ABSTRACT

CHITWOOD, MICHAEL COLTER. Assessment of Hunters and White-tailed Deer of Hofmann Forest, North Carolina. (Under the direction of Christopher S. DePerno and Richard A. Lancia).

White-tailed deer (*Odocoileus virginianus*) physiology has been studied across much of the species range. However, few studies have been conducted in the Southeast and no studies have been conducted in North Carolina. Further, no physiological studies have been conducted in nutrient deficient pocosin habitat. Using blood serum chemistries and body condition indices, we evaluated deer health in July 2008 and March 2009 at Hofmann Forest, a privately owned pocosin forest managed intensively for timber production near Jacksonville, North Carolina. During both sampling periods, we head shot 30 female deer and performed complete field necropsies. Serum chemistries were within normal ranges with the exception of potassium, which was twice as high as expected. Throughout the study, levels of kidney fat and femur marrow fat were within ranges reported in the literature and abomasal parasite counts did not indicate heavy parasite loads. Spleen and adrenal gland weights were similar between periods. Our results create baseline data for physiological condition of white-tailed deer in coastal North Carolina and indicate that deer in nutrient deficient pocosin habitats are obtaining adequate nutrition.

Hofmann Forest provided a unique opportunity to study how hunting deer and black bear (*Ursus americanus*) with dogs (i.e., dog hunting) contributes to identity. Hofmann Forest had 9 hunt clubs (~450 hunters) who hunted predominantly with dogs. Employing a qualitative approach, we conducted semi-structured interviews and used participant-observation to immerse ourselves into the social context of dog hunting. From interview transcripts, field notes, and actual dog hunting experiences, we performed a narrative

analysis using Paul Ricoeur's theory of narrative identity. The analysis revealed that dog hunter's identified themselves (i.e., sameness) through relationships with other people and dogs. Their sameness with people came from family relationships, friendships, integrating others into dog hunting, and coping with life events through dog hunting, and their sameness with dogs came from the connection to nature that dogs provided. Also, dog hunter identity was shaped by contrasting themselves with others (i.e., selfhood). Dog hunters defined their selfhood using the value of dog hunting to their heritage and the well-being of dogs and wildlife. The differences between how dog hunters and others viewed heritage and animal well-being provided evidence of how conflicts with still-hunters and the non-hunting public arose. Further, dog hunters were concerned that conflicts with still-hunters and non-hunters would lead to dog hunting being restricted or banned. Our results contribute an understanding of how dog hunting plays a constitutive role in the narrative identity of this rural culture and indicate that dog hunters might possess a willingness to compromise on regulatory issues that make dog hunting more socially legitimate.

# Assessment of Hunters and White-tailed Deer of Hofmann Forest, North Carolina

by

Michael Colter Chitwood

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# DEDICATION

I dedicate my thesis to Mom and Dad, for the love and support and the encouragement to stay outdoors; and to my brother, Connor, for being my partner in everything outdoors.

# BIOGRAPHY

Michael Colter Chitwood was born in Dalton, Georgia, on February 6, 1983. Growing up fishing, hunting, and exploring the woods of north Georgia, he developed an early appreciation for wildlife and science. After graduating from Dalton High School in 2001, he pursued his Bachelor of Science degree in Environmental Sciences at the University of North Carolina at Chapel Hill. Graduating in 2005, he returned to Georgia to work in an unrelated field. Over the next two years, his desire to return to graduate school slowly grew, and in August 2007 he entered the Fisheries and Wildlife Sciences Program at North Carolina State University. In August 2010, he is transitioning into a doctoral position at NCSU.

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**Physiological Condition of White-tailed Deer in Pocosin Habitat of Coastal North Carolina**


## Abstract

Physiological and morphological indices are useful for determining physical condition of white-tailed deer (*Odocoileus virginianus*) and are important for deer management. However, information about deer condition in nutrient deficient habitats is sparse. Pocosin habitats are characterized by deep, acidic, peat soils and a dense shrub layer that provides little or no hard and soft mast. In July 2008 and March 2009, we collected a total of 60 female deer from a 31,565-hectare pocosin forest managed intensively for loblolly pine (*Pinus taeda*) in coastal North Carolina. We recorded whole weight, eviscerated weight, spleen and adrenal gland weights, and kidney fat index (KFI). Abomasal parasite counts (APC) and femur marrow fat index (MFI) were determined post-collection in the laboratory, and blood samples were analyzed for packed cell volume and standard serum chemistries. Serum chemistries were within expected ranges with the exception of elevated potassium concentrations. The KFI and MFI were within levels reported in the literature and APC levels did not indicate heavy parasite loads. Spleen ($t_{58} = 0.69$, $P = 0.492$) and adrenal gland weights ($t_{58} = 1.46$, $P = 0.151$) were similar between periods. Our results provide baseline physiological data for deer in coastal North Carolina and indicate that deer in nutrient deficient pocosin habitats are healthy.

## Introduction

White-tailed deer (*Odocoileus virginianus*) are among the most managed species in the United States. Deer management typically focuses on population-level parameters (e.g., relative density, sex ratios, etc.), but the popularity of Quality Deer Management (QDM) has elevated interest in individual-level health parameters (e.g., body weight) that can be used by state agencies, private managers, and hunters to assess the success of management strategies.

Physiological analyses of white-tailed deer are based on blood serum parameters and body condition indicators (e.g., kidney fat, femur marrow fat). Serum chemistry results have been reported from South Dakota (Osborn 1994, Hippensteel 2000), Minnesota (Seal and Erickson 1969, Seal et al. 1978), Michigan (Johnson et al. 1968), Oklahoma (DeLiberto et al. 1989), Kansas (Klinger et al. 1986), Missouri (Tumbleson et al. 1968), Texas (White and Cook 1974, Blankenship and Varner 1977, Kie et al. 1983, Waid and Warren 1984), and Maryland (Wilber and Robinson 1958) and body condition results have been reported from Manitoba (Ransom 1965), South Dakota (Osborn 1994, Hippensteel 2000), Oklahoma (DeLiberto et al. 1989), Texas (Kie et al. 1983, Waid and Warren 1984), and South Carolina (Finger et al. 1981, Johns et al. 1984). However, physiological data for deer from North Carolina and in nutrient deficient pocosin habitats are lacking in the literature. Hence, the objectives of our study were to establish baseline physiological values and determine the health of white-tailed deer in previously unstudied pocosin habitats of coastal North Carolina.

## Study Area

We conducted our study on Hofmann Forest, which was owned and managed by the North Carolina State Natural Resources Foundation. Hofmann Forest was a 31,565-hectare tract of contiguous pocosin habitat intensively managed for loblolly pine (*Pinus taeda*) production in the Coastal Plain of North Carolina (Jones and Onslow counties). Pocosins are unique habitats characterized by deep, acidic, nutrient deficient sandy or peat soils (Richardson et al. 1981). Typical pocosins are fire adapted (15 to 20 year disturbance interval), have temporary surface water (but may flood for long periods), and maintain a high water table (Christensen et al. 1981, Richardson et al. 1981). During the study, Hofmann Forest contained 28 % natural habitat, 52 % pine plantation, and 10 % clearcut. In the natural areas, dominant vegetation included pond pine (*Pinus serotina*) and a dense shrub layer comprised of titi (*Cyrilla racemiflora*), sweetbay (*Magnolia virginiana*), redbay (*Persea borbonia*), inkberry (*Ilex glabra*), and greenbriar (*Smilax* spp.) (Christensen et al. 1981, Richardson et al. 1981). Pocosin habitats provide little or no hard mast, and soft mast is limited. Thus, deer were largely dependent upon browse (Hazel et al. 1978). At their natural climax stage, pocosin habitats represented a low browse resource, with many plants unpalatable to deer. Browse species in undisturbed pocosin habitats contain low crude protein, phosphorus, boron, and calcium, which could affect body maintenance of deer (Sossaman and Weber 1974). Only about 2 % of Hofmann Forest was converted to agriculture (e.g., corn, soybeans, wheat).

During the study, 9 hunt clubs were active on Hofmann Forest, and their hunting areas ranged in size from about 445 to 5,460 ha. Deer and black bear (*Ursus americanus*)

were hunted predominately using dogs (hereafter, dog hunting). Hunters were permitted to run dogs for practice and competitive field trials before, during, and after the actual hunting seasons. Deer gun season began the third Saturday in October and ended January 1 for Jones and Onslow counties. Bear season was the second week of November and the third and fourth weeks of December for Jones County and began the second Monday of November and ended January 1 for Onslow County. Throughout the study period, dog running season lasted from August 1 through February 28.

Harvest records maintained by hunt clubs from 2001 through 2006 indicated a male-biased harvest. On average, hunters harvested antlered males 74 % of the time, and the total deer harvest averaged 430 deer/year during this time period. The North Carolina Wildlife Resources Commission (NCWRC) estimated the deer density in the two-county area including Hofmann Forest was between 6 and 17 deer/$km^2$, with the lower density in pocosin habitat and the higher density in the agricultural areas outside of Hofmann Forest (R. Norville, North Carolina Wildlife Resources Commission, personal communication).

**Methods**

We head shot deer with high-powered rifles at night prior to (July 2008) and after (March 2009) the dog running season. Within minutes of collapse, we collected blood via cardiac puncture and then stored blood samples on ice until centrifuged for serum separation, usually within 6 hours of collection. Serum samples were placed on ice, frozen, and later analyzed by Antech Diagnostics (on an Olympus AU5400) for glucose, urea nitrogen (BUN), creatinine, total protein, albumin, total bilirubin, alkaline phosphatase (ALP), alanine aminotransferase (ALT), aspartate aminotransferase (AST), cholesterol, calcium,

phosphorus, sodium, potassium, chloride, albumin/globulin ratio, BUN/creatinine ratio, globulin, and creatine kinase (CK). We measured packed cell volume (PCV) of whole blood in the field using a hematocrit centrifuge.

