APPENDIX A

ESTABLISHING OPENING DATES FOR SPRING WILD TURKEY HUNTING SEASONS

SOUTHEASTERN ASSOCIATION OF FISH AND WILDLIFE AGENCIES

ESTABLISHING OPENING DATES FOR

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Prepared by:

Wild Turkey Working Group
of the
Wildlife Resources Committee

This white paper was prepared by the Wild Turkey Working Group of the Wildlife Resources Committee for the Southeastern Association of Fish & Wildlife Agencies. This document is not intended to be a binding document, but provides technical information and recommendations for consideration in establishing opening dates for spring turkey seasons. This document was adopted by the Wildlife Resources Committee on October 16, 2016 and was subsequently adopted by the SEAFWA Board of Directors on October 18, 2016 in Baton Rouge, Louisiana

Executive Summary

Wild turkeys (*Meleagris gallopavo*; hereafter, turkeys) are widely recognized throughout the southeastern United States as a species of ecological, recreational, aesthetic, and economic importance. As a game species, turkeys are most popularly pursued during the spring, a timeframe coinciding with the bird's breeding and nesting activities. Given this period's biological importance, managers are challenged to avoid negative population impacts while simultaneously providing quality hunting opportunities. Biological considerations associated with timing spring turkey season frameworks include the potential effects of early and excessive male harvest on productivity and the tendency for intentional or inadvertent illegal female kill to occur earlier in the reproductive season. Turkey hunters often request frameworks to maximize exposure to gobbling activity, but these sociological considerations may conflict with biological concerns. Recent declining trends in turkey reproductive indices, abundance, and harvest in several southeastern states have heightened the need to evaluate potential consequences of spring hunting season timing on turkey population demographics. In this report, the Southeast Association of Fish and Wildlife Agencies Wild Turkey Working Group (SEAFWA-WTWG) summarizes factors state wildlife agencies should consider when setting the timing of spring turkey seasons. Based on this literature review, the SEAFWA-WTWG suggests spring turkey season opening dates that coincide with peak egg-laying (i.e., the mean date of initial nest initiation) are biologically sound and may reduce illegal female kill. This season timing also addresses concerns surrounding potential effects of male harvest on productivity, while acknowledging hunter expectations of hearing vocal male turkeys when hunting. Furthermore,

the SEAFWA-WTWG suggests state wildlife agencies should place emphasis on research to reduce uncertainty surrounding this important topic.

Introduction

Although historically abundant, turkey numbers in the southeastern United States declined precipitously during the late 1800s and early 1900s because of unregulated harvest and habitat loss (Kennamer et al. 1992). Due largely to restoration efforts by SEAFWA member states and their partners, turkeys now exist throughout the region. With an estimated population of about 2.6 million turkeys in the SEAFWA geography (Eriksen et al. 2015) and established spring turkey hunting seasons in all member states, turkeys are widely recognized as an important species from an ecological, recreational, aesthetic, and economic standpoint.

Unlike hunting seasons for other North American gallinaceous birds, spring turkey seasons coincide with breeding and nesting, challenging managers to provide hunter opportunity without negatively affecting turkey populations during a sensitive biological period (Kurzejeski and Vangilder 1992). The timing of spring turkey season is therefore a significant management consideration which must take into account turkey reproductive chronology and harvest susceptibility (Kurzejeski and Vangilder 1992). Concurrently, managers must also acknowledge the relationship between season timing and hunter satisfaction (Taylor et al. 1996). Seeing (Little et al. 2001, Nicholson et al. 2001, Dingman et al. 2005), hearing (Vangilder et al. 1990, Thackston and Holbrook 1996, Isabelle and Reitz 2015), and harvesting turkeys (Swanson et al. 2005) are often cited as factors most positively effecting the spring hunting experience, and the behavioral tendencies of male turkeys that dictate these interactions with hunters (e.g., gobbling propensity) can vary considerably throughout the breeding season's progression (Bevill 1973, Miller et al. 1997*b*, Palumbo 2010).

Unsurprisingly, the philosophical balance between the biological and sociological considerations of spring season timing is weighed differently among states (Kurzejeski and Vangilder 1992). In some states, spring turkey seasons are timed to occur after the first peak in gobbling activity so that the second gobbling peak (Bevill 1975) will fall midway through the hunting season (Kurzejeski and Vangilder 1992). This approach aims to lessen disruption to turkey breeding activities, diminish potential for illegal female kill, and an increase responsiveness of turkeys to hunters' calls. Conversely, this framework yields relatively short seasons, which limits hunting opportunity in comparison with other approaches. This shorter approach may also increase chances for periods of extended inclement weather to reduce gobbling activity and hunter success during the season (Norman et al. 2001*a*). Furthermore, in hunted populations, two peaks in gobbling may not always be present (Kienzler et al. 1996, Miller et al. 1997*b*, Norman et al. 2001*a*, Palumbo 2010, Colbert 2013), challenging the idea spring seasons should be structured in such a manner. In other states, spring turkey seasons begin early in the reproductive season and can nearly span the entire breadth of gobbling activity. This framework increases hunting opportunities, lessens the impact of inclement spring weather on hunting success by offering more potential days afield (Norman et al. 2001*a*), but ignores critical biological considerations which may dictate long-term turkey population health. Given these differing perspectives, spring turkey seasons vary greatly throughout the Southeast as strategies have evolved to fit state-specific turkey management goals and hunter preferences.

Recently, many SEAFWA states have documented declining trends in turkey reproductive indices, abundance, and harvest totals (Byrne et al. 2015). These population trends have occurred concurrent with hunter requests for earlier opening dates. Although the simultaneous occurrence of these two developments does not necessarily imply a causative

relationship, these population trends have generated concern about the potential effects of spring turkey season timing on turkey population demographics. In light of these concerns, this document seeks to overview biological and sociological considerations associated with the timing of spring turkey seasons. Our objectives are to (1) summarize literature pertaining to factors which should be considered when setting the timing of spring turkey seasons, (2) examine potential undesirable consequences associated with inappropriately timed spring season frameworks, and (3) provide recommendations for state wildlife agencies to consider when setting the timing of spring turkey seasons. Finally, we provide an appendix which summarizes options for opening dates of spring wild turkey hunting seasons with their potentially associated positive, negative, and unknown biological and sociological consequences

Factors to Consider when Setting Spring Turkey Seasons

Although the chronology of turkey gobbling can be influenced by weather (Kienzler et al. 1996, Miller et al. 1997*a*, Norman et al. 2001*a*), the reproductive period is primarily triggered by photoperiod (Healy 1992), and latitude can be used to predict broad regional variation (Whitaker et al. 2005, Palumbo 2010). For turkey populations experiencing little to no hunting pressure, researchers have documented one (Colbert 2013) or two (Bevill 1975) gobbling peaks. These peaks may coincide with breakup of winter flocks (Bevill 1973), initiation of laying behavior (Miller et al. 1997*b*), peak nest initiation (Colbert 2013), or peak nest incubation (Bailey and Rinell 1967, Bevill 1975, Norman et al. 2001*a*). Hunting can affect gobbling activity (Kienzler et al. 1996) and has the potential to obscure its chronology (Bevill 1975, Norman et al. 2001*a*), due to male removal via harvest and/or depression of gobbling activity from hunter presence (Kienzler et al. 1996, Norman et al. 2001*a*, Lehman et al. 2007). Thus, in hunted populations, only one gobbling peak may exist (Kienzler et al. 1996, Miller et al. 1997*b*, Norman et al. 2001*a*,

Colbert 2013). In unhunted southeastern populations, gobbling activity generally peaks from late April (28 April; Bevill 1975) to early May (7 May; Norman et al. 2001*a*). By comparison, gobbling peaks can occur from early (2 April; Miller et al. 1997*b*) to mid-April (12 April; Norman et al. 2001*a*) in hunted populations.

Despite their generally gregarious nature, female turkeys become secretive and avoid other turkeys during the nesting period (Healy 1992). Although they may feed or mate with other turkeys, these activities take place away from the nest (Williams et al. 1974). It takes females approximately two weeks to lay a clutch of eggs (Healy 1992) and early in the egg-laying period, they spend about an hour each day on the nest (Williams and Austin 1988). Continuous incubation takes about 26 days, during which females leave the nest every day or every other day (Williams et al. 1971) to feed, drink, and defecate, with average recesses varying from one (53 min; Green 1982) to two hours (1 hr 50 min; Williams et al. 1971). As such, female turkeys are generally solitary during the incubation period and spend considerably less time than normal with other turkeys throughout the nesting process.

Photoperiod triggers nesting in turkeys (Healy 1992). As with gobbling chronology, broad regional variation in nesting chronology is relatively predictable based on latitude (Whitaker et al. 2005), although weather can cause considerable annual variability (Vangilder and Kurzejeski 1995, Norman et al. 2001*b*). In the southeastern U.S., median dates of initial nest incubation generally occur from late April to early May. In Mississippi, Arkansas, Missouri, Virginia, and West Virginia, mean or median dates of first nest incubation initiation ranged from 22 April – 5 May (Vangilder and Kurzejeski 1995, Miller et al. 1998*b*, Thogmartin and Johnson 1999, Norman et al. 2001*b*). Given the two weeks needed to lay a clutch of eggs (Healy 1992),

average dates of egg-laying initiation in the southeastern U.S. based on these studies would be approximately 9–22 April.

Although average dates of nest initiation are generally similar across the southeastern U.S., annual variability can be great. For example, in Virginia and West Virginia, annual mean incubation initiation dates for first nests ranged 12 days (29 April – 10 May; Norman et al. 2001*b*). In Mississippi, annual median dates of incubation initiation ranged 22 days (12 April – 3 May; Miller et al. 1998*b*). Median annual date of first-nest incubation of adult females in Arkansas showed even greater variation, ranging 25 days (26 April – 20 May; Thogmartin and Johnson 1999), and in Missouri, annual median dates of incubation initiation ranged 29 days (28 April – 26 May; Vangilder and Kurzejeski 1995). Researchers have related this variability to weather (Vangilder and Kurzejeski 1995, Norman et al. 2001*a*) and female body condition (Thogmartin and Johnson 1999), which may shift incubation initiation considerably earlier or later than average in some years.

Potential Biological Consequences of Turkey Season Timing

Survival of adult female turkeys is one of the most important factors determining annual changes in turkey abundance (Vangilder and Kurzejeski 1995, Alpizar-Jara et al. 2001). Therefore, hunting regulations protecting female turkeys from being killed during the reproductive period represent a safeguard against negative effects on population growth. As such, most spring hunting regulations allow harvest of male turkeys, while prohibiting or restricting harvest of female turkeys. While some states within the region permit harvest of bearded female turkeys during the spring hunting season, these turkeys generally represent ≤1% of the total spring harvest (Waymire 2013; Isabelle 2015).

Despite regulations designed to protect female turkeys during the spring hunting season, research in some areas of the southeastern U.S. has documented considerable inadvertent or intentional illegal kill of female turkeys by hunters during these seasons (Wright and Speake 1975, Kimmel and Kurzejeski 1985, Williams and Austin 1988, Davis et al. 1995, Norman et al. 2001*a*). Conversely, studies in other portions of the region suggest illegal female kill during spring seasons is insignificant (Everett et al. 1980, Palmer et al. 1993, Vangilder 1996, Miller et al. 1998*a*, Wilson et al. 2005). Numerous issues likely influence the degree to which illegal female kill occurs including hunter density (Williams and Austin 1988, Vangilder and Kurzejeski 1995) and pressure (Kurzejeski et al. 1987), habitat fragmentation (Norman et al. 2001*a*), gobbling activity (Williams and Austin 1988), male turkey density (Williams and Austin 1988), and hunter experience (Vangilder 1996). However, despite complexities associated with these factors, female reproductive status has been demonstrated as one of the most direct determinants of susceptibility to illegal female kill (Miller et al. 1998*a*). Hens actively involved in the nesting process are less likely to flock with gobblers, minimizing inadvertent kill when gobblers are targeted, and incubating hens remain solitary and concealed, reducing their exposure to illegal kill (Williams and Austin 1988, Vangilder and Kurzejeski 1995). Predictably, higher rates of illegal hen kill have been documented in some areas of the southeastern U.S. when the opening of the spring hunting season occurs before the onset of nesting activities, suggesting hunting seasons that occur prior to this timeframe place hens at greater risk (Norman et al. 2001*a*). Such risk could be significant to population viability, as modeling studies suggest population growth rates may drop linearly with increases in hen harvest (Alpizar-Jara et al. 2001), and population declines likely occur as female harvest rates approach 10% (Vangilder and Kurzejeski 1995, McGhee et al. 2008).

Due to wild turkey's polygamous breeding system, an underlying assumption of spring turkey seasons is male-only harvest should not negatively impact population growth when its implementation does not disrupt or impede breeding activities (Allen 1956, Healy and Powell 2000). Nonetheless, potential effects of spring season timing on male harvest and its relationship to population vigor are important to consider, especially in areas of low turkey densities, intense hunting pressure, high harvest rates, and fragmented habitats (Vangilder 1992, Kurzejeski and Vangilder 1992, Stafford et al. 1997, Chamberlain et al. 2012). These concerns are based on observations that suggest insufficient availability of adult gobblers can detrimentally impact localized population productivity (Exum et al. 1987, Isabelle et al. 2016). Annual adult gobbler survival can be relatively high, yet most gobbler mortality occurs during spring with hunter harvest often accounting for the bulk of losses (Godwin et al. 1991, Vangilder 1996, Wright and Vangilder 2000). In relation to natural sources of mortality, hunter harvest can be additive for gobblers (Moore et al. 2008), indicating harvest plays a role in governing gobbler availability and distribution. Furthermore, the majority of gobbler harvest may be concentrated early in the spring season under frameworks in which access or opportunity is unrestricted (Miller et al. 1997*b*, Lehman et al. 2007). These traits are important to consider in regards to the timing of harvest within the breeding season's progression. A recent meta-analysis of turkey nesting phenology (Whitaker et al. 2007) compared the predicted onset of reproductive activities to the opening date for spring gobbler seasons. Most SEAFWA member states opened spring hunting seasons early in the breeding season, prior to the predicted nest incubation date ($\bar{x}$ = 29.5 days prior; range 9–47 days prior; Whittaker et al. 2007). If male availability is severely reduced given this timing, the combination of additive harvest concentrated prior to completion of breeding activities could result in insufficient gobblers remaining for copulation with hens,

thereby violating the assumption that spring turkey seasons do not impact reproduction. Though this situation is theoretically possible, it is largely uninvestigated.

Removal of males prior to breeding activities could also cause long-term detrimental consequences to populations if individuals of greater fitness are removed prior to their contribution to reproduction (Harris et al. 2002, Milner et al. 2007). While this potential has not been explored in turkeys, correlates of fitness have been shown to determine participation in the species' breeding season (Bevill 1973, Badyaev et al. 1998), with more dominant turkeys engaging in reproductive activities earlier than subdominants (Badyaev et al. 1996*a*, Badyaev et al. 1996*b*). Hunting frameworks occurring before completion of breeding activities could expose these early-engaging, dominant individuals to increased risk of harvest, potentially posing a problem for long-term population vigor (Milner et al. 2007).

Summary and Recommendations

The SEAFWA-WTWG acknowledges tradition and hunter opinions are important and play a role in establishing opening dates for spring turkey seasons. We also acknowledge that beyond biological and sociological considerations, differences in hunter densities, turkey densities, turkey habitat, and management goals are all important considerations state wildlife agencies must factor into setting spring turkey seasons (Norman et al. 2001*a*). We believe spring turkey hunting seasons should be timed to ensure sustainable harvests while affording quality opportunities for hunters in regards to gobbling frequency and responsiveness to calling.

Nonetheless, we believe it is important to recognize potential consequences of spring turkey season timing. Inadvertent or intentional illegal kill of female turkeys has been documented as a significant issue in portions of the southeastern U.S. (Wright and Speake 1975, Williams and Austin 1988, Davis et al. 1995, Vangilder and Kurzejeski 1995, Norman et al.

2001*a*). Research suggests the likelihood of illegal female kill is greatest prior to the onset of incubation (Miller et al. 1998*a*, Norman et al. 2001*a*). Therefore, in areas where substantial illegal female kill occurs, the relationship between spring season timing and female mortality should be considered when establishing spring season timing. We also believe contemporary research to estimate rates of illegal female kill are needed, as most studies investigating illegal female kill during spring seasons occurred ≥20 years ago (e.g., Wright and Speake 1975, Kimmel and Kurzejeski 1985, Williams and Austin 1988).

The effect of male harvest on turkey production remains a considerable knowledge gap. Yet, we believe it imprudent to ignore evidence that suggests excessive, ill-timed spring harvest (Exum et al. 1987) or insufficient adult gobbler abundance (Isabelle et al. 2016) may locally suppress turkey productivity. In fact, many authors (Vangilder 1992, Kurzejeski and Vangilder 1992, Healy and Powell 2000) have warned against potential implications of excessive gobbler mortality on population productivity when it occurs early in the breeding season. While unquantified in turkeys, excessive, selective, or inappropriately timed male harvest has been demonstrated to negatively impact production in a variety of other species (Saether et al. 2003, Sato and Goshima 2006, Milner et al. 2007), suggesting this theory is not unfounded. The long-term genotypic or phenotypic consequences of removing gobblers, particularly individuals which are dominant or most fit, prior to their contribution to reproduction is also unknown, but should be a concern of wise management (Fenberg and Roy 2008). Given these considerations, we believe research assessing the effects of variously timed spring harvest intensities on turkey productivity would be beneficial for managers and would provide information useful in evaluating the appropriateness of spring turkey season timing.

