

2011-12 NORTH CAROLINA WOODCOCK HUNTER SURVEY



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EXECUTIVE SUMMARY

Introduction

We conducted this statewide survey to examine the views and opinions of North Carolina woodcock hunters regarding a variety of topics related to woodcock hunting and management. We believe this to be the first ever opinion survey of woodcock hunters conducted by the North Carolina Wildlife Resources Commission (NCWRC).

Methods

In late winter and spring of 2012, we surveyed a random sample of 2,872 hunters that were registered in the Harvest Information Program (HIP). The sampling frame included only registrants who indicated that they harvested one or more woodcock the previous season. The survey response rate was 48%.

Results

General Participation

- Only 21% of respondents indicated that during most of their woodcock hunting and harvest, they were specifically pursuing woodcock.
- 57% of woodcock hunters started woodcock hunting before 1990 and 16% started after 2005.
- Only 16% of all respondents indicated that they considered woodcock hunting to be their most important or one of their most important hunting activities; however, of those respondents that indicated that they specifically pursued woodcock, 45% indicated that woodcock hunting was one of their most important or most important hunting activity
- 44% of respondents indicated hunting the most days in the Coastal Plain, while 15% indicated hunting woodcock the most days in the mountains.
- When asked to identify **all** the areas they hunted woodcock, 41% of woodcock hunters indicated they had hunted on NCWRC game lands sometime during the last five years.
- 22% of woodcock hunters indicated that they **most** often hunted on NCWRC game lands.
- Woodcock hunters in the mountains hunt on NCWRC game lands (52%) more often than woodcock hunters in other regions

Barriers to Participation and Satisfaction

- 28% of woodcock hunters were satisfied with how the NCWRC manages woodcock in North Carolina, while 16% were dissatisfied. 55% of respondents were neither dissatisfied nor satisfied or were unsure of their satisfaction with NCWRC woodcock management.
- 34% of woodcock hunters indicated that a major barrier affecting their woodcock hunting experience and participation was that it was difficult to find public lands that hold huntable numbers of woodcock.

- Difficulty finding areas to hunt woodcock on private land, difficulty finding public lands that hold huntable numbers of woodcock and woodcock populations being too low appear to be major barriers affecting hunters in the mountain region more than hunters in the Piedmont and Coastal Plain.
- 36% of woodcock hunters indicated that the overall quality of their woodcock hunting had gotten worse over time compared to 13% that indicated that it had gotten better over time.

Seasonal Hunting Patterns, Success and Opinions on the Woodcock Season Structure

- Of those respondents that hunted during the 2011-12 season, 57% hunted less than 6 days while 23% hunted more than 10 days.
- 78% of woodcock hunters harvested 5 or fewer woodcock during the 2011-12 season while 3% harvested more than 20 woodcock
- 53% of respondents agreed that the NCWRC should keep the current woodcock hunting season structure, while only 13% felt that the current woodcock season structure should be changed. There were no differences of opinion regarding changes to season structure based on region of hunting or whether respondents indicated that they specifically pursued woodcock or not.

Management Considerations

- Of the alternative choices provided, there was no support for making changes to the woodcock season structure. Given the federal frameworks from which to select season dates, hunters are supportive of the current season structure.
- 22% of all woodcock hunters hunt woodcock most often on NCWRC game lands. It appears that woodcock hunters utilize game lands as their principal hunting area more so than other hunter groups (waterfowl, doves and deer).
- Habitat management currently occurring on NCWRC game lands that targets quail and grouse likely benefits woodcock as well. However, we suggest that land managers more fully consider habitat management geared towards woodcock and determine if additional management practices are warranted.
- This survey sampled only those individuals that indicated that they harvested 1 or more woodcock the previous year according to Harvest Information Program (HIP) registrations. However, only 25% of respondents indicated that they actually hunted woodcock sometime during the previous 5 years. This discrepancy underscores the inefficiencies and inaccuracy of the HIP registration process in North Carolina.