We recorded total body weight and collected kidneys with all perirenal fat, spleens, adrenal glands, fetuses (in March), both lower incisors, and the right femur (Osborn 1994, Hippensteel 2000). Eviscerated weights were recorded after all internal organs, the lower jaw, and the right femur were removed. For abomasal parasite counts (APC), we randomly selected a deer from the first 6 processed, then systematically sampled every $6^{th}$ deer to obtain a total of 5 deer. Each abomasum was removed from the digestive tract and stored on ice until processed by the North Carolina State University College of Veterinary Medicine using the methods of Eve and Kellogg (1977).

We determined fat reserves using total perirenal fat (Monson et al. 1974) and femur marrow fat (Verme and Holland 1973). We recorded spleens and paired adrenal gland weights (Osborn 1994, Hippensteel 2000) and estimated ages of collected deer by tooth replacement and wear (Severinghaus 1949) to separate deer into yearling (< 1.5 years) and adult (> 1.5 years) age classes.

We evaluated fecundity and breeding season dates, noting lactation status in July and recording the number, lengths, and weights of fetuses collected in March. We determined reproductive rate from fetal counts (Hesselton and Sauer 1973) and back-calculated conception dates by measuring (Cheatum and Morton 1946) and aging (Hamilton et al. 1985) fetuses using a commercially available fetal aging scale (Quality Deer Management

Association). All research activities were approved by the NCWRC and the North Carolina State University Institutional Animal Care and Use Committee (08-082-O).

Analyses were primarily descriptive, which facilitated qualitative comparison to the literature and veterinary reference values. We compared seasonal means believed to be biologically significant with *t*-tests ($\alpha = .05$) in SYSTAT 10 (Systat Software, Chicago, IL).

**Results**

We collected 30 female deer in July 2008 and again in March 2009. Ages ranged from 1 to 10 years in both sampling periods, with 10 and 3 yearlings in July and March, respectively. Serum chemistry results were obtained for all deer in the July collection (Table 1) and all deer except 1 in the March collection (Table 2). Our results were comparable to ranges in the published literature except for elevated potassium levels. Potassium averaged 9.7 (SD = 1.7) and 8.9 (SD = 1.3) mEq/L in July and March, respectively. We obtained total KFI and MFI, spleen and paired adrenal gland weights (standardized by eviscerated body weight), and total and eviscerated body weights (July and March, Table 3 and Table 4, respectively). Mean spleen ($t_{58} = 0.77$, $P = 0.444$) and paired adrenal gland ($t_{58} = 1.85$, $P = 0.070$) weights were similar between sampling periods.

Mean PCV was 45 % (SD = 5.6; range = 38-63; n = 28) in July and 53 % (SD = 6.6; range = 39-70; n = 30) in March. Mean abomasal parasite counts were low in both seasons, with 440 and 580 worms/L of abomasal content in July and March, respectively. Three genera were identified (*Ostertagia*, *Trichostrongylus*, *Skrjabinagia*), though most worms were *Ostertagia* spp. (possibly *O. mossi*).

In July, lactation rate was 50 % (75 %, excluding 10 yearlings). In March, reproductive rate was 1.5 fetuses/female (1.7 fetuses/female, excluding 3 yearlings), and we collected 7 singletons, 16 sets of twins, and 2 sets of triplets. Conception dates ranged from mid-October to mid-December.

**Discussion**

Serum chemistry results were consistent with the published literature. High potassium values, as encountered in this study, have been reported in free-ranging cervids (e.g., Wilber and Robinson 1958, White and Cook 1974, Kie et al. 1983). Currently, why deer experience higher than expected potassium concentrations and how they tolerate levels that would have adverse consequences in other mammals in not clear.

Total KFI and MFI were comparable to values reported from South Carolina (Johns et al. 1984) and Texas (Kie et al. 1983, Waid and Warren 1984), but lower than those reported from other regions (DeLiberto 1989, Osborn 1994, Hippensteel 2000). Seasonal variation in fat indices has been described for deer in the southeastern United States (Johns et al. 1984), with peak fat reserves occurring in winter (Stockle et al. 1978, Finger et al. 1981, Waid and Warren 1984, DeLiberto et al. 1989). During our collections, females were experiencing the physiological demands of reproduction (gestation in March and lactation in July) which likely required mobilization of stored fat. Forage limitations in pocosin habitats could add to physiological stress and require further mobilization of fat reserves. However, the KFI and MFI values we observed were similar to Johns et al. (1984) and appear to confirm that large fat reserves are not necessary for white-tailed deer in the Southeast (Finger et al. 1981).

Spleen (Aiton 1938, Osborn 1994, Hippensteel 2000) and paired adrenal gland weights (Welch 1962, Osborn 1994, Hippensteel 2000) were greater (60-110 % and 7-75 %, respectively) than those reported in other studies. Increased spleen and adrenal gland weights have been linked to increased stress levels resulting from social stress caused by high population density (Aiton 1938, Christian 1959, Christian et al. 1960, Christian and Davis 1964). However, few studies of white-tailed deer physiology have reported spleen or adrenal glands weights (Aiton 1938, Welch 1962, Osborn 1994, Hippensteel 2000), so regional comparisons are difficult. We suggest the similarities in spleen and paired adrenal gland weights between our sampling periods could indicate chronic population level stress. However, without data from other seasons, we cannot determine if the weights we observed in July and March were normal (but simply higher than other published values) or elevated due to stress. Thus, our results establish baseline values for these metrics, but further study is required to adequately determine the relationship of these values to white-tailed deer physiological condition and health.

Mean PCV from both seasons did not indicate anemia, supporting our assertion that APC levels in our study are not pathogenic. According to Eve and Kellogg (1977), our APC values indicate a low probability of deer overpopulation. Although seasonal variation has been documented (Baker and Anderson 1975, Eve and Kellogg 1977, Moore and Garner 1980), our APC values are consistent with data available from the Southeast (Monschein 1977, Demarais et al. 1983), suggesting our parasite numbers are unlikely to have an adverse impact on overall health. Additionally, we did not detect *Haemonchus contortus*, a large stomach worm, which has been implicated as a major pathogen for white-tailed deer,

particularly in the Coastal Plain of the Southeast (Prestwood et al. 1973, Davidson et al. 1980).

Lactation and reproductive rates determined in this study indicate adequate productivity spanning 2 separate breeding seasons. The high reproductive rate and prevalence of twins and triplets suggest the productivity of the herd is much higher than might be expected from poor quality habitat. Conception dates spanned 2 months, and this could be explained by hunter bias toward harvesting males. Fewer breeding males could contribute to females not being bred in their first estrous of the breeding season.

Most metrics we used to determine deer health corresponded to values reported from other regions of the country and reflected adequate health. Considering that pocosin soil and vegetation are nutrient deficient, we believe that deer from pocosin habitats are finding adequate nutrition and the habitat is not necessarily deficient from a deer health perspective. Likewise, deer density at Hofmann Forest does not appear to be too high. We speculate that deer condition could be dramatically lowered if population density limited access to required forage, particularly considering the natural pocosin forage is nutrient deficient. Our reproductive results, combined with the other physiological parameters, do not suggest that deer are nutritionally constrained by over-population. Further, our deer collections occurred before and after Hofmann Forest's dog running season, so our data indicate that concerns of population-level stress due to dogs is probably unwarranted at this study area. Additional sampling will more adequately identify the range of physiological values that can be expected from coastal North Carolina deer.

## Management Implications

High or increasing deer populations require additional management attention from state agencies and private landowners, and the management of healthy deer populations often includes individual level health parameters. For state agencies, land managers, and hunters, understanding the variation (across regions and habitat types) in these health parameters is important. Our study established baseline physiological data for white-tailed deer from a previously unstudied habitat in coastal North Carolina. Though pocosins are characteristically described as nutrient deficient, our results indicate that deer are obtaining adequate nutrition, which implies that land managers must consider deer health on the natural nutritional plane of any habitat before establishing management strategies that are meant to improve deer health. State agencies and deer managers should benefit from new deer physiological data as hunters and private land managers become ever more focused on evaluating the health of deer under QDM-type programs in varying habitat conditions throughout the white-tailed deer range.

