7.2
Predator management (e.g., coyote, fox removal)	7.0
Controlling invasive plants	5.9
Disking for wildlife purposes	5.7
Un-harvested crops left in agricultural fields for wildlife	5.1
Pest species management (e.g., beaver, wild hog, mole/vole removal)	5.1
Timber thinning/harvesting for wildlife purposes	3.4
Herbicides for wildlife purposes	2.5
Prescribed burning for wildlife purposes	2.3
Conducting wildlife sex and age population counts	1.8
Winter flooding for waterfowl (pumping or catching rainfall/runoff)	0.8

Table 2. Binary logistic regression models predicting participation in wildlife management practices, North Carolina, 2007.

Independent Variables	Coefficients (Odds Ratio) [Standardized Odds Ratio]									
	Predator Mngmnt	Pest Species Mngmnt	Animal Harvest Records	Supplemental Feeding	Nesting Boxes	Wildlife Food Plots	Mowing for wildlife	Disking for Wildlife	Controlling Invasive Plants	Leaving Un-harvested Crops
<i>Land Used to Earn Income</i>	0.49 (1.63) [1.27]	0.49 (1.61) [1.28]	-0.07 (0.93) [0.97]	-0.16 (0.86) [0.93]	0.07 (1.08) [1.04]	-0.06 (0.94) [0.97]	-0.31 (0.731) [0.86]	-0.46 (0.63) [0.80]	-0.01 (1.00) [1.00]	0.70 (2.01) [1.42]
<i>Live on Land</i>	0.95*** (2.58) [1.61]	0.94** (2.55) [1.60]	0.51 (1.67) [1.29]	1.53*** (4.61) [2.14]	1.81*** (6.13) [2.47]	0.47* (1.60) [1.27]	0.70*** (2.02) [1.42]	0.47 (1.59) [1.26]	1.42*** (4.12) [2.03]	0.99** (2.70) [1.64]
<i>Hunt</i>	1.35*** (3.84) [1.96]	0.89** (2.43) [1.56]	2.88*** (17.89) [4.22]	1.09*** (2.97) [1.72]	0.54** (1.71) [1.31]	2.25*** (9.47) [3.07]	0.83*** (2.30) [1.51]	2.53*** (12.51) [3.53]	0.36 (1.43) [1.20]	1.14** (3.11) [1.76]
<i>Gender</i>	-0.66 (0.52) [0.74]	-0.36 (0.70) [0.84]	-0.74 (0.48) [0.71]	-0.43* (0.65) [0.82]	0.03 (1.04) [1.02]	-1.19*** (0.31) [0.58]	-.62** (0.54) [0.75]	-1.23* (0.29) [0.57]	-.041 (0.96) [0.98]	-1.20* (0.30) [0.57]
<i>Education</i>	0.06 (1.06) [1.07]	0.29* (1.33) [1.38]	0.04 (1.04) [1.05]	0.09 (1.10) [1.11]	0.17 (1.18) [1.20]	-0.23* (0.79) [0.77]	0.12 (1.12) [1.14]	-0.08 (0.92) [0.91]	0.38** (1.46) [1.53]	-0.06 (0.95) [0.94]

Table 2. Continued.

