



5-2001

## **Landowners' perceptions of deer damage in Henry and Weakley counties, in West Tennessee**

Dill D. Hughes

Follow this and additional works at: [https://trace.tennessee.edu/utk\\_gradthes](https://trace.tennessee.edu/utk_gradthes)

---

### **Recommended Citation**

Hughes, Dill D., "Landowners' perceptions of deer damage in Henry and Weakley counties, in West Tennessee. " Master's Thesis, University of Tennessee, 2001.  
[https://trace.tennessee.edu/utk\\_gradthes/6579](https://trace.tennessee.edu/utk_gradthes/6579)

This Thesis is brought to you for free and open access by the Graduate School at TRACE: Tennessee Research and Creative Exchange. It has been accepted for inclusion in Masters Theses by an authorized administrator of TRACE: Tennessee Research and Creative Exchange. For more information, please contact [trace@utk.edu](mailto:trace@utk.edu).

To the Graduate Council:

I am submitting herewith a thesis written by Dill D. Hughes entitled "Landowners' perceptions of deer damage in Henry and Weakley counties, in West Tennessee." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural and Extension Education.

Roy R. Lessly, Major Professor

We have read this thesis and recommend its acceptance:

Randol Waters, Mark Fly

Accepted for the Council:

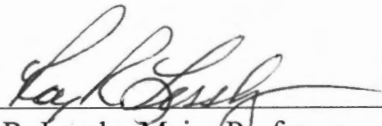
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

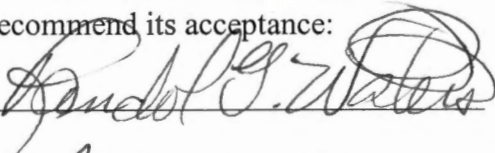
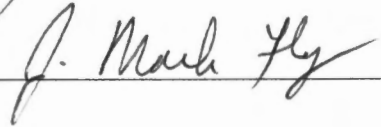
(Original signatures are on file with official student records.)

To the Graduate Council:


I am submitting herewith a thesis written by Dill D. Hughes entitled "Landowners' Perceptions of Deer Damage in Henry and Weakley Counties, in West Tennessee." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural and Extension Education.

  
\_\_\_\_\_  
Roy R. Lessly, Major Professor

We have read this thesis and  
recommend its acceptance:

  
\_\_\_\_\_  
  
\_\_\_\_\_

Accepted for the Council:

  
\_\_\_\_\_  
Interim Vice Provost and  
Dean of the Graduate School

**Landowners' Perceptions of Deer Damage  
in Henry and Weakley Counties, in West Tennessee**

A Thesis Presented  
for the  
Master of Science Degree  
The University of Tennessee, Knoxville

Dill D. Hughes  
May 2001



AG-VET-MED.  
TWSIS  
2001  
'H88

## ACKNOWLEDGMENTS

There are many people to whom I am grateful for their support, help and encouragement during my graduate studies at the University of Tennessee. I wish to thank my graduate committee Dr. Roy Lessly, Dr. Randol Waters, and Dr. Mark Fly for providing me the opportunity to obtain a degree from the University of Tennessee in an area in which I have a great interest. I am indebted to Dawn Johnson for her help and assistance while working on this project. I also wish to thank the University of Tennessee Agricultural Extension Service for providing an opportunity to receive an advanced degree while working in a county position. I am grateful to Dr. Jim Byford and Dr. Mike Butler at the University of Tennessee at Martin for their support, encouragement, and opportunities provided by them during my graduate work.

I am most thankful to my co-workers in the Henry County Extension office, Ken Goddard, Mike Page, Mary Kate Ridgeway, Michele Atkins and secretaries Ruth Vandyke and Carole Stoble for their encouragement and covering for me during times when I was required to be out of the county.

I am grateful to the many friends, too numerous to name, for their friendship, encouragement, and good times while pursuing this degree.

Lastly I am most thankful to my family for their never ending support. My parents, Malcolm and Opal Hughes who have been instrumental throughout my education: My mother-in-law, Sue Quinn, who always had an encouraging word .

Most of all, I am gratefully indebted to my wife Kristi for her never ending love, support, patience, tolerance and understanding and my children Courtney and Dillon, for

there love and tolerance, both whom always know how to encourage me in there own innocent, childlike way.

## ABSTRACT

The focus of this study was to determine if landowners in two west Tennessee counties, Henry and Weakly, who have a history of high deer harvest and soybean production, had similar perceptions of deer and deer damage as other portions of Tennessee. This was a follow up study, utilizing secondary data, from a Wildlife Survey conducted by Dawn Johnson at the University of Tennessee in 1998. This study focused on two counties out of eight Tennessee counties she surveyed. Respondents who had wildlife damage, and that also grew field crops were used for comparison. Descriptive statistics was used to summarize data. Frequencies were tabulated and used to explain data.

The majority (68%) of respondents were classified as farmers and 65% managed primarily for field crops. Almost all (93%) of respondents perceived that deer populations had increased either greatly (58%) or slightly (35%). Eighty- six percent indicated that deer damage had increased either greatly (55%) or slightly (31%).

Almost all (99%; N=139) of respondents reported having had crop damage from deer. Deer (91%) accounted for the most damage by any wildlife species. All respondents (n=117) experienced some damage to soybeans. The largest percentage (46%) described deer damage as moderate around the field edges and light across the field.

The majority (78%) estimated losses due to deer to be between \$100 to \$5000. Twelve percent reported losses greater than \$5000. Seven percent indicated that any damage was intolerable , while the majority (70%) felt that up to \$500 was intolerable. Over half (51%) had taken measures to control deer on their property. Most (87%) indicated hunting as the most used method of control. Of all methods used, shooting

outside of the season with a depredation permit was considered the most effective method, however with only average success.

Almost all respondents (96%) allowed hunting on their property. Over half (59%) of the respondents have had problems with hunters on their property and 56% had posted their land with “No Trespassing” signs.

Only seven percent of respondents belonged to a conservation group, however 50% did something to provide wildlife habitat on their property. Most (73%) indicated they managed for game birds with 45% managing for deer. The most common habitat improvement was to provide cover (81%). Time and cost were the most common reasons for not managing wildlife on property. Some 27% of the respondents were worried that managing wildlife would increase the amount of damage while 18% indicated they didn’t know how to manage for wildlife. Most (61%) reported they would accept cash payments to improve habitat on their property.

Almost all (99%) soybean producers experienced deer damage. Crop damage affects the perception and attitude toward deer populations and damage. Hunting alone does not seem to control deer damage problems, however if used in conjunction with depredation permits, the combination may prove to be more effective. Quality Deer Management programs provide opportunities to better control the reproductive portion of the deer population thus reducing damage. Most damage occurs around field edges and in small fields surrounded by woods, thus causing a need to study these areas more deeply. Education about control methods and studies to evaluate losses in a quantitative manner are needed.

## Table of Contents

Chapter	Page
I. INTRODUCTION .....	1
Need for the Study .....	3
Purpose of the Study .....	4
Scope of the Study .....	4
Objectives of the Study .....	5
II. LITERATURE REVIEW .....	6
Deer Population .....	6
Damage .....	8
Economic Impact .....	9
Human Dimension .....	12
Tennessee .....	13
III. METHODS .....	15
Study Area .....	15
Agriculture .....	15
Survey Participants .....	16
Data Analysis .....	19
IV. RESULTS .....	20
Personal and Farm Operation Characteristics .....	20
Perceptions and Attitudes about Deer Populations .....	23
Extent, Level of Tolerance and Value of Deer Damage .....	25
Deer Damage Control Measures and Experience with Hunting .....	27
Effectiveness of Control Measures .....	31
Wildlife Management Practices on Property .....	31
V. SUMMARY .....	36
Methods .....	39
Descriptive Statistics .....	40
Comparisons to Other Tennessee Studies .....	44
Management Implications .....	51
Future Research .....	56
LITERATURE CITED .....	59
APPENDIX .....	65
VITA .....	76

## List of Tables

<b>Table</b>	<b>Page</b>
1 . Deer harvest numbers for the last five years in Henry and Weakley counties. ....	7
2. Soybean and corn yields for the last five years in Henry and Weakley counties .....	17
3. Personal characteristics of respondents. ....	21
4. Land operation characteristics of respondents. ....	22
5. Respondents perception and attitude concerning deer populations .....	24
6. Respondents perception of the extent, tolerance and value of deer damage .....	26
7. Respondents use of damage control measures for deer .....	29
8. Respondents experience with hunting on property. ....	30
9. Landowners' rating of the effectiveness of deer damage control measures .....	32
10. Respondents wildlife management practices on property .....	33
11. Respondents reasons for not managing wildlife habitat on property and assistance landowners would accept to help with wildlife habitat on property. ....	34

## CHAPTER I

### INTRODUCTION

Deer (*Odocoileus spp.*) are probably the most widely distributed and best recognized large mammals in North America. The Whitetail Deer (*Odocoileus virginianus*) is found throughout much of North America, to include 48 of the 50 states in the United States with the exception of Alaska and Utah. Deer range from near treeline in Canada to sub equatorial South America and are extolled as the premier big game animal providing millions of people with recreation, food, clothing, decorations and even utensils (Halls 1984). In 1994, the US population of whitetail deer was estimated to be more than 25 million and growing. ( Alabama Extension Publication ANR-961 1996)

Geographically speaking, Tennessee is a diverse state with huntable populations of whitetail deer in all of it's 95 counties, but this has not always been the case. When settlers arrived in Tennessee, whitetail deer were abundant and increasing across the state and played an important role in their lives. Deer were used for clothing and were an important food source, sometimes meaning the difference between starvation and survival. During the late 1800s and early 1900s, extensive logging, overgrazing, annual burning, clearing of land for farming and over hunting or market hunting extirpated deer from most of Tennessee. Several factors began a population increase and the restoration of whitetail deer in the 1930's. Human populations began moving to cities and once cultivated land was abandoned and provided mixed habitats excellent for deer. The Pittman-Robertson Federal Aid to Wildlife Restoration Act was Passed in 1937 providing funds for wildlife management. Restoration programs were started with a great



deal of success. As populations increased, hunting resumed with enforced regulations. State Game and Fish agencies saw the need for controlled wildlife management and the need to keep deer populations in balance with available habitat. Because most predators were also extirpated, hunting was the only means to control the deer population. At first hunting was limited to specific counties and to antlered bucks. Seasons were later extended statewide and included either-sex hunts (Halls 1984). Deer populations have increased both in Tennessee and nationwide since that time. In 1974 about 2 million whitetail deer were harvested by over 8 million hunters nationwide . The positive economic value of deer through license fees, meat, hunter expenditures on equipment, food and transportation can be measured in the millions of dollars (Craven and Hygnstrom 1994). Hesslerton and Hesslerton (1982) estimated the value of a deer harvested in the US to be \$1250. This value would be much higher now based on the increase in the amount of money spent by hunters. The additional aesthetic value of deer to landowners, vacationers and other wildlife enthusiast indicate the importance of deer as a wildlife resource cannot be disputed (Craven and Hygnstrom 1994). The Whitetail deer is the most popular big game animal in Tennessee. In 1993, nearly 200,000 hunters spent an estimated 125 million dollars for licenses, transportation, food, lodging and equipment (King 1994). In 1996, just over 300,000 big game hunters spent 300 million dollars in Tennessee (USFWS 1996).

Whitetail deer to the above mentioned groups provide positive economic and aesthetic values, but can have a negative economic impact to some clientele. They often damage vegetable and row crops, orchards, nursery stock and frequently cause

automobile accidents. Most deer damage is on private land. Whitetail deer are a public resource and protected by law, therefore making deer management and deer damage abatement a complex issue involving several user groups. (King 1994) Given these variables, deer management is not just a biological concern any more. Deer population and habitat, their damage and the people involved in these issues, all must be managed for a successful program.