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Table 1. Serum chemistries of female deer collected at Hofmann Forest, NC, July 2008.

| Chemistry (units) | $\bar{x}$ | SD | Range |
|---|---|---|---|
| total protein (g/dL) | 7.3 | 0.44 | 6.4-8.2 |
| albumin (g/dL) | 2.5 | 0.22 | 2.1-3.0 |
| globulin (g/dL) | 4.8 | 0.36 | 3.9-5.3 |
| albumin:globulin ratio | 0.5 | 0.07 | 0.4-0.6 |
| AST (U/L) | 90 | 21.5 | 62-157 |
| ALT (U/L) | 42 | 7.6 | 30-64 |
| alkaline phosphatase (U/L) | 119 | 53.5 | 47-267 |
| total bilirubin (mg/dL) | 0.2 | 0.06 | 0.1-0.3 |
| urea nitrogen (mg/dL) | 17 | 6.4 | 6-33 |
| creatinine (mg/dL) | 1.1 | 0.20 | 0.7-1.6 |
| BUN:creatinine ratio | 17 | 6.7 | 5-31 |
| phosphorus (mg/dL) | 12.6 | 1.85 | 8.9-15.5 |
| glucose (mg/dL) | 194 | 75.9 | 85-333 |
| calcium (mg/dL) | 10.1 | 0.65 | 8.8-11.6 |
| sodium (mEq/L) | 151 | 6.2 | 142-171 |
| potassium (mEq/L) | 9.7 | 1.65 | 5.8-12.0 |
| chloride (mEq/L) | 107 | 3.8 | 101-119 |
| cholesterol (mg/dL) | 45 | 7.1 | 31-58 |
| CK (U/L) | 327 | 335 | 80-1883 |

Table 2. Serum chemistries of female deer collected at Hofmann Forest, NC, March 2009.

| Chemistry (units) | $\bar{x}$ | SD | Range |
|---|---|---|---|
| total protein (g/dL) | 6.3 | 0.44 | 5.3-7.0 |
| albumin (g/dL) | 2.8 | 0.24 | 2.3-3.3 |
| globulin (g/dL) | 3.5 | 0.38 | 2.7-4.4 |
| albumin:globulin ratio | 0.8 | 0.11 | 0.5-1.0 |
| AST (U/L) | 87 | 31.1 | 47-166 |
| ALT (U/L) | 29 | 6.9 | 11-43 |
| alkaline phosphatase (U/L) | 71 | 31.4 | 24-152 |
| total bilirubin (mg/dL) | 0.3 | 0.15 | 0.1-1.0 |
| urea nitrogen (mg/dL) | 19 | 6.3 | 7-35 |
| creatinine (mg/dL) | 1.3 | 0.21 | 1.0-1.9 |
| BUN:creatinine ratio | 14 | 5.3 | 5-29 |
| phosphorus (mg/dL) | 9.7 | 1.65 | 5.6-13.2 |
| glucose (mg/dL) | 200 | 90.2 | 74-409 |
| calcium (mg/dL) | 9.6 | 0.54 | 8.7-10.9 |
| sodium (mEq/L) | 144 | 4.5 | 139-158 |
| potassium (mEq/L) | 8.9 | 1.34 | 6.5-11.9 |
| chloride (mEq/L) | 101 | 2.4 | 97-105 |
| cholesterol (mg/dL) | 45 | 8.6 | 29-65 |
| CK (U/L) | 194 | 142 | 63-739 |

Table 3. Body parameters of deer collected at Hofmann Forest, NC, July 2008.

| Parameter (units) | $\bar{x}$ | SD | Range |
|---|---|---|---|
| KFI (%) | 25.2 | 25.79 | 3.0-116.6 |
| MFI (%) | 33.8 | 27.00 | 2.1-85.4 |
| spleen weight (g/kg)[a] | 8.22 | 1.78 | 5.18-13.72 |
| adrenals weight (g/kg)[a] | 0.15 | 0.048 | 0.04-0.26 |
| whole body weight (kg) | 39.8 | 6.75 | 27.2-54.5 |
| eviscerated weight (kg) | 27.9 | 4.49 | 20.4-40.9 |

[a]gram weights standardized by kg of eviscerated body weight

Table 4. Body parameters of deer collected at Hofmann Forest, NC, March 2009.

| Parameter (units) | $\bar{x}$ | SD | Range |
|---|---|---|---|
| KFI (%) | 32.4 | 26.62 | 2.8-110.6 |
| MFI (%) | 78.5 | 53.44 | 10.0-204.2 |
| spleen weight (g/kg)[a] | 7.87 | 1.73 | 5.2-14.43 |
| adrenals weight (g/kg)[a] | 0.13 | 0.037 | 0.07-0.25 |
| whole body weight (kg) | 39.4 | 7.99 | 22.2-50.8 |
| eviscerated weight (kg) | 28.1 | 4.92 | 17.3-36.8 |

[a]gram weights standardized by kg of eviscerated body weight

**Assessing Dog Hunter Identity in Coastal North Carolina**


## Abstract

As state agencies in the Southeast grapple with restrictions or outright bans on pursuing white-tailed deer (*Odocoileus virginianus*) and black bear (*Ursus americanus*) with dogs (i.e., dog hunting), it is crucial that researchers and managers understand how dog hunting contributes to identity in rural communities. We addressed this need with a qualitative study of dog hunting in coastal North Carolina. We used Paul Ricoeur's theory of narrated identity to evaluate how dog hunting contributes to identity. According to Ricoeur's theory, identity can be divided into sameness (how one recognizes similarities with others) and selfhood (how one distinguishes him- or herself from others). To evaluate dog hunters' sameness and selfhood, we conducted semi-structured interviews, informal interviews, and participant-observation from fall 2007 through winter 2009. Dog hunters' sameness was characterized by relationships with people and dogs. Human relationships included family relationships and friendships, and how dog hunters socially integrated others and used dog hunting to cope with major life events. Human-dog relationships provided connections to nature. Dog hunters' selfhood was characterized by participants distinguishing between themselves and the non-hunting public and between hunters who do not use dogs (i.e., still-hunters). The differences included perspectives on the value of dog hunting to heritage and opinions about animal well-being. Dog hunters viewed these differences as threats to their culture and threats to the future of dog hunting. Our results suggest dog hunting may define identity for some rural communities in coastal North Carolina. Further, the vulnerability

expressed through dog hunter identity suggests an opportunity for states to regulate dog hunting in ways that simultaneously create social legitimacy for the activity and improve relationships between diverse stakeholders. Future research should address the extent these results apply to dog hunters from other parts of the United States.

**Introduction**

For many Southern men, particularly those in rural landscapes, hunting is "woven into the very fabric of personal and social history" (Marks, 1991). Historically, participation in hunting facilitated social relationships, differentiated men and animals, and connected people to the land. Elements of hunting (e.g., firearms, special equipment, dogs, hunting partners) were intimately linked to individual identity (Marks, 1991).

In most southeastern states, hunting with dogs (hereafter, dog hunting) for white-tailed deer (*Odocoileus virginianus*) and black bear (*Ursus americanus*) is a popular rural practice. Though states have different regulations on where and how dog hunting is conducted, the practice is legal in 9 southeastern states (Rabb, 2009). Dog hunters are a small minority of the total number of deer and bear hunters. Currently, many Southeast wildlife management agencies are struggling with how to regulate dog hunting because land fragmentation affects access and exacerbates conflict between dog hunters and private landowners.

Recent declines in hunter participation have spurred many studies of perceptions and participation in hunting (Campbell & Mackay, 2003; Clendenning, Field, & Kapp, 2005; Heberlein & Ericsson, 2005; Li, Zinn, Barro, & Manfredo, 2003; Miller & Graefe, 2001; M. N. Peterson, Mertig, & Liu, 2006; Stedman & Decker, 1993; Zinn, Manfredo, & Barro,

2002). However, little research has focused on dog hunting culture or how it contributes to the identity of dog hunters. Potential declines in dog hunting associated with land fragmentation and with the possibility of an outright ban of the activity make understanding dog hunter identity an urgent need. Research can both document a rapidly disappearing culture and inform the often emotional debates that occur between dog hunters and other stakeholders.

We utilize Paul Ricoeur's theory of narrated identity to analyze narratives shared by dog hunters. Narrated identity refers to how an individual makes sense of his- or herself in and through involvement with others. The narrative unifies actions conducted over time, often including other people and the connections between those people and actions (Paul Ricoeur, 1992). We use the language of dog hunters themselves to ground our understanding of how selves are constructed in narratives (Clarke & Milburn, 2009). We examine how dog hunters used identity for themselves and others and how that identity relates to the constructed meaning of dog hunting.

Ricoeur argued that one's experience of identity has a narrative structure. Further, it is created and recreated, negotiated and renegotiated through the narrative. The construction and reconstruction of identity occurs through a process he calls emplotment, which is "a perpetual weaving and reweaving of past and present events into characters, motives, situations, and actions" (Clarke & Milburn, 2009). Emplotment is the "synthesis between events or incidents which are multiple and the story which is unified and complete" (P. Ricoeur, 1991). Thus, the plot organizes events into a coherent story in which people

become characters in the stories that are told, retold, and revised as their lives unfold (Clarke & Milburn, 2009).

Ricoeur argued that narrating an identity enables humans to conceptualize themselves as distinct from others, continually through time. Thus, narrative construction of identity must allow one to identify him- or herself and identify how s/he is different from others. Sameness refers to the aspects of identity that are fixed, remaining fairly consistent over time and making an individual recognizable. For example, when a dog hunter said, "just got in our blood…you know, dog runnin'," he expressed long-term identification as a dog hunter. Also, sameness describes similarities with others who share the same attributes. By contrast, selfhood refers to differences from others and is created by contrasting oneself against another person. Selfhood takes on an ethical dimension by holding us accountable to others for our actions (Clarke & Milburn, 2009). A selfhood narrative might sound like the sentiment expressed when a dog hunter explained, "there`s a whole lot of land that we have hunted all our life and people come in and buy it and they still-hunt it and they don`t want dogs runnin' cross it." He distinguished himself as a dog hunter from non-dog hunters (i.e., still-hunters), while still recognizing connections between both groups.

**Study Area**

We conducted our study on Hofmann Forest in coastal North Carolina (Jones and Onslow counties). Dog hunting was prevalent in the Coastal Plain of North Carolina, but it was particularly common at Hofmann Forest where all of the 9 hunting clubs that were active on the forest during our study were dog hunting clubs. The North Carolina State Natural Resources Foundation owned and managed Hofmann Forest, a 78,000-acre tract of

contiguous pocosin habitat intensively managed for loblolly pine (*Pinus taeda*) production. Pocosin habitats are comprised of a dense shrub layer (Christensen, Burchell, Liggett, & Simms, 1980; Richardson, Evans, & Carr, 1980) that is difficult for hunters to see through or walk through, making deer and bear hunting with dogs particularly practical. Hunters were allowed to run dogs on Hofmann Forest property for practice, hunting, and competitive field trials from August 1 through February 28. Gun season for deer began in mid-October and ended January 1, but bear seasons varied by county. In Jones County, the bear season was the second week of November and the third and fourth weeks of December. In Onslow County, the bear season began the second week of November and stayed open through January 1.