Coefficients (Odds Ratio) [Standardized Odds Ratio]										
Independent Variables	Predator Mngmnt	Pest Species Mngmnt	Animal Harvest Records	Supplemental Feeding	Nesting Boxes	Wildlife Food Plots	Mowing for wildlife	Disking for Wildlife	Controlling Invasive Plants	Leaving Un-harvested Crops
<i>Distance to City</i>	0.08 (1.08) [1.16]	0.07 (1.07) [1.13]	0.06 (1.06) [1.12]	0.07 (1.07) [1.13]	0.02 (1.02) [1.04]	0.05 (1.05) [1.10]	0.04 (1.04) [1.08]	0.03 (1.03) [1.06]	-0.12 (0.89) [0.81]	0.28** (1.32) [1.65]
<i>Age</i>	-0.03*** (0.97) [0.66]	-0.01 (0.99) [0.84]	-0.03* (0.98) [0.73]	-0.03*** (0.98) [0.73]	-0.01 (0.99) [0.85]	-0.03*** (0.97) [0.70]	-0.01 (0.99) [0.86]	-0.03* (0.97) [0.72]	-0.03* (0.98) [0.73]	-0.04** (0.97) [0.64]
<i>Annual Household Income</i>	-0.06 (0.94) [0.90]	0.10 (1.10) [1.19]	0.06 (1.07) [1.12]	0.15** (1.16) [1.31]	0.07 (1.08) [1.15]	0.07 (1.07) [1.13]	0.05 (1.05) [1.10]	-0.07 (0.93) [0.87]	0.13 (1.14) [1.26]	-0.03 (0.97) [0.94]
<i>Largest Tract Acreage</i>	1.34*** (3.81) [1.92]	0.69* (1.99) [1.40]	0.67** (1.96) [1.39]	0.11 (1.12) [1.06]	0.01 (1.06) [1.03]	0.92*** (2.50) [1.56]	0.74*** (2.09) [1.43]	1.15*** (3.17) [1.75]	0.33 (1.39) [1.18]	1.14*** (3.11) [1.74]

APPENDIX

Appendix A

North Carolina Private Landowner Survey

North Carolina State University is a land-grant
university and a constituent institution of
The University of North Carolina

Fisheries and Wildlife Sciences Program
College of Natural Resources
Campus Box 7646
Raleigh, NC 27695

I am writing to request your help in a study of wildlife conservation on private land in North Carolina. The enclosed survey will improve our understanding of wildlife habitat management practices on private land and economic incentives available for North Carolina land owners.

You are one of a select number of landowners in your county who was asked to participate. The survey is divided into three parts and most landowners will complete only parts one and three, which will take less than 30 minutes. I understand your time is valuable, but your opinion and the information you provide is critical to help make wildlife habitat management more profitable for North Carolina landowners. Results will be used to help landowners throughout the state.

Individual information gathered from this survey will not be given or sold to any organization and all answers are confidential. The survey and all protocols have been approved by the Institutional Review Board at North Carolina State University (IRB Number: 268-07-6).

As a token of our appreciation, all completed and returned surveys will be entered into a drawing for a \$100 gift certificate to Gander Mountain, a portion of which was generously donated by Gander Mountain of Charlotte, NC.

Please complete the survey to the best of your ability by April 18, 2008. It can be returned postage paid by closing the booklet and securing with provided sticker.

If you have questions, please contact me via email at kegolden@ncsu.edu or by phone at 919-513-7559 through the Fisheries and Wildlife Sciences office at NCSU. Thank you for taking the time to complete the survey.

Sincerely,

Katherine Golden
M.S. Student, North Carolina State University

Chris DePerno, Ph.D., NCSU, Department of Forestry and Environmental
Resources, Fisheries and Wildlife Sciences Program
Chris Moorman, Ph.D., NCSU, Department of Forestry and Environmental
Resources, Fisheries and Wildlife Sciences Program
Bob Bardon, Ph.D., NCSU, Department of Forestry and Environmental Resources

Surveying North Carolina Private Landowners



Fisheries & Wildlife Sciences Program
North Carolina State University
Campus Box 7646
Raleigh, NC 27695-7646

PART I: Land & Activity Description

1. What is the acreage of your largest tract of land in North Carolina? acres

a. In what county is it located?

b. If you own more than one tract of land, please list each tract of land owned in North Carolina:

County	Total Acreage
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>

*****The questions in the remainder of this survey refer to the LARGEST TRACT OF LAND you owned during 2007*****

2. Is your largest tract of land used to generate income (e.g., manufacturing services, real estate development, agriculture/farming practice, or fee-hunting, etc.)?