### **Need for the study**

Wildlife management is conducted by many entities, but applications of social science to understand management actions have been focused primarily on state and federal agencies. Activities undertaken by the individual landowner, for whom management is motivated by personal gain or problem aversion is often overlooked (Siemer et.al.1991) While biological factors are important, human sociological factors must be incorporated into the decision making process. Often the most sociological consideration is deer damage to agricultural crops (Brown et. al. 1978)

Several studies have been conducted looking at deer damage and the perceptions of this damage, however, little information is available in Tennessee, especially in middle and west Tennessee where deer are most abundant and row crop farming activities are interspersed with forest land (King 1993). Tanner and Dimmick (1983) surveyed three west Tennessee counties, to look at farmers attitudes toward deer damage. King (1993) surveyed the state of Tennessee on deer populations and their damage. Their findings were similar for both groups as only 12% of respondents indicated that the deer damage

was intolerable. Data from the Johnson(2000) study is the basis for this study. An informal survey conducted by Tennessee Farm Bureau in 1986 found deer to be the most problematic wildlife species to their members. (Tennessee Farm Bureau 1986).

Henry and Weakley Counties rely heavily on agriculture and as deer numbers have increased so have complaints from local farmers. As a result, Dixon (1998) and Ken Goddard (personal communication, September 15, 2000), a University of Tennessee Wildlife Specialist, and Henry County Extension Leader, respectively, conducted some deer damage demonstrations in Henry , Carroll, and Gibson counties. Their results indicated that chemically treated fences show some promise to help alleviate some deer damage, especially in small fields. However, busy landowners' may consider this method time or cost prohibitive.

### **Purpose of the Study**

The purpose of this study was to determine the perception of landowners' in Henry and Weakley counties regarding deer population, the extent of damage deer cause and to identify possible damage control methods.

### **Scope of the Study**

Data collected by Johnson(2000) in her 1998 UT Wildlife Damage Survey was used to look at responses of landowners specific to Henry and Weakley counties. These data were also compared to other studies to determine if damage is more problematic within these two counties.

### **Objectives of the Study**

1. Determine personal and farm operation characteristics of landowners.
2. Determine landowner perceptions and attitudes about county deer populations.
3. Determine the extent, level of tolerance and value of deer damage.
4. Determine what is currently being done to alleviate damage and assess attitudes about hunting as a control measure.
5. Determine landowners' perceptions regarding the effectiveness of control measures.
6. Determine respondents perceptions of wildlife management practices on their property.

## **CHAPTER II**

### **LITERATURE REVIEW**

#### **Deer Population**

Whitetail Deer populations have increased nationwide during this century. In the early 1900's deer numbers in Tennessee were estimated at 1000 or less state wide. Regulated hunting, reintroduction programs, favorable agriculture and forestry practices have resulted in population growth and expanded range (Tennessee Wildlife Resources Agency 1991). The Tennessee Wildlife Resources Agency (TWRA) now estimates the deer herd to be approximately 850,000 animals (A. Peterson TWRA, personal communication, September 15, 2000) In general, the regions of the state that experience the most damage are those in middle and west Tennessee. Predictably, these areas currently have the highest deer populations and are the areas where the majority of the most susceptible crops, primarily row crops, particularly, corn, soybeans , wheat, and nursery stock are being grown (King 1993)

In 1998, both Henry and Weakly counties had an estimated pre-hunt population of just over 25,000 deer (A. Peterson TWRA, September 15, 2000). During that same year, Henry county reported the highest deer harvest in the state with 4896 deer killed. Weakley county reported 4565 deer harvested (TWRA 1999). During the past few years both counties recorded high deer harvest. (Table 1 ).

Table 1 . Deer harvest numbers for the last five years in Henry and Weakley counties.

County	Deer Harvest <sup>1</sup>				
	1995	1996	1997	1998	1999
Henry	4216	4373	4209	4896	4850
Weakley	3980	3832	3668	4565	4095

<sup>1</sup> Tennessee Wildlife Resources Agency. 2000. Big game harvest report 1999-2000.  
Tennessee Wildlife Resources Agency Technical Report No. 20-1.



## **Damage**

It is ironic that the restoration of deer populations in the United States, which represents one of the most successful examples of wildlife management, has led to one of the most challenging problems facing wildlife managers today (Warren 1997). Deer damage has become a nationwide problem in the past several years and deer are considered “pests” by many. Fragmentation of habitat, creation of urban green belts, spatial changes in agricultural landscapes, changes in availability and types of agricultural crops, restriction of hunting seasons and bag limits, elimination or reduction of available lands for sport hunting, and predator control also may have also contributed to deer becoming overabundant (Coffey and Johnstone 1997). Wildlife cause a myriad of problems in the U.S; including deer-automobile collisions, disease, reduced agricultural productivity, and nuisances (Conover et. al. 1995) Deer damage to agricultural and forest crops is a severe problem in many parts of North America and can make a normally profitable farming operation unprofitable (Caslick and Decker 1977) Deer have caused damage to soybeans in the southeast (Moore and Folk 1978, Garrison 1984) and field corn in the Midwest (Wywialowski 1996, Hygnstrom and Craven 1988). They have also caused considerable problems in winter when they browse on apple orchards, commercial nurseries and ornamental plants around homes (Anthony and Fisher 1977, Conover 1984, Matschke et.al. 1984)

Some individuals are concerned about the transmission of Lyme disease due to deer overpopulation and increased human population. Deer are host for the deer tick which carries Lyme disease. Infected ticks transmits the disease to humans through tick

bites. Conover et. al.(1995) reported that in 1991 there were 11,639 reported cases of 11 different wildlife reportable diseases at the U.S. Centers for Disease Control and Prevention. Lyme disease accounted for 81% of these cases.

Deer-automobile accidents are a concern to individuals involved as well as insurance companies (E. Bradley, Henry County Farm Bureau, personal communication, October 10, 2000; Redonna Rose, Tennessee Farm Bureau, personal communication, October 10, 2000). Romin (1994) reported that 538,000 deer collided with vehicles during 1991 in 35 states that responded to her study (Conover et.al.1995).

### **Economic Impacts**

Initial impacts of deer are often thought of as positive and include revenues and operating expenses through license sales, sporting goods sales, food, lodging and transportation. Whitetail deer are an important resource throughout their range. In 1991 a national survey indicated that 10.3 million hunters spent 113 million days and nearly five billion dollars pursuing deer (U.S. Dep. Int.et.al.1993) In 1993, Nearly 200,000 thousand hunters spent an estimated \$125 million in deer related activities in Tennessee. (King 1994) In 1996, just over 300,000 big game hunters spent 300 million dollars or an average of \$1,010 per hunter in Tennessee (USFWS 1996). Landowners, nature lovers, wildlife viewers, vacationers, and other non-consumptive users enjoy this resource as well . It is difficult to assign a dollar value to this aesthetic value, but it should be kept in mind that this group also contributes to the deer economy.

Deer also have negative impacts on parts of the economy. Depredation to crops,



orchard and nursery damage, landscape damage and auto collisions contribute to these negative impacts. Food habits of deer include native forbs, browse, fruits and nuts including acorns, forages, and agricultural crops such as corn, soybeans, small grains, alfalfa, vegetables, and fruit trees when available (Weckerly 1988 , Wentworth 1989, Craven and Hygnstrom 1994).

In 1988, the USDA Animal Damage Control Program (ADCP) spent over \$26 million on damage control and another \$11 million on administration, and 14 U.S. states and 4 Canadian provinces provided some sort of compensation for wildlife damage to agricultural crops (Rollins and Briggs 1996).

Sixty percent of the land base in the U.S. is in private ownership. In 1990, 991 million acres in the U.S. were under the control of farmers. This represents 45% of the total surface area of the U.S. that is in agriculture production (U.S. Bureau of Census 1991 cited in Conover 1994). Conover (1994) commented that it was not surprising that a great topic of interest to wildlife biologist is how to motivate farmers to improve wildlife habitat on their property (Noonan and Zagata 1982 , Swenson 1983) or allow access to hunters (Wright and Kaiser 1986). Determining cost associated with wildlife damage is a difficult but important aspect of wildlife management. Damage-cost information is used to evaluate the need for programs and convey the magnitude of damage problems. A Nebraska report estimated deer damages of \$48,000 annually for trees and shrubs, \$250,000 to established plantings, \$135,100 for hay, \$175,000 from crops with total annual estimated losses of \$608,000. (Johnson and Timm 1987) . Approximately 20% of the New York orchard growers reported significant losses to deer (Caslick and Decker

1979) with some reporting annual losses greater than \$10,000 (Dyment 1979 in Caslick and Decker 1979). In ten of the top corn producing states, Wywialowski (1996) found wildlife caused an estimated loss of 35 million bushels annually valued at \$92 million. Conover (1994) surveyed 6,432 grass-roots leaders in the U.S. agricultural community in 1991 and found that 89% reported wildlife damage with 67% reported that deer caused the most problems. In 1986, the Tennessee Farm Bureau conducted an informal survey of members to obtain opinions on wildlife damage problems. About 300 members responded with 64% indicating that deer damage was the major wildlife problem encountered. (Tennessee Farm Bureau 1986)

Deer-vehicle collisions have also increased due to increased deer populations. Romin (1994) reported that in 1991 538,000 deer collided with vehicles in 35 states. The average vehicle repair bill after a collision in 1993 of five states was \$1,577 (Conover et. al. 1995). In 1996, Tennessee Farmer Mutual Insurance Companies reported \$7,000,000 in estimated losses caused by deer. Henry County had 233 claims and paid \$276,462 with average loss per claim of \$1,186.52 (E. Bradley ,Henry County Farm Bureau, personal communication, October 10, 2000).

Being hit by a vehicle is fatal to deer 92% of the time (Allen and McCullough 1976) Human injuries and death can also result from deer-vehicle collisions. Rue (1989) reported 29,000(4%) injuries per 726,000 deer-vehicle collisions nationwide and 211(0.029%) fatalities annually.

## **Human Dimension**

Wildlife managers, landowners, hunters, home owners, farmers and other wildlife enthusiasts often have differing opinions about how a resource should be managed. Deer overabundance is not just a biological or ecological problem. These are very important aspects of the problem, however, even more challenging are the social, political, legal, and economic aspects that are collectively referred to as the human dimension (Warren 1997) Optimizing population levels of whitetail deer in a predominately agricultural area requires more than carrying capacity of the land. The human perception of carrying capacity also must be incorporated into the decision making process (Brown and Decker 1979). Successful deer management, including the resolution of problems caused by overabundance, will routinely incorporate the results of human dimensions research. Knowledge of human attitudes and human dimension research should be an integral part of improving methods for population control of deer (Healy et. al. 1997). Contemporary definitions of the science and art of wildlife management include a human dimension. Decker and Purdy (1988) quoted Giles (1978) as depicting the interplay of wildlife management including three fundamental elements: wildlife populations, habitat, and people. We have been accustomed to following Leopold 's 1933 suggestion that the way to manage game is to manage habitat (Waller and Alverson 1997). This concept worked well as populations are increasing and deer restoration has been a success. Alverson (1988) warned of the ecological consequences of overabundant deer populations. Since then, deer populations and their ecological and economic impacts appear to have increased and worsened. We have grown accustomed to the concept of biological carrying

capacity (BCC), a fundamental principle of modern wildlife management . Inherent in BCC are factors of environmental resistance limiting wildlife populations. These factors, encompassing the quantity, quality, and distribution of food, cover, and water, have been the wildlife managers focus of regulating wildlife populations (Decker and Purdy 1988) Another concept in wildlife management relative to the human dimension is that of the Wildlife Acceptance Capacity (WAC). The WAC includes peoples acceptance thresholds for various forms of damage and nuisance associated with a particular wildlife species in a given situation, perceived competition of a species with another of interest to people, the role of a wildlife species in disease transmission to humans or their domestic animals, and the values humans place on a species of concern, such as economic, aesthetic, ecological, educational, scientific and intrinsic values. BCC is dynamic and changing where as WAC reflects the acceptance of one key constituency for a species at a given point in time (Decker and Purdy 1988).

## **Tennessee**

There have been few studies in Tennessee to look at deer damage to crops and farmers perceptions' of the problems associated with deer numbers. Tanner and Dimmick (1983) looked at farmers' attitudes toward deer damage in Tennessee and found that 59% of farmers incurred some damage to their crops. Almost 70% of the farmers deriving 75-100% of their income from their farm, indicated that deer had damaged their crops to some extent, and over 12% of that group felt that the amount of damage was unreasonable. Only 10% of the total surveyed indicated that the damage was

unreasonable. Sixty-two percent enjoyed having deer despite the potential damage. This 1983 survey was conducted in 3 west Tennessee counties (Henry, Montgomery, and Stewart). Caution must be used in generalizing to other areas of the state (King 1993), however, this information will be helpful for comparison in this study.