## Methods

### *Qualitative Approach*

Because this research was an attempt to understand and explain how dog hunters understand and express their identity in their own social context, we employed a qualitative approach (Denzin & Lincoln, 2005). We conducted semi-structured, open-ended interviews with dog hunters and used participant-observation to obtain field notes, additional interviewees, and corroborate data from interviews. We gained initial access to interviewees by holding an organizational meeting with hunt club presidents at the beginning of the project. Club presidents were interested in the outcome of our research because they feared dog hunting bans, and once hunt club presidents volunteered for interviews, additional interviewees were obtained in snowball fashion. We built rapport by accepting when dog hunters invited us to hunt with them. During the 2008 and 2009 hunting seasons, researchers

hunted deer and black bear with dog hunters. Often, additional dog hunters volunteered to be interviewed when we met them in the field during hunts. During fall 2008-winter 2009, we conducted 25 semi-structured (and many more informal) interviews with dog hunters. Interviews lasted from 20 minutes to 1 1/4 hours. The researcher used an interview guide but allowed the informant to direct the conversation. From fall 2007-winter 2009, we collected field notes during participant-observation and informal interviews (where the interview guide was not used). M. Colter Chitwood conducted all semi-structured interviews, though several other researchers contributed to field notes and informal interviews. We reduced bias by using triangulation of interviews, field notes, and participant-observation (Silverman, 2001). Using three methods of data collection helped reveal multiple facets of the people and circumstances under study, creating a more complex, and thus more revealing, depiction of the social context (Fossey, Harvey, McDermott, & Davidson, 2002).

We transcribed all audio files (interviews, field notes) and field notes into Microsoft Word documents and analyzed documents using Weft QDA coding software (Weft QDA, Alex Fenton, 2006). We used first-name pseudonyms for all informants to comply with confidentiality requirements. We used the following citation format to identify quotations from interviews or field notes: Pseudonym, Interview number. For example, a quotation identified as (Justin, I8) was spoken by Justin during interview number 8. Quotations or paraphrases from field notes were attributed to speakers when possible (e.g., William, field notes) but otherwise were cited simply as (field notes).

### *Narrative Analysis*

We used the concepts of emplotment, sameness, and selfhood to examine dog hunter narratives and to further investigate specific instances that communicated self and social identity for dog hunting participants (Clarke & Milburn, 2009). We encouraged themes to emerge from interview transcripts and field notes through constant review and comparison of data (Draucker, Martsolf, Ross, & Rusk, 2007; T. R. Peterson et al., 1994). We systematically coded interview transcripts and field notes by identifying and grouping similar pieces of data in a hierarchical fashion. With the entirety of data arranged in hierarchical coding schemes, perceptions and motivations of dog hunter identity began to emerge. As themes emerged, we categorized them as focusing on sameness or selfhood. We checked themes against observed behaviors of the dog hunters to confirm their validity (Draucker et al., 2007; T. R. Peterson et al., 1994).

## Results

### *Background*

Dog hunting begins when hounds are released onto fresh tracks or into an area where deer or bear are thought to be present. In either scenario, the dogs use their sense of smell to follow the quarry's path (i.e., scent-trailing) until the dogs catch up to the target animal, requiring the animal to move to stay ahead of the dogs (i.e., "the jump"). After the animal is jumped, "the race" or "the chase" begins, and dogs continue to follow the animal by sight or smell (usually the latter) until hunters can put themselves in position to intercept the animal or the dogs. If hunters do not want to shoot the animal being pursued, they must get between the animal and the dogs and "pull the dogs off" the trail. When hunting deer, dog hunters

usually kill the deer as it moves ahead of the dogs. In contrast, many bears are killed when the dogs stop ("bay") the bear by surrounding it on the ground or forcing it to climb a tree ("treeing"). In both cases, hunters must subsequently find the pack of dogs holding the bear at bay, then decide to kill the bear or "pull the dogs off." Dog hunters refer to other hunters collectively as "still-hunters." Though many hunters define still-hunting as a method of slowly stalking through the woods, which would be defined separately from "stand hunting" from a tree stand, in the following we will use the definition used by dog hunters.

***Narrative Identity***

Dog hunting was woven into the narrative identity of dog hunters via human relationships and human-dog relationships. These relationships comprised the two major components of sameness and within each there were essential sub-themes. Within human relationships, dog hunting contributed to identity through family relationships and friendships, which included using those relationships to integrate others into dog hunting and cope with life events. Within human-dog relationships, dog hunting contributed to identity by providing a connection to nature. Selfhood was defined in two major components as well. Dog hunters differentiated themselves from others by emphasizing the value of the heritage of dog hunting and through their views of dog and wildlife well-being. Combined, the components of sameness and selfhood illustrate the variety of themes present in dog hunter identity and how the stories, perceptions, and motivations of dog hunters coalesced into narrative.

### *Sameness with Humans*

*Family Relationships*

Many hunters elaborated on statements about the social importance of dog hunting by emphasizing family and generational aspects. "When I was a baby in diapers, [Dad] would get up in the mornin' and he`d load the dogs up, he`d load me up, the diaper bag up, and we`d go in the woods to hunt and so I have done it ever since. My family, my granddaddy, my uncles, right on down to my cousins--anybody that was raised up around us, that`s what we done--we dog hunted" (Corey, I12). Corey continued, "I grew up doing it…it`s a family thing…I just love, well, I love to be around the people. It`s just the camaraderie with the people" (I12). Further, even respondents who were not introduced to dog hunting by family members agreed the social aspect of dog hunting was important and facilitated surrogate-family relationships. For example, Robert said, "When I was 10 years old, I got diabetes and I was in the hospital for about a week or so and Brandon and Barney came to see me and invited me to go with 'em dog hunting and when I got better, where I could, I went with them and I've been ever since. I've hunted with 'em ever since they invited me that day" (I19). Bill added, "Most of those guys that I'm huntin' with tomorrow I've grown up with as a child…they're kinda like my dads, too--all 35 of 'em" (I15).

Many hunters took pride in dog breeding and thought it was an important activity in which family members participated (e.g., father and son work together to raise a new litter of puppies). Matt told us about his daughter's dog, "the runt of the litter," being taken to a field trial, placing, and winning a trophy. "My daughter was tickled to death about it. It was 27th place and I didn't even know that they started giving out 30 places. It was 27th, but to her,

that was just as good as first" (I13). "We had so many dogs and daddy raised so many dogs. We sold dogs all the way to Arkansas and everywhere else. And it's just the bloodline that you have…after you've fed him and looked after him all year and raised him and then you can turn around and do something with him to win….then it really says somethin'" (Seth, I18). Seth took pride in having "some of daddy's old bloodline," knowing he could keep "messin' with 'em and messin' with 'em [to breed better dogs]" (I18).

*Friendships*

Interviewees believed "dog hunting is really…about the camaraderie and the team" (Dale, I14). On one occasion, a dog hunter mentioned that he "was here for the bull-s---tin'" (William, field notes). Paul talked about the camaraderie in his group, mentioning that "all these local guys come out and cook at my house--once a week, every Wednesday night" (I2). He explained that somebody volunteers to cook and "they do a big thing out at my shop or pool house even when me and my sons are out of town" (Paul, I2).

Competition was an important aspect of the camaraderie in dog hunting. Many hunters expressed interest in competition, from informal comparisons of which hunter's dogs ran the most deer to formal field trials in which awards were given. "It`s kinda a little bit of bragging rights. Sometimes you go there and your dogs run the deer and your dogs up first and that`s one of the reasons we have the field trials--to see if you can outrun your buddies--bragging rights" (Corey, I12). Seth explained that "when you mess with dogs...after you get a name built up for yourself, that you really know what a dog is…they invite you to go judge the hunts to look at other people's dogs" (I18). Mike described field trials as "an excuse for guys to get together, have a little competition, run the dogs, [and] hang out together" (I10).

Another said, “We met a lot of new people through "field trialing" and made lifelong friends” (Rick, field notes). Corey said that “we started doing the field trials and it seemed to have brought everybody together. I knew 10 times or a hundred times the people now in these clubs than what I used to…I went to school with some of ‘em and kinda got away from ‘em. But the field trials brought us all back together” (I12).

*Integrating Others*

Hunt club members typically made guest, novice, or young hunters the focus of the hunt (field notes). First dog hunts and first kills served as rites of passage for the dog hunters. Several interviewees invited researchers to come on dog hunts to “see what dog huntin’ is all about” (field notes). One day in the field, we met a group already involved in a bear chase and Peter explained that “another member’s son was here to maybe take his first bear” (I22). Likewise, when researchers hunted with deer or bear hunters, the focus always tended toward putting researchers (rather than a dues-paying club member) in the right place for a shot at the deer or bear. On several occasions, as it sounded like the dogs had finally treed a bear, hunters openly stated they did not want to shoot the bear. They turned to the researchers to make sure they were ready to go into the woods for the kill (field notes). In another case, a researcher killed a doe one hour into his first dog hunt for deer, and Rick (the club member mentoring the researcher) called over the radio, “Alright! The rookie got ‘em one!” (field notes).