Contents

EXECUTIVE SUMMARY	i
INTRODUCTION.....	1
METHODS	1
Survey Instrument Design	1
Survey Implementation	2
Data Weighting	2
Data Analysis.....	2
RESULTS	3
Response Rate.....	3
Woodcock Hunter Characteristics and Participation	3
<i>General Demographics</i>	3
<i>General Participation</i>	3
<i>Areas Hunted and Hunting Styles</i>	4
<i>Opinions on Woodcock Season Alternatives</i>	5
<i>Barriers to Participation and Satisfaction</i>	6
DISCUSSION	7
LITERATURE CITED	10
Appendix A: Survey Instrument/Frequencies.....	11
Appendix B: Survey Design and Analysis	20
Appendix C: Cross-tabulations	26
Appendix D: Frequency distributions of County most often woodcock hunted and Game Land most often woodcock hunted	37

INTRODUCTION

Compared to other species, e.g., deer, turkeys and waterfowl, woodcock are pursued by relatively few hunters in North Carolina. Whereas the bobwhite quail may be considered the preferred upland game bird by southern hunters, woodcock hunting has more traditional roots in the northeast and upper Midwest. Long-term trends of numbers of hunters pursuing woodcock are lacking, but we suspect that they have declined along with the pursuit of other game birds such as quail and ruffed grouse. In North Carolina, estimates of woodcock hunters are lacking prior to 1976. Since 1976 however, there appears to have been a decline in woodcock hunters in North Carolina (NCWRC – unpublished data, Figure 1).

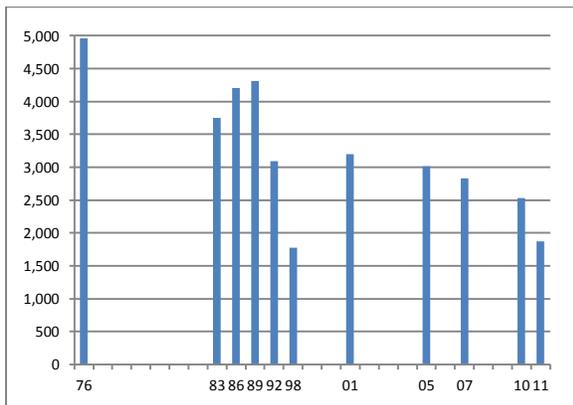


Figure 1. Number of woodcock hunters in North Carolina as estimated by statewide hunter surveys.

Possibly due to generally low numbers of hunters, North Carolina Wildlife Resources Commission (NCWRC) staff rarely receives direct, formal communication from woodcock hunters. Although lack of hunter comments (and complaints) may indicate general hunter satisfaction, it is actually unknown if the majority of woodcock hunters are satisfied with NCWRC's management direction and season structure. The NCWRC does include woodcock

in statewide hunter harvest surveys which provide estimates of hunter numbers and harvest; but to our knowledge, there have been no statewide woodcock hunter **opinion** surveys in the history of the NCWRC. With this survey, our goal was to provide some baseline information on woodcock hunter demographics, statewide and regional woodcock hunting participation, hunting on private and public lands, and barriers to hunting. Woodcock are classified as migratory game birds; therefore, hunting seasons are regulated the U.S. Fish and Wildlife Service (USFWS). In the past, the NCWRC has set woodcock seasons (within federal guidelines) with very little input from woodcock hunters. This survey also requested input regarding the current season structure and several alternatives.

METHODS

Survey Instrument Design

The survey was conducted in the late winter and spring of 2012. We used the USFWS Harvest Information Program (HIP) to identify possible woodcock hunters as all woodcock hunters 16 years of age and older are required to be HIP certified. For this study, the sampling frame was all hunters ≥ 16 who had HIP certification with an effective date of January 29, 2011 through January 28, 2012, and according to HIP screening questions, harvested one or more woodcock the previous season. Our initial intention was to include hunters who indicated they hunted but did not bag woodcock, as we believed it important to include the views of this group of hunters. However, upon reviewing the initial sampling frame, we discovered that 86% of HIP registrants indicated they hunted but did not

“bag” any woodcock. While we recognize that there is some percentage of hunters who do not bag woodcock each year, we believe the high percentage reflected in our HIP registration database was considerably inflated and not representative of woodcock hunters in North Carolina. As we believe this inflated number was likely due to incorrect coding of this question by license vendors, we did not include this group of hunters in our sampling frame in order to avoid surveying large numbers of license holders who did not hunt woodcock.