The second study, conducted by King (1993), surveyed Tennessee landowners and found only 33% experienced deer damage statewide. Still 12.6% felt the damage was unreasonable. Sixty-two percent statewide enjoyed having deer around.

A demonstration conducted by Dixon (1998) and Goddard (Henry County Extension Leader, personal communication, September 15, 2000) found a great need for deer damage control in specific areas and fields in Henry and Carroll counties. Three fields of three, six and ten acres in size were used to test damage control methods. Damage control methods allowed soybeans to be harvested in these fields where they could not be harvested in the past due to deer damage.



## **CHAPTER III**

### **METHODS**

#### **Study Area**

Henry County is located in northwest Tennessee bordering Kentucky to the north and the Tennessee River (Kentucky Lake) to the east. Henry County was originally covered by a thick hardwood forest. All of the forest has been cut over at least once and much of it has been cleared for farming. The county has an area of 599 square miles of which 33 are covered by Kentucky Lake. Paris, the county seat and principal business center, is centrally located within the county and is 90 miles from Nashville and 130 miles from Memphis.(Figure 1).

Weakley County is located in northwest Tennessee bordering Kentucky to the north and Henry County to the East. The county covers an area of 576 square miles. Dresden is the county seat and is near the geographic center of the county. It is 100 miles from Nashville and 120 miles from Memphis.

#### **Agriculture**

According to the 1997 Census of Agriculture, Henry County had 831 farms. A farm is a place which sells or could sell \$1,000 of agricultural products during the year (Tennessee Ag. Stats 2000). In 1999, the average farm size was 223 ac. and there were 185,304 acres in farms in Henry County. Major agricultural products include corn, soybeans, wheat, tobacco and timber. Henry County ranks 5th in lumber production in Tennessee and produced 37.4 million board feet in 1999. Henry County ranks 1st in

western dark fired tobacco production and 5th, 11th and 7th in Tennessee in the production of corn, soybeans, and wheat, respectively. In 1999 Henry county farmers harvested 30,000 bushels of corn, 34,000 bushels of soybeans and 14,000 bushels of wheat. (Table 2 )

In 1997, Weakley County had 1012 farms with an average farm size of 220 acres. In 1999 there were 222,524 acres in farms in Weakley County. Major agricultural products include corn, soybeans, wheat, and tobacco. Weakley County ranks 4th in dark air-cured tobacco production and ranked 2th, 6th and 4th in the production of corn, soybeans, and wheat, respectively. In 1999 Weakley County farmers harvested 58,000 bushels of corn, 76,000 bushels of soybeans and 27,000 bushels of wheat.

### **Survey Participants**

In 1998 a survey was conducted in eight Tennessee counties which were grouped in four pairs of adjacent counties. These county groups were Weakly and Henry ; Hardeman and Fayette ; Lincoln and Franklin and Robertson and Montgomery . Two groups of these county groups were in west Tennessee with the remaining two groups in middle Tennessee (Johnson 2000)(Figure 1).

These counties were selected based on 1997 deer harvest numbers per county and 1998 soybean production. Counties with the highest deer harvest per county with presumably high deer populations, along with high soybean production were selected. Deer and other wildlife damage was expected to be high in these county groups. These counties were selected to target farmers who were most likely to experience wildlife

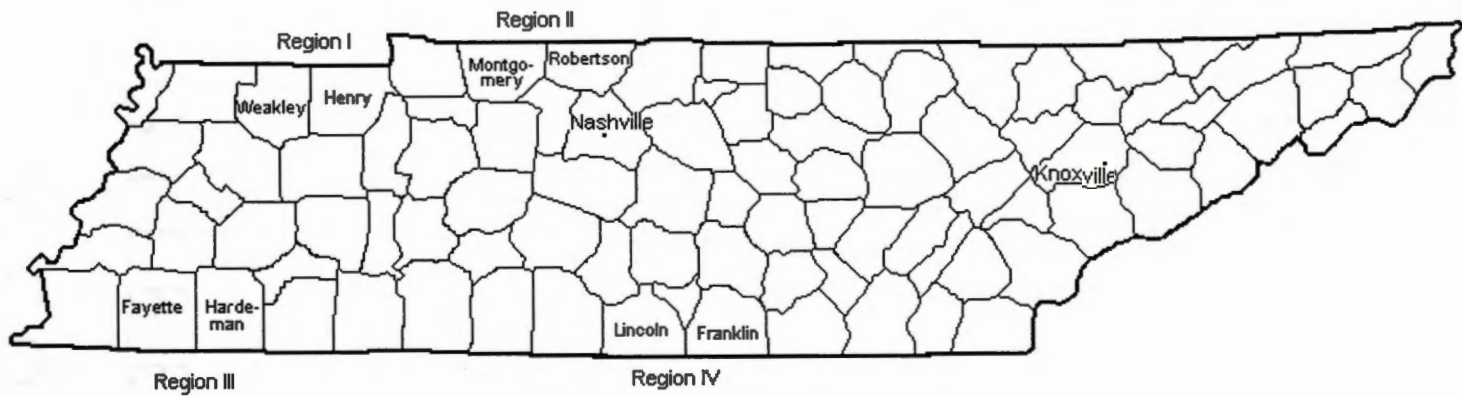
Table 2 . Soybean and corn yields for the last five years in Henry and Weakley counties.

County	Soybean production (in millions of bushels) <sup>1 2</sup>					Corn production (in millions of bushels) <sup>1 2</sup>				
	95	96	97	98	99	95	96	97	98	99
Henry	1.2	1.2	1.3	0.98	0.53	3.3	3.6	3.4	3.1	2.9
Weakley	2.3	2.6	2.6	2.2	1.2	7.0	7.8	5.7	5.7	5.9

<sup>1</sup> Tennessee Department of Agriculture.2000.Tennessee Agriculture. Tennessee Department of Agriculture, Nashville, Tennessee, USA.

<sup>2</sup> Tennessee Department of Agriculture.1998.Tennessee Agriculture. Tennessee Department of Agriculture, Nashville, Tennessee, USA.





**Figure 1. Tennessee counties selected for the study.**

damage and were not intended to be representative of the whole state. Survey participants were selected from a list of names and addresses provided by the USDA Farm Service Agency. A nine page questionnaire (Appendix 1 ) consisting of 43 closed-ended questions relating to participants attitude toward deer, experience with wildlife damage and control, and participants farming activities was mailed to each participant. The survey was administered using the four-wave mail survey method described by Dillman (1978), with a few modifications. (Johnson 2000).

This study used data collected by Johnson in her 2000 UT Wildlife Damage Survey and looks at responses for landowners specific to Henry and Weakly counties . Johnson indicated that more damage occurred within this county group than the other three groups in her study. Data will also be compared to other studies to determine if damage is more problematic within these two counties. Out of 566 surveys sent to Henry and Weakley County landowners in the Johnson study, 340 were returned and usable. Data for this study are specific to the 139 landowners and farmers in Henry and Weakly counties who indicated they had deer damage to corn, soybeans, or corn and soybeans in the Johnson study.

### **Data Analysis**

Descriptive statistics was used to summarize data. Means, percentages and frequencies were tabulated and used to explain data.

## **CHAPTER IV**

### **RESULTS**

Chapter four presents findings of the study and is presented in six sections.

Sections are consistent with objectives found in Chapter I. Each section will be presented according to the following objectives:

1. Determine personal and farm operation characteristics of landowners.
2. Determine landowner perceptions and attitudes about county deer populations.
3. Determine the extent, level of tolerance and value of deer damage.
4. Determine what is currently being done to alleviate damage and assess attitudes about hunting as a control measure.
5. Determine landowner perceptions regarding the effectiveness of control measures.
6. Determine respondents perceptions of wildlife management practices on their property.

#### **Personal and Farm Operation Characteristics**

This section addresses objective one and describes the respondents Personal and Farm Operation Characteristics. Results for this section are found in Tables 3 and 4.

Survey participants ranged from 25-90 years of age with a mean age of 52 and a standard deviation of 14.26 (n=130). Ninety-one percent of respondents were male with 38% having a high school education or less . Fourteen percent had some trade or vocational training and 48% either had some college, was a college graduate or

Table 3. Personal characteristics of respondents.

<b>Characteristic</b>		<b>Number</b>	<b>Percent</b>	
<b>Personal Characteristic</b>				
Age	under 30	2	1.6	
	31-40	17	13.1	
	41-50	29	22.3	
	51-60	36	27.7	
	61 -70	25	19.1	
	71-80	17	13.0	
	80 and up	4	3.2	
$X^2=52$ ; SD=14.26		Total	130	100
Gender	Male	121	91.0	
	Female	12	9.0	
Total		133	100.0	
Education	Less than High School	10	7.8	
	High School Graduate	39	30.2	
	Some College	20	15.5	
	Trade or Vocational School	18	14.0	
	College Graduate	27	20.9	
	Post Graduate	15	11.6	
Total		129	100.0	
Household Income	Less than \$10,000	3	3.3	
	\$10,000-\$19,999	4	4.4	
	\$20,000-\$24,999	3	3.3	
	\$25,000-\$29,999	12	13.4	
	\$30,000-\$49,999	24	26.7	
	\$50,000-\$74,999	15	16.7	
	Greater than \$75,000	29	32.2	
Total		90	100.0	
Income from Farming	Less than 10%	35	28.5	
	10%-25%	28	22.8	
	26%-50%	15	12.2	
	51%-75%	17	13.7	
	76%-100%	28	22.8	
Total		123	100.0	

Table 4. Land operation characteristics of respondents.

<b>Characteristic</b>		<b>Number</b>	<b>Percent</b>
<b>Land characteristic</b>			
Acres	under 100	29	21.3
	100-199	25	18.4
	200-499	28	20.6
	500-999	24	17.7
	1000-4999	25	18.4
	5000 +	5	3.6
Total		136	100.0
Farm Enterprise	Field Crops	89	65.4
	Field Crops and Livestock	11	8.1
	Field Crops and Forest Products	15	11.0
	Field Crops and Vegetables	1	0.7
	Field Crops and Other	2	1.5
	Field Crops/ Other/ Combinations	18	13.3
Total		136	100.0
Land Management	Own and Farm Land	71	51.8
	Lease Land from Someone	43	31.4
	Own Land and Lease it to Someone	73	53.3
Total*		187	
Live on Farm	Yes	93	67.9
	No	44	32.1
Total		137	100.0

\*Does not add up to 100% due to multiple responses.

completed post graduate work. Annual incomes ranged from less than \$10,000 to more than \$75,000 with 89% earning greater than \$25,000 per year. Fifty one percent earned less than 25 % of their income from farming, however 37% earned 51% or greater.

Ninety-six percent of respondents were Caucasian (n=124)

Acreage owned or farmed by respondents ranged from 15 to 17,000 acres (n=136) with a mean of 962 and a standard deviation of 2180 due to a few outliers with extremely large acreage. The median of 305 acres is probably a more accurate figure and is more in line with Tennessee Ag. Statistics which in 1997 shows average farm size in Henry county at 223 and Weakley county at 220. Respondents managed their property for a variety of products with over 65% managing primarily for field crops. Fifty-two percent owned and farmed their own land, 53% leased their land to someone else to farm, and 31% leased land to farm from someone else. Landowners could choose more than one answer in the ownership categories, therefore causing overlap of responses. The majority of farmers (68%) live on the farm. Most (72%) were Tennessee Farm Bureau members with only 5.8% belonging to a conservation organization (n=137).

### **Perceptions and Attitudes about Deer Populations**

This section addresses objective two and describes the results of respondents perception and attitude regarding changes in the deer populations. Results for this section can be found in Table 5.

Fifty-eight percent of the participants thought that deer populations had increased greatly (n=139), 35% indicated it had increased slightly for a total of 93% indicating an

Table 5. Respondents perception and attitude concerning deer populations.