*Coping with Life Events*

Dog hunting played a major role in how hunters dealt with life events. Rick revealed that his own interest in dog hunting and competitive field trials was the result of his son

introducing him to everything. He acknowledged that his background in dog hunting was different from most because he did not start until he was 41 years old and "wasn't raised by a 'hunting dad'" (Rick, field notes). Rick said, "It came a little late but a father and son had finally truly bonded. Our relationship became more than a father and a son--we were buddies" (Rick, field notes). When Rick's son passed away one year before this study, dog hunting and the relationships created through dog breeding and field trials became the foundation from which he dealt with his loss. "Words can never describe how badly I miss him. Hunting season is coming up and I really don't know if I can stand it without him. I do know I cherish the memories. I am so thankful I joined 'his sport' back in 1997….And the friendships made from 'our sport' are equally as important. In closing I want to thank these friends for being there for me and our family through this difficult time" (Rick, field notes).

Also, dog hunting was used to raise funds for community members facing expensive injuries and illnesses. One hunter mentioned, "there's several Relay for Life cancer hunts and benefit hunts" and if "somebody gets in a car wreck…they throw a field trial for it. And it's a quick way…to raise a couple or three thousand dollars or so" (Matt, I13). Field trials were also used to raise money and awareness for local high schools, hunter safety courses, and charities (field notes).

***Sameness with Dogs***

Informants made it clear that emphasis on the dogs was one of the most important aspects of being a dog hunter (field notes). Deer and bear hunters demonstrated that focus on dogs extended beyond the hunting hounds. On almost every trip to the field, we saw "pet" dogs riding in pickup trucks with the hunters (field notes). Corey mentioned that he owned

13 hunting dogs and added, “I`ve got two housedogs. I`ve got a little lab puppy and I`ve got a dachshund” (I12). When asked about his dogs, Matt said, “I've only got eight walkers [hounds] right now. I've got two labs and a rat terrier at my house as pets” (I13).

*Connection to Nature*

Dog hunting served as connections to nature for a majority of hunters. The hunters could be out in the woods, socializing by the truck, or relaxing while the dogs worked and thus, the dogs mediated the hunters’ connection to the natural world. Dog hunters expressed simple interest in “the chase” or “hearin’ the dogs” (field notes). When asked about their favorite aspect of dog hunting, Bill and Barney both said, “I like listenin’ to the dogs” (I15, I17). Seth confirmed his favorite thing was “hearing the dogs run.” “Yeah, I’d sit right there. If they would run right there in that block, around and around, I’d sit there all day long” (I18). Many hunters emphasized their interest in the dogs outweighed a presumed interest in killing big bucks. After Barney said that listening to the dogs was his favorite part of dog hunting, he added, “If I wanna kill a big buck, I’ll go still-hunt” (I17).

In their descriptions of how dog hunting was focused on the dogs (or social aspects), hunters often mentioned that it was not about the kill. “It ain't all about killing something. Hearing the dogs run is wonderful….It ain't all about killing” (Robert, I19). Some older respondents frankly admitted they had killed enough (deer or bear) in the past and did not care about killing more. “I enjoy messing with the dogs--that's the part I enjoy. If it was up to me there wouldn't really be an open huntin’ season. There would be an all year long dog [running] season” (Matt, I13). Another hunter added, “I've killed several bear in my life. I don't plan on killing no more” (Bill, I15). Of course, dog hunters were still interested in big

bucks or big bears. Most hunters, even those deemphasizing the kill, were willing to shoot a big buck if the opportunity presented itself. "They wanna hear the dogs run and maybe get a chance to kill a nice buck" (Bill, I15). On deer hunts, hunters often mentioned "wanting to run racked bucks," just as bear hunters mentioned wanting to find big tracks on which to turn out the dogs (field notes). Bear hunters even showed preference for larger bears by pulling the dogs off the trail of small bears or out from under the tree in which a small bear was treed (field notes). In one instance, the dogs treed a legal bear, yet the hunters considered it too small to be killed. The hunters took pictures of the bear and the dogs, and then pulled the dogs away leaving the bear free to leave the tree (field notes).

### *Selfhood*

Dog hunters defined differences between themselves and others using the concepts of heritage and animal well-being. They described dog hunting as a valuable part of their heritage and believed that others did not place the same value on dog hunting. This included that dog hunters remembered "the good 'ol days" when they could run dogs across vast areas of land, private or otherwise, without fear of repercussions. Dog hunters explained how they took care of their dogs and did not purposely stress wildlife. They believed that their views of dog and wildlife well-being differed from those of people outside of dog hunting.

#### *Heritage*

Dog hunters often reflected on the past when discussing how their views of heritage differed from others'. This included different views on what dog hunting meant to the dog hunters, how much (or little) dog hunters focused on killing, and how land use changes impacted dog hunter access. When asked to describe the difference(s) between dog hunters

and others, one man responded immediately, “Well, it all comes down to a misunderstanding." He explained “that people outside of dog hunting don’t understand how dog hunting works and what it’s all about.” He said “they basically view using dogs and chasing deer with them as a bad thing compared to just shootin’ one in its tracks” (Brandon, I25). Further, dog hunters believed the misunderstanding in the heritage of dog hunting was leading to discussions of banning the practice and that dog hunters “see the writin’ on the wall” (field notes). We heard dog hunters say that dog hunting “ain’t gon be around as long as it has been” (field notes) and "the country is out to get dog hunting" (Paul, I2). “I just think people don't understand…that [dog hunting] is our heritage” (Bill, I15). Interestingly, several hunters pointed out that the Plott hound, the most common dog used for bear hunting at Hofmann Forest, is the state dog of North Carolina (field notes). Originally bred in the mountains in the western part of the state, the breed has over 200 years of history in North Carolina (American Kennel Club, 2010).

Dog hunters explained that some of the misunderstanding about their hunting method was rooted in the act of killing deer or bears. Dog hunters often characterized other people’s opinion of dog hunting as being about the kill. “What those people don’t understand is that [we] don’t kill every deer that the dogs run” (Brandon, I25). “You can't kill all the deer you run…You just ain't going around killin’ everything. A lot of times you'll break the dogs off and you sometimes don't even see the deer. It's not as easy as a lot of people think it is, and it ain't a killin’ sport like everybody thinks it is--that you just shoot, the dogs run ‘em out to you and you shoot ‘em dead” (Robert, I19). By contrast, a few hunters mentioned that to be successful hunting such dense habitats found at Hofmann Forest, dog hunting was a practical

method. "You can`t even hardly walk through there without a machete in your hand, so…the dogs are just practical. I mean, pretty much you got to have 'em" (Dale, I14). Another hunter added, "You really can't still-hunt on that club because the woods are so thick" (Robert, I19).

Dog hunters recognized a difference in their land use needs and the land use needs of others, particularly still-hunters. Hence, still-hunters were less likely to share dog hunters' views that dog chases could progress across property boundaries. "It takes a good bit of land to hunt these dogs. They can cover…a good amount of ground in a short period of time" (Matt, I13). Dog hunters knew that large tracts of land were required to run dogs without disturbing the land uses of other hunters or the non-hunting public. Whether dogs were turned out onto private property on purpose or ended up there accidentally, dog hunters constantly mentioned trespassing as a critical issue (field notes). "There`s a whole lot of land that we have hunted all our life and people come in and buy it and they still-hunt it and they don`t want dogs runnin' 'cross it and that`s their business" (Corey, I12). Then he said that the still-hunters "bad mouth the dog hunters and then the dog hunters, they come back and they bad mouth the [still-] hunters." "And some of the dog hunters, don`t get me wrong, need to be bad mouthed because of some of the things they do…a few bad apples will give everything a bad name" (Corey, I12). However, Corey carefully pointed out on the issue of trespassing, "still-hunters do it too" (I12). Corey explained that both dog hunters and still-hunters "have got some outlaw people that`ll pull right up and shoot in your front yard" (I12). One hunter lamented, "I don't know. I just wish we could get together and wish we

could, ya know, come to a median. I got no problem with a man not runnin' dogs on his private land…I don't know. I just wish that we--we could work out somethin'" (Gabe, I11).

Many dog hunters pointed out that conflict among dog hunters and still-hunters was detrimental to the heritage of hunting itself. When asked whether still-hunters or the non-hunting public were the greater risk to dog hunting, most agreed that the conflict with still-hunters was more problematic, mainly because of the trespassing issue and "buttin' heads" between the two groups (field notes). "I don`t want to down the still-hunter because we need to stay united. The sports fishermen is fighting the commercial fishermen so one of 'em is gonna phase the other out. And I don`t want the huntin' to get phased out in either aspect" (Corey, I12). "I think a non-hunter may be a little more objective. A still-hunter, they put their time in staking out where they want to put their stand, they sneak in there, get in their stand, and they're there for an hour and all of a sudden a pack of dogs comes through there. And so, that builds up some animosity" (Matt, I13). Several hunters made more extreme comments, threatening they would quit hunting all together if dog hunting were banned. Paul said, "If it goes away, I'm done" (I2). He elaborated, saying that he had nothing against still-hunters, but he does not like to still-hunt. Similarly, Corey said, "If I had to still-hunt, I`d probably quit. I just like being involved with the dogs" (I12).