Upon evaluation of the sociological and biological considerations associated with spring turkey season timing, we believe delaying spring turkey seasons until peak egg-laying, defined as the mean date of initial nest initiation, may reduce illegal and inadvertent female kill where it occurs (Norman et al. 2001*a*), while minimizing concerns about the potential effects of male harvest on productivity and sustainability of the resource. We believe this approach to be biologically-sound, while also offering the opportunity for hunters to experience high gobbling activity (Norman et al. 2001*a*), an important component of hunter satisfaction (Vangilder et al. 1990, Thackston and Holbrook 1996, Isabelle and Reitz 2015). We recognize that spring turkey seasons beginning during peak egg-laying (9–22 April; Vangilder and Kurzejeski 1995, Miller et al. 1998*b*, Thogmartin and Johnson 1999, Norman et al. 2001*b*) may not overlap with early gobbling peaks (Miller et al. 1997*b*), which, although variable (Colbert 2013), on average, occur one week earlier (2–12 April; Miller et al. 1997*b*, Norman et al. 2001*a*). As such, managers should consider nesting and gobbling chronology, in conjunction with other factors, when establishing starting dates of spring turkey seasons.

An even more conservative approach to establishing spring season timing is opening seasons during the peak of incubation initiation (Kurzejeski and Vangilder 1992, Healy and Powell 2000). However, later spring season opening dates may lead to dissatisfaction among hunters (Cartwright and Smith 1990, Taylor et al. 1996), especially in southern latitudes where warmer temperatures and vegetative growth are likely to be greater during spring seasons.

Although spring season timing is only one of many factors potentially impacting turkey populations, its true effect remains uncertain. Butler et al. (2015) demonstrated that a framework change that moved Mississippi's opening date earlier was responsible for a subsequent decline in harvest per unit effort by a group of avid spring turkey hunters; however, the causative

mechanism behind the relationship was unclear. In Arkansas, a long-term decline in total statewide harvest reversed following a framework alteration that pushed the spring season's opening date after the peak of nest incubation, but the casual mechanisms for the harvest rebound are likewise uncertain (J. Honey, Arkansas Game and Fish Commission, unpublished data). While these case studies raise interesting questions, we acknowledge that linkages between season timing and declining trends in turkey abundance or productivity have not been clearly documented or quantified. However, we maintain that turkeys are an infinitely valuable public trust resource that deserve a cautious, prudent, and conservative management approach. Thus, we feel that SEAFWA member states should thoroughly evaluate their current spring season timing and adjust frameworks if deemed appropriate. We feel that strong consideration should be given to delaying spring seasons until peak egg-laying. Furthermore, we believe targeted research to reduce the uncertainty associated with the biological effects of spring season timing is warranted and should be made a priority by SEAFWA member states.

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APPENDIX A.

Representative options for opening dates of spring wild turkey hunting seasons and potential positive, negative, and unknown biological and sociological consequences. Framework descriptions (liberal, recommended, and conservative) are theoretical and would vary in calendar date based upon state-specific differences in wild turkey reproductive chronology.

	POTENTIAL POSITIVE FACTORS	**POTENTIAL NEGATIVE FACTORS**	**UNKNOWNS & RESEARCH NEEDS**
LIBERAL FRAMEWORK *Opening date prior to peak egg-laying*	- Acknowledges hunter requests - Maximizes hunter opportunity - Encompasses all peaks in gobbling activity - Reduces inclement weather impacts on hunter success and satisfaction	- Population productivity may be reduced via: - Heightened risk of illegal hen kill - Excessive or selective gobbler mortality possibly impacting turkey reproduction	- Risk of illegal hen kill varies and should be assessed state by state - True impact of early-season gobbler mortality likely variable and currently unquantified
RECOMMENDED FRAMEWORK *Opening date concurrent with peak egg laying*	- Reduced risk of illegal hen kill - Diminished risk associated with excessive or selective gobbler mortality - Allows for hunter exposure to secondary peak in gobbling activity - Increased responsiveness of gobblers to hunter calls	- Hunters may miss early gobbling or first peak in gobbling - Requires shorter, more precisely timed frameworks - Some hens may still be at risk of illegal kill	- Same as above, plus: - Uncertain effects on hunter satisfaction - Requires accurate knowledge of local nesting and gobbling chronology
CONSERVATIVE FRAMEWORK *Opening date concurrent or following peak nest-incubation*	- Minimized risk of illegal hen kill - Eliminates risks associated with excessive gobbler mortality – all gobblers have become a biologically unneeded surplus	- Occurs late in breeding season resulting in shortest season frameworks - Hunters may miss all gobbling peaks in some years - Warmer temperatures and advanced vegetation becomes problematic to hunters in southern latitudes - Likely requires significant outreach and education for continued hunter buy-in	- Uncertain effects on hunter satisfaction

APPENDIX B

2015 – 2018 SOUTH CAROLINA TURKEY HARVEST REPORTS

SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES

2015 South Carolina
TURKEY HARVEST REPORT

SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES
TURKEY RESEARCH & MANAGEMENT PROJECT

DNR

Submitted by
Charles Ruth; Deer & Wild Turkey Program Coordinator

INTRODUCTION

Ranking only behind the white-tailed deer in popularity among hunters, the Eastern wild turkey is an important natural resource in South Carolina. The 2015 Turkey Hunter Survey represents the South Carolina Department of Natural Resources (DNR), Wildlife Section's ongoing commitment to conduct pertinent research related to the state's wild turkey population. The primary objectives of this survey research were to obtain valid estimates of; (1) the statewide spring gobbler harvest in 2015, (2) the harvest of gobblers in the constituent counties of the state, and (3) hunting effort related to turkeys. Information on hunter's opinions of the turkey resource and other aspects of turkey hunting are also presented.

Due to the importance of turkeys as a state resource, DNR believes that accurately assessing the harvest of turkeys, as well as hunter participation in turkey hunting, is key to the management of this species. Proposed changes in turkey-related laws and regulations should have foundations in biology, therefore, the population dynamics associated with annual hunting mortality cannot be ignored. Similarly, when issues arise that do not involve biological parameters, it is important to have information related to turkey hunter activities afield because they too form an important basis for managing wild turkeys.

Since the inception of the Statewide Turkey Restoration and Research Project (Turkey Project) the methods used to document the turkey harvest have changed. Historically, turkey harvest figures were developed using a system of mandatory turkey check stations across the state. This system yielded an actual count of harvested turkey and was, therefore, an absolute minimum harvest figure. Shortcomings in this system included deterioration of check station compliance, complaints from hunters regarding the inconvenience of check stations, and costs associated with the check station system. The requirement to check harvested turkeys in South Carolina was eliminated following the 2005 season. Prior to eliminating the check-in requirement, DNR conducted surveys in order to document the rate of noncompliance, as well as, to determine the relationship between harvest figures obtained from check stations and those obtained from surveys. As would be expected, harvest figures obtained from surveys are higher than those from check stations due to lack of compliance with the check-in requirement.

Survey Methodology

The 2015 Turkey Hunter Survey represented a random mail survey that involved a single mail-out. The questionnaire for the 2015 Turkey Hunter Survey was developed by Wildlife Section personnel (Figure 1). The mailing list database was constructed by randomly selecting 27,000 individuals who received a set of 2015 Turkey Transportation Tags which are required in order to hunt turkeys in South Carolina. Data entry was completed by Priority Data, Inc., Omaha, Nebraska.

Results from the mail survey were corrected for nonresponse bias using data collected during 2008-2013 by Responsive Management of Harrisonburg, Virginia using a Computer Assisted Telephone Interview program (CATI).

Statistical analysis was conducted using Statistix 7 (Analytical Software, Tallahassee, FL).

RESULTS AND DISCUSSION

Turkey Harvest

During the 2015 spring season it is estimated that a total of 12,741 adult gobblers and 2,496 jakes were harvested for a statewide total of 15,237 turkeys (Table 1). This figure represents a 6 percent decrease in harvest from 2014 (16,248) and a 40 percent decrease from the record harvest established in 2002 (16,348 check station, 25,487 estimated by survey). The overall reduction in harvest seen since 2002 can likely be attributable to one primary factor, poor reproduction.

Reproduction in wild turkeys has generally been poor over the last decade (Figure 2) leading to a long-term declining harvest trend (Figure 3). Of particular note as it relates to the 2015 season is the fact that reproduction in 2013 was the lowest ever documented since the summer turkey reproduction survey began in 1982. Hunters most frequently have success calling and harvesting 2 year old gobblers and with poor reproduction in 2013 there were simply few 2 year old birds available in 2015. The harvest of adult gobblers in 2015 was down 13 percent from 2014, however, the overall harvest of turkeys was bolstered by a 36 percent increase in the harvest of jakes compared to 2014. The percentage of jakes in the harvest in 2015 was the highest in a number of years. This overall association between changes in reproduction and its effects on harvest are rather remarkable in South Carolina's turkey harvest and reproductive data sets.

Unlike deer, wild turkeys are much more susceptible to significant fluctuations in recruitment. Lack of reproductive success is typically associated with bad weather (cold and wet) during nesting and brood rearing season. On the other hand, habitats are continually changing in South Carolina. Although forest management activities stimulated the growth in South Carolina's turkey population in the 1980s, considerable acreage is currently in even-aged pine stands that are greater than 10 years old, a situation that does not support turkeys as well due to decreases in understory vegetation which is important to nesting and brood rearing.

Harvest Per Unit Area County Rankings

Comparisons can be made between turkey harvests from the various counties in South Carolina if a harvest per unit area is established. Harvest per unit area standardizes the harvest among counties regardless of the size of individual counties. One measure of harvest rate is the number of turkeys taken per square mile (640ac. = 1 mile^2). When considering the estimated turkey habitat that is available in South Carolina, the turkey harvest rate in 2015 was 0.7 gobblers per square mile statewide (Table 2). Although this harvest rate is not as high as it once was, it should be considered good and is similar to other Southeastern states. The top 5 counties for harvest per unit area were Cherokee (1.4 turkeys/mile^2), Spartanburg (1.2 turkeys/mile^2), Pickens (1.2 turkeys/mile^2), Anderson (1.1 turkeys/mile^2), and Newberry (1.1 turkeys/mile^2) (Table 2).

Turkey Harvest Rankings by County

Total turkey harvest is not comparable among counties because there is no standard unit of comparison, i.e. counties vary in size and are, therefore, not directly comparable. However, some readers may be interested in this type of ranking. The top 5 counties during 2015 were Williamsburg, Berkeley, Fairfield, Colleton, and Newberry (Table 3).

Turkey Harvest by Week of Season

Gobbling by male wild turkeys occurs primarily in the spring and is for the purpose of attracting hens for mating purposes. Therefore, spring turkey hunting is characterized by hunters attempting to locate and call gobbling male turkeys using emulated hens calls. With respect to both biology and effective hunting, the timing of the spring gobbler season should take into account three primary factors; peak breeding, peak gobbling, and peak incubation. Considering these factors, seasons can be set to afford hunters the best opportunity to hunt during the best time (i.e. peak gobbling) without inhibiting reproductive success.

South Carolina currently has two spring turkey season frameworks. Throughout most of the state (Game Zones 1, 2, 3, 4, and 5) the season is April 1-May1. This season is based on a recommendation from DNR following gobbling and nesting studies that were conducted in the 1970's. The other season framework is March 15-May 1 and is only in effect in Game Zone 6

(lower coastal plain). This season is socio-politically based. For additional information on setting spring turkey season refer to: http://www.dnr.sc.gov/wildlife/turkey/springseason09.html.

If seasons are set appropriately, the greatest proportion of turkeys should be harvested during the first week of the season because hens should be laying or nesting resulting in gobblers that are naïve and most responsive to hunter's calls. Harvest by week of season demonstrates that the timing of the April 1 opening season affords higher turkey harvests as most turkeys are harvested during the week following the April 1 opening date (Figure 4). When broken-out by specific season frameworks the results are similar. In areas were the season begins March 15, only 23 percent of the total harvest was accounted for during the first week of the season (Figure 5). This is likely due to the fact that late March is the time of peak breeding and males gobble less because "they are all henned up". On the other hand, 43 percent of the harvest occurred during the first week of the season in areas where the season begins April 1 (Figure 6). This is due to the fact that by the first week in April, a significant number of hens have left the gobblers and begun continuous incubation.

Comparing the first two weeks of each season format, we find that where the season opens March 15, 42 percent of gobblers were harvested while this figure is 65 percent where the season opens on April 1. Finally, the percentage of turkeys harvested in the first week of the season in areas where the season opens April 1 is the same as the percentage of turkeys harvested during the first two weeks of the season in areas where the season opens March 15. Again, this is a reflection of fewer available hens due to nesting and this lack of hens stimulates peak gobbling resulting in hunters being more successful in locating and calling responsive birds. These results have been consistent since this type of data has been available.

Number of Turkey Hunters

Even though all individuals receiving a set of Turkey Transportation Tags were licensed to hunt turkeys, only 54 percent actually hunted turkeys. Based on this figure, approximately 44,205 hunters participated in the 2015 spring turkey season, a 3.8 percent decrease from 2014 (45,949). Counties with the highest estimates for individual hunters include Fairfield, Newberry, Laurens, Union, and Chester (Table 4).

Hunter Effort

For the purposes of this survey hunter effort was measured in days with one day being defined as any portion of the day spent afield. Turkey hunters averaged approximately 5.0 days afield during the 2015 season (Table 4). Successful hunters averaged significantly more days afield (6.8 days) than unsuccessful hunters (4.5 days). Extrapolating to the entire population of turkey hunters yields a figure of 218,258 total days of spring gobbler hunting, down 4 percent from 2014 (227,069 days).

The number of days devoted to turkey hunting in South Carolina is significant and points not only to the availability and popularity of turkeys as a game species, but to the obvious economic benefits related to this important natural resource. Figures generated by a 2003 Survey by the National Wild Turkey Federation estimate that approximately 35 million dollars are added to South Carolina's economy annually from turkey hunting. The top 5 South Carolina counties for overall days of turkey hunting during 2015 were Fairfield, Newberry, Berkeley, Union, and Edgefield counties (Table 4).

Hunting Success

For determination of hunting success only those individuals that actually hunted turkeys were included in the analysis and similarly, success was defined as harvesting at least one turkey. Overall hunting success in 2015 was 26 percent (Figure 7). Unlike deer hunting which typically has high success, turkey hunting can be an inherently unsuccessful endeavor, relatively speaking. As would be expected, the majority of successful hunters take one gobbler (Figure 7). However, the percentage of successful hunters who take two birds is quite high as well. This indicates that successful hunters had nearly the same chance of taking two birds as they did one bird.

The statewide bag limit in South Carolina is five gobblers. Obviously, most successful hunters harvest only one or two birds. However, it is interesting to note the relative contribution to the total harvest of turkeys by the few hunters that harvest many birds. Ironically, the percentage of hunters taking more than 3 birds was only 2.2 percent, however, this small percentage of hunters harvested 25 percent of the total birds taken in the state (Figure 8). These results have been consistent since this type of data has been available.

Hunter Opinion Regarding Turkey Numbers

The 2014 Turkey Hunter Survey asked participants to compare the number of turkeys in the area they hunt most often with the number of turkeys in past years. Participants were given 3 choices; increasing, about the same, or decreasing. Approximately 43 percent of hunters indicated that the number of turkeys in the area they hunted most often was about the same as in past years. A higher percentage of hunters (46%) believed that the turkey population was decreasing than increasing (11%). On a scale of 1 to 3 with 1 being increasing, 2 being the same, and 3 being decreasing, the overall mean rating of 2.3 suggests that hunters viewed the turkey population as decreasing. The opinion among hunters that the turkey population is decreasing is consistent with recent harvest trends and reproductive data.

Turkeys Shot but not Recovered

Harvesting game signals the end of a successful hunt and although most hunters do a good job of preparing their equipment and mental state, it goes without saying that a certain percentage of game is shot or shot at and not killed or recovered. This point is no different when turkey hunting.

In order to estimate the prevalence of errant shots at turkeys, the 2015 Turkey Hunter Survey asked hunters to indicate the number of turkeys that they "shot but did not kill or recover during the 201 season in South Carolina". Approximately 9.9 percent of hunters indicated that they shot but did not kill or recover at least one turkey in 2015 (10.8% in 2014). There were approximately 44,205 turkey hunters in 2015 meaning that approximately 4,365 turkeys were shot or shot at and not killed or recovered. Therefore, approximately 22 percent of the total number of turkeys shot at were not killed or recovered. These results have been consistent since this type of data has been available.

This data is certainly not indicative of "dead and unrecovered turkeys", however, it is clear that some percentage of the 4,365 turkeys that were shot at did eventually die. Although shot shells for turkeys have become increasingly sophisticated, accurate, and lethal it is a fact that the pattern of a shotgun is relatively broad and contains between 200 and 400 pellets. Therefore, a "clean miss" is not as clear-cut for turkeys compared to other big game like deer where there is typically a single projectile. Additional research is needed on this topic.