<b>Perception or Attitude</b>		<b>Number</b>	<b>Percent</b>
<b>Response</b>			
5 year population change	Increased greatly	81	58.3
	Increased slightly	48	34.5
	Stayed the same	4	2.9
	Decreased slightly	5	3.6
	Decreased greatly	1	0.7
<b>Total</b>		<b>139</b>	<b>100.0</b>
5 year damage amount	Increased greatly	77	55.4
	Increased slightly	43	30.9
	Stayed the same	15	10.9
	Decreased slightly	1	0.7
	Decreased greatly	2	1.4
	No opinion	1	0.7
<b>Total</b>		<b>139</b>	<b>100.0</b>
Like deer population to:	Increase greatly	1	0.7
	Increase slightly	6	4.3
	Stay the same	24	17.3
	Decrease slightly	50	36.0
	Decrease greatly	56	40.3
	No opinion	2	1.4
<b>Total</b>		<b>139</b>	<b>100.0</b>
Attitude toward deer	Enjoy deer	26	19.0
	Enjoy deer, worry about damage	84	61.3
	Deer are a nuisance	27	19.7
<b>Total</b>		<b>137</b>	<b>100.0</b>



increase. A small number (3%) indicated it had stayed the same, while 4% indicated the population had decreased either slightly or greatly. Most (77%) wanted to see deer populations decrease, 18% wanted it to stay the same, and 5% wanted to see an increase.

Fifty-five percent of the respondents felt that deer damage had increased greatly and 31% thought it had increased slightly for a total of 86% indicating deer damage had increased to some extent. Some (11%) felt it had stayed the same while only 2% thought it had decreased. Farmers attitude toward deer was that 80% enjoyed deer, but of those respondents 61% worried about damage. The remaining 20% thought deer were a nuisance.

### **Extent, Level of Tolerance and Value of Deer Damage**

This section addresses objective three and describes the results of respondents perception of the extent, tolerance and value of deer damage. Findings for this section can be found in Table 6.

Almost all (99%) respondents reported deer damage to crops within the last year and 46% reported damage from wildlife species other than deer. Deer accounted for the most damage caused by any wildlife species.

Ninety-five or 68% of farmers reported growing corn . Of that group, eighty-six percent experienced some damage to corn with 35% indicating damage to 10 or more acres due to the differing size of farm operations. The size of the damage areas ranged from .2 to 110 acres.



Table 6. Respondents perception of the extent, tolerance and value of deer damage.

<b>Perception or Attitude</b>		<b>Number</b>	<b>Percent</b>
<b>Extent, tolerance, or value</b>			
Damage rating	Light damage	46	34.1
	Moderate damage	51	37.7
	Substantial damage	26	19.3
	Severe damage	12	8.9
Total		135	100.0
Describe damage	Light around field edge	26	19.7
	Moderate around edge, light across field	61	46.2
	Severe around edge, moderate across field	38	28.8
	Severe across field	7	5.3
Total		132	100.0
Value of damage	Less than \$100	13	10.4
	\$100-\$500	40	32.0
	\$501-\$1000	29	23.2
	\$1001-\$5000	28	22.4
	\$5001-\$10,000	9	7.2
	More than \$10,000	6	4.8
Total		125	100.0
Maximum damage considered tolerable	None	9	6.5
	Less than \$100	45	32.4
	\$100-\$500	52	37.4
	\$501-\$1000	22	15.8
	\$1001-\$5000	3	2.2
	Don't know	8	5.8
Total		137	100.0

One hundred and seventeen or 84% of farmers indicated growing soybeans. All respondents (n=117) experienced some damage to soybeans with 56% indicating damage to 10 acres or less, 31% to 12-75 acres and 11% experienced damage to 100 acres or more due to the differing size of farm operations. Damage occurred in acreage ranging from .1 to 500 acres.

Light or moderate deer damage was reported by 34% and 38% of respondents, respectively. Substantial damage was reported by 19% and severe damage by 9%. The largest percentage of respondents (46%) described deer damage as moderate around the field edges and light across the field. Twenty percent indicated damage was light around the field edge. Almost a third (29%) reported severe damage around the field edge with moderate damage across the field and 5% reported severe damage across the entire field.

A small percentage (10%, n=125) estimated their losses due to deer damage to be less than \$100. Almost a third (32%) estimated damage between \$100 and \$500. Twenty-three percent reported damage between \$501-\$1000 and 22% reported damage of \$1001-\$5000. Several respondents (7.2%) estimated losses between \$5001 and \$10,000 with 5% reporting losses at more than \$10,000.

Slightly less than a third (32%) indicated that less than \$100 was intolerable, 37% reported that \$100-\$500 was intolerable, 16% reported that \$501-1000 was intolerable and 2% reported \$1001-\$5000 as intolerable.

### **Deer Damage Control Measures and Experience with Hunting**

This section addresses objective four and presents the results of

respondents use of damage control measures and experience with hunting. Results for this section can be found in Tables 7 and 8.

Just over half (51%) of respondents had taken measures to control deer on their property (n=138). The majority (87%) had used hunting to control deer populations on their property while others used methods which included repellants , scare devices , electric fence, non-electric fence and shooting with depredation permits. However, no other method was used to the extent of hunting for controlling deer.

Over half of the respondents (57%) indicated they had hunted in the last five years, while 22% hunt but had not hunted in the last five years and 22% indicated they had never hunted. Almost all respondents (96.4%; n=139) allowed hunting on their property. Just over half (51%) hunted themselves, 63% allowed friends and neighbors to hunt, 59% allowed family members to hunt, 44% allowed people who asked permission, 19% allowed people who paid access and only 3% allowed just anyone to hunt . Several landowners (23%: n=133) leased their land for hunting. Average lease cost was \$2.96 per acre.

Over half (59%; n=135) of respondents have had problems with hunters on their property in the past and 56% have their land posted with “No Trespassing” signs.

Table 7. Respondents use of damage control measures for deer.

<b>Control measure</b>		<b>Number</b>	<b>Percent</b>
<b>Response</b>			
Taken measures to control damage	Yes	70	50.7
	No	68	49.3
Total		138	100.0
Control measure	Repellants	11	15.5
	Scare devices	11	15.7
	Hunting	61	87.1
	Electric fencing	9	12.9
	Non-electric fencing	5	7.1
	Shooting with depredation permit	8	11.4
	Other	5	7.1
*Total		110	

\* Does not add up to 100% due to multiple responses.

Table 8. Respondents experience with hunting on property.

<b>Experience</b>		<b>Number</b>	<b>Percent</b>
<b>Response</b>			
Do you hunt?	Yes, in the past 5 years	79	56.8
	Yes, not in the last 5 years	30	21.6
	No, never hunted	30	21.6
<b>Total</b>		<b>139</b>	<b>100.0</b>
Allow hunting	Yes	134	96.4
	No	5	3.6
<b>Total</b>		<b>139</b>	<b>100.0</b>
Who can hunt?	Yourself	66	49.3
	Friends or neighbors	85	63.4
	Anyone	4	3.0
	Family members	79	59.0
	People who ask permission	59	44.0
	People who pay for access	25	18.7
<b>*Total</b>		<b>318</b>	
Do you lease?	Yes	31	23.3
	No	102	76.7
<b>Total</b>		<b>133</b>	<b>100.0</b>
Acreage leased for hunting	Less than 200ac	4	28.6
	200-500ac	6	42.8
	More than 500ac	4	28.6
<b>Total</b>		<b>14</b>	<b>100.0</b>
Cost per lease	Less than \$500	4	33.3
	\$500-\$1000	6	50.0
	Greater than \$1000	2	16.7
<b>Total</b>		<b>12</b>	<b>100.0</b>
Problems with hunters	Yes	79	58.5
	No	56	41.5
<b>Total</b>		<b>135</b>	<b>100.0</b>

\* Does not add up to 100% due to multiple responses.

## **Effectiveness of Control Measures**

This section addresses objective five and describes the results of respondents perception on the effectiveness of various damage control measures they have tried. Results for this section can be found in Table 9.

Respondents were asked to rate the effectiveness of the damage control methods they had used on a scale of 1-5 (1=not very effective: 5=very effective). Shooting outside of hunting season with a depredation permit was most effective with a mean score of 2.88 followed by chemical repellents (2.40) and hunting (2.37). Shooting with a depredation permit had the highest mean, however no method was considered effective in controlling deer damage. Seventy-eight percent indicated that they were not aware that TWRA offers assistance with crop damage problems (n=139) however 29% had contacted TWRA about crop damage.

## **Wildlife Management Practices on Property**

This section addresses objective six and describes the results of respondents perception of wildlife habitat and management on their properties. Results for this section can be found in Tables 10 and 11.

Only 7% of respondents belonged to a conservation organization, however 50% indicated they did something to provide wildlife habitat on their property. Of those who managed for wildlife, 73% managed for game birds, 62% managed for small game, 46% managed for general wildlife and 45% managed for deer . The most common habitat improvement was to provide cover (81%), followed by retaining wooded areas (78%),

Table 9. Landowners' rating of the effectiveness of deer damage control measures .

<b>Control Method</b>	<b>*Mean Scores</b>	<b>n</b>	<b>Std.Dev</b>
Depredation Permits	2.88	8	1.64
Repellants	2.40	10	1.07
Hunting	2.37	60	1.21
Electric Fencing	2.22	9	1.30
Scare devices	1.60	10	.70
Non-electric fencing	1.25	4	.50

\* Mean scores 1=very ineffective; 5=effective



Table 10. Respondents wildlife management practices on property.

<b>Wildlife Practice</b>		<b>Number</b>	<b>Percent</b>
<b>Response</b>			
Practice wildlife	Yes	69	50.4
habitat improvement	No	68	49.6
		<b>Total</b>	<b>137</b>
			<b>100.0</b>
Manage for	Deer	31	44.9
	Small game	43	62.3
	Waterfowl	25	36.2
	Game birds	50	72.5
	Songbirds	23	33.3
	General wildlife	32	46.4
	Other	1	1.4
		<b>*Total</b>	<b>205</b>
Wildlife habitat management practices	Provide general cover	56	81.2
	Plant warm season grasses	16	23.2
	Provide food plots	36	52.2
	Delay tillage	23	33.3
	Provide fence rows	47	68.1
	Protect wetlands	24	34.8
	Retain wooded areas	54	78.3
	Manage forested areas	18	26.1
	Leave unharvested crops	31	44.9
	Other	6	8.7
		<b>*Total</b>	<b>311</b>

\* Does not add up to 100% due to multiple responses.

Table 11. Respondents reasons for not managing wildlife habitat on property and assistance landowners would accept to help with wildlife habitat on property.

<b>Reason/Assistance</b>		<b>Number</b>	<b>Percent</b>
<b>Response</b>			
Hindrances of managing land for wildlife	Don't have time	61	46.6
	Too Expensive	51	38.9
	Don't know how	23	17.6
	Not interested	10	7.6
	Concerned about damage	35	26.7
	Other	20	15.3
		<b>*Total</b>	<b>200</b>
Assistance you would accept to manage wildlife habitat	None	28	20.9
	Technical advice	52	38.8
	Seed for food plots	53	39.6
	Tax incentives	61	54.5
	Cash payments	82	61.2
	Other	6	4.5
		<b>*Total</b>	<b>282</b>

\*Does not add up to 100% due to multiple responses.

providing fence rows (68%) and providing food plots (52%). Time (47%) and cost (39%) were the two obstacles preventing landowners from managing wildlife on their property. Some (27%) were worried that managing wildlife would increase the amount of damage, while 18% indicated they did not know how to manage for wildlife. Respondents reporting types of assistance they would accept to improve wildlife habitat on their property indicated they would accept cash payments (61%), tax incentives (46%), seed for food plots (40%), and technical advice and information (39%), while 21% indicated they would not accept any assistance.

## CHAPTER V

### SUMMARY

All participants in this study had incurred wildlife damage and 99% indicated they had incurred deer damage. This study was designed to look at farmer responses to wildlife damage, however the list from which names were drawn from Farm Services indicated many landowners were not actively farming or were absentee landowners. Of the respondents in Henry and Weakly counties, 81.5% were active farmers, however, all 139 landowners' had damage to crops, primarily by deer with only a few other species causing any damage. Therefore, the concern is with damage by deer and the economic losses associated with their damage.