- ☐ YES
☐ NO

If YES, please describe: _____

3. Do you live on this tract of land?

- ☐ YES
☐ NO

If NO, approximately how far do you live from the property?

miles

4. Do you make joint decisions about the land with another person?

☐ YES

☐ NO

If YES, please describe their relationship to you:

5. Which city is closest to your largest tract of land?

☐ Asheville, NC

☐ Bristol, TN

☐ Charlotte, NC

☐ Chattanooga, TN

☐ Fayetteville, NC

☐ Florence, SC

☐ Greensboro, NC

☐ Greenville, NC

☐ Greenville, SC

☐ Jacksonville, NC

☐ Knoxville, TN

☐ Martinsville, VA

☐ Norfolk, VA

☐ Raleigh, NC

☐ Wilmington, NC

☐ Winston-Salem, NC



6. Traveling by road, what is the approximate distance from your largest tract of land to the city checked above?

 miles

7. Do you or an immediate family member hunt?

☐ YES

☐ NO

If YES, who? Please check all that apply.

☐ Person taking survey

☐ Spouse

☐ Child/children

☐ Extended relative

8. What is the acreage per habitat type described below on your largest tract of land?
 (*If a habitat description does not apply, please leave blank.)

FOREST (*Trees of any size or type, including land that has been recently harvested*)

	CUTOVER	PLANTED PINES	NATURAL PINES	UPLAND HARD-WOODS	BOTTOM-LAND HARD-WOODS	MIXED PINE HARD-WOODS	Other (Please Specify):
DESCRIPTION	Trees harvested within the last 5 years	Planted pines > 5 years in age	Mostly unplanted natural pines > 5 years in age	Mostly hard-woods on upland sites > 5 years in age	Mostly hard-woods on bottom-land sites > 5 years in age	Relatively equal amounts of pine and hard-wood > 5 years in age	
ACRES							

AGRICULTURE (*Row crops, pasture, fallow fields, orchards, or aquaculture*)

	ROW CROPS	PASTURE/FALLOW FIELDS	ORCHARDS	FARMS OF STOCK PONDS/AQUACULTURE	OTHER (Please Specify)
DESCRIPTION	Planted row crops (corn, wheat, etc.)	Lands for livestock grazing or left inactive & unseeded for at least 1 season	Land devoted to the cultivation of fruit and/or nut trees	Cultivation of aquatic plants and animals	
ACRES					

OTHER (Land not included in the agriculture or forest categories including swamps, lakes, ponds, semi-permanent/permanent man-made or natural water sources)

	PERMANENT WATER (Man-made)	PERMANENT WATER (Natural)	POWERLINES, RIGHT OF WAYS, ETC.	RESIDENCE(S)/ STRUCTURE(S)	OTHER (please specify)
DESCRIPTION	Ponds, waterfowl impoundments (Do not include aquaculture pond)	Sloughs, beaver ponds, lakes, major streams	Pathways for transportation, utilities	House, yard, outbuildings, production facilities, other building structures	
ACRES					

9. What HABITAT management practices were implemented on your land during 2007? Please indicate the number of acres where the practice was implemented and the approximate cost of implementing the practice. **If not applicable, please leave blank.*

HABITAT PRACTICES	ACRES	ANNUAL COST
Wildlife food plot establishment/maintenance		
Mowing to maintain wildlife habitat		
Disking for wildlife purposes		
Prescribed burning for wildlife purposes		
Herbicides for wildlife purposes		
Timber thinning/harvesting for wildlife purposes		
Controlling invasive plants		
What trees and shrubs have you planted for wildlife? Please list:		
Un-harvested crops left in agricultural fields for wildlife		
Winter flooding (pumping or catching rainfall/runoff)		
Other (Please specify):		