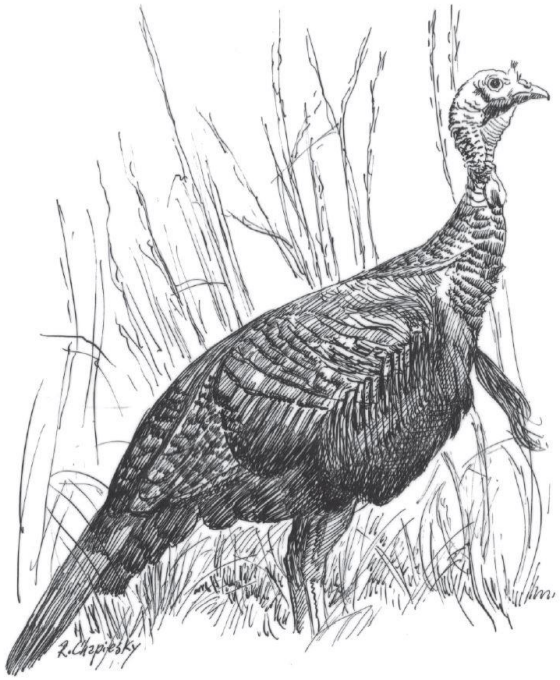
Turkey Harvest in the Morning VS. Afternoon

The typical spring turkey hunt is characterized by attempting to locate a gobbling bird prior to or just after sunrise. Once a gobbler is located most hunters position themselves as close as they can to the gobbler without scaring it away. Various types of callers that mimic the sounds of wild turkeys are then used to attempt to call the gobbler into gun range. This technique of locating a gobbling bird, setting-up, and calling is repeated as necessary.

Traditionally, spring turkey hunting was primarily carried out during the first few hours of the day. As the popularity of turkey hunting has increased, many hunters now hunt in the afternoon as well. Gobblers are generally not as vocal in the afternoon but they can be stimulated to gobble using the various turkey calls, particularly late in the afternoon near areas where turkeys frequently roost.

In order to gain a better understanding of the distribution of harvest with respect to time of day, the 2015 Turkey Hunter Survey asked hunters to identify the number of birds harvested in the morning compared to the afternoon. Results indicate that approximately 75 percent of gobblers were harvested in the morning compared to 25 percent in the afternoon. This data may be useful if discussions arise concerning the relative importance of morning compared to afternoon harvest of gobblers in the spring. These results have been consistent since this type of data has been available.

2017 South Carolina
TURKEY HARVEST REPORT



SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES

WILD TURKEY RESEARCH & MANAGEMENT PROJECT

Submitted by

Charles Ruth and Jay Cantrell

Wildlife Biologists, SCDNR Big Game Program

INTRODUCTION

Ranking only behind the white-tailed deer in popularity among hunters, the Eastern wild turkey is an important natural resource in South Carolina. The 2017 Turkey Hunter Survey represents the South Carolina Department of Natural Resources (DNR), Wildlife Section's ongoing commitment to conduct pertinent research related to the state's wild turkey population. The primary objectives of this survey research were to obtain valid estimates of; (1) the statewide spring gobbler harvest in 2017, (2) the harvest of gobblers in the constituent counties of the state, and (3) hunting effort related to turkeys. Information on hunter's opinions of the turkey resource and other aspects of turkey hunting are also presented.

Due to the importance of turkeys as a state resource, DNR believes that accurately assessing the harvest of turkeys, as well as hunter participation in turkey hunting, is key to the management of this species. Proposed changes in turkey-related laws and regulations should have foundations in biology, therefore, the population dynamics associated with annual hunting mortality cannot be ignored. Similarly, when issues arise that do not involve biological parameters, it is important to have information related to turkey hunter activities afield because they too form an important basis for managing wild turkeys.

Since the inception of the Statewide Turkey Restoration and Research Project (Turkey Project) the methods used to document the turkey harvest have changed. Historically, turkey harvest figures were developed using a system of mandatory turkey check stations across the state. This system yielded an actual count of harvested turkey and was, therefore, an absolute minimum harvest figure. Shortcomings in this system included deterioration of check station compliance, complaints from hunters regarding the inconvenience of check stations, and costs associated with the check station system. The requirement to check harvested turkeys in South Carolina was eliminated following the 2005 season. Prior to eliminating the check-in requirement, DNR conducted surveys in order to document the rate of noncompliance, as well as, to determine the relationship between harvest figures obtained from check stations and those obtained from surveys. As would be expected, harvest figures obtained from surveys are higher than those from check stations due to lack of compliance with the check-in requirement.

Survey Methodology

The 2017 Turkey Hunter Survey represented a random mail survey that involved a single mail-out. The questionnaire for the 2017 Turkey Hunter Survey was developed by Wildlife Section personnel (Figure 1). The mailing list database was constructed by randomly selecting 30,000 individuals who received a set of 2017 Turkey Transportation Tags which are required in order to hunt turkeys in South Carolina. Data entry was completed by Priority Data, Inc., Omaha, Nebraska.

Results from the mail survey were corrected for nonresponse bias using data collected during 2007-2013 by Responsive Management of Harrisonburg, Virginia using a Computer Assisted Telephone Interview program (CATI).

Statistical analysis was conducted using Statistix 7 (Analytical Software, Tallahassee, FL).

RESULTS AND DISCUSSION

Turkey Harvest

During the 2017 spring season it is estimated that a total of 17,093 adult gobblers and 2,078 jakes were harvested for a statewide total of 19,171 turkeys (Table 1). This figure represents a 14 percent increase in harvest from 2016 (16,783). Combined with a 10 percent increase from 2015 to 2016 the statewide turkey harvest increased 24 percent the last two seasons. These recent increases in harvest may be partially related to better reproduction and recruitment in turkeys since 2013 (Figure 2). Recruitment in 2013 was the lowest ever documented by the annual Summer Turkey Survey which has been conducted since 1982. With an expected two-year time lag, in 2015 this poor recruitment resulted in the lowest spring harvest in nearly two decades. Recruitment has been somewhat better since, therefore, recent improvements in harvest are not surprising.

However, legislative changes that went into effect in 2016 provided an earlier starting date and increased number of days in the turkey season in 34 of 46 South Carolina counties. The effect of this season change was a 50 percent increase in opportunity (days) for the majority of the state. Hunter effort statistics indicate hunters have taken advantage of the increased opportunity. Statewide man/days of effort were at an all-time high in 2017 and represent a 27 percent increase over 2015 which was the last season prior to the changes being initiated.

With slightly higher recruitment and significantly higher hunter effort the last two years it is difficult to determine which is more responsible for the dramatic increase in harvest since 2015. On one hand, better recruitment has historically been followed by higher harvests, i.e. more turkeys on the landscape generally equals a higher harvest. On the other hand, more hunter effort can clearly increase the harvest, to a point, regardless of the number of turkeys on the landscape. It will likely take several years for these relationships to become clearer.

Harvest Per Unit Area County Rankings

Comparisons can be made between turkey harvests from the various counties in South Carolina if a harvest per unit area is established. Harvest per unit area standardizes the harvest

among counties regardless of the size of individual counties. One measure of harvest rate is the number of turkeys taken per square mile (640ac. = 1 mile^2). When considering the estimated turkey habitat that is available in South Carolina, the turkey harvest rate in 2017 was 0.9 gobblers per square mile statewide (Table 2). Although this harvest rate is not as high as it once was, it should be considered good and is similar to other Southeastern states. The top 5 counties for harvest per unit area were Union (1.8 turkeys/mile^2), Cherokee (1.4 turkeys/mile^2), Williamsburg (1.3 turkeys/mile^2), Charleston (1.3 turkeys/mile^2), and Newberry (1.3 turkeys/mile^2) (Table 2).

Turkey Harvest Rankings by County

Total turkey harvest is not comparable among counties because there is no standard unit of comparison, i.e. counties vary in size and are, therefore, not directly comparable. However, some readers may be interested in this type of ranking. The top 5 counties during 2017 were Williamsburg, Orangeburg, Berkeley, Colleton, and Union (Table 3).

Turkey Harvest by Week of Season

South Carolina historically had two spring turkey season frameworks. Throughout most of the state (Game Zones 1, 2, and 4) the season was April 1 – May 1. This season was based on a recommendation from DNR following gobbling and nesting studies that were conducted in the 1970's. The other season framework was March 15 - May 1 and was only in effect in 12 counties in Game Zone 3 which comprised the lower coastal plain. This early opening season was socio-politically based.

Due to legislation passed in 2015, the spring 2016 season was the first with a single statewide season of March 20-May 5. In past years it was customary to compare the harvest trends between the two season frameworks. With the single statewide season now in place, this comparison is no longer available. Nonetheless, Figure 4 depicts the harvest trends over the course of the season.

Number of Turkey Hunters

Even though all individuals receiving a set of Turkey Transportation Tags were licensed

to hunt turkeys, only 62 percent indicated that they actually hunted turkeys. Based on this figure, approximately 52,429 hunters participated in the 2017 spring turkey season, a 1.5 percent increase from 2016 (51,867). Counties with the highest estimates for individual hunters include Newberry, Fairfield, Orangeburg, Berkeley, and Union (Table 4) and all of these counties other than Berkeley were in the top 5 in 2016.

Hunter Effort

For the purposes of this survey hunter effort was measured in days with one day being defined as any portion of the day spent afield. Turkey hunters averaged approximately 5.9 days afield during the 2017 season (Table 4). Successful hunters averaged significantly more days afield (7.1 days) than unsuccessful hunters (4.9 days). Extrapolating to the entire population of turkey hunters yields a figure of 277,300 total days of spring gobbler hunting, up 2.2 percent from 2016 (271,302 days).

The number of days devoted to turkey hunting in South Carolina is significant and points not only to the availability and popularity of turkeys as a game species, but to the obvious economic benefits related to this important natural resource. Figures generated by a 2003 Survey by the National Wild Turkey Federation estimate that approximately 35 million dollars are added to South Carolina's economy annually from turkey hunting. The top 5 South Carolina counties for overall days of turkey hunting during 2017 were Newberry, Union, Fairfield, Berkeley, and Chester counties (Table 4).

Hunting Success

For determination of hunting success only those individuals that actually hunted turkeys were included in the analysis and similarly, success was defined as harvesting at least one turkey. Overall hunting success in 2017 was 26 percent (Figure 5). Unlike deer hunting which typically has high success, turkey hunting can be an inherently unsuccessful endeavor, relatively speaking. As would be expected, the majority of successful hunters take one gobbler (Figure 5). However, the percentage of successful hunters who take two birds is quite high as well. This indicates that successful hunters had essentially the same chance of taking two birds as they did one bird.

The statewide bag limit in South Carolina is 3 gobblers. Obviously, most successful hunters harvest only one or two birds. However, it is interesting to note the relative contribution to the total harvest of turkeys by the few hunters that harvest 3 birds. Ironically, the percentage of hunters taking 3 birds was only 2.9 percent, however, this small percentage of hunters harvested an estimated 28 percent of the total birds taken in the state (Figure 6).

Hunter Opinion Regarding Turkey Numbers

The 2017 Turkey Hunter Survey asked participants to compare the number of turkeys in the area they hunt most often with the number of turkeys in past years. Participants were given 3 choices; increasing, about the same, or decreasing. Approximately 46 percent of hunters indicated that the number of turkeys in the area they hunted most often was about the same as in past years. A higher percentage of hunters (38%) believed that the turkey population was decreasing than increasing (16%). On a scale of 1 to 3 with 1 being increasing, 2 being the same, and 3 being decreasing, the overall mean rating of 2.2 suggests that hunters viewed the turkey population as decreasing. The opinion among hunters that the turkey population is decreasing is been consistent the last few years.

Turkeys Shot but not Recovered

Harvesting game signals the end of a successful hunt and although most hunters do a good job of preparing their equipment and mental state, it goes without saying that a certain percentage of game is shot or shot at and not killed or recovered. This point is no different when turkey hunting.

In order to estimate the prevalence of errant shots at turkeys, the 2017 Turkey Hunter Survey asked hunters to indicate the number of turkeys that they "shot but did not kill or recover during the 2017 season in South Carolina." Approximately 10.8 percent of hunters indicated that they shot but did not kill or recover at least one turkey in 2017 (9.8% in 2016). There were approximately 52,429 turkey hunters in 2017 meaning that approximately 5,245 turkeys were shot or shot at and not killed or recovered. Therefore, approximately 22 percent of the total number of turkeys shot at were not killed or recovered. These results have been consistent since this type of data has been available.

This data is certainly not indicative of "dead and unrecovered turkeys," however, it is clear that some percentage of the 5,245 turkeys that were shot at did eventually die. Although shot shells for turkeys have become increasingly sophisticated, accurate, and lethal it is a fact that the pattern of a shotgun is relatively broad and contains between 200 and 400 pellets. Therefore, a "clean miss" is not as clear-cut for turkeys compared to other big game like deer where there is typically a single projectile. Additional research is needed on this topic.

Turkey Harvest in the Morning VS. Afternoon

The typical spring turkey hunt is characterized by attempting to locate a gobbling bird prior to or just after sunrise. Once a gobbler is located most hunters position themselves as close as they can to the gobbler without scaring it away. Various types of callers that mimic the sounds of wild turkeys are then used to attempt to call the gobbler into gun range. This technique of locating a gobbling bird, setting-up, and calling is repeated as necessary.

Traditionally, spring turkey hunting was primarily carried out during the first few hours of the day. As the popularity of turkey hunting has increased, many hunters now hunt in the afternoon as well. Gobblers are generally not as vocal in the afternoon but they can be stimulated to gobble using the various turkey calls, particularly late in the afternoon near areas where turkeys frequently roost.

In order to gain a better understanding of the distribution of harvest with respect to time of day, the 2017 Turkey Hunter Survey asked hunters to identify the number of birds harvested in the morning compared to the afternoon. Results indicate that approximately 78 percent of gobblers were harvested in the morning compared to 22 percent in the afternoon. This data may be useful if discussions arise concerning the relative importance of morning compared to afternoon harvest of gobblers in the spring. These results have been consistent since this type of data has been available.

List of Tables

List of Figures

Table 1. Estimated statewide turkey harvest in South Carolina in 2017.

County	Acres*	Square Miles	Gobbler Harvest	Jake Harvest	Total Harvest	Percent Jakes	Harvest Rates	
							Ac/Turkey	Turkey/Mi.^{2}
Abbeville	223,113	349	297	38	335	11.3	666	1.0
Aiken	500,546	782	387	57	444	12.8	1,127	0.6
Allendale	216,455	338	327	44	371	11.9	583	1.1
Anderson	219,068	342	320	63	383	16.4	572	1.1
Bamberg	196,573	307	342	50	392	12.8	501	1.3
Barnwell	281,764	440	238	50	288	17.4	978	0.7
Beaufort	147,441	230	44	6	50	12.0	2,949	0.2
Berkeley	567,530	887	789	50	839	6.0	676	0.9
Calhoun	190,584	298	260	12	272	4.4	701	0.9
Charleston	288,732	451	558	31	589	5.3	490	1.3
Cherokee	156,664	245	290	50	340	14.7	461	1.4
Chester	300,589	470	439	69	508	13.6	592	1.1
Chesterfield	372,478	582	357	31	388	8.0	960	0.7
Clarendon	298,087	466	238	31	269	11.5	1,108	0.6
Colleton	502,666	785	677	38	715	5.3	703	0.9
Darlington	286,228	447	201	25	226	11.1	1,266	0.5
Dillon	214,069	334	134	12	146	8.2	1,466	0.4
Dorchester	302,717	473	528	42	570	7.4	531	1.2
Edgefield	246,543	385	305	57	362	15.7	681	0.9
Fairfield	384,607	601	506	63	569	11.1	676	0.9
Florence	397,888	622	506	38	544	7.0	731	0.9
Georgetown	399,638	624	305	25	330	7.6	1,211	0.5
Greenville	294,257	460	372	95	467	20.3	630	1.0
Greenwood	204,400	319	223	44	267	16.5	766	0.8
Hampton	324,840	508	484	25	509	4.9	638	1.0
Horry	533,336	833	521	63	584	10.8	913	0.7
Jasper	309,889	484	372	31	403	7.7	769	0.8
Kershaw	360,485	563	245	76	321	23.7	1,123	0.6
Lancaster	266,382	416	268	50	318	15.7	838	0.8
Laurens	317,916	497	528	114	642	17.8	495	1.3
Lee	220,106	344	320	12	332	3.6	663	1.0
Lexington	280,742	439	29	12	41	29.3	6,847	0.1
McCormick	212,021	331	201	19	220	8.6	964	0.7
Marion	216,907	339	245	6	251	2.4	864	0.7
Marlboro	281,271	439	193	6	199	3.0	1,413	0.5
Newberry	317,761	497	543	101	644	15.7	493	1.3
Oconee	284,348	444	268	57	325	17.5	875	0.7
Orangeburg	504,516	788	863	63	926	6.8	545	1.2
Pickens	219,926	344	379	38	417	9.1	527	1.2
Richland	340,121	531	238	25	263	9.5	1,293	0.5
Saluda	192,173	300	134	38	172	22.1	1,117	0.6
Spartanburg	265,939	416	357	95	452	21.0	588	1.1
Sumter	338,968	530	335	19	354	5.4	958	0.7
Union	258,111	403	625	88	713	12.3	362	1.8
Williamsburg	513,851	803	1012	50	1062	4.7	484	1.3
York	276,650	432	290	69	359	19.2	771	0.8
Total	**14,028,896**	**21,920**	**17,093**	**2,078**	**19,171**	**10.8**	**732**	**0.9**
95% Conf. Interval for harvest			**(+-) 1,525**	**(+-) 566**	**(+-) 1,641**			

* Acreage shown represents the acreage of forested land and acreage of row crops considered to be significant turkey habitat within each county.

Table 2. County rankings based on turkey harvest per unit area in South Carolina in 2017.