The whitetail deer (*Odocoileus virginianus*) is found throughout much of North America, to include 48 of the 50 states in the United States with the exception of Alaska and Utah. They range from near treeline in Canada to sub equatorial South America and are extolled as the premier big game animal. In 1994, the US population of whitetail deer was estimated to be more than 25 million and growing. ( Alabama Extension Publication ANR-961 1996)

Geographically speaking, Tennessee is a diverse state with huntable populations of whitetail deer in all of its 95 counties, but this has not always been the case. During the late 1800s and early 1900s, extensive logging, overgrazing, annual burning, clearing of land for farming and over hunting or market hunting extirpated deer from most of Tennessee. Several factors began a population increase and the restoration of whitetail deer in the 1930's. The Pittman-Robertson Federal Aid to Wildlife Restoration Act was

Passed in 1937 providing funds for wildlife management. Restoration programs were started with a great deal of success. State Game and Fish agencies saw the need for controlled wildlife management and the need to keep deer populations in balance with available habitat. Because most predators were also extirpated, hunting was the only means to control the deer population. At first hunting was limited to specific counties and to antlered bucks. Seasons were later extended to statewide and to include either-sex hunts (Halls 1984). Deer populations have increased both in Tennessee and nationwide since that time. In 1974 about 2 million whitetail deer were harvested by over 8 million hunters nationwide . The positive economic value of deer can be measured in the millions of dollars (Craven and Hygnstrom 1994). The Whitetail deer is the most popular big game animal in Tennessee. In 1993, nearly 200,000 hunters spent an estimated 125 million dollars for licenses, transportation, food, lodging and equipment (King 1994). In 1996, just over 300,000 big game hunters spent 300 million dollars in Tennessee (USFWS 1996).

Whitetail deer provide positive economic and aesthetic values, but can have a negative economic impact to some clientele. They often damage vegetable and row crops, orchards, nursery stock and frequently cause automobile accidents. Whitetail deer are a public resource and protected by law, therefore making deer management and deer damage abatement a complex issue involving several user groups. (King 1994) Given these variables, deer management is not just a biological concern any more. Deer population and habitat, their damage and the people involved in these issues, all must be managed for a successful program.

Wildlife management is conducted by many entities, but applications of social science to understand management actions have been focused primarily on state and federal agencies. Activities undertaken by the individual landowner, for whom management is motivated by personal gain or problem aversion is often overlooked (Siemer et.al.1991) While biological factors are important, human sociological factors must be incorporated into the decision making process. Often the most sociological consideration is deer damage to agricultural crops (Brown et. al. 1978)

Little information is available in Tennessee, especially in middle and west Tennessee. Tanner and Dimmick (1983) surveyed three west Tennessee counties, to look at farmers attitudes toward deer damage. King (1993) surveyed the state of Tennessee on deer populations and damage. In both studies only 12% of respondents indicated that the deer damage was intolerable. An informal survey conducted by Tennessee Farm Bureau in 1986 found deer also to be the problematic wildlife species to their members. (Tennessee Farm Bureau 1986).

Henry and Weakley Counties rely heavily on agriculture and as deer numbers have increased so have complaints from local farmers. The purpose of this study was to determine the perception of landowners in Henry and Weakley counties regarding the deer population, the extent of damage they cause and possible damage control methods.

Data collected by Johnson in her 2000 UT Wildlife Damage Survey was used to look at responses of landowners specific to Henry and Weakly counties.

The Objectives of this research were to:

1. Determine personal and farm operation characteristics of landowners.
2. Determine landowner perceptions and attitudes about county deer populations.
3. Determine the extent, level of tolerance and value of deer damage.
4. Determine what is currently being done to alleviate damage and assess attitudes about hunting as a control measure.
5. Determine landowner perceptions regarding the effectiveness of control measures.
6. Determine respondents perceptions of wildlife management practices on their property.

## **Methods**

In 1998 a survey was conducted in eight Tennessee counties which were grouped in four pairs of adjacent counties. These counties were Weakly and Henry ; Hardeman and Fayette ; Lincoln and Franklin and Robertson and Montgomery . Two groups of these counties were in west Tennessee with the remaining two groups in middle Tennessee (Johnson 2000).

These counties were selected based on 1997 deer harvest numbers per county and 1998 soybean production. Counties with the highest deer harvest per county with presumably high deer populations, along with high soybean production were selected. Deer and other wildlife damage was expected to be high in these county groups. These counties were selected to target farmers who were most likely to experience wildlife



damage and were not intended to be representative of the whole state. Survey participants were selected from a list of names and addresses provided by the USDA Farm Service Agency. A nine page questionnaire (Appendix 1 ) was mailed to each participant. The survey was administered using the four-wave mail survey method described by Dillman (1978).

This study used data collected by Johnson in her 2000 UT Wildlife Damage Survey and looks at landowners' responses specific to Henry and Weakly counties . Johnson indicated that more damage occurred within this county group than the other three groups in her study. Out of 566 surveys sent to Henry and Weakley County landowners in the Johnson study, 340 were returned and usable. Data for this study are specific to the 139 landowners and farmers in Henry and Weakly counties who indicated they had deer damage. Descriptive statistics was used to summarize data. Means, percentages and frequencies were tabulated and used to explain data.

### **Descriptive Statistics**

*Demographics*--Survey participants ranged in age from 25-90 with a mean age of 52. The majority (91%) were male and 48% either had some college, was a college graduate or completed post graduate work. Most (88.9%) earned greater than \$25,000 per year and (96%) of respondents were Caucasian .

*Farm Information*-- Mean acreage owned or farmed was 962. Henry and Weakly county have some farmers with large acreage that skewed data and increased the mean well

above the average indicated by Tennessee Agriculture Statistics. The median of 305 acres is a more accurate figure and is more in line with the 1997 Tennessee Ag. Statistics figure which shows average farm size in Henry county at 223 and Weakley county at 220. The majority of respondents (65%) managed primarily for field crops. Fifty-two percent owned and farmed their own land, the majority of farmers (68%) lived on the farm. Most (72%) were Tennessee Farm Bureau members and only 7% belonged to a conservation organization.

*Perception of Deer Population*--Over half (58%) of participants thought that deer populations had increased greatly and 35% indicated it had increased slightly for a total of 93% indicating an increase. Most (77%) wanted to see deer populations decrease. Over half (55%) of the respondents felt that deer damage had increased greatly and 31% thought it had increased slightly for a total of 86% indicating deer damage had increased to some extent. Farmers attitude toward deer was that 80% enjoyed deer, but of those 61% worried about damage. Twenty percent thought they were a nuisance.

*Experience with Deer Damage*--Ninety-nine percent of respondents reported deer damage to crops within the last year and 46% reported damage from wildlife species other than deer . Deer accounted for the most damage caused by any wildlife species.

Sixty-eight percent of farmers grew corn. Mean acreage was 269. Over three quarters (86%) experienced some damage to corn with 35% indicating damage to 10 or more acres.

Eighty-four percent of farmers grew soybeans. Mean acreage was 375. All respondents experienced some damage to soybeans with 11% experiencing damage to 100 acres or more.

Substantial damage was reported by 19% and severe damage by 9%. The largest percentage (46%) described deer damage as moderate around the field edges, light across the field . Almost a third (29%) reported severe damage around the field edge with moderate damage across the field and 5% reported severe damage across the entire field.

The majority (78%) estimated damage between \$100 and \$5000. Several respondents estimated losses between \$5001 and \$10,000 with 5% reporting losses at more than \$10,000. Seven percent indicated that any damage was intolerable. Slightly less than a third (32%) indicated that \$100 or less was intolerable, 37% reported that \$100-\$500 was intolerable, 16% reported that \$501-1000 was intolerable and 2% reported \$1001-\$5000 as intolerable.

*Deer Damage Control Measures*--Just over half (51%) of respondents had taken measures to control deer on their property . The majority (87%) had used hunting to control deer populations on their property. Other methods were used but none to the extent of hunting. Shooting outside of hunting season with a depredation permit was most effective means of damage control. Seventy-eight percent indicated that they were not aware that TWRA offers assistance with crop damage problems, however 29% had contacted TWRA about crop damage.

*Hunting on Property*--Over half of the respondents (57%) indicated they had hunted in the last five years and almost all respondents allowed hunting on their property. Over half (51%) hunted themselves, 63% allowed friends and neighbors to hunt, 59% allowed family members to hunt, 44% allowed people who asked permission, 19% allowed people who paid access and only 3% allowed just anyone to hunt as would be expected. Several (23%) leased their land to hunt on and leases range in size from 40 -1000 acres with a mean of 374 acres. Average lease cost was \$2.96 per acre.

Over half (59%) of respondents have had problems with on their property in the past and 56% have their land posted with "No Trespassing" signs.

*Wildlife Habitat on Property*--Only 7% of respondents belonged to a conservation organization, however 50% did something to provide wildlife habitat in their property. Of those who managed for wildlife, 73% managed for game birds, 62% managed for small game, 46% managed for general wildlife and 45% managed for deer. The most common habitat improvement was to provide cover (81%), followed by retaining wooded areas (78%), providing fence rows (68%) and providing food plots (52%). Time and cost were the two obstacles preventing landowners from managing wildlife on their property. Some (27%) were worried that managing wildlife would increase the amount of damage, while 18% indicated they didn't know how to manage for wildlife. Respondents reporting types of assistance they would accept to improve wildlife habitat on their property indicated they would accept cash payments (61%), tax incentives (46%), seed for food plots (40%), and technical advice and information (39%), while 21% indicated they

would not accept any assistance.

### **Comparisons with Other Studies**

Three formal studies have been conducted in Tennessee that have looked at landowners' and farmers' perception of deer and the damage they cause. This information is very important as landowner perception influences the tolerance of wildlife, damage and hunters that may ask to use property. This tolerance affects the access to private land for hunting and other uses. Some informal information has been collected through the use of surveys by the Tennessee Farm Bureau, and on farm demonstrations done by the University of Tennessee Agricultural Extension Service. This information may warrant further investigation. Little quantitative data has been collected in Tennessee to verify perceptions of damage, although some quantitative data can be found in other studies nationwide.

Tanner and Dimmick (1983) surveyed Henry, Stewart and Montgomery counties in west Tennessee to look at farmers attitudes toward deer damage. Their study included Henry, Stewart and Montgomery counties. Tanner and Dimmick reported general farmer response but also looked at responses within income level from farming. King (1993) surveyed the state of Tennessee on deer populations and damage. Some of his results were divided into what was at that time five Extension Districts. The most recent survey information was conducted in 8 middle and west Tennessee counties identified by high deer harvest and soybean production by University of Tennessee Graduate Research Assistant Dawn Johnson (2000). An informal survey conducted by the Tennessee Farm



Bureau in 1986 found deer also to be the most problematic wildlife species to their members. (Tennessee Farm Bureau 1986)

Deer damage demonstrations conducted in Henry and Carroll counties by Dixon (1998) and Goddard (personal communication, September 15, 2000) found results of chemically treated fences show some promise to help alleviate some deer damage, especially in small fields.

Caution must be used in making study comparisons, due to variations in location, time, and questions used in the above mentioned studies. There are some useful similarities but also some differences that have to be considered. One variable that affects results was the place from which the respondent list was obtained. Johnson used a Farm Services list, King used voting members of the Tennessee Farm Bureau drawn randomly and Tanner and Dimmick used a list provided from County Extension Agents. This study on deer damage was done with secondary data from Johnson's (2000) study. The focus of her study was to determine if counties like Henry and Weakley, where row crops are a major farm enterprise, would show a higher probability of damage occurring and being problematic than in other regions of Tennessee. The following discusses the findings of this study as compared to previous studies. This information can help determine future direction of investigations by considering changes over time as well as region.

*Demographics*--Mean landowner age was 52 compared with 59.4 in Johnson. This may indicate a need to focus educational programs not only to older populations who are not familiar with wildlife damage control methods but also younger people who may become landowners' and be forced to address wildlife damage issues. Ninety- one

percent of respondents were male compared with 84% in Johnson and 84% in King. Over half (62%) of the respondents (52% in Johnson) had education in either trade or vocational training or education beyond high school in the form of college or post graduate work. This study and Johnson's study indicated that just over 30% of respondents were high school graduates. Average number years of education in King was 12.5.

Twenty-nine percent earned less than 10% of their income from farming, as compared with 42% in Johnson, 63% in King and 20% in Tanner and Dimmick. This difference probably represents a situation where more of the Henry and Weakley county respondents are full time farmers than in other studies. Tanner and Dimmick stated that farmers with higher incomes also reported larger farm size. These differences may be due to the geographic locations of the respondents and the list from which they were chosen. .