10. How much did you spend on habitat management expenses during 2007?

- | | | |
|--|--|--|
| <input type="checkbox"/> \$0 | <input type="checkbox"/> \$2,001-\$5,000 | <input type="checkbox"/> \$15,001-\$25,000 |
| <input type="checkbox"/> \$1-500 | <input type="checkbox"/> \$5,001-\$7,000 | <input type="checkbox"/> \$25,001-\$50,000 |
| <input type="checkbox"/> \$501-\$1,000 | <input type="checkbox"/> \$7,001-\$10,000 | <input type="checkbox"/> \$50,001-\$75,000 |
| <input type="checkbox"/> \$1,001-\$2,000 | <input type="checkbox"/> \$10,001-\$15,000 | <input type="checkbox"/> \$75,001 + |

11. What WILDLIFE management practices were implemented on your land during 2007? Please indicate the approximate annual cost of implementing the practice.

**If not applicable, please leave blank.*

WILDLIFE PRACTICES	YES	NO	IF YES, WHAT IS THE ANNUAL COST?
Predator management (e.g., coyote, fox removal)			
Pest species management (e.g., beaver, wild hog, mole/vole removal)			
Kept records of the number of animals harvested from your property			
Conducted wildlife sex and age population counts			
Supplemental Feeding (e.g., feeders)			
Nesting boxes erected (e.g. wood ducks, bluebirds.)			
Other (Please specify):			

12. Are you conducting specific management practices for harvesting white-tailed deer (e.g. minimum antler size, required doe harvest)?

- ☐ YES
- ☐ NO

If YES, please check all that apply.

- ☐ Harvest more does
- ☐ Earn-a-buck (i.e., shoot doe first)
- ☐ Minimum spread
- ☐ Minimum number of points
- ☐ Harvest "cull" bucks

13. Please **RANK** the 3 most important habitat management activities on your property

(1 = MOST IMPORTANT 2 = 2ND MOST IMPORTANT 3 = 3RD MOST IMPORTANT)

- ___ Timber management
- ___ Prescribed (controlled) burning for wildlife purposes
- ___ Food plot establishment and management
- ___ Selective harvest of game animals
- ___ Management for non-game species (e.g. songbirds)
- ___ Management of aquatic or wetland resources
- ___ Pest species management
- ___ Predator management

___ Other (Please specify)

___ Other (Please specify)

___ Other (Please specify)

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14. During 2007, did you receive financial incentives or participate in land conservation programs for habitat improvement from any of the following?

If YES, please check all that apply.

If NO, please skip to question 16.

- ☐ Agriculture Cost Share Program for soil and water conservation
- ☐ Conservation banking/mitigation banking
- ☐ Conservation easements with a land trust
- ☐ Conservation Reserve Enhancement Program (CREP)
- ☐ Conservation Reserve Program (CRP)
- ☐ Environmental Quality Incentives Program (EQIP)
- ☐ Forest Land Enhancement Program (FLEP)
- ☐ U.S. Fish and Wildlife Service Partners Program
- ☐ Wildlife Habitat Incentives Program (WHIP)
- ☐ Other (Please specify)

15. Do you conduct more wildlife habitat management on your property because you receive cost share or financial incentives?

- ☐ YES
- ☐ NO

16. What incentives would you like to see made available for implementing wildlife habitat management practices on your land?

17. Please **RANK** the top 3 sources you use (or would potentially use) to find information about wildlife/habitat management.

(1 = MOST IMPORTANT 2 = 2ND MOST IMPORTANT 3 = 3RD MOST IMPORTANT)

- ☐ U.S. Fish and Wildlife Service
- ☐ North Carolina Wildlife Resources Commission
- ☐ North Carolina Division of Forest Resources
- ☐ North Carolina Cooperative Extension Service
(County Extension Agents)
- ☐ Natural Resources Conservation Service (NRCS)
- ☐ North Carolina State University
- ☐ Private consultation/Consultation with an expert
- ☐ Farm supply store/Sporting goods store
- ☐ Family/Friends/Other landowners
- ☐ Internet/TV/Hunting or outdoor magazine
- ☐ Other (please specify)

18. Please **RANK** the top 3 ways you prefer to receive information about wildlife/habitat management.

(1 = MOST IMPORTANT 2 = 2ND MOST IMPORTANT 3 = 3RD MOST IMPORTANT)

- ☐ Printed information sheets or brochures
- ☐ Magazines/Hunting and outdoor publications
- ☐ Newspapers
- ☐ Books
- ☐ Internet websites
- ☐ Email
- ☐ Radio
- ☐ Television
- ☐ Videos/DVDs
- ☐ Short courses/Workshops
- ☐ Demonstration areas/Field days
- ☐ Other (please specify)

19. Please check whether or not you allowed non-hunting activities on your property during 2007 and indicate the total income you received from the activity last year.