*Dog and Wildlife Well-being*

Many dog hunters differentiated themselves from the non-hunting public based on views of animal well-being (field notes). When asked about how they care for their dogs (e.g., feeding, safety precautions), most hunters described their dogs as athletes. It was apparent their descriptions were worded to refute claims that dogs were starved. The

“Humane Society might not like the way they look because they got a few bones showin` but they’re in running shape. They can go out there and run 12 or 14 hours. And you take one that`s as wide as I am…and in about 2 hours he`s gon be suckin’ air” (Corey, I12). “I treat my dogs like if I was a dog I'd want to be treated” (Robert, I19). “They got the opinion that it's cruel--the way we run the dogs…that you're bein' inhumane to ‘em. And they…don't realize how happy them dogs are when you back up there and you put ‘em in the truck” (Gabe I11). Often, dog hunters added that owning and maintaining dogs was expensive and seemed to use money as evidence they were not mistreating dogs. They cited dog food, “wormer” and other medicines, vet bills, gas for trucking the dogs around, and maintenance of dog pens (field notes). One bear hunter even shared that surgical bills on his best dog had totaled nearly $15,000, half of which was related to an injury inflicted by a bear (Paul, I2). Also, dog hunters mentioned that dog hunting was valuable to the local economy. “You have to buy stuff--feed for my dogs, collars, tracking collars, gas for the truck” (Matt, I13). Matt admitted that he spends “probably $4,000 a year counting the hunting club dues” (I13). Further, dog hunters mentioned that hounds were bred for running and hunting. “I think that's what they were bred for and that's what they strive for. They want to be out and they want to be chasin’ somethin’. When they get tired, they're done. When they don't want to do it no more, you can't make ‘em do it (Robert, I19). Additionally, dog hunters mentioned heat and highways when discussing dog well-being. Hunters mentioned training dogs at night during summer because over-heating was a concern during hot summer days (field notes). Hunters thought colder weather was better because the risk of overheating was low. However, one deer hunt in December 2009 was particularly cold and several hunters had

lined their truck bed with straw so that the dogs did not have to rest on the cold, usually wet, truck bed. We noticed that dogs in trucks with straw curled up to rest between hunts, while dogs in trucks without straw seemed reluctant to lie down (field notes). Also, several hunters put plastic windshields along the sides of the dog boxes to further enclose the dogs. One hunter expressed regret about not putting his windshields on because he did not realize how cold it was going to be that morning (field notes). Concerning highways, one hunter said, "Highways are deadly to 'em. We've come so far in the past 10 years--ya know, trackers on dogs...it's really been a great help…to be able to be able to find your dogs" (Bill, I15).

When asked to consider the impacts of dog hunting on the well-being of wildlife, most hunters believed that wildlife were unharmed. Hunters asserted that wildlife were accustomed to the dogs and could easily out-distance the pack. "If the deer wants to, he can get so far ahead of them dogs, where he can just walk. Some deer's been run and they know what they're gonna to do when they get jumped. They got one area they want to go to. They know when they get there, most time they're safe. And they're going to make a quick escape to it" (Robert, I19). When hunters mentioned that exhaustion was a possibility in some cases, they often followed with the caveat that hunters would break the dogs off the track if necessary (field notes). One hunter explained that younger deer seemed more susceptible to exhaustion and they would actually help the deer and stop the chase when possible. "I mean we've actually picked 'em up outta the bottom of the ditch ya know, and get 'em out of the water, where the small deer are kinda exhausted…and try to help 'em get on along--pull the dogs off of 'em. So most of your deer hunters are conservationists. They're not just out to run the deer to death" (Bill, I15). During our study, one club had about 20 dogs become sick

during a hunt and about half of the dogs died within a week. One hunter had 2 dogs necropsied to find the cause and it was determined the dogs had come into contact with the herbicide paraquat. Another hunter who had lost a dog to the chemical expressed concern for the wildlife as much as the dogs. He said, "if somethin' is hurtin' them dogs, you know its killin' deer and bear and other wildlife" (Barney, I17).

**Discussion**

Dog hunting was constitutive of local culture and contributed significantly to dog hunters' identity. They used narrative to explain how dog hunting contributed to both sameness and selfhood. Their sameness was rooted in social aspects of human relationships and human-dog relationships, while their selfhood was rooted in differences in the value placed on dog hunting as a part of heritage and differences in perceptions of dog and wildlife well-being.

Dog hunters' characterization of their heritage included aspects of land use, and their acknowledgment that land was becoming more fragmented and populated indicated they were aware of how trespassing conflicts, particularly with other hunters, occurred. The inability to control the direction and distance that dogs travel during a chase clearly plays a role in the trespassing conflicts that arise. Unfortunately, not all dog hunters restrict their efforts to tracts of land that are large enough to contain the chase. Dog hunters expressed great concern that trespassing conflicts with other hunters were the most important conflicts they faced.

Our informants argued that others had falsely characterized dog hunters as engaging in animal cruelty and emphasizing the kill, and other research has addressed how hunter

identity differs from the identity characterized for hunters by non-hunting groups (Heberlein & Willebrand, 1998; Minnis, 1997; M. N. Peterson, 2004). Hunters usually identify themselves as playing a natural role of predator or as being sportspersons (M. N. Peterson, 2004), while non-hunting groups identify hunters as immoral and unethical killers and promoters of violence (Heberlein & Willebrand, 1998; Minnis, 1997). However, dog hunters' narrative emphasized social interactions, rather than the kill. In response to charges of animal cruelty, dog hunters used their personal experiences with deer and bear chases as evidence that dog running did not stress wildlife in most cases. Some studies of dog-deer chases support the dog hunters' statements (e.g., Progulske and Baskett (1958), Sweeney et al. (1971), and Gavitt et al. (1974)). Also, two other qualitative studies of (non-dog) hunters (Boglioli, 2009; Reis, 2009) support our conclusion that dog hunters are not focused on the kill. Reis (2009) determined that New Zealand hunters "almost dismissed" the killing aspect and were "highly satisfied" with hunts that did not end with an animal being killed. In a study of Vermont hunters, Boglioli (2009) determined that hunters derived satisfaction from "engaging in the process of hunting" rather than from the kill itself.

We demonstrated how dog hunters constructed and negotiated their identity through their narratives, which included participation in dog hunting and their expressed perceptions of how others characterized dog hunters. Understanding how dog hunting contributes to local culture through hunter identity and identifies cultural threats (and subsequent conflict) can provide insight for potential regulation changes. Familiarity with the narrative identity of dog hunters provides useful information for managers to enhance opportunities for dog hunters and increase awareness with other stakeholders (Clarke & Milburn, 2009).

Dog hunter narrative identity included acknowledging that irresponsible dog hunters are problematic, both in terms of animal well-being and trespassing. Also, dog hunters projected a sense of vulnerability and a suspicion that changes in how dog hunting is regulated are imminent. Results indicate that dog hunters might welcome opportunities to make dog hunting more socially acceptable. Policy solutions represent an area of future research that should be beneficial to dog hunters, other hunters, and the public. Likewise, similar research should be conducted in other parts of the Southeast to confirm that our conclusions regarding the narrative identity of dog hunters at Hofmann Forest are applicable to all dog hunters.

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# APPENDICES

Appendix 1

**Report: Hofmann Forest White-tailed Deer Population**

## Background and Study Area

Intensive management of white-tailed deer (*Odocoileus virginianus*) requires an understanding of population size and composition. Managers can use population size and demographics to establish harvests, which can impact total population numbers, sex ratio, recruitment, and age structure. Currently, detailed information on the Hofmann Forest deer population is lacking, but there is management value in understanding the herd dynamics.

Hofmann Forest was a 78,000-acre tract of contiguous pocosin habitat intensively managed for loblolly pine (*Pinus taeda*) production in the Coastal Plain of North Carolina (Jones and Onslow counties). Owned and managed by the North Carolina State Natural Resources Foundation, Hofmann Forest was purchased in 1934 for teaching and forestry demonstration at North Carolina State University (Miller 1970). Deer hunting has occurred on Hofmann Forest with the exception of 1950 and 1951 when hunting was closed to allow wildlife to rebound after a severe fire in 1950 (Miller 1970). Historically, Hofmann Forest has not intensively managed white-tailed deer (*Odocoileus virginianus*) populations, but due to its size, Hofmann Forest could manage deer at a large scale. However, the forest was broken into regions used by 9 hunt clubs, which made management more difficult and required coordination and cooperation. Spatially, the clubs covered all of Hofmann Forest and ranged in size from about 1,100 to 13,500 acres. The total number of individual hunters was about 450. Excluding black bear (*Ursus americanus*), Hofmann Forest did not impose

wildlife harvest quotas or restrictions. In 2008, hunt permits (term used in lieu of "hunt lease") between hunt clubs and Hofmann Forest stipulated that clubs were to harvest deer in a sex ratio of 1 female for every 2 males, and a ratio of 1:1 was encouraged, but not required. Further, clubs were limited to running dogs (dog hunting) three days per week. Beyond the harvest ratio and dog running rules, hunt clubs were allowed to set their own rules regarding deer management as long as they complied with North Carolina hunting regulations and safety rules established by Hofmann Forest. Hunters were allowed to run dogs for practice and competitive field trials before, during, and after the actual hunting seasons. Deer gun season began the third Saturday in October and ended January 1 for Jones and Onslow counties. Throughout the study period, the entire dog running season lasted from August 1 through February 28.

Pocosin habitats are characterized by deep, acidic, nutrient deficient sandy or peat soils (Richardson et al. 1981). Pocosins are fire adapted (15 to 20 year disturbance frequency), have temporary surface water (but may flood for long periods), and maintain a high water table (Christensen et al. 1981, Richardson et al. 1981). During the study, Hofmann Forest contained 28 % natural habitat, 52 % pine plantation, and 10 % clearcut. In the natural areas, dominant vegetation included pond pine (*Pinus serotina*) and a dense shrub layer comprised of titi (*Cyrilla racemiflora*), sweetbay (*Magnolia virginiana*), redbay (*Persea borbonia*), inkberry (*Ilex glabra*), and greenbriar (*Smilax* spp.) (Christensen et al. 1981, Richardson et al. 1981). Only about 2 % of Hofmann Forest was converted to agriculture (e.g., corn, soybeans, wheat).