*Farm Information*--Average farm size was 962ac. ( 442ac. in Johnson) which seemed high based on Tennessee Ag. Statistics data. This is probably due in both cases due to a few outliers with extremely large acreage. Henry and Weakley county data indicated this to be the case. The median of 305 ac. (154 ac. in Johnson) is probably a more accurate figure for the majority of respondents. Average property size in King's study was 198ac probably due to his respondents across the state where large farms are not as common. Sixty-five percent of respondents ( 44% in Johnson) managed their property primarily for field crops. King reported grain crops as the primary land use in just 8.2% of his respondents. The majority of farmers (68%) and 71% in Johnson's study lived on the farm. Most (72%) and 70% in Johnson's study were Tennessee Farm Bureau



members with only 7% ( 6% in Johnson) belonging to a conservation organization .

*Perception of Deer Population*--Fifty-eight percent of the participants thought that deer populations had increased (39% in Johnson). Thirty-five percent (37% in Johnson) indicated populations had increased slightly for a total of 93% indicating an increase versus 76% in Johnson, 44% in King and 58% in Tanner and Dimmick. Tanner and Dimmick and King's answer choices were similar, however more choices were given in Johnson's study that could be combined to make comparisons. Tanner and Dimmick found that higher income level respondents reported higher levels of deer population increase. Three percent (16% in Johnson , 23% in King and 28% in Tanner and Dimmick) indicated that deer populations had stayed the same. Four percent ( 9% in Johnson, 12% in King and 10% in Tanner and Dimmick) indicated that the deer population had decreased either slightly or greatly. Seventy-seven percent (49% in Johnson, 33% in King and 28% in Tanner and Dimmick) wanted to see deer populations decrease. Only 17% of respondents (32% in Johnson, 45% in King and 37% in Tanner and Dimmick) reported they would like to see the deer population remain the same.

Eighty-six percent felt that deer damage had increased compared to 64% in Johnson and 19% in King. Attitudes toward deer was that 80% (48% in Johnson, 62% in King and Tanner and Dimmick) enjoyed deer, but of those 61% ( 38% in Johnson, 12% in King, 13% in Tanner and Dimmick) worried about damage. The remaining 20% (15% in Johnson, 10% in King, 15% in Tanner and Dimmick) thought they were a nuisance.

*Experience with Deer Damage*--Ninety-nine percent of respondents reported deer damage to crops within the last year and 46% reported damage from wildlife species

other than deer. Johnson reported 47% by deer and 30% from other wildlife. King reported 33% of landowners had damage the year prior to his survey. Deer (91.3%, 78% in Johnson) accounted for the most damage caused by any wildlife species, however King reported groundhogs (31%) causing the most damage followed by deer (27%). Tanner and Dimmick only reported on deer.

Just over 70% in this study and Johnsons' study (27% in King, 50% in Tanner and Dimmick) reported light or moderate deer damage. Substantial damage was reported by 19% in this study (20% in Johnson, 4% in King, 7% in Tanner and Dimmick) and severe damage by 9% in this and Johnsons' study (2% by King and Tanner and Dimmick). The largest percentage (46%)(40% in Johnson) described deer damage as moderate around the field edges, light across the field. Twenty percent (24% in Johnson) reported light damage around the field edge. Twenty- nine percent (23% in Johnson) reported severe damage around the field edge with moderate damage across the field and 5% reported severe damage across the entire field in both.

Ten percent (18% in Johnson) estimated losses due to deer damage to be less than \$100 . The majority (78%, 94% in Johnson) estimated damage between \$100 and \$5000. Twelve percent ( 5% in Johnson) estimated losses greater than \$5000. Seven percent (17% in Johnson) indicated that any damage was intolerable. The Majority (86%, 80% in Johnson) reported up to \$1000 as tolerable. Very few (2%, 3% in Johnson reported over \$1000 as tolerable. This is probably the small number of extremely large landowners. It appears that landowners' with larger properties are willing to absorb damage losses more readily than landowners with smaller properties. This may be due to the increased

visibility of the damage as it is more concentrated in smaller areas. King and Tanner and Dimmick reported landowner feelings about damage in the last year as negligible (44/24%), tolerable (43/22%) and unreasonable (13/10%). Dollar amounts were not attached to amount of damage.

*Deer Damage Control Measures*—Fifty-one percent (25% in Johnson, 14% in King) of respondents had taken measures to control deer on their property. Eighty-seven percent (77% in Johnson, 41% in King) had used hunting to control deer populations on their property. Respondents reported shooting outside of hunting season with a depredation permit was most effective abatement method listed in the survey, however the means of 2.88 (3.0 in Johnson) reflects average success with this practice. King reported only 12% recommending the use of depredation permits, however 99% of landowners that experienced damage did not request a deer kill permit. Seventy-eight percent (80% in Johnson) indicated that they were not aware that TWRA offers assistance with crop damage. King reported 34% of landowners not getting deer kill permits from TWRA because they did not know they were available. However 29% (20% in Johnson, 50% in King n=38) had contacted TWRA about crop damage. King also reported 29% contacting the Tennessee Agriculture Extension Service. This may indicate an opportunity for the Extension Service and TWRA to work together in an effort to help landowners alleviate deer damage problems.

*Hunting on Property*—Fifty-seven percent of the respondents (43% in Johnson) indicated they had hunted in the last five years. Only 19% in King hunted during the previous year. Twenty-two percent (31% in Johnson) had never hunted. Twenty-two

percent (31% in Johnson, 71% in King) indicated they had never hunted. The majority of respondents (96%, 79% in Johnson) allowed hunting on their property. King reported that 70% of landowners with or without damage did not allow free hunting, however landowners with some damage were more willing to allow free hunting. Some 19% ( 8% in Johnson) allowed people who paid access and only 2-3% allowed just anyone to hunt in both this study and Johnsons study. Average lease cost was approximately \$3.00 per acre.

Fifty-nine percent of respondents ( 50% in Johnson) have had problems with hunters on their property in the past and 56% (51% in Johnson) have their land posted with “No Trespassing” signs. King reported that 69% of respondents indicated that legal hunters had not caused any problems. Tanner and Dimmick reported that farmers with a history of problems with hunters expressed significantly more negative attitudes toward deer. Burger and Teer (1981 in Tanner and Dimmick) noted, “Wildlife was a nuisance to some ranchers(farmers) because it forces them to deal with people who hunt.

*Wildlife Habitat on Property*--Only 7% (6% in Johnson) of respondents belonged to a conservation organization, however 50% (42% in Johnson) did something to provide wildlife habitat in their property. Of those who managed for wildlife, the majority managed for game birds (73%, 59% in Johnson).Only 45% ( 57% in Johnson) managed for deer. The most common habitat improvement was to provide cover (81%, 77% in Johnson). Time and cost were the two obstacles preventing landowners from managing wildlife on their property in both studies. Cash payments was the most reported type of assistance a landowner would accept to improve wildlife habitat on their property (61%,

42% in Johnson).

### **Management Implications**

Deer are an important resource to Tennessee and to Henry and Weakly counties. Much income is brought into the state and these counties as a result of the excellent hunting opportunities afforded in these counties. However, deer populations appear to have increased in these counties over the years, while hunter harvest has somewhat stabilized. Deer populations still appear to be on the rise as does deer damage. Henry and Weakley county landowners' reported greater losses than the other counties previously studied. Ironically, these landowners' (80%) enjoyed deer more than landowners in previous studies but also worry more about damage (61%). This may indicate that hunting alone is not the best solution to control high deer populations. Most survey participants felt that shooting with a depredation permit was the most effective abatement method, however it may take both methods in combination to control deer numbers and damage problems. The majority of participants in Henry and Weakley counties believe that deer populations and damage have increased and 77% wanted to see a population decrease. Again, this is more than landowners' in previous studies.

A discussion with a local farmer revealed that he felt that deer had been mismanaged over the years and that a long range plan needed to be implemented. He also believed that there is a balance where deer populations and field crop production could co-exist at tolerable levels. He felt that shooting deer with depredation permits was more effective than hunting and that leasing his property to hunters allowed him to control his



property and alleviate hunter use problems (E. Diggs, personal communication, January 21, 2001).

Farmers growing field crops, specifically soybeans, are the ones that are most threatened by ever increasing deer populations. Farmers who's livelihood is dependent upon farming and successful crop production are already burdened by financial difficulties associated with farming. Private landowners and farmers control the majority of private land in Tennessee including Henry and Weakley counties. There appears to be no quick and easy solution to deer damage problems. However, each time more information is gathered, better direction is determined as to how to alleviate damage concerns. In this instance it appears that a landowner who does not farm may not consider deer damage to be a problem like that of a full or part time farmer. Absentee landowners do not see deer as often as someone who is on the property regularly and may not estimate damage or populations to be a problem. On the other hand, farmers and landowners who frequent property or have problems with hunters and deer may over estimate damage.

There needs to be an accurate population count, especially in areas or counties where damage is reported in the greatest amounts. Then management practices could be prescribed to help better control the deer population and damage. There also needs to be a method to accurately determine if perceived damage is actual damage. Acres damaged are estimates by landowners and may not be accurate. Some farmers are dependent on fields with small acreage surrounded by woods to help increase there production and income from farming. These fields are most subject to damage problems and are the ones where

damage methods are most effective, however, in a tough farm economy crop losses on these fields, usually by smaller part time farmers, lead to greater losses than can be handled financially. Farmers indicated that time and money are the reasons they do not try to control deer. This may be why some damage methods are not tried.

Less than half (45%) of the respondents reported that they managed for deer. Landowners' , especially where damage is a problem may feel that deer have enough without planting additional food plots just for deer. However, it may be that field buffers could be planted to keep deer from reaching crop fields, hopefully reducing crop damage. Field borders surrounded by trees, especially in small fields where the most damage occurs, would be ideal areas to plant buffers. This would also provide small game habitat which the most respondents (62%) already are trying to do. Farmers that can afford to do so may consider taking small fields, surrounded by trees, where the most damage occurs out of production. They may also consider taking advantage of federal or state programs that would cost share for providing wildlife habitat. This would help to offset personal expenses. Only 50% presently do something for wildlife. These ideas may encourage the landowners' who are not managing for wildlife to consider doing so if both TWRA and the Extension Service would provide demonstrations showing cost and time effective methods considering that time and cost were the biggest reasons for not managing wildlife. Farmers that participate in wildlife management may consider leasing their property to control hunter access and deer damage by harvest.

Hunters should be aware that their behavior develops perceptions by farmers of both deer and deer hunters. This opinion affects hunters access to private property which



in turn could affect how a deer population is controlled. Past studies also indicated that hunter were more of a problem than deer. However, the majority (96%) allow hunting on there property. Dr. King reported that 72% of his respondents did not know how many deer had been harvested on their property. Landowners' keeping up with deer harvest would require some effort but could help control damage by requiring hunters to harvest specific numbers or sexes of deer on the property. Education concerning hunter ethics needs to be presented, to all, but especially young hunters and farmers through Hunter Education, 4-H shooting sports, FFA and other educational public meetings. A system could be developed to match hunters with farmers who are having deer problems. Farmers could work with a deer management plan like that of the "Quality Deer Management Association", which promotes to sound deer management through controlled harvest of specific components of the deer population. This system starts by evaluating the population, harvesting adequate numbers of does, and controlling the buck harvest. The increase in doe harvest affects the reproductive component of the herd and could, in effect, help control deer populations and damage. Quality Deer Management promotes ethical hunting and positive relationships among landowners, hunters, non-hunters and biologists. These relationships could lead to better hunting opportunities as well as a better regulated deer herd and better damage control. Hunters would adhere to a lease system that would allow hunting access, provided they followed the deer management plan for that property. Violators would not be allowed to operate in this system.

There needs to be a better way for landowners' and public agencies like TWRA

and the Extension Service to work together to address the needs of landowners with damage problems. Seventy-eight percent of landowners were not aware that TWRA offers assistance with crop damage problems. However 29% had contacted TWRA, indicating that landowners may not understand what is or can be provided to them. This overlap of contact versus lack of awareness may reveal that 7% felt they had not been helped even though they had sought assistance. Dr. King reported that 99% of his respondents did not request a depredation permit. This indicates that landowners with damage problems either do not feel the damage is problematic enough to deal with, do not have or want to take time to address the problem, or would like for someone else to deal with the problems. Deer like to eat soybeans when the plants are young. This is a busy time of year for crop farmers. Farmers consider their time a limiting factor in the control of deer damage and do not want to have to deal with a deer carcass in the hot weather. Depredation permits allow deer to be left in the field and in some cases, have to be left after the soybeans have reached a height such that retrieving a carcass would destroy a crop. Bones from these carcasses have been known to damage farm equipment. Budget constraints and lack of manpower may prevent landowners' damage problems from being a priority. Dr. King reported that 29% of his respondents contacted the Extension Service about damage. This may indicate a need to provide more public awareness and educational opportunities by both the Extension Service and TWRA.