**If you did not receive income please enter \$0.*

ACTIVITY	YES	NO	INCOME
Fishing			\$
Wildlife watching, photography, bird watching			\$
Horseback riding			\$
Motorized travel (ATV, dirt bike, boat, jet-ski, etc.)			\$
Ecotourism (camping, picnicking, hiking, swimming, and non-motorized boating)			\$
Other (please specify):			\$

20. Are wildlife related fee-activities (please see examples in question 19) NOT related to fee-hunting something you would be interested in?

☐ YES

☐ NO

If YES, please list the activities you would be interested in:

21. Did you engage in leasing your land for fee-hunting (an agreement between landowners and hunters in which a landowner charges a fee to hunt on their property) during 2007?

☐ YES: IF YES, PLEASE SKIP TO QUESTION 24

☐ NO: IF NO, PLEASE CONTINUE WITH QUESTION 22

22. Is fee-hunting something you would be willing to establish on your property in the future?

☐ YES

☐ NO

23. Please indicate how important each of the following reasons is for NOT offering a fee-hunting operation or a wildlife-related fee access operation on your property.

(PLEASE CIRCLE CHOICE)

	Unimportant -2	Somewhat Unimportant -1	Neutral 0	Somewhat Important 1	Important 2
Loss of Privacy	-2	-1	0	1	2
Difficulty with trespassing	-2	-1	0	1	2
Damage to property	-2	-1	0	1	2
Accident liability concerns	-2	-1	0	1	2
Safety for yourself or your family	-2	-1	0	1	2
Compatibility with existing land use	-2	-1	0	1	2
Disruption of existing outdoor recreation activities	-2	-1	0	1	2
Do not want wildlife hunted on land	-2	-1	0	1	2
Opposed to hunting	-2	-1	0	1	2
Over-harvest and disturbance of wildlife	-2	-1	0	1	2
Introduction of pest species	-2	-1	0	1	2
Property size is too small	-2	-1	0	1	2
Financial gain not worth the inconvenience	-2	-1	0	1	2
Liability insurance cost	-2	-1	0	1	2
Lack of financing for fee-related activities	-2	-1	0	1	2
Do not understand leasing or other legal arrangements	-2	-1	0	1	2
Do not know of enough hunters who would pay to hunt	-2	-1	0	1	2
Do not know who to contact for information regarding hunting leases	-2	-1	0	1	2
Other (Please Specify)	-2	-1	0	1	2

*****PLEASE GO TO QUESTION 40*****

PART II: Fee Hunting

24. Please **RANK** the top 3 reasons your property is available for fee-hunting.

(1 = MOST IMPORTANT 2 = 2ND MOST IMPORTANT 3 = 3RD MOST IMPORTANT)

- ___ Enhancement of wildlife population management
- ___ Habitat improvement
- ___ Environmental stewardship of the property
- ___ Reduce crop or tree damage through animal harvest
- ___ Lessees monitor trespassing
- ___ Economic diversification or extra income
- ___ Lessees help with wildlife and land management
- ___ Other (please specify)

25. How many years have you received income from fee-hunting on your largest tract of land?

years

26. What was the estimated total revenue received from fee-hunting on your largest tract of land during 2007?

\$

27. How important is the revenue received from fee-hunting to your total household income? (PLEASE CIRCLE CHOICE)

unimportant	somewhat unimportant	neutral	somewhat important	important
-2	-1	0	1	2

28. Estimate the value of the permanent facilities and capital improvements used solely for your hunting operation. Include all capital investments such as guest accommodations, equipment, out buildings, wells, and levees.