## Methods

*Problems with Distance Sampling*

Accurately estimating deer populations can be difficult, and numerous studies have demonstrated that population estimates are often inaccurate and biased, regardless of technique [infrared cameras (Jacobson et al. 1997), aerial surveys (Koerth et al. 1997), FLIR (Drake et al. 2005), spotlight counts (Fafarman and DeYoung 1986, McCullough 1982), and daytime field counts (Downing et al. 1977)].

Distance sampling on Hofmann Forest is problematic due to the dense shrub layer common in pocosin habitats. Using the established roads (~300 miles available) to conduct line transect surveys (daytime or spotlighting) creates bias because roads disrupt habitat and potentially have an effect on animal behavior. However, conducting the surveys in the forest itself is impossible because of limited sight distance and the impossibility of moving along a line transect without spooking deer. Though using the roads is the best compromise, there is still difficulty with distance estimation because habitats vary widely along any road. Hofmann Forest contains timber blocks ranging from complete clearcuts to freshly planted or regenerating stands to mature stands of harvestable trees. This variation in habitat causes observable strip width along any random survey route to vary considerably. Additionally, distance estimation to sighted deer is difficult, particularly in the areas where sight distance is large. When deer are seen with spotlights hundreds of meters from a road, the estimates of that true distance will be imprecise. Range-finders may mitigate this effect to some extent, but in more densely vegetated areas, range-finders will not work because the vegetation disrupts the signal.

*Spotlight Surveys*

Although spotlighting has methodological drawbacks and will not satisfy all assumptions in population estimation, dense vegetation and the extensive, grid-like road network make it the most efficient way to count deer at Hofmann Forest. Dense vegetation serves as a barrier to aerial surveys and ground or air infrared surveys. Additionally, because of the expense associated with these techniques, spotlighting is the most cost-effective and replicable sampling technique available.

We conducted spotlight surveys in July, August, and September 2008 and 2009. We used a 37-mile route designed by Hofmann Forest managers. Surveys began one hour after sunset and usually took 3 or 4 hours to complete. One spotlight in the pick-up truck covered 180 degrees on the right side of the truck. When deer or *tapetum lucidum* reflections were spotted, we stopped the truck and a spotter used 10 x 50 binoculars to identify the number of deer in each group, sexes of individuals, and ages (adult or fawn; yearling deer were counted as adult; McCullough 1982). As necessary, the driver used binoculars to assist in determining numbers and sexes of deer. If an accurate determination of sex could not be made, we counted deer as "unknown."

*Population Modeling*

Hofmann Forest provided harvest records from 2001 through 2006. Using a compounding Excel model (Jenks et al. 2002), we modeled the Hofmann Forest deer population using biological inputs such as adult sex ratio, fawn recruitment rate, and fawn sex ratio (see Chapter 1). We estimated the adult sex ratio and fawn recruitment rate, and we did not include any non-hunting related mortality. Our physiological data indicated the fetal

sex ratio was biased toward males (62%; see Chapter 1), so we included a fawn sex ratio of 55% male to 45% female.

**Results**

We conducted 3 spotlight surveys in August and September 2008 and 2 spotlight surveys in July and August 2009. We conducted several other surveys in February and May but determined that sex identification was unreliable outside of the summer months (i.e., males did not have antlers). Further, the few fawns we were able to observe during our surveys were spotted in August or September. Average number of deer seen was 44 (SD = 16) in 2008 and 46 (SD = 4) in 2009. Thus, we used 45 deer per survey to calculate our estimate. Because our observational strip was highly variable, we made several population estimates with different strip widths (Table 1). We then compared the range of estimates to deer density data provided online (North Carolina 2005) by the North Carolina Wildlife Resources Commission (NCWRC). Deer densities near Hofmann Forest were variable because the natural pocosin areas had lower densities (15-30 deer/$mi^2$) than the surrounding areas of mixed forest and agriculture (30-45 deer/$mi^2$) (North Carolina 2005). The 300-yard width estimated a population density of 7 deer/$mi^2$. With the exception of the 300-yard width estimate, all estimates fell within the range of densities provided by NCWRC (Table 1). However, averaging the effects of natural pocosin areas and surrounding agricultural areas, we concluded that 25 deer/$mi^2$ was an appropriate density estimate to compare with our data (R. Norville, North Carolina Wildlife Resources Commission, personal communication). Thus, we selected the 87-yard strip width estimate of 2,999 deer because it is equivalent to a deer density of 25 deer/$mi^2$. The model representation of Hofmann Forest's deer herd

revealed an increasing population (Figure 1). The population ranges from a low of 969 deer in 2003 to a high of 2,999 in 2009. In 2009, the model converges with the spotlight survey population estimate of about 3,000 deer.

**Conclusion**

We recognize that a model is an abstraction of reality. However, this was the first population analysis conducted at Hofmann Forest. Because the model is compounding, the population model reflects a growing population. Additionally, Hofmann Forest harvest records indicate a strongly male biased harvest, which contributes to population growth by protecting females. Further, we believe the spotlight survey results reflect a minimum deer population. It is likely the actual population and density are higher than our estimates because limited sight distance caused by dense vegetation likely resulted in underreporting of deer. Deer are known to use densely vegetated areas for bedding, sanctuary, and escape cover, so it is likely that we missed deer in these areas (McCullough 1982).

We made no attempt to determine detection probability because they varied along the route (i.e., low in dense vegetation and much higher in clear cuts). However, by combining spotlight survey results with historical harvest data, the survey estimates can provide an index of population trends. Hofmann Forest should be able to use these data for future population comparisons and to evaluate long-term changes in population parameters. Spotlight counts are practical, cheap, and cover a large area, which make them an ideal survey technique for Hofmann Forest. However, the counts may be influenced by a host of environmental (often uncontrollable) factors such as behavioral changes of deer, weather, and food sources. Standardizing the spotlight surveys as much as possible will help reduce

the variability between the counts. We suggest that Hofmann Forest continue to use summer spotlight surveys along the same route if they intend to use population estimates as a part of future white-tailed deer management. Additionally, Hofmann Forest should consider that detection probabilities are likely to change in the future (because timber management is constantly changing the landscape of Hofmann Forest), impacting the reliability of the counts.

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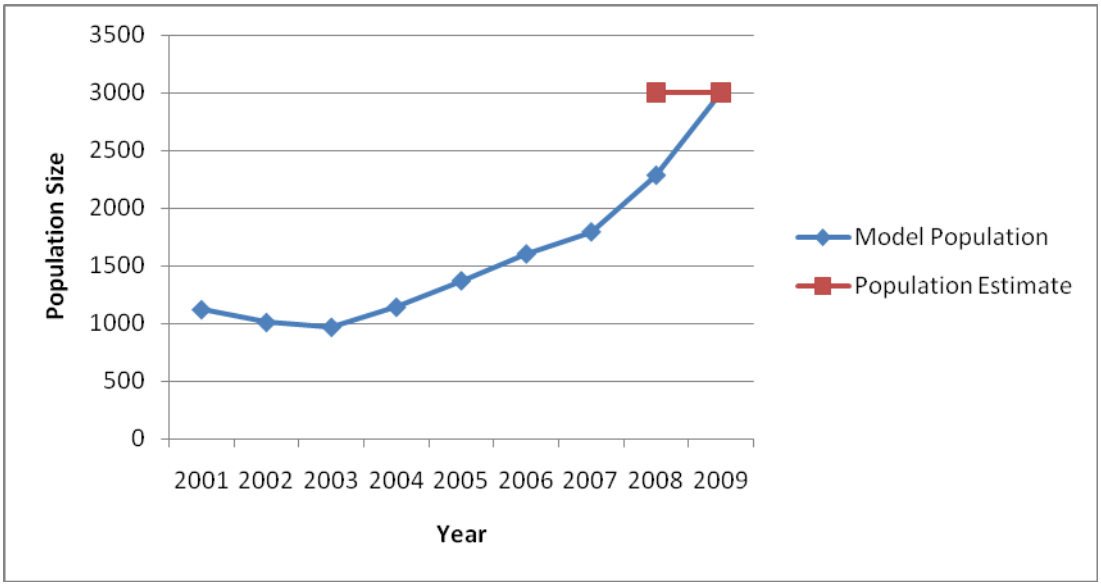
Table 1. Estimated deer population using spotlight survey data and different observational strip widths, Hofmann Forest, North Carolina.

| Strip Width (yds) | Deer Population Estimate | Equivalent Deer Density (deer/mi$^2$) |
|---|---|---|
| 50 | 5,223 | 43 |
| 75 | 3,471 | 28 |
| 87 | 2,999 | 25 |
| 100 | 2,612 | 21 |
| 300 | 869 | 7 |

Figure 1. Model of Hofmann Forest white-tailed deer population from 2001-present, including spotlight survey estimates in 2008 and 2009, Hofmann Forest, North Carolina.



Appendix 2

**Report: Hofmann Forest Hunter Opinions about White-tailed Deer Management**

## Background and Study Area

Hofmann Forest was a 78,000-acre tract of contiguous pocosin habitat intensively managed for loblolly pine (*Pinus taeda*) production in the Coastal Plain of North Carolina (Jones and Onslow counties). Owned and managed by the North Carolina State Natural Resources Foundation, Hofmann Forest was purchased in 1934 for teaching and forestry demonstration at North Carolina State University (Miller 1970). With the exception of 1950 and 1951 when hunting was closed to allow wildlife to rebound after a severe fire in 1950, white-tailed deer (*Odocoileus virginianus*) hunting has occurred on Hofmann Forest (Miller 1970).