TWRA could consider specific regulation for Henry and Weakley counties, at least until there is better control of the damage and a more accurate population estimate. Doe harvest in these two counties could be required before buck harvest or before buck

permits would be issued. Some doe permits are dated to be used in the later part of the season when some hunters have quit deer hunting for the year. A required doe harvest during the first gun season before a buck can be harvested may prove to be useful to reduce the doe population and ultimately deer damage.

A long range plan involving public agencies such as TWRA, the Extension Service, hunters, non-hunters and landowners to provide public education about deer populations, deer damage and control methods needs to be in place. This plan would address population estimates, population management, land use management, and hunter access. Landowners with damage problems could work with specific hunters through leases or hunting rights to manage the deer on their property in a specific management scheme based on recommendations of certified professionals. Landowners may consider using their property specifically for youth hunts to teach young hunters the value of proper behavior and proper wildlife management.

### **Future Research**

This study provided valuable information perceptions about deer damage in Henry and Weakly counties. Landowners experiences with hunters and crop losses dictate perceptions regarding deer populations, hunting and damage. Johnson(2000) reported that county group 1 (Henry and Weakley) had the most deer damage. It should be determined if regulations specific to these two counties would prove beneficial to alleviate deer damage problems. There remains the need to assess deer damage in a quantitative method and also to make more accurate population estimates. More accurate population

estimates, especially in areas with damage problems, would allow TWRA and private landowners to address deer numbers specific to an area and develop a plan to prevent future problems. All Tennessee studies have focused on perceptions, which also carries merit in that farmers perceptions dictates their attitudes about hunters, deer, damage and wildlife management. There is a need to develop a method to determine the amounts of damage and dollar amounts lost in a more accurate manner.

Studies need to include hunters input to determine what can be done by them to help farmers alleviate damage problems such that both parties agree on the methods used and common ground can be reached. Public agencies such as TWRA and the Extension Service should promote sound deer management practices through public education.

Future surveys could have question's added to help clarify responses where more specific responses may yield better information. Respondent list's should be more closely monitored to determine the specific information one is trying to obtain. Landowners or farmers with such damage as to cause economic hardships should be taken into consideration. The different lists used for the past Tennessee studies reflect responses according to different geographic locations within the state and cannot be used as a paradigm for all counties or regions within the state. Future studies may consider looking at farmers who hunt versus farmers who do not hunt and their opinions toward deer to see if the two group have differing opinions. Personal interviews with farmers reporting substantial damage may help determine views and opinions not found in a survey.

New damage abatement and control methods need to be studied. Deterring deer

from a specific field may not control the problem. Abatement methods that are time and cost effective should be considered.

**LITERATURE CITED**

GILBERT  
100% CO



## Literature Cited

- Allen, R.E. and D. R. McCullough. 1976. Deer-car accidents in southern Michigan. *Journal of wildlife Management*. 40:317-325.
- Alverson, W.S., W. Kuhlmann, D.M. Waller. 1998. *Wild forest: Conservation biology and public policy*. Island Press, Washington, D.C.300pp.
- Anthony, R. G., and A.R. Fisher. 1977. Wildlife damage in orchards-a need for better management. *Wildlife Society Bulletin*. 5:107-112.
- Brown, T.L., and D.J. Decker. 1979. Incorporating farmers' attitudes into management of white-tailed deer in New York. *Journal of Wildlife Management*. 43:236-239.
- Brown, T. L., and D. J. Decker, and C.P. Dawson 1978. Willingness of New York farmers to incur white-tailed deer damage. *Wildlife Society Bulletin* 6:235-239.
- Caslick, J.W. and D.J. Decker. 1977. Controlling deer damage to orchards in New York. Department of natural resources, New York State College of Agriculture and Life Sciences, Conservation Circ. 15. 15pp.
- Caslick, J.W., and D.J. Decker. 1979. Economic feasibility of a deer-proof fence for apple orchards. *Wildlife Society Bulletin*. 7:173-175.
- Coffey, M.A. and G.H. Johnstone. 1997. A planning process for managing white-tailed deer in protected areas:integrated pest management. *Wildlife Society Bulletin*. 25(2):433-439.
- Conover, M.R. 1984. Effectiveness of repellents in reducing deer damage in nurseries. *Wildlife Society Bulletin*. 12:399-404.
- Conover, M.R. 1994. Perceptions of grass-roots leaders of the agricultural community about wildlife damage on their farms and ranches. *Wildlife Society Bulliten*. 22:94-100.
- Conover M.R., W.C. Pitt, K.K. Kessler, T.J.DuBow and W.A Sanborn. 1995. Review of human injuries, illnesses, and economic losses caused by wildlife in the United States. *Wildlife Society Bulliten*. 23(3):407-414.
- Craven, S.R. and S.E. Hygnstrom. 1994. Prevention and control of wildlife damage:Deer. Cooperative Extension Division, Institute of Agriculture and Natural Resources, University of Nebraska. Lincoln, Nebraska, USA. pp.D25-D40.

Decker, D.J. and K.G. Purdy. 1988. Toward a concept of wildlife acceptance capacity in wildlife management. *Wildlife Society Bulletin* 16:53-57.

Dillman, D.A. 1978. *Mail and telephone surveys: the total design method*. John Wiley and Sons, New York, New York, USA.

Dixon, C. 1998. Evaluation of the effectiveness of deer repellents and electric fences to reduce deer damage on soybeans: A preliminary report. University of Tennessee Agricultural Extension Service. Brochure. University of Tennessee, Knoxville, Tennessee, USA.

Dyment, R. 1979. They cost farmers dearly. *American Agriculture*. 176 (9):46.

Garrison, R.L. 1984. Browsing of soybeans by white-tailed deer in Georgia. M. S. Thesis, University of Georgia. Athens, Georgia. 51pp.

Giles, R. H. 1978. *Wildlife management*. W. H. Freeman Co., San Francisco, California. 416pp. Tennessee Wildlife Resources Agency one pop

Halls, L.K., Ed. 1984. *White-tailed Deer: Ecology and Management*. Stackpole Books, Harrisburg, Pennsylvania. 870pp.

Healy, W.M., D.S. deCalesta, and S.L. Stout. 1997. A research perspective on white-tailed deer overabundance in the northeastern United States. *Wildlife Society Bulletin* 25 (2):259-263.

Hesslton, W.T. and R.A.M. Hesslton. 1982. White-tailed deer. Pages 878-901 in J.A. Chapman and G.A. Feldhamer, eds. *Wild Mammals of North America*. The John Hopkins University Press, Baltimore Maryland.

Hyingstrom, S. E. and S. R. Craven. 1988 Electric fences and commercial repellents for reducing deer damage in cornfields. *Wildlife Society Bulletin* 16:291-296

Johnson, D.L. 2000. Landowners, perception of deer damage to crops in Tennessee. Thesis, University of Tennessee, Knoxville, Tennessee, USA.

Johnson, J. 1986. Farm bureau seeking information on wildlife damage to your crops: background, questionnaire noted here. *Tennessee Farm Bureau News*. Tennessee Farm Bureau Federation. Volume 65. No 6.

Johnson, R.J. and R.M. Timm .1987. Wildlife damage to agriculture in Nebraska: A preliminary cost assessment. *Proceedings of the Third Eastern Wildlife Damage Control Conference*. 3:57-65.



King, M.. 1993. Tennessee population and damage survey report. Tennessee Wildlife Resources Agency Technical Report No. 93-18.

King, M. 1994. Managing deer damage in Tennessee. University of Tennessee. Agricultural Extension Service Publication PB 1509.

Matsche, G.H. and D.S. deCalesta, and J.D. Harder. 1984. Pages 647-654 in L.K. Halls, ed. White-tailed deer ecology and management. Stackpole Books, Harrisburg, Pennsylvania.

Moore, W.G. and R.H. Folk, III. 1978. Crop damage by white-tailed deer in the southeast. Proceedings Annual Conference of the Southeast Associations of Game and Fish Commissions. 32:263-68.

Noonan, P.F., and M.D. Zagata 1982. Wildlife in the market place: using the profit motive to maintain wildlife habitat. Wildlife Society Bulliten. 10:46-49\*

Rollins, K. and H.C. Briggs. 1996. Moral hazard, externalities, and compensation for crop damages from wildlife. Journal of Environmental Economics and Management 31, 368-386.

Romin, L. 1994. Factors associated with mule deer highway mortality at Jordanel Reservoir, Utah. M. S. Thesis, Utah State University., Logan, Utah. 80pp.

Rue, L. L., III. 1989. The deer of North America. Outdoor Life Books, Danbury, Connecticut. 544pp.

Siemer, W.F., G.A. Pomerantz, and D. J. Decker. 1991 A conceptual framework for analysis of agriculturalists' deer-damage-control decisions. Cornell Univ., Dep. Nat Resour. Res. And Ext. Ser. No. 35 14pp.

Swenson, J.E. 1983. Free public hunting and the conservation of public resources. Wildlife Society Bulliten. 11:300-303.

Tanner, G., and R.W. Dimmick 1983. An assessment of farmers, attitudes towards deer and deer damage in West Tennessee. Proceedings of the Eastern Wildlife Damage control Conference 1:195-199.

Tennessee Department of Agriculture. 1998. Tennessee agriculture. Tennessee Department of Agriculture, Nashville, Tennessee, USA.

Tennessee Department of Agriculture. 2000. Tennessee agriculture. Tennessee Department of Agriculture, Nashville, Tennessee, USA.

Tennessee Farm Bureau. 1986. Tennessee Farm Bureau News. Vol. 65, No.7.

Tennessee Wildlife Resources Agency. 1991. Deer restoration in Tennessee, 1940-1985: a final report. TWRA Wildlife Research Report No.91-1.

Tennessee Wildlife Resources Agency .1999.Big Game harvest report 1998-1999. Tennessee Wildlife Resources Agency Technical Report No. 99-1.

Tilt, K., J. Armstrong, D. Williams, M.K. Gaylor. 1996. Controlling deer in our nurseries and landscapes. Alabama Cooperative Extension System. Alabama Extension Publication ANR-961.

U. S. Bureau of Census. 1991. Statistical abstract of the United States: 1991 (111<sup>th</sup> ed.). U.S. Gov. Printing Off., Washington, D.C. 986pp.\*

United States Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, Bureau of the Census. 1993. 1991 National survey of fishing, hunting, and wildlife associated recreation. U.S. Government Printing Office, Washington, D.C.

United States Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce ,Bureau of the Census. 1997. 1996 National survey of fishing, hunting, and wildlife associated recreation. U.S. Government Printing Office, Washington, D.C.

Waller, D.M. and W.S. Alverson. 1997. The white-tailed deer: a keystone herbivore. Wildlife Society Bulletin 25(2):217-226.

Warren, R.J. 1997. The challenge of deer overabundance in the 21<sup>st</sup> century. Wildlife Society Bulletin. 25(2):213-214.

Weckerly, F.W. 1988. Ecological studies relating to white-tailed deer: I. Evaluation of surveys for determining use of woody browse by white-tailed deer: II. Seasonal feeding strategies of white-tailed deer in Tennessee. Tennessee Wildlife Resources Agency Technical Report No. 88-14.

Wentworth, J.M. 1992. Deer -habitat relationships in the southern Appalachians. Tennessee Wildlife Resources Agency Technical Report No. 92-1.

Wright, B. A. and R. A. Kaiser. 1986. Wildlife administrators' perceptions of hunter access problems: a national overview. Wildlife Society Bulliten. 14:30-35.

Wywiałowski , A.P. 1996. Wildlife damage to field corn in 1993. Wildlife Society Bulletin 24:264-271.

100% COTTON

**APPENDIX**

## CONTENTS

APPENDIX	PAGE
A1. Wildlife damage questionnaire.	67

GILBERT

FOOD & CO.

Please complete the survey by marking your answers in the appropriate place or by filling in the blanks. This survey is strictly confidential. Thank you again for your cooperation in this research on wildlife damage.