In order to test the survey instrument, we conducted structured cognitive interviews with a convenience sample of woodcock hunters (persons known by NCWRC staff prior to the interviews). During cognitive interviews, we examined how well questions and directions were interpreted in order to improve the survey instrument wording and design. The final survey instrument contained questions on woodcock hunting behaviors, views on woodcock hunting regulations and season structure, barriers to woodcock hunting and demographics (Appendix A).

Survey Implementation

We contacted all 2,872 hunting license holders ≥ 16 who reported harvesting one or more woodcock in the previous season. We used four different survey methods (Dillman et al. 2009) in order to investigate ways to minimize costs for future surveys while maintaining response rates (Appendix B, Table 1). We used a traditional mail survey, without the option to respond to the survey online, for the Mail Exclusive group. We initially contacted the Web Primary group by mail and the Email Primary group by email to ask them to complete the survey online, but during the final survey mailing we gave them the option to complete a

paper-based survey. We had valid email addresses for 22% of the license holders in our sampling frame. Because the Email Primary and Email Exclusive groups were contacted by email, and because we found differences in response rates during a 2011 survey of waterfowl hunters based on whether or not individuals had an email address in our automated licensing system (ALVIN), we stratified our sample based on email addresses in ALVIN.

Data Weighting

To investigate possible nonresponse bias we compared survey respondents with the entire sampling frame for the following variables: state of residence, age, sex, number of woodcock harvested, type of hunting license and email address. There were differences for all variables except sex, and the strength of association between response and number of woodcock harvested and state of residence was minimal. There was evidence of a stronger association between email address, age and type of hunting license and response to the survey, but, of these three variables, the effect size was weakest for email address. Therefore, we weighted all statewide frequency data based on age and hunting license type (Appendix B, Table 2). Following the recommendation of Winship and Radbill (1994), we did not use weighted data for statistical tests which depend on standard errors.

Data Analysis

We analyzed data using IBM SPSS Statistics 19.0 (SPSS Inc. 2010). We calculated frequency distributions and percentages of respondents in each category for every survey question. For bivariate comparisons, we used cross-tabulations, chi-square tests (χ^2), *t*-tests and *F*-tests to test null hypotheses that there were not differences between variables. We used a

probability value (P) ≤ 0.05 to indicate statistically significant relationships. We omitted or combined categories in cross-tabulations when $> 20\%$ of cells had expected values < 5 or when any cells had expected values < 1 (Delucchi 1983). We calculated adjusted residuals to determine which cells in cross-tabulations were significantly different from expected values. An adjusted residual with an absolute value ≥ 2.0 was evidence against independence in the cell (Agresti and Finlay 1999). Whenever chi-square tests, t -tests or F -tests had $P \leq 0.05$ we calculated effect sizes (Cramer's V for cross-tabulations and Cohen's d or eta for means) (Vaske 2008). We used Vaske's (2008) guidelines for interpreting effect sizes (Appendix B, Table 3). We calculated means for items which used a 5 point disagreement/agreement scale (Strongly Disagree = 1, Strongly Agree = 5) or a 5 point conflicts scale (Conflicts Very Unlikely = 1, Conflicts Very Likely = 5). We did not include responses of "unsure" in mean calculations. Due to rounding, percentages may not total 100% or may appear off when individual categories were combined. In general, we considered an eta and Cramer's V statistic ≥ 0.10 and a Cohen's d value ≥ 0.20 worthy of reporting in that it suggested at least a "minimal" relationship.

RESULTS

Response Rate

The survey response rates by strata, calculated by omitting incorrect addresses, deceased persons, and persons ineligible to respond, were 46% for Mail Exclusive – no email address in ALVIN, 78% for Mail Exclusive – email address in ALVIN, 35% for Web Primary – no email address in ALVIN, 66% for Web Primary – email

address in ALVIN, 67% for Email Primary, 37% for Email Exclusive, and 48% overall (Appendix B, Table 4).

Woodcock Hunter Characteristics and Participation

(See Appendix A for response frequencies for all questions.)