County	Acres*	Square Miles	Gobbler Harvest	Jake Harvest	Total Harvest	Percent Jakes	Harvest Rates	
							Ac/Turkey	Turkey/Mi.^{2}
Union	258,111	403	625	88	713	12.3	362	1.8
Cherokee	156,664	245	290	50	340	14.7	461	1.4
Williamsburg	513,851	803	1012	50	1062	4.7	484	1.3
Charleston	288,732	451	558	31	589	5.3	490	1.3
Newberry	317,761	497	543	101	644	15.7	493	1.3
Laurens	317,916	497	528	114	642	17.8	495	1.3
Bamberg	196,573	307	342	50	392	12.8	501	1.3
Pickens	219,926	344	379	38	417	9.1	527	1.2
Dorchester	302,717	473	528	42	570	7.4	531	1.2
Orangeburg	504,516	788	863	63	926	6.8	545	1.2
Anderson	219,068	342	320	63	383	16.4	572	1.1
Allendale	216,455	338	327	44	371	11.9	583	1.1
Spartanburg	265,939	416	357	95	452	21.0	588	1.1
Chester	300,589	470	439	69	508	13.6	592	1.1
Greenville	294,257	460	372	95	467	20.3	630	1.0
Hampton	324,840	508	484	25	509	4.9	638	1.0
Lee	220,106	344	320	12	332	3.6	663	1.0
Abbeville	223,113	349	297	38	335	11.3	666	1.0
Fairfield	384,607	601	506	63	569	11.1	676	0.9
Berkeley	567,530	887	789	50	839	6.0	676	0.9
Edgefield	246,543	385	305	57	362	15.7	681	0.9
Calhoun	190,584	298	260	12	272	4.4	701	0.9
Colleton	502,666	785	677	38	715	5.3	703	0.9
Florence	397,888	622	506	38	544	7.0	731	0.9
Greenwood	204,400	319	223	44	267	16.5	766	0.8
Jasper	309,889	484	372	31	403	7.7	769	0.8
York	276,650	432	290	69	359	19.2	771	0.8
Lancaster	266,382	416	268	50	318	15.7	838	0.8
Marion	216,907	339	245	6	251	2.4	864	0.7
Oconee	284,348	444	268	57	325	17.5	875	0.7
Horry	533,336	833	521	63	584	10.8	913	0.7
Sumter	338,968	530	335	19	354	5.4	958	0.7
Chesterfield	372,478	582	357	31	388	8.0	960	0.7
McCormick	212,021	331	201	19	220	8.6	964	0.7
Barnwell	281,764	440	238	50	288	17.4	978	0.7
Clarendon	298,087	466	238	31	269	11.5	1,108	0.6
Saluda	192,173	300	134	38	172	22.1	1,117	0.6
Kershaw	360,485	563	245	76	321	23.7	1,123	0.6
Aiken	500,546	782	387	57	444	12.8	1,127	0.6
Georgetown	399,638	624	305	25	330	7.6	1,211	0.5
Darlington	286,228	447	201	25	226	11.1	1,266	0.5
Richland	340,121	531	238	25	263	9.5	1,293	0.5
Marlboro	281,271	439	193	6	199	3.0	1,413	0.5
Dillon	214,069	334	134	12	146	8.2	1,466	0.4
Beaufort	147,441	230	44	6	50	12.0	2,949	0.2
Lexington	280,742	439	29	12	41	29.3	6,847	0.1
Total	**14,028,896**	**21,920**	**17,093**	**2,078**	**19,171**	**10.8**	**732**	**0.9**
95% Conf. Interval for harvest			**(+-) 1,525**	**(+-) 566**	**(+-) 1,641**			

Table 3. County rankings based on total turkeys harvested in South Carolina in 2017.

County	Acres*	Square Miles	Gobbler Harvest	Jake Harvest	Total Harvest	Percent Jakes	Harvest Rates	
							Ac/Turkey	Turkey/Mi.^{2}
Williamsburg	513,851	803	1012	50	1062	4.7	484	1.3
Orangeburg	504,516	788	863	63	926	6.8	545	1.2
Berkeley	567,530	887	789	50	839	6.0	676	0.9
Colleton	502,666	785	677	38	715	5.3	703	0.9
Union	258,111	403	625	88	713	12.3	362	1.8
Newberry	317,761	497	543	101	644	15.7	493	1.3
Laurens	317,916	497	528	114	642	17.8	495	1.3
Charleston	288,732	451	558	31	589	5.3	490	1.3
Horry	533,336	833	521	63	584	10.8	913	0.7
Dorchester	302,717	473	528	42	570	7.4	531	1.2
Fairfield	384,607	601	506	63	569	11.1	676	0.9
Florence	397,888	622	506	38	544	7.0	731	0.9
Hampton	324,840	508	484	25	509	4.9	638	1.0
Chester	300,589	470	439	69	508	13.6	592	1.1
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Spartanburg	265,939	416	357	95	452	21.0	588	1.1
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Sumter	338,968	530	335	19	354	5.4	958	0.7
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Saluda	192,173	300	134	38	172	22.1	1,117	0.6
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Total	**14,028,896**	**21,920**	**17,093**	**2,078**	**19,171**	**10.8**	**732**	**0.9**
95% Conf. Interval for harvest			**(+-) 1,525**	**(+-) 566**	**(+-) 1,641**			

Table 4. Estimated number of turkey hunters, average days hunted, and total hunting effort in South Carolina in 2017.

County	Total Harvest	Number Hunters	Avg. Days Hunted	Total Man/Days
Abbeville	335	1,375	5.8	7,977
Aiken	444	1,047	5.8	6,122
Allendale	371	913	4.9	4,432
Anderson	383	1,283	5.1	6,533
Bamberg	392	811	4.7	3,783
Barnwell	288	575	7.0	4,021
Beaufort	50	267	2.5	676
Berkeley	839	2,032	5.3	10,682
Calhoun	272	780	5.6	4,368
Charleston	589	1,539	4.4	6,716
Cherokee	340	821	5.8	4,788
Chester	508	1,580	6.1	9,649
Chesterfield	388	1,016	7.5	7,584
Clarendon	269	841	3.9	3,271
Colleton	715	1,683	5.1	8,553
Darlington	226	718	5.5	3,938
Dillon	146	421	4.4	1,837
Dorchester	570	1,098	5.7	6,250
Edgefield	362	1,149	6.2	7,182
Fairfield	569	2,093	5.1	10,764
Florence	544	1,016	6.4	6,497
Georgetown	330	872	4.4	3,874
Greenville	467	1,385	5.2	7,264
Greenwood	267	1,098	5.2	5,729
Hampton	509	1,262	5.4	6,835
Horry	584	1,190	5.5	6,588
Jasper	403	800	4.8	3,865
Kershaw	321	934	6.2	5,821
Lancaster	318	1,016	5.3	5,346
Laurens	642	1,868	4.7	8,763
Lee	332	749	5.7	4,286
Lexington	41	400	3.5	1,416
McCormick	220	1,201	5.6	6,725
Marion	251	534	4.2	2,257
Marlboro	199	400	5.6	2,248
Newberry	644	2,114	5.7	12,144
Oconee	325	985	6.2	6,067
Orangeburg	926	2,042	5.0	10,143
Pickens	417	1,160	5.3	6,095
Richland	263	1,026	4.2	4,267
Saluda	172	852	5.0	4,231
Spartanburg	452	1,416	5.0	7,027
Sumter	354	1,160	4.5	5,181
Union	713	1,960	5.7	11,230
Williamsburg	1,062	1,704	4.6	7,913
York	359	1,242	5.1	6,360
Total	**19,171**	**52,429**	**5.9**	**277,300**

Figure 1. South Carolina Department of Natural Resources 2017 Turkey Hunter Survey.

2017 South Carolina Turkey Hunter Survey

1. Did you turkey hunt in SC this past season (2017)? **1. Yes 2. No**
   If you answered **No** to this question please **go to question # 8**.

2. Did you harvest any turkeys in SC this past season? **1. Yes 2. No**

3. Even if you did not harvest a turkey, please record the SC counties you turkey hunted and the number of days hunted in each county this past season (2017). If you harvested turkeys please record the number of adult gobblers and jakes taken in each county. A day of hunting is defined as any portion of the day spent afield. Please do not give ranges (i.e. 5-10), rather provide absolute numbers (i.e. 5). Provide information only for yourself - not friends, relatives, or other people you may have called or guided for. See the diagram below if you are unsure how to determine an adult gobbler or "longbeard" from a juvenile gobbler or "jake".

SC Counties You Turkey Hunted	# Days Hunted	Number Turkeys Harvested
1		Adult gobblers_____ Jakes_____
2		Adult gobblers_____ Jakes_____
3		Adult gobblers_____ Jakes_____
4		Adult gobblers_____ Jakes_____
5		Adult gobblers_____ Jakes_____

If you did not harvest any turkeys in SC this past season please go to question 6.

4. If you harvested turkeys in SC this past season, please indicate as best you can the number of turkeys killed by week of season.

Date of Season	# Turkeys Harvested	Date of Season	# Turkeys Harvested
1 March 20-31		4 April 15-21	
2 April 1-7		5 April 22-30	
3 April 8-14		6 May 1-5	

5. How many turkeys did you kill in the morning_____ after 12:00 noon _____?

6. How many turkeys did you shoot but not kill or recover in SC this past season?_____

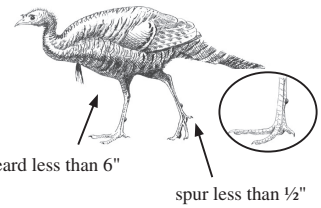
7. Compared to past years, how would you describe the number of turkeys in the area that you hunted most often this spring? **Circle one**
   1. Increasing 2. About the same 3. Decreasing

8. Are you a resident of SC? **1. Yes 2. No**

9. If yes, which county _____

Separate and return this portion of the survey. Postage is prepaid. Please do not staple this form.

Juvenile "Jake"



Adult "Gobbler"

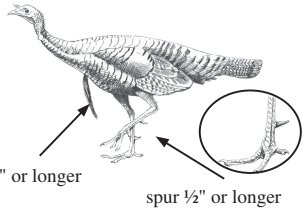


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Figure 1. continued

May, 2017

Dear Sportsman:

Eastern wild turkeys are one of the most important game species in South Carolina. Therefore, it is important that this species be monitored for population status and harvesting activities. Wildlife resource managers require current and accurate information about wild turkey harvests to aid in successfully managing this important natural resource and to optimize future hunting potential. To obtain this needed data, the South Carolina Department of Natural Resources (SCDNR) is conducting a survey of hunters who received a set of turkey tags during spring 2017.

You are one of a group of randomly selected hunters asked to participate in this survey. To draw accurate conclusions it is very important that you complete the survey and return it. Please take time to read each question. Even if you did not hunt wild turkeys this spring please indicate this by answering the appropriate questions and moving on to the next set of questions.

Please note that complete confidentiality will be given to you. There is no number on your survey form, therefore, there is no way to link your responses to you.
Keep in mind that the purpose of the survey is to determine the wild turkey harvest in South Carolina and not to determine whether game laws are observed. By accurately answering the survey questions you will enable SCDNR biologists to better manage the Eastern wild turkey resource for you and other citizens of the state. Therefore, it is very important that you take a few minutes to complete this survey and mail it. Return postage is prepaid.

Results of this survey will be posted on the SCDNR web site once completed. The results from the 2016 survey can be found at:
www.dnr.sc.gov/wildlife/turkey/2016TurkeyHarvest.html

Thank you for your assistance.

Charles Ruth
Wildlife Biologist
Deer/Turkey Project Supervisor

PLEASE MAIL YOUR SURVEY AFTER SEPARATING THIS HALF FROM THE SIDE ON WHICH YOUR ANSWERS HAVE BEEN ENTERED. NO POSTAGE IS NECESSARY.

If you have questions regarding this survey, please call 803-734-3886 or write 2017 Turkey Hunter Survey, SCDNR, P.O. Box 167, Columbia, SC 29202.

The South Carolina Department of Natural Resources prohibits discrimination on the basis of race, color, sex, national origin, disability, religion or age. Direct all inquiries to the Office of Human Resources, P.O. Box 167, Columbia, SC 29202

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Figure 2. Summer wild turkey recruitment ratio in South Carolina 1982-2016. Note declining trend since 1988. Average recruitment prior to 1988 = 3.5. Average recruitment since 1988 = 2.2. This represents a 37 percent decrease.

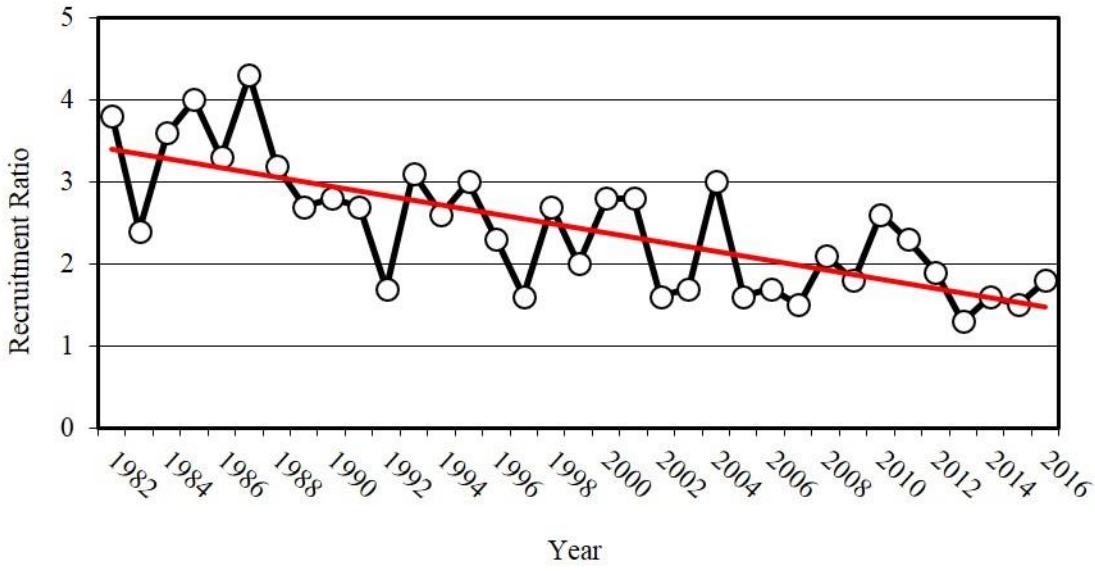


Figure 3. Spring wild turkey harvest in South Carolina 1982-2017. Harvest increased (R^2 = 0.95) between 1982 and 1997 as a result of increasing turkey population during restoration efforts. Since 1998 the harvest has been up and down but statistically has remained relatively stable (R^2 = 0.14) over the long-term averaging approximately 18,900 birds. Restoration ended in 2005.

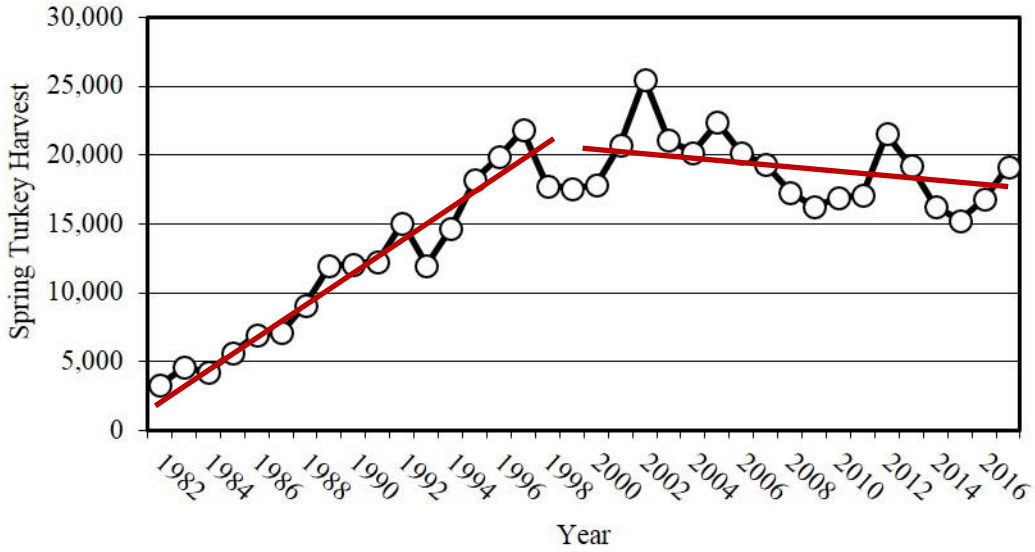


Figure 4. Percentage of gobblers harvested by week of season in South Carolina in 2017.

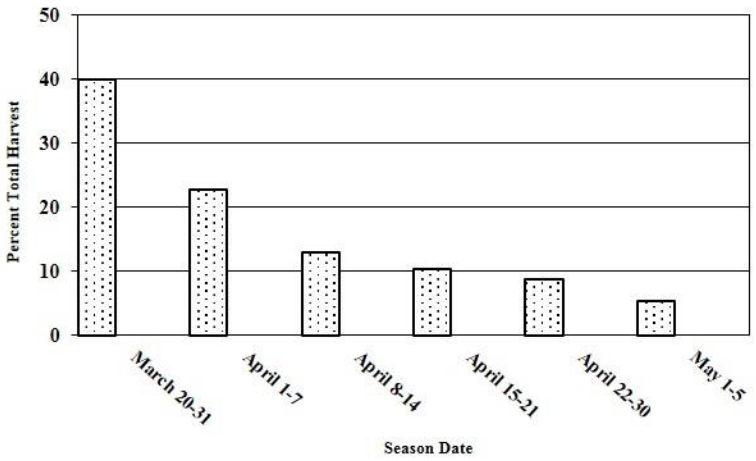


Figure 5. Hunter success during the spring turkey season in South Carolina in 2017. Overall success was 26 percent at harvesting at least one gobbler.