**Deer populations in your area:**

1. In the **past 5 years**, do you think **deer populations** in your area have...?  
 Increased greatly                       Decreased slightly  
 Increased slightly                       Decreased greatly  
 Stayed the same                       No opinion
  
2. In the **past 5 years**, do you think that **deer damage** in your area has...?  
 Increased greatly                       Decreased slightly  
 Increased slightly                       Decreased greatly  
 Stayed the same                       No opinion
  
3. Would you like to see **deer populations** in your area...?  
 Increase greatly                       Decrease slightly  
 Increase slightly                       Decrease greatly  
 Stay the same                       No opinion
  
4. Which of the following statements best describes **your attitude toward deer** in your area?  
 I enjoy having deer in my area.  
 I enjoy having deer in my area, but worry about crop damage.  
 Deer are a nuisance.  
 No opinion

**Deer damage in the past twelve months:**

5. Have you experienced **damage to your crops from deer** in the past year?  
 Yes                       No ( If no, go to question 10 )

**A1. Questionnaire**

6. In column one, please provide the **total number of acres** you had in **each crop in 1998**. In column two, please estimate the **total number of acres** you had **damaged by deer for each crop**.

	1998 Total Crop Acres	1998 Total Acres Damaged by Deer
Corn	_____ acres	_____ acres
Soybeans	_____ acres	_____ acres
Hay	_____ acres	_____ acres
Orchard crops	_____ acres	_____ acres
Vegetable crops	_____ acres	_____ acres
Others ( please specify )		
_____	_____ acres	_____ acres
_____	_____ acres	_____ acres
_____	_____ acres	_____ acres

7. Overall, how would you **rate the damage** caused by deer?

- |  |   |
|--|---|
| <input type="checkbox"/> Light damage    | <input type="checkbox"/> Substantial damage |
| <input type="checkbox"/> Moderate damage | <input type="checkbox"/> Severe damage      |

8. Choose the option that best **describes the deer damage** you have experienced.

- Light damage around edges of field only
- Moderate damage around edges, light damage across field
- Severe damage around edges, moderate damage across field
- Severe damage across entire field
- Other ( please specify ) \_\_\_\_\_

9. Please estimate the **dollar value of your crop loss from deer** in the past twelve months.

- |  |   |
|--|---|
| <input type="checkbox"/> None            | <input type="checkbox"/> \$1,001 - \$5,000  |
| <input type="checkbox"/> Less than \$100 | <input type="checkbox"/> \$5,001 - \$10,000 |
| <input type="checkbox"/> \$100 - \$500   | <input type="checkbox"/> More than \$10,000 |
| <input type="checkbox"/> \$501 - \$1,000 | <input type="checkbox"/> Don't know         |

**A1. (continued)**



10. Have you experienced any **damage** to your crops from wildlife species **other than deer** in the **past twelve months**?  Yes  No

If yes, please list those species. \_\_\_\_\_

11. Which **one** wildlife species, **including deer**, has caused the **most** damage to your crops in the past year? ( If no damage, answer "none" ) \_\_\_\_\_

12. What is the **maximum** amount of **crop damage** from wildlife that you would consider tolerable?

- |  |   |
|--|---|
| <input type="checkbox"/> None            | <input type="checkbox"/> \$1,001 - \$5,000  |
| <input type="checkbox"/> Less than \$100 | <input type="checkbox"/> \$5,001 - \$10,000 |
| <input type="checkbox"/> \$100 - \$500   | <input type="checkbox"/> More than \$10,000 |
| <input type="checkbox"/> \$501 - \$1,000 | <input type="checkbox"/> Don't know         |

**Deer damage control measures:**

13. Have you taken any **measures to prevent deer damage** to your crops?  
 Yes  No ( If no, go to **question 16** )

14. What **measures** have you **taken** to prevent deer damage to your crops?  
( Check **all** that apply )

- |  |   |
|--|---|
| <input type="checkbox"/> Repellants                            | <input type="checkbox"/> Electric fencing                   |
| <input type="checkbox"/> Scare devices                         | <input type="checkbox"/> Non-electric fencing               |
| <input type="checkbox"/> Hunting ( yourself or others )        | <input type="checkbox"/> Shooting with a depredation permit |
| <input type="checkbox"/> Other method ( please specify ) _____ |   |

**A1. (continued)**

15. Please rate the effectiveness of these methods on a scale of 1 to 5, with 1 being "Not Effective at All," and 5 being "Very Effective." Please rate only the methods that you have tried, as you indicated in question 14.

	Not Effective at All		----->		Very Effective
	1	2	3	4	5
Chemical repellants	1	2	3	4	5
Electric fencing	1	2	3	4	5
Non-electric fencing	1	2	3	4	5
Scare devices	1	2	3	4	5
Hunting	1	2	3	4	5
Shooting in off season (with permit)	1	2	3	4	5
Other method:	1	2	3	4	5
( please specify ) _____					

16. Were you aware that the **Tennessee Wildlife Resources Agency ( TWRA )** offers **assistance** with crop damage problems?

Yes                       No ( If no, go to question 18)

17. If yes, have you ever **contacted** TWRA concerning **crop damage**?

Yes                       No

**Hunting and your property:**

18. Do you hunt?

Yes, I have hunted in the past five years.

Yes, I have hunted, but not in the past five years.

No, I have never hunted.

19. In the past twelve months, did you **allow deer hunting** on your property?

Yes                       No ( If no, go to question 24 )

**A1. (continued)**

20. Who do you **allow to hunt deer** on your property?  
 (Check all that apply )

<input type="checkbox"/> Yourself	<input type="checkbox"/> Family members
<input type="checkbox"/> Friends or neighbors	<input type="checkbox"/> People who ask permission
<input type="checkbox"/> Anyone	
<input type="checkbox"/> People who pay for access to your property	

21. Do you **lease** your land to others for hunting?  
 Yes  No ( If no, go to **question 24** )

22. How many **acres do you lease** for hunting? \_\_\_\_\_ acres

23. How much do you **charge** for the hunting **lease**? \$\_\_\_\_\_

24. Have you had **problems with hunters** on your property in the past?  
 Yes  No ( If no, go to **question 26** )

25. If you **have had problems** with hunters on your property, could you please **describe those problems**. \_\_\_\_\_  
 \_\_\_\_\_

26. Is your **land posted** with "**No Trespassing**" signs?  Yes  No

**Wildlife habitat and your property:**

27. Do you do anything to **improve the quality of wildlife habitat** on your property?  
 Yes  No ( If no, go to **question 30** )

28. Which of the following kinds of **wildlife do you manage for?** (Check all that apply)

<input type="checkbox"/> Deer	<input type="checkbox"/> Game birds
<input type="checkbox"/> Small game	<input type="checkbox"/> Songbirds
<input type="checkbox"/> Waterfowl	<input type="checkbox"/> General wildlife
<input type="checkbox"/> Other ( please specify ) _____	

A1. (continued)

29. Which of the following things do you do to **improve the quality of wildlife habitat** on your property? ( Check **all** that apply )

- |  |   |
|--|---|
| <input type="checkbox"/> Provide general cover                               | <input type="checkbox"/> Protect wetland areas                |
| <input type="checkbox"/> Plant warm season grasses                           | <input type="checkbox"/> Retain wooded areas                  |
| <input type="checkbox"/> Provide food plots                                  | <input type="checkbox"/> Manage forested areas for wildlife   |
| <input type="checkbox"/> Delay tillage of fall harvested fields until spring | <input type="checkbox"/> Leave some rows of crops unharvested |
| <input type="checkbox"/> Provide fence rows                                  |   |
| <input type="checkbox"/> Other ( please specify ) _____                      |   |

30. What keeps you from **managing or doing more to manage your land for wildlife**? ( Check **all** that apply )

- |  |   |
|--|---|
| <input type="checkbox"/> Don't have time   | <input type="checkbox"/> Don't know how |
| <input type="checkbox"/> Too expensive   | <input type="checkbox"/> Not interested |
| <input type="checkbox"/> Concerned about wildlife damaging crops or other property |   |
| <input type="checkbox"/> Other reasons ( please specify ) _____                    |   |

31. Which of the following **types of assistance** would you be willing to accept to **improve** your property for **wildlife habitat**? ( Check **all** that apply )

- |  |   |
|--|---|
| <input type="checkbox"/> None                            | <input type="checkbox"/> Tax incentives                 |
| <input type="checkbox"/> Technical advice or information | <input type="checkbox"/> Cash payments                  |
| <input type="checkbox"/> Seed for food plots             | <input type="checkbox"/> Other ( please specify ) _____ |

**About your farm:**

32. How many **acres** do you own or manage? \_\_\_\_\_ acres

33. Do you **manage your farm** primarily for... ( please check **only one** )

- |  |   |
|--|---|
| <input type="checkbox"/> Field crops     | <input type="checkbox"/> Vegetable crops                |
| <input type="checkbox"/> Livestock       | <input type="checkbox"/> Orchard crops                  |
| <input type="checkbox"/> Forest products | <input type="checkbox"/> Other ( please specify ) _____ |

**A1. (continued)**

34. Do you... ( Check **all** that apply )

Own and farm your own land

Lease the land you farm from someone else

Own land and lease it to someone else to farm

35. Do you **live** on your farm?  Yes  No

36. Are you a member of the **Tennessee Farm Bureau**?  Yes  No

37. Are you a member of any **wildlife conservation organizations**?

Yes  No

If yes, please list \_\_\_\_\_

**Background Information**

The following information will help us understand who is being affected by deer damage. Answering these questions is **voluntary**. Your answers are **confidential and will not be associated with your name**.

38. What is your **age**? \_\_\_\_\_

39. **Gender** ( circle ):  Male  Female

40. What is the **highest grade of school** you have completed?

Less than high school graduate  College graduate

High school graduate  Post graduate

Some college  Don't wish to answer

Trade or vocational school

41. Approximately what **percent** of your household **income is from farming**?

Less than 10%  51% to 75%

10% to 25%  76% to 100%

26% to 50%  Don't know / don't wish to answer

**A1. (continued)**

42. What was your **total annual household income for 1998**, before taxes? (If you don't know yet, please estimate.)

- |   |  |
|---|--|
| <input type="checkbox"/> Under \$10,000       | <input type="checkbox"/> \$30,000 to \$49,999              |
| <input type="checkbox"/> \$10,001 to \$19,999 | <input type="checkbox"/> \$50,000 to \$74,999              |
| <input type="checkbox"/> \$20,000 to \$24,999 | <input type="checkbox"/> More than \$75,000                |
| <input type="checkbox"/> \$25,000 to \$29,999 | <input type="checkbox"/> Don't know / don't wish to answer |

43. What is your **ethnic origin**?

- |  |   |
|--|---|
| <input type="checkbox"/> African-American          | <input type="checkbox"/> Hispanic                       |
| <input type="checkbox"/> American Indian           | <input type="checkbox"/> Other ( please specify ) _____ |
| <input type="checkbox"/> Asian or Pacific Islander | <input type="checkbox"/> Don't wish to answer           |
| <input type="checkbox"/> Caucasian                 |   |

Please use this space to write any **additional comments** you may have regarding wildlife or wildlife damage in Tennessee.

**A1. (continued)**

Depending on the results of the survey, we may want to continue our research in the future by contacting those producers with significant damage. If you indicated that you had wildlife damage, **may we contact you** in the future to discuss the possibility of a farm visit to assess wildlife damage?     Yes                       No

**If you answered yes**, please fill in the following information so that we can contact you. This page will be separated from the rest of the survey. Your answers are **strictly confidential** and **will not be associated with your name** in any written report.

Name: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_

Zip Code: \_\_\_\_\_

Phone #: (     ) \_\_\_\_\_

**Thank you again for your assistance with this project.**

**A1. (continued)**



## Vita

Dill D. Hughes was born in Greer, South Carolina on October 10, 1964. He grew up in Greer and graduated from Blue Ridge High School in 1982. He continued his education at Berea College in Berea, Kentucky. He earned a Bachelor of Arts degree with a major in Agriculture in the spring of 1997.

In the fall of 1997 he entered graduate school at the University of Tennessee at Knoxville in the department of Forestry , Wildlife and Fisheries on a graduate research assistantship. After two and a half years working on classes and a research project, unforeseen circumstances prevented the completion of the graduate project.

In 1996, he was employed by the University of Tennessee Agricultural Extension Service in Paris, Tennessee as the Henry County 4-H Agriculture agent. In 1997 he started pursuing a Masters degree in Agricultural and Extension Education with an emphasis on wildlife. He received his Master of Science degree in May 2001.

8833 6227 27

07-18-01

✓

MFB