In 2008, hunt permits (term used in lieu of "hunt lease") between 9 hunt clubs (~450 hunters) and Hofmann Forest stipulated that clubs were to harvest deer in a sex ratio of 1female for every 2 males (and a ratio of 1:1 was encouraged, but not required). Further, clubs were limited to running dogs (dog hunting) three days per week but were allowed to run dogs for practice and competitive field trials before, during, and after the actual hunting seasons. Beyond the harvest ratio and dog running rules, hunt clubs were allowed to set their own rules regarding deer management providing they complied with North Carolina hunting regulations and safety rules established by Hofmann Forest. Deer gun season began the third Saturday in October and ended January 1 for Jones and Onslow counties. Throughout the study period, the entire dog running season lasted from August 1 through February 28.

## Methods

It is likely that future large-scale white-tailed deer management on Hofmann Forest will depend on cooperation of hunt clubs at smaller scales. Hence, a survey of clubs' willingness to cooperate with others and opinions about current management practices was needed. Further, understanding general attitudes and opinions concerning major deer management topics (e.g., female harvest, the definition of a "quality" deer) was needed. On October 10, 2008, we hosted a meeting and free barbeque dinner at the Jones County Civic Center in Trenton, North Carolina. We invited all Hofmann Forest hunters to attend, provided dinner, presented project objectives, and administered the survey. The survey was designed to gather information concerning what each hunter thinks about: 1) his/her own club's deer management practices; 2) his/her neighboring clubs' deer management practices; and 3) Hofmann Forest's role in deer management.

## Results

### *Demographics*

One hundred seventy (170) people attended the meeting and 152 people completed the survey. Members of all 9 hunt clubs were present (Table 1) and 22 people (14.5%) were members of two clubs and 10 people (6.6%) were members of 3-6 clubs. Demographically, Hofmann Forest hunters were white (92.7%) males (94.7%) with an average age of 40 years (range: 11-75 years). Most hunters (94.5%) had 4 or fewer people living in their home, with 35.9% reporting 2 members. In 2007, annual household income ranged from less than $25,000 (14.1%) to greater than $175,000 (5.2%), with most hunters (55.6%) reporting a

range of $25,000 to $65,000. Most hunters had completed high school (92.7%), with 8% having a four-year college degree (6.7%) or graduate degree (1.3%).

*Club-level Deer Management*

Most hunters (95.4%) used dogs to hunt deer at least one day per week, and 33.8% used all three of their dog hunting days each week. Only 4 respondents (2.6%) did not hunt deer with dogs. When asked if their club had rules regulating the kind of deer they can shoot, 94.3% responded "yes." The most common rule reported by those answering "yes" was that males had to have a forked antler on one side (35.6%). The second and third most common rules were that members had to shoot one female (22.1%) and females must weigh 75 pounds or more (13.5%), respectively. Hunters agreed with their club rules 73.9% of the time and disagreed 26.1% of the time. Hunters rationalized their opinions based on the female population needing to be reduced (18.8%), "taking care of the herd" (14.6%), and giving deer a chance to grow bigger/older (13.5%). When asked about how their club responds when a rule is broken, hunters mentioned bringing the offender in front of the board to decide the punishment (28.0%), fines (22.3%), and suspensions/probations (20.4%). Hunters believed the number of hunters and the deer hunting pressure on their club was "about right" (81.3% and 82.1%, respectively).

*Neighboring Clubs' Deer Management*

When asked how well hunters knew members of clubs that border their own, 50.3% responded "somewhat," 32.5% responded "well," and 15.2% responded "very well." Most hunters were not aware of other clubs' rules regarding deer management (54.2%) and had not had any disagreements with other clubs (93.8%). When asked about willingness to work

with other clubs regarding deer management, 85.5% responded "yes." Further, 48.9% of respondents said they were willing to work on deer management with all Hofmann Forest hunting clubs. When asked to list deer management practices hunters would like to pursue with other clubs, food plots (21.2%), shooting larger, more mature deer (14.1%), and male/female rules for population control (11.8%) were the three most commonly listed practices.

*Hofmann Forest Deer Management*

When asked if Hofmann Forest regulated what kind of deer hunters are allowed to shoot, 84.4% said "no." Of the 15.6% who responded "yes," the most common reason given (20%) was that Hofmann Forest encouraged an increase in female harvest. When asked about outcomes they would like to see as a result of Hofmann Forest deer management, the most popular response was "males with larger antlers" (71.8%, Table 2). Hunters were divided concerning whether Hofmann Forest should set harvest minimums (requiring hunters to shoot at least a certain number of deer each season); 50.8% supported minimum harvest requirements. However, 80.6% opposed Hofmann Forest setting lower deer limits than North Carolina state regulations. We asked respondents to indicate the management actions they would like to see on their club, neighboring clubs, and Hofmann Forest, and the most popular choice at all three levels was "planting food plots for deer" (Table 3). We asked hunters if they thought the deer population on their club, neighboring clubs, and Hofmann Forest was "too high," "too low," or "about right," and the majority of hunters thought the population was "about right" at all three levels (53.2%, 50.4%, and 55.3%, respectively).

*Motivations for Hunting*

When asked to check all the reasons why they hunt, the three most popular choices were "to be with friends" (95.3%), "for sport" (91.3%), and "for relaxation" (86.0%; Table 4). Also, many respondents selected "other" and indicated they hunted to "hear dogs run" (73.7%). When asked to check the #1 reason why they hunt, 19.4% selected "to be with friends," 15.3% selected "for sport," and 14.5% selected "for tradition" (Table 4). Eleven respondents (8.9%) selected "other" and indicated "hear dogs run."

*Quality*

When asked to select all types of deer believed to be quality deer, the three most popular choices were "male with 16-inch or greater inside spread" (79.9%), "male with 8 or more points" (78.5%), and "large female" (51.7%) (Table 5). When asked to select the one type of deer that is the highest quality deer, 61.7% selected "male with 16-inch or greater inside spread," 20.3% selected "male with 8 or more points," and 7.8% selected "hunter's first deer" (Table 5).

**Conclusion**

About half of the respondents indicated they were somewhat familiar with members of neighboring clubs, and most indicated they would be willing to work with other clubs on deer management issues. These results indicate that if Hofmann Forest decided to manage white-tailed deer across all clubs, there would be support from most hunters. However, most respondents opposed Hofmann Forest setting deer limits lower than those established under North Carolina state regulations. Therefore, if Hofmann Forest's management plan suggested reduced bag limits, support from hunters might be reduced.

Not surprisingly, Hofmann Forest hunters expressed an interest in large-antlered males when identifying "quality" deer and that was their preferred outcome of Hofmann Forest deer management. However, support for management efforts that move harvest in the direction of protecting smaller or younger males could be problematic because hunters were comfortable with their clubs' current rules, which did not restrict male harvest appreciably. Further, Hofmann Forest hunters were predominantly dog hunters, which may make hunter selectivity difficult.

**Literature Cited**

Miller, W. D. 1970. The Hofmann Forest: a history of the North Carolina Forestry Foundation. North Carolina State University, Raleigh, North Carolina.

Table 1. Number of members of Hofmann Forest hunt clubs represented at the 10 October 2008 survey meeting held in Trenton, North Carolina.

| Hunt Club | # of Members Present |
|---|---|
| Cow Horn | 4 |
| Deppe | 31 |
| Half Moon | 6 |
| Juniper Swamp | 32 |
| Little Hell | 13 |
| North East | 31 |
| Sopp Hollow | 4 |
| Trenton | 46 |
| White Oak | 17 |

Table 2. Percent respondents selecting each management outcome, Hofmann Forest, North Carolina, 2008.

| Outcome | % Yes |
|---|---|
| More deer | 34.5 |
| Larger, older deer | 55.0 |
| Larger-bodied males | 45.6 |
| Males with larger antlers | 71.8 |
| Balanced sex ratio (1:1) | 40.3 |
| Less deer | 1.3 |
| No change, keep things the same | 12.1 |

Table 3. Percent respondents selecting each management action for their club, neighboring clubs, and Hofmann Forest, Hofmann Forest, North Carolina, 2008.

| Management Action | Your Club | Neighboring Clubs | Hofmann Forest |
|---|---|---|---|
| Putting out food for deer | 65.5 | 49.0 | 51.7 |
| Planting food plots for deer | 81.1 | 61.2 | 65.1 |
| Letting young males walk so they grow older | 66.9 | 51.7 | 46.3 |
| Killing females | 52.7 | 43.5 | 36.9 |
| Not killing females | 12.8 | 5.4 | 8.7 |
| Predator management | 57.4 | 44.9 | 49.0 |
| Keeping harvest records | 45.3 | 36.1 | 39.6 |
| No change, keep things the same | 7.4 | 2.0 | 4.7 |

Table 4. Hunter motivations for hunting (percent), Hofmann Forest, North Carolina, 2008.

| Motivation | All Reasons to Deer Hunt | #1 Reason to Deer Hunt |
|---|---|---|
| For sport | 91.3 | 15.3 |
| For recreation | 82.7 | 12.1 |
| To be with family | 76.0 | 11.3 |
| To be with friends | 95.3 | 19.4 |
| For meat | 80 | 8.1 |
| To be close to nature | 73.3 | 3.2 |
| For relaxation | 86.0 | 6.5 |
| For tradition | 78.7 | 14.5 |

Table 5. Hunter opinions about what represents a quality deer (percent), Hofmann Forest, North Carolina, 2008.

| Characteristics of Quality Deer | All Types of Quality Deer | #1 Type of Quality Deer |
|---|---|---|
| Male with 8 or more points | 78.5 | 20.3 |
| Male with 16-inch or greater inside spread | 79.9 | 61.7 |
| Large female | 51.7 | 3.1 |
| Hunter's first deer | 43.6 | 7.8 |
| Any antlered male | 9.4 | 2.3 |
| Any legal deer | 14.1 | 3.9 |