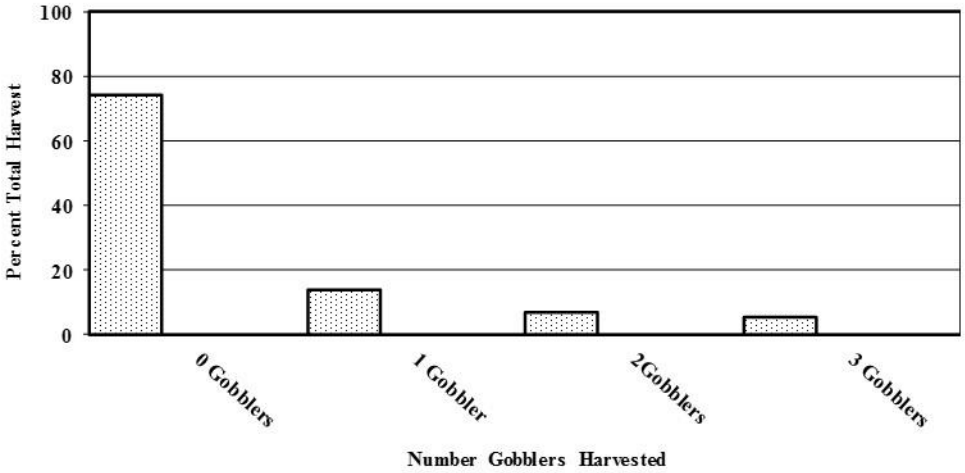
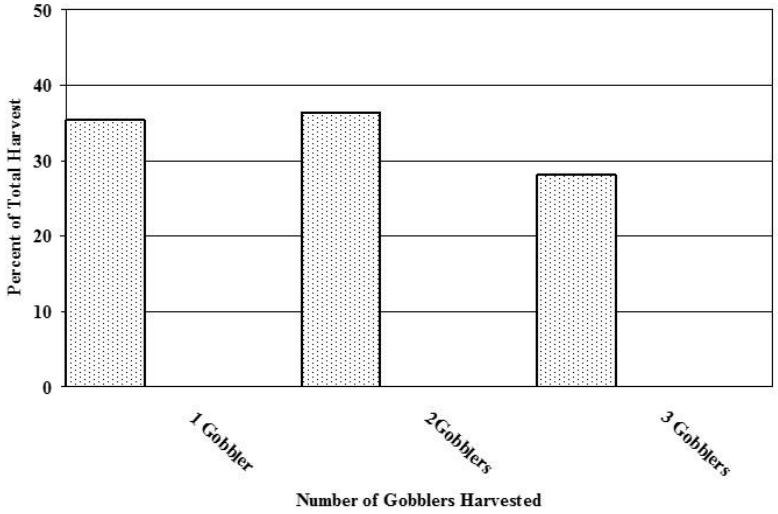


Figure 6. Relative contribution to the total turkey harvest by hunters taking between 1 and 3 gobblers in South Carolina in 2017.



2018 South Carolina
TURKEY HARVEST REPORT

SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES
TURKEY RESEARCH & MANAGEMENT PROJECT

Submitted by
Charles Ruth & Jay Cantrell; Wildlife Biologists, SCDNR Big Game Program

Introduction

Ranking only behind the white - tailed deer in popularity among hunters, the Eastern wild turkey is an important natural resource in South Carolina. The 2018 Turkey Hunter Survey represents the South Carolina Department of Natural Resources (SCDNR), Wildlife Section's ongoing commitment to conduct pertinent research related to the state's wild turkey population. The primary objectives of this survey research were to obtain valid estimates of; (1) the statewide spring gobbler harvest in 2018, (2) the harvest of gobblers in the constituent counties of the state, and (3) hunting effort related to turkeys. Information on hunter's opinions of the turkey resource and other aspects of turkey hunting are also presented.

Due to the importance of turkeys as a state resource, SCDNR believes that accurately assessing the harvest of turkeys, as well as hunter participation in turkey hunting, is key to the management of this species. Proposed changes in turkey-related laws and regulations should have foundations in biology, therefore, the population dynamics associated with annual hunting mortality cannot be ignored. Similarly, when issues arise that do not involve biological parameters, it is important to have information related to turkey hunter activities afield because they too form an important basis for managing wild turkeys.

Since the inception of the Statewide Turkey Restoration and Research Project (Turkey Project) the methods used to document the turkey harvest have changed. Historically, turkey harvest figures were developed using a system of mandatory turkey check stations across the state. This system yielded an actual count of harvested turkey and was, therefore, an absolute minimum harvest figure. Shortcomings in this system included deterioration of check station compliance, complaints from hunters regarding the inconvenience of check stations, and costs associated with the check station system. The requirement to check harvested turkeys in South Carolina was eliminated following the 2005 season. Prior to eliminating the check-in requirement, SCDNR conducted surveys in order to document the rate of noncompliance, as well as, to determine the relationship between harvest figures obtained from check stations and those obtained from surveys. As would be expected, harvest figures obtained from surveys are higher than those from check stations due to lack of compliance with the check - in requirement.

Survey Methodology

The 2018 Turkey Hunter Survey represented a random mail survey that involved a single mail-out. The questionnaire for the 2018 Turkey Hunter Survey was developed by Wildlife Section personnel (Figure 1). The mailing list database was constructed by randomly selecting 30,000 individuals who received a set of 2018 Turkey Transportation Tags which are required in order to hunt turkeys in South Carolina. Data entry was completed by Priority Data, Inc., Omaha, Nebraska.

Results from the mail survey were corrected for nonresponse bias using data collected during 2007 - 2013 by Responsive Management of Harrisonburg, Virginia using a Computer Assisted Telephone Interview program (CATI).

Statistical analysis was conducted using Statistix 7 (Analytical Software, Tallahassee, FL).

Results and Discussion

Turkey Harvest

During the 2018 spring season it is estimated that a total of 16,145 adult gobblers and 1,794 jakes were harvested for a statewide total of 17,939 turkeys (Table 1). This figure represents a 6.4 percent decrease in harvest from 2017 (19,171). Keep in mind that legislative changes that went into effect in 2016 provided an earlier starting date and increased number of days in the turkey season in 34 of 46 South Carolina counties. The effect of this season change was a 50 percent increase in opportunity (days) for the majority of the state. Although the harvest was down slightly from 2017 to 2018, the harvest under the new season framework has consistently been higher (18 percent) than the year prior to the new season (Figure 2).

This increase in harvest can be explained in 2 ways. First, perhaps turkey numbers have increased since the new season went into place leading to an increase in harvest because more birds are available for harvest on the landscape. Alternatively, more hunter effort can clearly increase the harvest, to a point, regardless of the number of turkeys on the landscape.

Digging deeper into this issue we find that turkey production, as measured during the Summer Turkey Survey which has been conducted annually since 1982, has been poor since the new season began (Figure 3). In fact, recruitment during the last 5 years has been the lowest of any 5 year period since the survey began. Typically, low recruitment is followed by decreasing harvest and good recruitment is followed by increasing harvest. Based on this analysis the recent trend of higher harvest under the new season does not fit with the notion of a recent increase in the turkey population.

On the other hand, hunter effort (days/hunted) has increased an average of 23 percent under the new season framework compared to 2015 which was the last season prior to the new framework. Again, the new season increased opportunity (days) for hunters in 34 of 46 counties by 50 percent and this data clearly indicates that hunters have taken advantage of the additional opportunity. With turkey production being low recently, it appears that increased effort rather than increased turkey numbers is more influential in the increase in harvest that has accompanied the new season.

Finally, another measure of this harvest versus effort issue is catch per unit effort (CPUE) which is the amount of effort (days) it takes to harvest a turkey. Statewide CPUE prior to the new season was 12.7 days per turkey harvested. It was virtually the same for the 34 counties (12.4 days/turkey) that received more days under the new season framework as the 12 counties (13.4 days/turkey) that received no more days. Under the new season framework the CPUE in the 34 counties receiving more days increased 36 percent to 16.9 days/turkey, whereas, it remained the same in the 12 counties (12.6 days/turkey) that received no more days. This may be indicative of hunters in the 34 counties that received more days under the new framework using the additional days to kill more gobblers from a population that had no more birds than it previously did.

Harvest Per Unit Area County Rankings

Comparisons can be made between turkey harvests from the various counties in South Carolina if a harvest per unit area is established. Harvest per unit area standardizes the harvest among counties regardless of the size of individual counties. One measure of harvest rate is the number of turkeys taken per square mile (640ac. = 1 mile^2). When considering the estimated turkey habitat that is available in South Carolina, the turkey harvest rate in 2018 was 0.8 gobblers per square mile statewide (Table 2). Although this harvest rate is not as high as it once was, it should be considered good and is similar to other Southeastern states. The top 5 counties for harvest per unit area were Union (1.7 turkeys/mile^2), Spartanburg (1.4 turkeys/mile^2), Cherokee (1.3 turkeys/mile^2), Anderson (1.3 turkeys/mile^2), and Fairfield (1.2 turkeys/mile^2) (Table 2).

Turkey Harvest Rankings by County

Total turkey harvest is not comparable among counties because there is no standard unit of comparison, i.e. counties vary in size and are, therefore, not directly comparable. However, some readers may be interested in this type of ranking. The top 5 counties during 2018 were Williamsburg, Berkeley, Orangeburg, Fairfield, and Colleton (Table 3).

Number of Turkey Hunters

Even though all individuals receiving a set of Turkey Transportation Tags were licensed to hunt turkeys, only 60 percent indicated that they actually hunted turkeys. Based on this figure, approximately 50,772 hunters participated in the 2018 spring turkey season, a 3.2 percent decrease from 2017 (52,429). Counties with the highest estimates for individual hunters include, Fairfield, Union, Newberry, Orangeburg, and Berkeley, and (Table 4) and these were the same counties that made up the top 5 in 2017.

Hunter Effort

For the purposes of this survey hunter effort was measured in days with one day being defined as any portion of the day spent afield. Turkey hunters averaged approximately 5.7 days afield during the 2018 season (Table 4). Successful hunters averaged significantly more days afield (7.1 days) than unsuccessful hunters (4.7 days). Extrapolating to the entire population of turkey hunters yields a figure of 258,786 total days of spring gobbler hunting, down 6.7 percent from 2017 (277,300 days).

The number of days devoted to turkey hunting in South Carolina is significant and points not only to the availability and popularity of turkeys as a game species, but to the obvious economic benefits related to this important natural resource. Figures generated by a 2003 Survey by the National Wild Turkey Federation estimate that approximately 35 million dollars are added to South Carolina's economy annually from turkey hunting. The top 5 South Carolina counties for overall days of turkey hunting during 2018 were Fairfield, Union, Berkeley, Newberry, and Orangeburg counties (Table 4).

Turkey Harvest by Week of Season

South Carolina historically had two spring turkey season frameworks. Throughout most of the state (Game Zones 1, 2, and 4) the season was April 1 - May 1. This season was based on a recommendation from SCDNR following gobbling and nesting studies that were conducted in the 1970's. The other season framework was March 15 - May 1 and was only in effect in 12 counties in Game Zone 3 which comprised the lower coastal plain. This early opening season

was socio - politically based.

Due to legislation passed in 2015, the spring 2016 season was the first with a single statewide season on private land of March 20 - May 5. In past years it was customary to compare the harvest trends between the two season frameworks. With the single statewide season now in place, this comparison is no longer available. Nonetheless, Figure 4 depicts the harvest trends over the course of the season.

Hunting Success

For determination of hunting success only those individuals that actually hunted turkeys were included in the analysis and similarly, success was defined as harvesting at least one turkey. Overall hunting success in 2018 was 23 percent (Figure 5). Unlike deer hunting which typically has high success, turkey hunting can be an inherently unsuccessful endeavor, relatively speaking. Curiously though, the proportion of hunters who take two gobblers was slightly greater than those who take one indicating that successful hunters had essentially the same chance of taking two birds as they did one bird (Figure 5).

The statewide bag limit in South Carolina is 3 gobblers. Obviously, most successful hunters harvest only one or two birds. However, it is interesting to note the relative contribution to the total harvest of turkeys by the few hunters that harvest 3 birds. Ironically, the percentage of hunters taking 3 birds was only 2.3 percent, however, this small percentage of hunters harvested an estimated 28 percent of the total birds taken in the state (Figure 6).

Hunter Opinion Regarding Turkey Numbers

The 2018 Turkey Hunter Survey asked participants to compare the number of turkeys in the area they hunt most often with the number of turkeys in past years. Participants were given 3 choices; increasing, about the same, or decreasing. Approximately 46 percent of hunters indicated that the number of turkeys in the area they hunted most often was about the same as in past years. A higher percentage of hunters (37 percent) believed that the turkey population was decreasing than increasing (17 percent). On a scale of 1 to 3 with 1 being increasing, 2 being the same, and 3 being decreasing, the overall mean rating of 2.2 suggests that hunters viewed the turkey

population as decreasing. The opinion among hunters that the turkey population is decreasing has been consistent the last few years.

Turkeys Shot but not Recovered

Harvesting game signals the end of a successful hunt and although most hunters do a good job of preparing their equipment and mental state, it goes without saying that a certain percentage of game is shot or shot at and not killed or recovered. This point is no different when turkey hunting.

In order to estimate the prevalence of errant shots at turkeys, the 2018 Turkey Hunter Survey asked hunters to indicate the number of turkeys that they "shot but did not kill or recover during the 2018 season in South Carolina." Approximately 9.6 percent of hunters indicated that they shot but did not kill or recover at least one turkey in 2018 (10.8 percent in 2017). There were approximately 50,772 turkey hunters in 2018 meaning that approximately 4,870 turkeys were shot or shot at and not killed or recovered. Therefore, approximately 21 percent of the total number of turkeys shot at were not killed or recovered. These results have been consistent since this type of data has been available.

This data is certainly not indicative of "dead and unrecovered turkeys," however, it is clear that some percentage of the 4,870 turkeys that were shot at did eventually die. Although shot shells for turkeys have become increasingly sophisticated, accurate, and lethal it is a fact that the pattern of a shotgun is relatively broad and contains between 200 and 400 pellets. Therefore, a "clean miss" is not as clear-cut for turkeys compared to other big game like deer where there is typically a single projectile. Additional research is needed on this topic.

Turkey Harvest in the Morning vs. Afternoon

The typical spring turkey hunt is characterized by attempting to locate a gobbling bird prior to or just after sunrise. Once a gobbler is located most hunters position themselves as close as they can to the gobbler without scaring it away. Various types of callers that mimic the sounds of wild turkeys are then used to attempt to call the gobbler into gun range. This technique of locating a gobbling bird, setting up, and calling is repeated as necessary.

Traditionally, spring turkey hunting was primarily carried out during the first few hours of the day. As the popularity of turkey hunting has increased, many hunters now hunt in the afternoon as well. Gobblers are generally not as vocal in the afternoon but they can be stimulated to gobble using the various turkey calls, particularly late in the afternoon near areas where turkeys frequently roost.

In order to gain a better understanding of the distribution of harvest with respect to time of day, the 2018 Turkey Hunter Survey asked hunters to identify the number of birds harvested in the morning compared to the afternoon. Results indicate that approximately 77 percent of gobblers were harvested in the morning compared to 23 percent in the afternoon. This data may be useful if discussions arise concerning the relative importance of morning compared to afternoon harvest of gobblers in the spring. These results have been consistent since this type of data has been available.

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Table 1. Estimated statewide turkey harvest in South Carolina in 2018.