General Demographics

Most (95%) woodcock hunters lived in North Carolina (Question 24), 99% were male (Question 26), and 59% were 45 years of age or older (Question 27). Forty-five percent of respondents had at least a Bachelor's degree (Question 25). Fifty-seven percent of woodcock hunters indicated having a gross household income of \$60,000 or more (Question 28). Sixty-three percent of woodcock hunters reported spending \$100 or less on things related to woodcock hunting in the past 12 months (Question 10).

General Participation

Survey respondents were asked about their general participation in woodcock hunting seasons in North Carolina. Only 25% of respondents hunted woodcock in North Carolina sometime during the last 5 years (Question 1). Only respondents who had hunted woodcock during the last 5 years could respond to the remaining questions in the survey.

Twenty-one percent of respondents indicated that during most of their woodcock hunting and harvest, they are specifically pursuing woodcock (Question 2). Alternately, 79% indicated most of their woodcock hunting and harvest occurs while hunting other small game (e.g., quail or grouse). Fifty-seven percent of woodcock hunters started woodcock hunting before 1990 and 16% started woodcock hunting after 2005

(Question 4). Sixteen percent of woodcock hunters considered woodcock hunting to be one of their most important or their most important hunting activity (Question 3). However, for those respondents that indicated that they specifically hunt woodcock, 45% indicated that woodcock hunting was one of their most important or their most important hunting activity (Appendix C, Table 1). Woodcock hunters were asked about their participation in North Carolina's woodcock season over the last five years. Forty-six percent of woodcock hunters indicated hunting woodcock each of the last five years (Question 5). Of those woodcock hunters who indicated hunting woodcock during the 2011-12 season, 57% hunted less than 6 days, while 23% indicated hunting more than 10 days (Question 6). In general, those respondents who indicated that they specifically hunt woodcock indicated hunting more days than those individuals who indicated that most of their woodcock hunting occurs while pursuing other small game (Appendix B, Table 2). The majority (79%) of woodcock hunters harvested 5 or fewer woodcock during the 2011-12 season, while 3% harvested more than 20 woodcock (Question 7). Those individuals who specifically hunt woodcock harvested significantly more woodcock than those who indicated that most of their woodcock hunting occurs while pursuing other small game (Appendix B, Table 3). For example, 38% of respondents who specifically hunt woodcock harvested 6 or more woodcock during the 2011-12 season compared to only 15% of respondents whose woodcock hunting occurs while hunting other small game.

Of the three regional choices, 44% of woodcock hunters indicated hunting the most days in the Coastal Plain, 41% indicated the Piedmont and 15% indicated hunting woodcock the most days

in the Mountains (Question 8). Additionally, we asked woodcock hunters which three counties they woodcock hunted the most days during the last 5 years (Question 9, Appendix D, Table 1). Respondents indicated hunting woodcock the most days in the following three counties in each region: Coastal Plain (Pender, Bladen, Carteret), Piedmont (Anson, Richmond, Granville), and Mountains (Caldwell, Burke, Ashe).

Areas Hunted and Hunting Styles

Woodcock hunters were asked to identify **all** the areas they hunted woodcock in North Carolina in the last 5 years (Question 11). Response frequencies included: private property either owned by the respondent or a hunting partner (50%), leased property (46%) or private property - neither owned nor leased (44%). Forty-one percent of woodcock hunters indicated hunting on game lands during the last 5 years.

When asked to identify the areas where they **most often** hunted woodcock in North Carolina in the last 5 years, 28% of woodcock hunters indicated they most often hunted on private property that was owned by them or a hunting partner, while 22% most often hunted on NCWRC game lands (Question 12). Woodcock hunters in the Coastal Plain hunt leased land more often than woodcock hunters in other regions of the state, while woodcock hunters in the Mountains hunted on NCWRC game lands (52%) more often than woodcock hunters in other regions (Appendix C, Table 4).

The majority (59%) of woodcock hunters typically use a dog when hunting (Question 13), while 17% typically keep records (birds flushed, number bagged, etc.) of their woodcock hunting trips (Question 14).