- ☐ <\$5,000
- ☐ \$5,001-\$25,000
- ☐ \$25,001-\$75,000
- ☐ \$75,001-\$150,000
- ☐ \$150,001-\$300,000
- ☐ \$300,001 +

29. Do you do more wildlife and habitat management on your property because you receive economic compensation from fee-hunting income?

- ☐ YES
- ☐ NO

30. Check which animals were located on your property and which animals were hunted during 2007.

	ON PROPERTY	HUNTED
BEAR	<input type="checkbox"/>	<input type="checkbox"/>
BOBCAT	<input type="checkbox"/>	<input type="checkbox"/>
COYOTE	<input type="checkbox"/>	<input type="checkbox"/>
CROW	<input type="checkbox"/>	<input type="checkbox"/>
DEER	<input type="checkbox"/>	<input type="checkbox"/>
DOVES	<input type="checkbox"/>	<input type="checkbox"/>
DUCKS, GEESE, SWANS	<input type="checkbox"/>	<input type="checkbox"/>
FOX	<input type="checkbox"/>	<input type="checkbox"/>
QUAIL, PHEASANT, GROUSE	<input type="checkbox"/>	<input type="checkbox"/>
RABBIT	<input type="checkbox"/>	<input type="checkbox"/>
RACCOON	<input type="checkbox"/>	<input type="checkbox"/>
SQUIRREL	<input type="checkbox"/>	<input type="checkbox"/>
TURKEY	<input type="checkbox"/>	<input type="checkbox"/>
WILD/FERAL HOG	<input type="checkbox"/>	<input type="checkbox"/>
OTHER	<input type="checkbox"/>	<input type="checkbox"/>

31. Did you have an **ANNUAL LEASE** fee-hunting arrangement on your largest tract of land during 2007? (*Annual Lease: Lessee has access to the property throughout the year*)

- ☐ YES *If yes, please complete the following table*
☐ NO

*If you have multiple agreements please complete multiple rows

ACRES	LEASE RATE/ACRE	SPECIES INCLUDED ON LEASE

32. Did you offer **SEASONAL LEASE** arrangements on your largest tract of land during 2007? (*Seasonal Lease: Lessee has access to the property only during specific seasons of the year; typically the hunting season for one or more game species*)

- ☐ YES *If yes, please complete the following table*
☐ NO

*If you have multiple agreements please complete multiple rows

ACRES	LEASE RATE/ACRE	TIME PERIOD	SPECIES INCLUDED ON LEASE

33. Did you offer **SHORT TERM** agreements (excluding shooting preserves) on your largest tract of land during 2007? (*Short Term Agreement: Daily, weekend, and/or weekly hunts (e.g. daily permits, gun fees, per animal fees, or package hunts)*)

- ☐ YES *If yes, please complete the following table*
☐ NO

*If you have multiple agreements please complete multiple rows

DURATION OF AGREEMENT (Daily, weekend, and/or weekly hunts)	FEE DESCRIPTION & RATE	SPECIES INCLUDED IN AGREEMENT

34. Did you offer **BROKERAGE LEASE** arrangements on your largest tract of land during 2007? (*Brokerage Lease: Lease with an outfitter or guide who handles all hunting arrangements with customers*)

- ☐ YES *If yes, please complete the following table*
☐ NO

*If you have multiple agreements please complete multiple rows

PACKAGE DESCRIPTION	FEE DESCRIPTION & RATE	SPECIES INCLUDED IN AGREEMENT

35. Did you operate a **SHOOTING PRESERVE** as a fee-hunting arrangement during 2007? (*Shooting Preserve: Privately owned land where wildlife is kept in captivity and released for the purpose of fee-hunting*)