County	Acres*	Square Miles	Gobbler Harvest	Jake Harvest	Total Harvest	Percent Jakes	Harvest Rates	
							Ac/Turkey	Turkey/Mi.^{2}
Abbeville	223,113	349	210	20	230	8.7	970	0.7
Aiken	500,546	782	275	27	302	8.9	1,657	0.4
Allendale	216,455	338	283	30	313	9.6	692	0.9
Anderson	219,068	342	397	41	438	9.4	500	1.3
Bamberg	196,573	307	292	13	305	4.3	645	1.0
Barnwell	281,764	440	251	13	264	4.9	1,067	0.6
Beaufort	147,441	230	105	15	120	12.5	1,229	0.5
Berkeley	567,530	887	778	54	832	6.5	682	0.9
Calhoun	190,584	298	259	13	272	4.8	701	0.9
Charleston	288,732	451	413	27	440	6.1	656	1.0
Cherokee	156,664	245	275	48	323	14.9	485	1.3
Chester	300,589	470	348	41	389	10.5	773	0.8
Chesterfield	372,478	582	283	27	310	8.7	1,202	0.5
Clarendon	298,087	466	429	20	449	4.5	664	1.0
Colleton	502,666	785	705	13	718	1.8	700	0.9
Darlington	286,228	447	210	20	230	8.7	1,244	0.5
Dillon	214,069	334	105	41	146	28.1	1,466	0.4
Dorchester	302,717	473	365	6	371	1.6	816	0.8
Edgefield	246,543	385	227	41	268	15.3	920	0.7
Fairfield	384,607	601	649	82	731	11.2	526	1.2
Florence	397,888	622	454	116	570	20.4	698	0.9
Georgetown	399,638	624	421	27	448	6.0	892	0.7
Greenville	294,257	460	503	55	558	9.9	527	1.2
Greenwood	204,400	319	186	13	199	6.5	1,027	0.6
Hampton	324,840	508	535	45	580	7.8	560	1.1
Horry	533,336	833	365	110	475	23.2	1,123	0.6
Jasper	309,889	484	235	6	241	2.5	1,286	0.5
Kershaw	360,485	563	381	27	408	6.6	884	0.7
Lancaster	266,382	416	389	75	464	16.2	574	1.1
Laurens	317,916	497	519	68	587	11.6	542	1.2
Lee	220,106	344	227	20	247	8.1	891	0.7
Lexington	280,742	439	64	20	84	23.8	3,342	0.2
McCormick	212,021	331	170	48	218	22.0	973	0.7
Marion	216,907	339	170	13	183	7.1	1,185	0.5
Marlboro	281,271	439	121	20	141	14.2	1,995	0.3
Newberry	317,761	497	421	48	469	10.2	678	0.9
Oconee	284,348	444	146	20	166	12.0	1,713	0.4
Orangeburg	504,516	788	705	41	746	5.5	676	0.9
Pickens	219,926	344	316	48	364	13.2	604	1.1
Richland	340,121	531	227	20	247	8.1	1,377	0.5
Saluda	192,173	300	202	27	229	11.8	839	0.8
Spartanburg	265,939	416	462	103	565	18.2	471	1.4
Sumter	338,968	530	373	6	379	1.6	894	0.7
Union	258,111	403	551	144	695	20.7	371	1.7
Williamsburg	513,851	803	908	27	935	2.9	550	1.2
York	276,650	432	235	55	290	19.0	954	0.7
Total	**14,028,896**	**21,920**	**16,145**	**1,794**	**17,939**	**10.0**	**782**	**0.8**
95% Conf. Interval for harvest			**(+-) 1,025**	**(+-) 385**	**(+-) 1,132**			

* Acreage shown represents the acreage of forested land and acreage of row crops considered to be significant turkey habitat within each county.

Table 2. County rankings based on turkey harvest per unit area in South Carolina in 2018.

County	Acres*	Square Miles	Gobbler Harvest	Jake Harvest	Total Harvest	Percent Jakes	Harvest Rates	
							Ac/Turkey	Turkey/Mi.^{2}
Union	258,111	403	551	144	695	20.7	371	1.7
Spartanburg	265,939	416	462	103	565	18.2	471	1.4
Cherokee	156,664	245	275	48	323	14.9	485	1.3
Anderson	219,068	342	397	41	438	9.4	500	1.3
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Charleston	288,732	451	413	27	440	6.1	656	1.0
Clarendon	298,087	466	429	20	449	4.5	664	1.0
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Abbeville	223,113	349	210	20	230	8.7	970	0.7
McCormick	212,021	331	170	48	218	22.0	973	0.7
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Barnwell	281,764	440	251	13	264	4.9	1,067	0.6
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Marion	216,907	339	170	13	183	7.1	1,185	0.5
Chesterfield	372,478	582	283	27	310	8.7	1,202	0.5
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Lexington	280,742	439	64	20	84	23.8	3,342	0.2
Total	**14,028,896**	**21,920**	**16,145**	**1,794**	**17,939**	**10.0**	**782**	**0.8**
95% Conf. Interval for harvest			**(+-) 1,025**	**(+-) 385**	**(+-) 1,132**			

* Acreage shown represents the acreage of forested land and acreage of row crops considered to be significant turkey habitat within each county.

Table 3. County rankings based on total turkeys harvested in South Carolina in 2018.

County	Acres*	Square Miles	Gobbler Harvest	Jake Harvest	Total Harvest	Percent Jakes	Harvest Rates	
							Ac/Turkey	Turkey/Mi.^{2}
Williamsburg	513,851	803	908	27	935	2.9	550	1.2
Berkeley	567,530	887	778	54	832	6.5	682	0.9
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95% Conf. Interval for harvest			**(+-) 1,025**	**(+-) 385**	**(+-) 1,132**			

* Acreage shown represents the acreage of forested land and acreage of row crops considered to be significant turkey habitat within each county.

Table 4. Estimated number of turkey hunters, average days hunted, and total hunting effort in South Carolina in 2018.

County	Total Harvest	Number Hunters	Success Rate	Avg. Days Hunted	Total Man/Days
Abbeville	230	1,206	37.0	4.8	5,777
Aiken	302	1,116	37.1	5.2	5,827
Allendale	313	891	38.4	5.2	4,636
Anderson	438	1,714	29.6	4.3	7,299
Bamberg	305	879	43.8	5.7	5,026
Barnwell	264	620	35.3	5.9	3,635
Beaufort	120	440	36.4	3.1	1,352
Berkeley	832	1,736	30.0	6.0	10,363
Calhoun	272	609	32.7	4.6	2,783
Charleston	440	1,184	32.6	3.9	4,576
Cherokee	323	688	28.5	6.7	4,606
Chester	389	1,635	33.7	5.2	8,501
Chesterfield	310	868	44.1	4.9	4,265
Clarendon	449	834	50.0	5.2	4,305
Colleton	718	1,545	51.8	5.7	8,841
Darlington	230	586	27.6	4.4	2,573
Dillon	146	304	29.4	5.3	1,622
Dorchester	371	812	34.0	5.6	4,576
Edgefield	268	1,184	26.7	5.0	5,947
Fairfield	731	2,075	28.8	5.8	12,055
Florence	570	1,139	32.9	4.9	5,577
Georgetown	448	868	40.9	4.2	3,615
Greenville	558	1,252	23.7	5.4	6,759
Greenwood	199	970	22.8	4.0	3,925
Hampton	580	1,342	33.8	5.2	6,979
Horry	475	1,274	47.6	5.7	7,239
Jasper	241	631	49.4	5.3	3,344
Kershaw	408	1,308	32.5	4.5	5,927
Lancaster	464	1,049	34.9	6.3	6,598
Laurens	587	1,725	32.0	4.5	7,680
Lee	247	710	30.0	5.3	3,785
Lexington	84	474	20.0	3.1	1,482
McCormick	218	947	26.5	5.2	4,916
Marion	183	598	36.2	4.5	2,713
Marlboro	141	440	32.1	5.8	2,563
Newberry	469	1,860	24.1	5.2	9,642
Oconee	166	981	20.0	6.4	6,238
Orangeburg	746	1,781	30.6	5.1	9,011
Pickens	364	1,206	35.4	6.3	7,610
Richland	247	1,026	23.9	4.4	4,486
Saluda	229	902	25.4	4.6	4,185
Spartanburg	565	1,488	27.9	4.8	7,089
Sumter	379	947	33.9	4.8	4,516
Union	695	2,030	32.5	5.2	10,453
Williamsburg	935	1,612	43.8	4.3	7,009
York	290	1,285	27.9	5.4	6,879
Total	**17,939**	**50,772**	**38.0**	**5.1**	**258,786**

Figure 1. South Carolina Department of Natural Resources 2018 Turkey Hunter Survey.

2018 South Carolina Turkey Hunter Survey

1. Did you turkey hunt in SC this past season (2018)? **1. Yes 2. No**
   If you answered **No** to this question please **go to question # 8**.

2. Did you harvest any turkeys in SC this past season? **1. Yes 2. No**

3. Even if you did not harvest a turkey, please record the SC counties you turkey hunted and the number of days hunted in each county this past season (2018). If you harvested turkeys please record the number of adult gobblers and jakes taken in each county. A day of hunting is defined as any portion of the day spent afield. Please do not give ranges (i.e. 5-10), rather provide absolute numbers (i.e. 5). Provide information only for yourself - not friends, relatives, or other people you may have called or guided for. See the diagram below if you are unsure how to determine an adult gobbler or "longbeard" from a juvenile gobbler or "jake".

SC Counties You Turkey Hunted	# Days Hunted	Number Turkeys Harvested
1		Adult gobblers_____ Jakes_____
2		Adult gobblers_____ Jakes_____
3		Adult gobblers_____ Jakes_____
4		Adult gobblers_____ Jakes_____
5		Adult gobblers_____ Jakes_____

If you did not harvest any turkeys in SC this past season please go to question 6.

4. If you harvested turkeys in SC this past season, please indicate as best you can the number of turkeys killed by week of season.

Date of Season	# Turkeys Harvested	Date of Season	# Turkeys Harvested
1 March 20-31		4 April 15-21	
2 April 1-7		5 April 22-30	
3 April 8-14		6 May 1-5	

5. How many turkeys did you kill in the morning_____ after 12:00 noon _____?

6. How many turkeys did you shoot but not kill or recover in SC this past season?_____

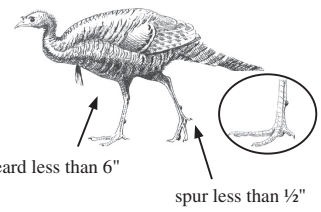
7. Compared to past years, how would you describe the number of turkeys in the area that you hunted most often this spring? **Circle one**
   1. Increasing 2. About the same 3. Decreasing

8. Are you a resident of SC? **1. Yes 2. No**

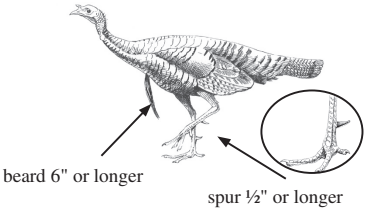
9. If yes, which county _____

Separate and return this portion of the survey. Postage is prepaid. Please do not staple this form.

Juvenile "Jake"



Adult "Gobbler"



HELP MANAGE TURKEYS IN S.C. COMPLETE YOUR HUNTER SURVEY

TURKEY HUNTER SURVEY
SCDNR
PO BOX 167
COLUMBIA SC 29202-0167
www.dnr.sc.gov

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Figure 1. continued

May, 2018

Dear Sportsman:

Eastern wild turkeys are one of the most important game species in South Carolina. Therefore, it is important that this species be monitored for population status and harvesting activities. Wildlife resource managers require current and accurate information about wild turkey harvests to aid in successfully managing this important natural resource and to optimize future hunting potential. To obtain this needed data, the South Carolina Department of Natural Resources (SCDNR) is conducting a survey of hunters who received a set of turkey tags during spring 2018.

You are one of a group of randomly selected hunters asked to participate in this survey. To draw accurate conclusions it is very important that you complete the survey and return it. Please take time to read each question. Even if you did not hunt wild turkeys this spring please indicate this by answering the appropriate questions and moving on to the next set of questions.

Please note that complete confidentiality will be given to you. There is no number on your survey form, therefore, there is no way to link your responses to you.
Keep in mind that the purpose of the survey is to determine the wild turkey harvest in South Carolina and not to determine whether game laws are observed. By accurately answering the survey questions you will enable SCDNR biologists to better manage the Eastern wild turkey resource for you and other citizens of the state. Therefore, it is very important that you take a few minutes to complete this survey and mail it. Return postage is prepaid.

Results of this survey will be posted on the SCDNR web site once completed. The results from the 2017 survey can be found at:
www.dnr.sc.gov/wildlife/turkey/2017TurkeyHarvest.html

Thank you for your assistance.

Charles Ruth
Wildlife Biologist
Big Game Program Coordinator

PLEASE MAIL YOUR SURVEY AFTER SEPARATING THIS HALF FROM THE SIDE ON WHICH YOUR ANSWERS HAVE BEEN ENTERED. NO POSTAGE IS NECESSARY.

If you have questions regarding this survey, please call 803-734-3886 or write 2018 Turkey Hunter Survey, SCDNR, P.O. Box 167, Columbia, SC 29202.

The South Carolina Department of Natural Resources prohibits discrimination on the basis of race, color, sex, national origin, disability, religion or age. Direct all inquiries to the Office of Human Resources, P.O. Box 167, Columbia, SC 29202

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Figure 2. Spring wild turkey harvest in South Carolina 1982-2018. Harvest increased (R^2 = 0.92) between 1982 and 2002 as a result of increasing turkey population during restoration efforts. Since 2002 harvest has generally decreased, although harvest has been up an average of 18 percent during the 3 years of the new season framework.

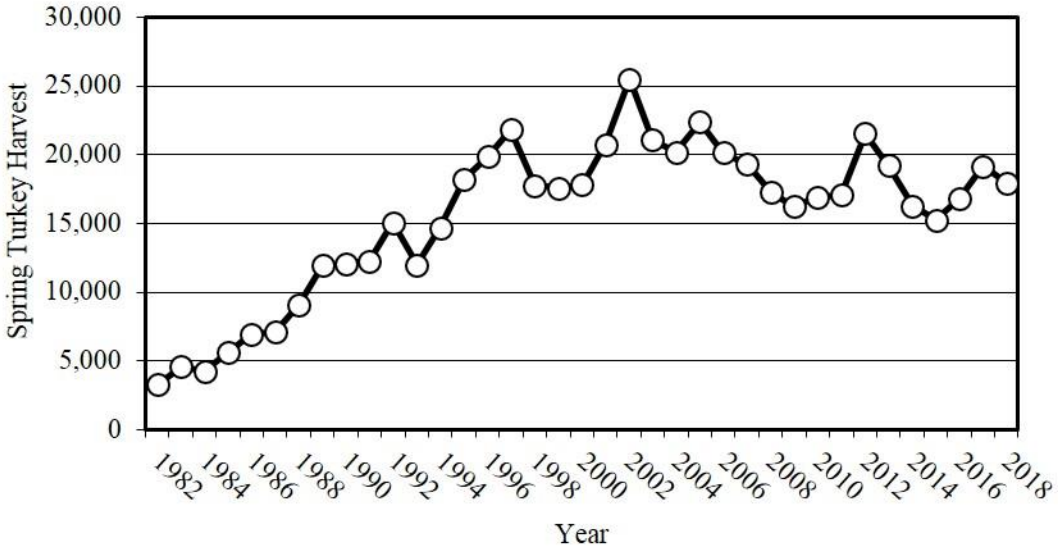


Figure 3. Summer wild turkey recruitment ratio in South Carolina 1982-2017. Note declining trend since 1988. Average recruitment prior to 1988 = 3.5. Average recruitment since 1988 = 2.1. This represents a 40 percent decrease in average recruitment.

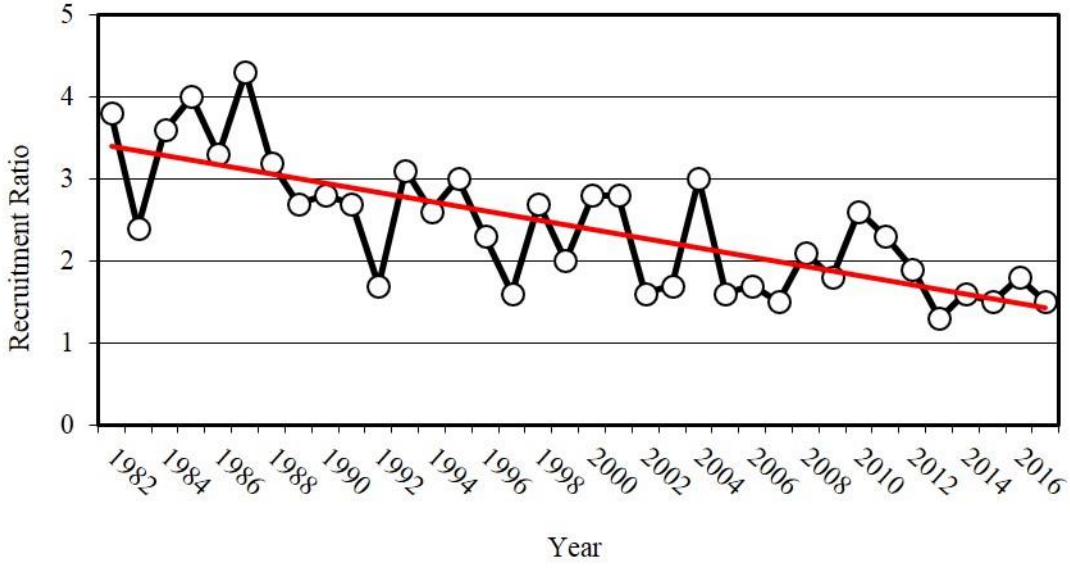


Figure 4. Percentage of gobblers harvested by period of season in South Carolina in 2018.

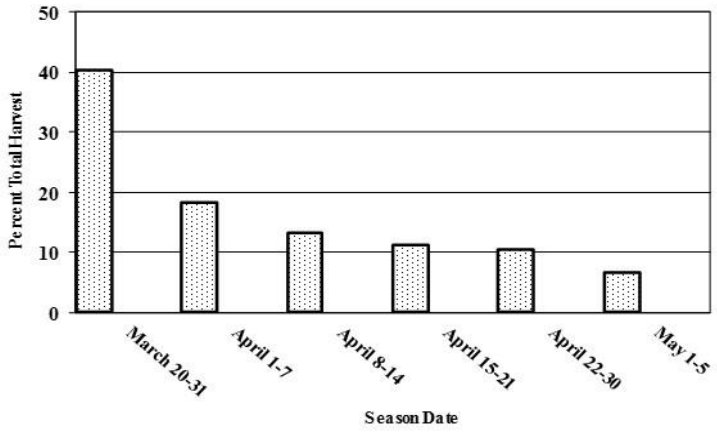


Figure 5. Hunter success during the spring turkey season in South Carolina in 2018. Overall success was 26 percent at harvesting at least one gobbler.