Thirty-six percent of woodcock hunters indicated that they have occasionally or frequently hunted woodcock on NCWRC game lands during the last 5 years (Question 15). We asked hunters to list the three game lands that they woodcock hunted on the most days during the last five years (Question 16, Appendix D, Table 2). The top three game lands in each region included: Coastal Plain (Croatan National Forest, Holly Shelter, Chowan Swamp), Piedmont (Pee Dee River, Sandhills, Butner-Falls of Neuse) and Mountains (Pisgah National Forest, Nantahala National Forest, Sandy Mush).

We also asked hunters about out-of-state travels for woodcock hunting. Twenty-nine percent of woodcock hunters indicated that they occasionally or frequently travel out-of-state to hunt woodcock (Question 17); and of these, 16% indicated they are specifically pursuing woodcock when hunting out-of-state (Question 18).

Opinions on Woodcock Season Alternatives

Currently, federal frameworks allow the NCWRC to open the woodcock season on October 1 and close the season no later than January 31. The season may be split into two segments. The current structure for the 45-day woodcock season in North Carolina includes 1 continuous season that runs from approximately mid-December through late January. Woodcock hunters were asked to indicate how much they disagreed or agreed with a series of statements about the current woodcock season structure and alternatives (Question 19). Respondents were asked to rate their level of disagreement/agreement on a five point scale (1=Strongly Disagree; 5=Strongly Agree) (Appendix C, Table 5).

Considering responses from all woodcock hunters, there appears to be no support for making changes to the current woodcock season structure. Fourteen percent of woodcock hunters disagreed, 53% agreed, 24% were neutral, and 9% were unsure (mean=3.8) whether or not the NCWRC should keep the current season structure. There were no significant differences of opinion detected based on region of hunting (Appendix C, Table 6).

When asked if NCWRC should shift the entire season earlier (mid-November to late December), 46% disagreed, 16% agreed, while 27% were neutral and 11% were unsure (mean=2.4). There were no significant differences of opinion detected based on region of hunting (Appendix C, Table 6).

When asked if the NCWRC should split the season with some days occurring in November and the rest occurring in January, 41% of woodcock hunters disagreed, 17% agreed, 29% were neutral, and 13% were unsure (mean=2.4). On average, hunters in all regions were opposed to this season structure option, although Coastal Plain woodcock hunters were more opposed than Mountain hunters (Appendix C, Table 6).

We also looked at opinions of season structure as it related to whether respondents indicated that they specifically hunted woodcock or rather, if they primarily hunted woodcock while hunting other species. Both groups of hunters agreed, on average, with keeping the current season structure. (Appendix C, Table 7). In regards to shifting the entire season earlier, both groups were opposed (means scores <3.0); however, respondents who specifically hunt woodcock had significantly higher opposition to this season option than those respondents who

primarily hunt woodcock while pursuing other species. Likewise, both groups were also opposed (mean scores <3.0) to splitting the woodcock season, while respondents who specifically hunt woodcock had significantly higher opposition than those who hunt woodcock while pursuing other species.

Barriers to Participation and Satisfaction

We asked several questions about general satisfaction with woodcock management, quality of hunting in North Carolina, and barriers to woodcock hunting participation. Thirty-six percent of woodcock hunters indicated the overall quality of their woodcock hunting had gotten worse compared to when they first started woodcock hunting, while only 13% indicated it had gotten better (Question 22). In general, woodcock hunters in all regions indicated that, over time, the quality of their hunting had gotten worse or stayed about the same. A higher percentage of hunters in the Mountains indicated their woodcock hunting had gotten worse over time (Appendix C, Table 8).

Of the 5 choices given, the highest percentage of respondents (39%) indicated that they were neither dissatisfied nor satisfied with how the NCWRC manages woodcock (Question 23). Ten percent indicated they were very satisfied, while 6% indicated they were very dissatisfied.

Woodcock hunters were asked to identify things that may affect their woodcock hunting experiences and participation in woodcock hunting in North Carolina (Question 20). The percentage of woodcock hunters who indicated the following were **major** barriers affecting their woodcock hunting experiences and participation were: difficult to find public lands that hold huntable numbers of woodcock – 34%, woodcock populations are too low – 33%,

difficult to find areas to hunt woodcock on private property – 22%, work or family obligations or health problems – 16%, hunters hunting other species interferes with woodcock hunting – 14%, woodcock hunting regulations are too confusing – 7%, and woodcock hunting is too expensive – 3%.