- ☐ YES *If yes, please complete the following table*
☐ NO

*If you have multiple agreements, or multiple preserves for different species please complete multiple rows

PRESERVE DESCRIPTION	FEE DESCRIPTION & RATE	SPECIES HUNTED

36. What was the total number of hunters permitted to use your largest tract of land during 2007?

37. Check the services/amenities that you provided in 2007 to lessees as part of an agreement or for an additional charge in addition to hunting rights:

- ☐ Area for food plots (installed and maintained by customers in landowner designated area)
- ☐ Food plots (installed and maintained by owners)
- ☐ Pump water as needed to flood (e.g. waterfowl impoundments)
- ☐ Guides
- ☐ Maps of hunting areas
- ☐ Transportation to/from hunt
- ☐ Ammunition
- ☐ Shooting range
- ☐ Sporting clays and/or trap skeet
- ☐ Hunting blinds and/or stands
- ☐ Dogs and/or kennels
- ☐ Horses and/or stables
- ☐ Lodging/cabins
- ☐ Bathrooms/showers
- ☐ Food and/or beverage
- ☐ Game processing
- ☐ Newsletter
- ☐ None of the above
- ☐ Other (please specify)

38. How do you develop your customer base?
(Please check all that apply)

- ☐ Booth at outdoor trade show
- ☐ Bulletin at local stores or hunting/fishing stores
- ☐ Customer referrals
- ☐ Family, friends, co-workers
- ☐ Internet website(s)
- ☐ Magazine/Hunting and outdoor publications
- ☐ Newspaper
- ☐ Personal letter to potential clients
- ☐ Professional journal
- ☐ Real estate broker
- ☐ Religious affiliations
- ☐ Road signs
- ☐ Other (please specify)

39. Please indicate how important each of the following concerns is when allowing fee-hunting on your property.

(PLEASE CIRCLE CHOICE)

	Unimportant -2	Somewhat Unimportant -1	Neutral 0	Somewhat Important 1	Important 2
Loss of privacy	-2	-1	0	1	2
Difficulty with Trespassing	-2	-1	0	1	2
Damage to property	-2	-1	0	1	2
Compatibility with existing land use	-2	-1	0	1	2
Disruption of existing outdoor recreation activity	-2	-1	0	1	2
Accident liability concerns	-2	-1	0	1	2
Safety for yourself or your family	-2	-1	0	1	2
Over-harvest and disturbance of wildlife	-2	-1	0	1	2
Establishing a customer base	-2	-1	0	1	2
Other (Please specify):	-2	-1	0	1	2

PART III: General Information

40. Gender

- ☐ Male
- ☐ Female

41. Year born

42. Race or ethnic background

- ☐ Caucasian
- ☐ African American
- ☐ Hispanic
- ☐ Native American
- ☐ Asian
- ☐ Other: _____

43. Highest level of education completed

- ☐ Did not complete high school
- ☐ High school
- ☐ Associates degree or some college
- ☐ Four-year college degree
- ☐ Graduate Degree

44. Annual Household Income in 2007

- ☐ Less than \$25,000
- ☐ \$25,001-\$45,000
- ☐ \$45,001-\$65,000
- ☐ \$65,001-\$85,000
- ☐ \$85,001-\$125,000
- ☐ \$125,001-\$175,000
- ☐ Greater than \$175,001

45. What is the total number of members in the household?

**FINISHED! THANK YOU FOR YOUR PARTICIPATION! YOUR
ANSWERS ARE VALUABLE TO THE STUDY!**

Additional comments:

Directions to Return Survey:

Please close booklet and tape together with provided sticker and
return **postage free**.

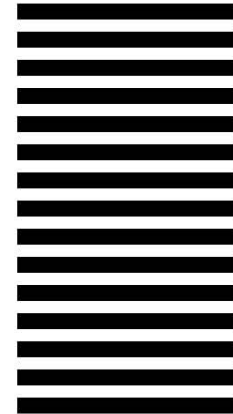
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Fisheries and Wildlife Sciences Program
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