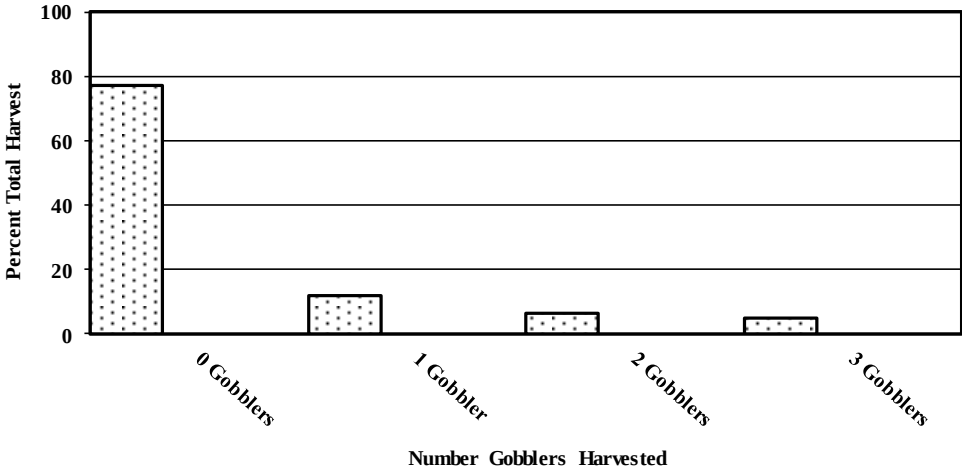
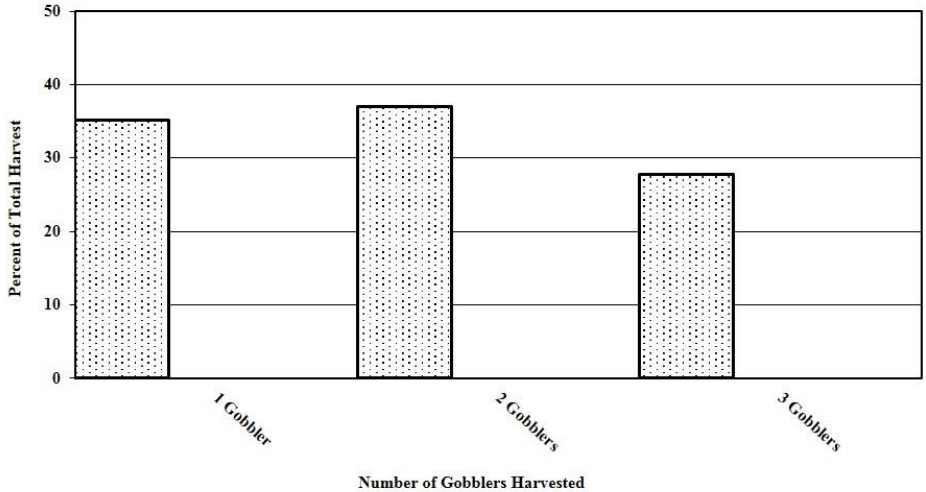


Figure 6. Relative contribution to the total turkey harvest by hunters taking between 1 and 3 gobblers in South Carolina in 2018.



APPENDIX C

2015 – 2018 WILD TURKEY SUMMER SURVEY REPORTS

SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES

2015 WILD TURKEY SUMMER SURVEY

Wild Turkey Reproduction Remains Low This Summer

Annually since the early 1980's, the S.C. Department of Natural Resources (DNR) conducts a Summer Turkey Survey to estimate reproduction and recruitment of wild turkeys in South Carolina. The survey involves agency wildlife biologists, technicians and conservation officers, as well as many volunteers from other natural resource agencies and the general public.

Although wild turkeys nest primarily in April and May in South Carolina, the survey does not take place until late summer, according to Charles Ruth, DNR Deer and Wild Turkey Program coordinator. Therefore, the survey statistics document poults (young turkeys) that actually survived and entered the fall population.

"Reproduction in turkeys has generally been low for the last decade", said Ruth. "This year, average brood size of 3.6 poults remained good, but the total recruitment ratio of 1.5 was low continuing a less than desirable trend. This low figure was driven by a high percentage of hens (59%) that had no poults at all by late summer. Recruitment ratio has averaged 1.7 over the last 5 years, keep in mind that 2.0 is somewhat of a break even mark. In fact, when turkey populations were expanding during the 1980's recruitment ratio averaged 3.5. Recruitment ratio is a measure of young entering the population based on the number of hens in the population. "At the regional level it appears that reproduction was poor in most of the state."

Unlike deer, wild turkeys are much more susceptible to significant fluctuations in reproduction and recruitment. Lack of reproductive success is often associated with bad weather (cold and wet) during nesting and brood rearing season. However, there are a host of predators that take advantage of turkey nests and broods including; raccoons, opossums, snakes, foxes, bobcats, and numerous avian predators. Coyotes which are not native but are now well established in the state can be added to the list of turkey predators. Turkeys naturally have high reproductive potential and are therefore able to maintain populations in spite of predation and other mortality factors. The problem is that we have not been getting much "bounce back" amid years of poor recruitment.

What does poor reproduction last summer mean for the spring turkey hunter? Ruth indicated, "spring harvest trends have followed trends in reproduction for many years. For example, the harvest in 2015 was down significantly which was not a surprise because reproduction in 2013 was the lowest on record. Two year old gobblers comprise most of the harvest because they are typically more abundant and more responsive to hunters' calls than older more dominant gobblers and there simply were not good numbers of two year old birds last season. On the other hand, the percentage of jakes (juvenile males) harvested in 2015 was substantially higher which is typical when 2 year old birds are not abundant. Finally, the gobbler to hen ratio during last summer's survey was 0.5 which is the lowest since the year 2000, said Ruth. Low gobbler to hen ratios can affect the quality of hunting because hens are extremely available which affects gobbling and responsiveness to calling by hunters."

"The bottom line," Ruth said, "is the state's turkey population is about 35 percent below record levels of around the turn of the century. We need better reproduction for several years to get the population back up. That is the nice thing about turkeys though; given the right conditions they can naturally bounce back in a short period of time."

Anyone interested in participating in the annual Summer Turkey Survey is encouraged to sign-up. The survey period is July 1-August 29 annually and those who participate typically spend a reasonable amount of time outdoors during that time period. Cooperators obviously must be able to identify wild turkeys and must be comfortable in telling the difference between hens, poults, and gobblers. If you would like to participate in the survey, send your name and address to Summer Turkey Survey, P.O. Box 167, Columbia, SC 29202. You will be added to the cooperator list and receive materials at the end of June annually. Those interested in the survey can also download instructions and survey forms at the following website:
http://www.dnr.sc.gov/wildlife/turkey/volunbroodsurvey.html

Figure 1. Map of physiographic regions for 2015 Summer Turkey Survey.

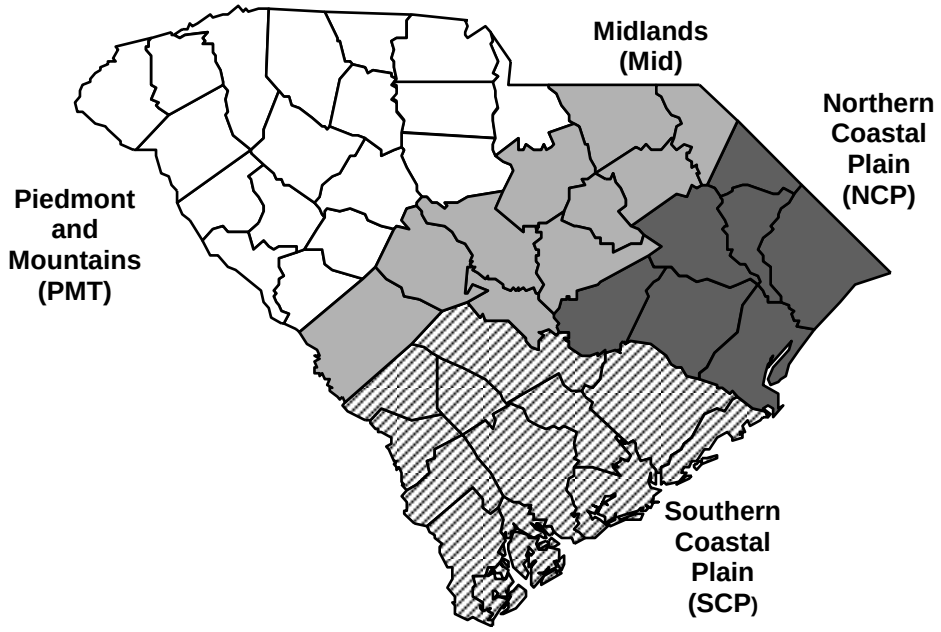


Table 1. Summary of reproductive data for 2015 Summer Turkey Survey by region.

Region	Gobbler Hen Ratio	No. Hens w/Poults	No. Hens w/o Poults (%)	No. Poults	Avg. Brood Size	Total Recruitment Ratio
Piedmont	0.37	496	606 (55)	1,720	3.5	1.3
Midlands	0.85	77	161 (68)	314	4.1	1.9
Northern Coastal	0.44	142	348 (71)	533	3.8	1.4
Southern Coastal	0.60	362	428 (54)	1,262	3.5	2.1
Statewide	0.49	1,077	1,543 (59)	3,829	3.6	1.5

Table 2. Statewide Summer Turkey Survey reproductive data 2011-2015.

Year	Gobbler Hen Ratio	No. Hens w/Poults	No. Hens w/o Poults (%)	No. Poults	Avg. Brood Size	Total Recruitment Ratio
2011	0.76	1,442	1,223 (46)	5,987	4.2	2.3
2012	0.78	1,208	1,472 (55)	5,085	4.2	1.9
2013	0.70	810	1,588 (66)	3.169	3.9	1.3
2014	0.60	983	1,403 (59)	3,834	3.8	1.6
2015	0.49	1,077	1,543 (59)	3,829	3.6	1.5
Average	0.67	1,104	1,446 (57)	4,381	4.0	1.7

Table 3. 2015 Summer Turkey Survey Results by County.

County	No. Observ.	No. Poults	No. Hens w/ Poults	No. Hens w/o	No. Hens	% Hens w/o Poults	No. Gobblers	No. Unid.	Total Turkeys Observed
Abbeville	21	16	6	22	28	79	13	13	70
Aiken	43	51	16	29	45	64	54	3	153
Allendale	30	23	14	28	42	67	53	31	149
Anderson	0	0	0	0	0		0	0	0
Bamberg	1	2	1	0	1	0	0	0	3
Barnwell	58	38	12	45	57	79	9	0	104
Beaufort	50	250	77	54	131	41	4	9	394
Berkeley	91	230	72	68	140	49	95	36	501
Calhoun	3	5	1	2	3	67	3	0	11
Charleston	53	149	47	55	102	54	55	15	321
Cherokee	3	22	6	2	8	25	0	0	30
Chester	51	170	51	42	93	45	30	20	313
Chesterfield	21	90	18	17	35	49	5	9	139
Clarendon	13	14	4	7	11	64	12	7	44
Colleton	29	138	43	46	89	52	69	0	296
Darlington	14	34	11	25	36	69	50	0	120
Dillon	9	19	7	11	18	61	15	3	55
Dorchester	8	9	3	8	11	73	17	1	38
Edgefield	14	38	17	29	46	63	3	0	87
Fairfield	77	270	77	100	177	56	56	39	542
Florence	52	128	35	98	133	74	89	42	392
Georgetown	44	118	35	76	111	68	13	13	255
Greenville	3	8	2	2	4	50	5	8	25
Greenwood	33	28	18	44	62	71	17	0	107
Hampton	104	356	75	77	152	51	144	39	691
Horry	10	19	7	9	16	56	7	14	56
Jasper	4	1	3	16	19	84	1	0	21
Kershaw	6	5	1	3	4	75	5	0	14
Lancaster	11	44	9	6	15	40	6	0	65
Laurens	16	33	8	14	22	64	1	12	68
Lee	2	6	2	6	8	75	3	0	17
Lexington	6	13	3	5	8	63	2	0	23
McCormick	33	86	33	30	63	48	2	5	156
Marion	32	50	17	51	68	75	24	1	143
Marlboro	5	0	0	3	3	100	11	5	19
Newberry	52	157	36	44	80	55	83	7	327
Oconee	13	31	8	3	11	27	4	10	56
Orangeburg	22	66	15	31	46	67	25	18	155
Pickens	45	126	34	37	71	52	37	1	235
Richland	31	92	22	22	44	50	38	0	174
Saluda	12	30	8	20	28	71	9	0	67
Spartanburg	35	98	24	43	67	64	24	0	189
Sumter	29	18	3	49	52	94	32	0	102
Union	147	506	144	150	294	51	95	43	938
Williamsburg	74	185	37	96	133	72	56	57	431
York	30	57	15	18	33	55	18	22	130
State Total	1,440	3,829	1,077	1,543	2,620	59	1,294	483	8,226

2016 WILD TURKEY SUMMER SURVEY

Wild Turkey Reproduction Showing Small Signs Of Improvement

Annually since the early 1980's, the S.C. Department of Natural Resources (DNR) conducts a Summer Turkey Survey to estimate reproduction and recruitment of wild turkeys in South Carolina. The survey involves agency wildlife biologists, technicians and conservation officers, as well as many volunteers from other natural resource agencies and the general public.

Although wild turkeys nest primarily in April and May in South Carolina, the survey does not take place until late summer, according to Jay Cantrell, DNR Assistant Big Game Program Coordinator. Therefore, the survey statistics document poults (young turkeys) that actually survived and entered the fall population.

"Reproduction in turkeys has generally been low for the last decade", said Cantrell. "This year, average brood size of 3.8 poults remained good, but the total recruitment ratio was 1.8, a less than desirable figure but an improvement over the previous three years. This low figure was driven by a high percentage of hens (53%) that had no poults at all by late summer. Just as the total recruitment ratio showed small signs of improvement, the percentage of hens without poults statistic was the best it has been since 2011. Recruitment ratio has averaged 1.6 over the last 5 years, keep in mind that 2.0 is somewhat of a break even mark. In fact, when turkey populations were expanding during the 1980's recruitment ratio averaged 3.5. Recruitment ratio is a measure of young entering the population based on the number of hens in the population. "It is basically a good news, bad news kind of year" said Cantrell "Reproduction was poor in most of the state and definitely lower than we would like to see, but numbers are better than the last few years. Although statewide numbers were less than favorable, the Southern Coastal Plain region did show signs of good reproduction with a recruitment ratio of 2.2, an average brood size of 4 and only 44% of hens without poults. Things are improving but not we're not back where we need to be to see widespread improvement in the turkey population in South Carolina."

Unlike deer, wild turkeys are much more susceptible to significant fluctuations in reproduction and recruitment. Lack of reproductive success is often associated with bad weather (cold and wet) during nesting and brood rearing season. However, there are a host of predators that take advantage of turkey nests and broods including; raccoons, opossums, snakes, foxes, bobcats, and numerous avian predators. Coyotes which are not native but are now well established in the state can be added to the list of turkey predators. Turkeys naturally have high reproductive potential and are therefore able to maintain populations in spite of predation and other mortality factors. The problem is that we have not been getting much "bounce back" amid years of poor recruitment.

What does reproduction last summer mean for the spring turkey hunter? Cantrell indicated, "Spring harvest trends have followed trends in reproduction for many years. For example, the harvest in 2015 was down significantly which was not a surprise because reproduction in 2013 was the lowest on record. The 2016 spring

harvest showed a 10 percent increase in harvest over 2015. Just as the reduced harvest in 2015 was explained by the all-time low reproduction in 2013, the increase in harvest seen in 2016 was likely a result of slightly better reproduction in both 2014 and 2015 which lead to an increase in turkey numbers in many parts of the state. However, in spite of the increase in 2016 harvest levels remains 34 percent below the record harvest established in 2002. The association between changes in reproduction and its effects on harvest are rather remarkable in South Carolina's turkey harvest and reproductive data sets. Based on this information we expect to see another slight increase in the harvest in the spring of 2017."

Finally, the gobbler to hen ratio during last summer's survey was 0.48 which is the lowest since the year 2000, said Cantrell. Low gobbler to hen ratios can affect the quality of hunting because hens are extremely available which affects gobbling and responsiveness to calling by hunters."

"The bottom line," Cantrell said, "is the state's turkey population is about 35 percent below record levels that we saw 15 years ago. This year showed a slight uptick over the last three years but additional improvements and better reproduction for several years is needed to get the population back up. That is the nice thing about turkeys though; given the right conditions they can naturally bounce back in a short period of time."

Anyone interested in participating in the annual Summer Turkey Survey is encouraged to sign-up. The survey period is July 1-August 29 annually and those who participate typically spend a reasonable amount of time outdoors during that time period. Cooperators obviously must be able to identify wild turkeys and must be comfortable in telling the difference between hens, poults, and gobblers. If you would like to participate in the survey, contact Jay Cantrell at cantrellj@dnr.sc.gov. You will be added to the cooperator list and receive materials at the end of June annually. Those interested in the survey can also download instructions and survey forms at the following website: http://www.dnr.sc.gov/wildlife/turkey/volunbroodsurvey.html

Figure 1. Map of physiographic regions for 2016 Summer Turkey Survey.

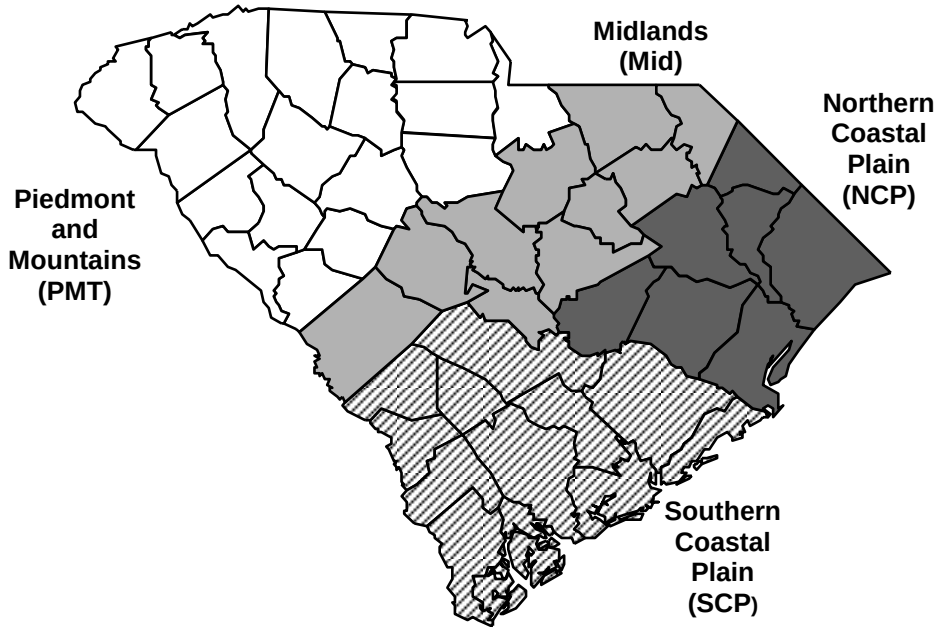


Table 1. Summary of reproductive data for 2016 Summer Turkey Survey by region.

Region	Gobbler Hen Ratio	No. Hens w/Poults	No. Hens w/o Poults (%)	No. Poults	Avg. Brood Size	Total Recruitment Ratio
Piedmont	0.39	486	504 (51)	1,800	3.7	1.8
Midlands	0.58	39	113 (74)	147	3.8	1.0
Northern Coastal	0.38	95	175 (65)	339	3.6	1.3
Southern Coastal	0.69	273	211 (44)	1,084	4.0	2.2
Statewide	0.48	893	1,003 (53)	3,370	3.8	1.8

Table 2. Statewide Summer Turkey Survey reproductive data 2012-2016.

Year	Gobbler Hen Ratio	No. Hens w/Poults	No. Hens w/o Poults (%)	No. Poults	Avg. Brood Size	Total Recruitment Ratio
2012	0.78	1,208	1,472 (55)	5,085	4.2	1.9
2013	0.70	810	1,588 (66)	3.169	3.9	1.3
2014	0.60	983	1,403 (59)	3,834	3.9	1.6
2015	0.50	1,077	1,543 (59)	3,829	3.6	1.5
2016	0.48	893	1,003 (53)	3,370	3.8	1.8
Average	0.61	994	1,402 (58)	3,857	3.9	1.6

Table 3. 2016 Summer Turkey Survey Results by County.

County	No. Observ.	No. Poults	No. Hens w/ Poults	No. Hens w/o Poults	No. Hens	% Hens w/o Poults	No. Gobblers	No. Unid.	Total Turkeys Observed
Abbeville	39	65	25	43	68	63	25	0	158
Aiken	79	50	14	42	56	75	53	14	173
Allendale	30	66	20	57	77	74	26	23	192
Anderson	0	0	0	0	0		0	0	0
Bamberg	0	0	0	0	0		0	0	0
Barnwell	61	200	44	22	66	33	38	38	342
Beaufort	17	87	26	26	52	50	24	2	165
Berkeley	73	333	85	32	117	27	101	14	565
Calhoun	1	18	4	0	4	0	0	0	22
Charleston	40	122	32	35	67	52	51	0	240
Cherokee	15	35	12	53	65	82	2	0	102
Chester	64	124	27	78	105	74	32	12	273
Chesterfield	0	0	0	0	0		0	0	0
Clarendon	1	8	4	3	7	43	0	0	15
Colleton	49	85	28	27	55	49	59	47	246
Darlington	8	35	8	8	16	50	5	0	56
Dillon	13	41	11	8	19	42	3	20	83
Dorchester	16	31	6	7	13	54	23	3	70
Edgefield	14	34	13	10	23	43	1	8	66
Fairfield	56	139	51	70	121	58	50	15	325
Florence	4	4	1	10	11	91	13	11	39
Georgetown	43	70	22	38	60	63	15	0	145
Greenville	0	0	0	0	0		0	0	0
Greenwood	40	131	38	26	64	41	34	0	229
Hampton	10	90	14	2	16	13	0	0	106
Horry	14	53	16	18	34	53	6	7	100
Jasper	5	17	4	0	4	0	8	0	29
Kershaw	6	13	4	5	9	56	0	0	22
Lancaster	0	0	0	0	0		0	0	0
Laurens	22	89	34	17	51	33	16	4	160
Lee	2	3	1	1	2	50	0	0	5
Lexington	1	0	0	1	1	100	0	0	1
McCormick	12	34	13	3	16	19	10	1	61
Marion	0	0	0	0	0		0	0	0
Marlboro	0	0	0	0	0		0	0	0
Newberry	48	221	39	24	63	38	33	13	330
Oconee	14	23	8	10	18	56	6	1	48
Orangeburg	9	53	14	3	17	18	3	2	75
Pickens	32	120	41	41	82	50	28	4	234
Richland	17	10	2	25	27	93	16	0	53
Saluda	17	73	22	11	33	33	7	18	131
Spartanburg	40	129	38	40	78	51	44	4	255
Sumter	10	18	6	31	37	84	14	0	69
Union	121	579	124	78	202	39	99	6	886
Williamsburg	70	163	41	98	139	71	65	38	405
York	3	4	1	0	1	0	1	6	12
State Total	1,116	3,370	893	1,003	1,896	53	911	311	6,488

2017 Wild Turkey Summer Survey

Wild Turkey Reproduction Holding Steady Across the State

Jay Cantrell, SCDNR Assistant Big Game Program Coordinator

Annually since the early 1980's, the S.C. Department of Natural Resources (SCDNR) has conducted a Summer Turkey Survey to estimate reproduction and recruitment of wild turkeys in South Carolina. The survey involves agency wildlife biologists, technicians and conservation officers, as well as many volunteers from other natural resource agencies and the general public. This year over 300 observers recorded 1866 unique observations, seeing over 10,000 turkeys across the state in July and August. This was the best participation in the survey in ten years. More observations lead to higher quality data and better confidence in the information collected.

Although wild turkeys nest primarily in April and May in South Carolina, the survey does not take place until late summer. Therefore, the survey statistics document poults (young turkeys) that actually survived and entered the fall population.

Reproduction in turkeys has generally been low for the last twelve years. This year, average brood size of 3.4 poults remained good, but the Total Recruitment Ratio (TRR) was 1.5, a less than desirable figure. This low figure was driven by a high percentage of hens (55%) that had no poults at all by late summer. TRR has averaged 1.5 over the last 5 years, keep in mind that 2.0 is somewhat of a break even mark. In fact, when turkey populations were expanding during the 1980's recruitment ratio averaged 3.5. Total Recruitment Ratio is a measure of young entering the population based on the number of hens in the population. Although this observed measure of reproduction was poor in most of the state and definitely lower than we would like to see, the good news is the recruitment index has been stable over the past 5 years. Although we are not seeing an increase in these numbers and we are not where we need to be to see widespread increases in the turkey population in South Carolina, it is encouraging that things seem to have leveled off and the downward trajectory of the population has stalled the last several years.

Unlike deer, wild turkeys are much more susceptible to significant fluctuations in reproduction and recruitment. Lack of reproductive success is often associated with bad weather (cold and wet) during nesting and brood rearing season. However, there are a host of predators that take advantage of turkey nests and broods including: raccoons, opossums, skunks, armadillos, snakes, foxes, bobcats, and numerous avian predators. Coyotes which are not native but are now well established in the state can be added to the list of turkey predators. Additionally, feral hogs are expanding on the landscape and can be a significant nest predator. Turkeys naturally have high reproductive potential and are therefore able to maintain populations in spite of predation and other mortality factors.

What does reproduction last summer mean for the spring turkey hunter? Spring harvest trends have followed trends in reproduction for many years. For example, the harvest in 2015 was down significantly which was not a surprise because reproduction in 2013 was the lowest on record. The 2016 spring harvest showed a 10 percent increase in harvest over 2015. Just as the reduced harvest in 2015 was explained by the all-time low reproduction in 2013, the increase in harvest seen in 2016 was likely a result of slightly better reproduction in both 2014 and 2015 which led to an increase in turkey numbers in many parts of the state. The 2017 spring harvest (19,171) was up 14 percent over 2016. The association between changes in reproduction and its effects on harvest are rather remarkable in South Carolina's turkey harvest and reproductive data sets. Based on this information and the 2016 summer recruitment numbers (TRR=1.8) being the highest since 2012, we can expect to see another increase in the harvest in the spring of 2018.

Finally, the gobbler to hen ratio during last summer's survey was 0.58 which is average for the past 5 years. Low gobbler to hen ratios can affect the quality of hunting because hens are extremely available which affects gobbling and responsiveness to calling by hunters.

The bottom line is this year's turkey harvest was 25 percent below the record level that we saw 15 years ago. However, that 2002 record was a one-time peak and the 2017 harvest estimate is dead on with the average gobbler harvest over the last 22 years. That fact combined with 5 years of stability in the summer survey data offers encouragement that the long term population trend is leveling off and moving toward static. It is possible that following restocking and restoration efforts and the tremendous population growth we experienced following those endeavors that we are now settling into a "new normal" of population levels, reproductive rates and harvest numbers. Fluctuations up and down are not unexpected given the reproductive strategy of turkeys and the multiple factors that influence their success and survival. This inherent instability is the reason that annual monitoring is critical for this species.

Anyone interested in participating in the annual Summer Turkey Survey is encouraged to sign-up. The survey period is July 1 - August 29 annually and those who participate typically spend a reasonable amount of time outdoors during that time period. Cooperators obviously must be able to identify wild turkeys and must be comfortable in telling the difference between hens, poults, and gobblers. If you would like to participate in the survey, contact Jay Cantrell at cantrellj@dnr.sc.gov. You will be added to the cooperator list and receive materials at the end of June annually. Those interested in the survey can also download instructions and survey forms at the following website: http://www.dnr.sc.gov/wildlife/turkey/volunbroodsurvey.html

Although we are not seeing an increase in these numbers and we are not where we need to be for widespread increases in the turkey population to occur in South Carolina, it is somewhat encouraging that the trend is at least stabilized and the downward trajectory of the population has stalled the last several years. It is possible that following restocking and restoration efforts and the tremendous population growth we experienced following those endeavors that we are now settling into a "new normal" of population levels, reproductive rates and harvest numbers. It is also worth noting that both short term and long term fluctuations up and down are not unexpected given the reproductive strategy of turkeys and the multiple factors that influence their success and survival. This inherent instability is the reason that annual monitoring is critical for this species.

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Figure 1. Map of physiographic regions for 2018 Summer Turkey Survey.

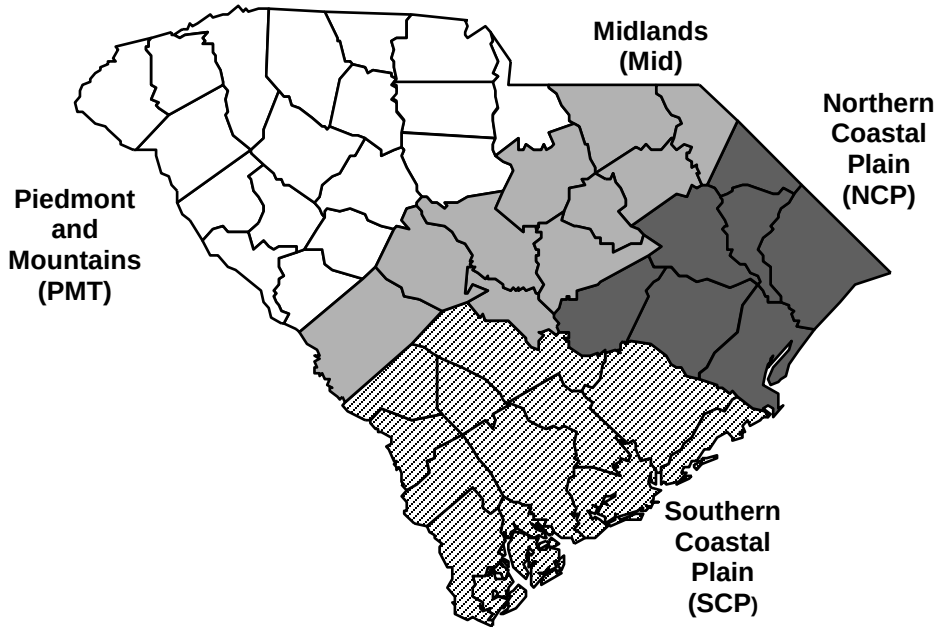

Table 1. Summary of reproductive data for 2018 Summer Turkey Survey by region.

Region	Gobbler Hen Ratio	No. Hens w/Poults	No. Hens w/o Poults (%)	No. Poults	Avg. Brood Size	Total Recruitment Ratio
Piedmont	0.39	442	450 (50)	1,747	4.0	2.0
Midlands	0.70	104	94 (47)	274	2.6	1.4
Northern Coastal	0.73	219	301 (58)	819	3.7	1.6
Southern Coastal	0.82	311	361 (54)	1,108	3.6	1.6
Statewide	**0.62**	**1,076**	**1,206 (53)**	**3,948**	**3.7**	**1.7**

Table 2. Statewide Summer Turkey Survey reproductive data 2014-2018.

Year	Gobbler Hen Ratio	No. Hens w/Poults	No. Hens w/o Poults (%)	No. Poults	Avg. Brood Size	Total Recruitment Ratio
2014	0.60	983	1,403 (59)	3,834	3.9	1.6
2015	0.50	1,077	1,543 (59)	3,829	3.6	1.5
2016	0.48	893	1,003 (53)	3,370	3.8	1.8
2017	0.58	1,409	1,737 (55)	4,832	3.4	1.5
2018	0.62	1,076	1,206 (53)	3,948	3.7	1.7
Average	**0.56**	**1,088**	**1,378 (56)**	**3,963**	**3.6**	**1.6**

Table 3 . 2018 Summer Turkey Survey Results by County.

County	No. Observ.	No. Poults	Hens w/ Poults	No. Hens w/o Poults	Tot. Hens	% Hens w/o Poults	No. Gobblers	No. Unid.	Total Turkeys
Abbeville	25	85	20	14	34	41	11	1	131
Aiken	10	11	3	17	20	85	2	0	33
Allendale	47	46	12	72	84	86	48	89	267
Anderson	7	26	5	11	16	69	0	0	42
Bamberg	18	65	14	16	30	53	18	0	113
Barnwell	4	9	2	5	7	71	0	0	16
Beaufort	35	95	20	14	34	41	45	0	174
Berkeley	137	409	96	93	189	49	200	49	847
Calhoun	2	11	3	0	3	0	0	0	14
Charleston	70	162	79	60	139	43	84	15	400
Cherokee	0	0	0	0	0	0	0	0	0
Chester	41	180	46	37	83	45	26	10	299
Chesterfield	3	19	4	10	14	71	0	0	33
Clarendon	20	92	18	22	40	55	19	1	152
Colleton	28	131	31	12	43	28	15	6	195
Darlington	15	47	11	10	21	48	8	0	76
Dillon	3	12	2	2	4	50	0	1	17
Dorchester	21	48	17	17	34	50	37	0	119
Edgefield	9	6	3	13	16	81	7	0	29
Fairfield	57	241	62	51	113	45	44	15	413
Florence	12	34	7	8	15	53	5	20	74
Georgetown	59	175	62	84	146	58	33	17	371
Greenville	2	0	0	0	0	0	11	0	11
Greenwood	18	44	13	21	34	62	17	0	95
Hampton	63	75	23	57	80	71	100	28	283
Horry	11	54	20	2	22	9	10	9	95
Jasper	8	25	7	2	9	22	5	0	39
Kershaw	17	25	8	20	28	71	5	3	61
Lancaster	18	50	16	57	73	78	10	2	135
Laurens	20	47	13	8	21	38	20	7	95
Lee	3	10	4	3	7	43	1	0	18
Lexington	5	19	4	4	8	50	4	0	31
Marion	18	117	29	33	62	53	69	0	248
Marlboro	2	0	0	4	4	100	0	0	4
McCormick	28	78	20	12	32	38	22	0	132

County	No. Observ.	No. Poults	Hens w/ Poults	No. Hens w/o Poults	Tot. Hens	% Hens w/o Poults	No. Gobblers	No. Unid.	Total Turkeys
Newberry	46	167	43	37	80	46	31	18	296
Oconee	15	14	3	8	11	73	10	2	37
Orangeburg	7	17	5	2	7	29	0	8	32
Pickens	74	225	57	59	116	51	51	4	396
Richland	58	129	63	19	82	23	115	6	332
Saluda	18	36	13	9	22	41	15	0	73
Spartanburg	40	174	43	29	72	40	20	38	304
Sumter	4	3	4	7	11	64	4	6	24
Union	86	371	80	87	167	52	52	13	603
Williamsburg	107	335	81	150	231	65	243	30	839
York	6	29	10	8	18	44	0	5	52
Total	**1297**	**3948**	**1076**	**1206**	**2282**	**53**	**1417**	**403**	**8050**