When examining responses in relation to the region most often hunted (Appendix C, Table 9), woodcock hunters who hunted the most days the last five years in the Mountains indicated that difficulty finding areas to hunt woodcock on private lands, difficulty finding public lands that hold huntable numbers of woodcock, and woodcock populations being too low as major barriers more often than hunters in the Piedmont and Coastal Plain. Conversely, woodcock hunters in the Coastal Plain indicated these same three conditions were not a barrier to woodcock hunting more often than Mountain and Piedmont hunters.

We also asked woodcock hunters to rate levels of potential conflicts with other hunters in two situations (Question 21). Possible levels of conflict were measured using a five point scale (1=Conflicts Very Unlikely; 5=Conflicts Very Likely). When asked about potential conflicts if all or some of the woodcock season was in **November**, 46% responded that conflicts were likely or very likely, 25% responded that conflicts were unlikely or very unlikely, while 24% were neutral (mean=3.4). From a regional perspective, more Piedmont hunters believed that conflicts in November were likely than hunters in the Mountains or Coastal Plain (Appendix C, Table 10). When asked about conflicts if all or some of the woodcock season was in **December**, 35% responded that conflicts were likely or very likely, 29% responded that conflicts were unlikely or very unlikely, while

30% were neutral (mean=3.1). There were no significant differences of opinion about conflicts in December detected based on region of hunting.

DISCUSSION

Based on this survey, woodcock hunters in North Carolina are almost exclusively male and 59% are at least 45 years old. In North Carolina, woodcock hunters are older than hunters who pursue other species – dove hunters (51% \geq 45 years), deer hunters (48% \geq 45 years) and duck hunters (40% \geq 45 years) (Palmer 2009, Fuller et al. 2011). We caution that hunters less than 16 years of age are underrepresented in the sample frames for each of these surveys because many are not required to be HIP certified and/or licensed. Compared to surveys of other hunter groups in North Carolina (Palmer 2009, Fuller et al. 2011), woodcock hunters in North Carolina had similar education levels to waterfowl hunters (45% of woodcock hunters and 42% of waterfowl hunters, had at least a Bachelor's degree), and higher levels of formal education than dove hunters (35% had at least a Bachelor's degree), and deer hunters (20% had at least a Bachelor's degree). North Carolina woodcock hunters reported intermediate levels of gross household income (57% \geq \$60,000) compared to waterfowl hunters (64% $>$ \$60,000), dove hunters (57% $>$ \$60,000) and deer hunters (43% \geq \$60,000).

We note that only 25% of respondents indicated that they hunted woodcock in North Carolina during the last 5 years. This was unexpectedly low as the HIP screening question specifically asks if the individual hunted woodcock the previous year and, according to HIP records, all of the individuals in our sampling frame harvested \geq 1 woodcock in the

previous year. We believe this low percentage is very likely related to vendor compliance issues. Administration of the HIP screening questions by vendors is suspect with numerous anecdotal examples of vendors answering questions without customer input. The error rate associated with incorrect coding of the screening question by vendors can be magnified by only a few vendors in instances where the hunter group, e.g., woodcock hunters, is few in numbers. Inefficiencies with data collection will likely continue until an overhaul is made to how migratory game bird hunters are licensed or permitted in North Carolina.

Prior to this survey, we suspected that some portion of woodcock hunting and harvest occurs while pursuing other species, unlike the hunting of many other species, e.g., deer, bear, turkey. Accordingly, only 21% indicated that most of their woodcock hunting and harvest occurred while specifically pursuing woodcock. We assume that the majority of this "incidental" hunting is occurring by quail hunters in the Piedmont and Coastal Plain and by grouse hunters in the Mountains. In a 2012 statewide survey of all licensed hunters, 16% of woodcock hunters were considered as "incidental" hunters as defined by indicating 0 days hunted, but \geq 1 woodcock harvested. Other than several predator species (bobcat, coyote, fox), the percent of incidental woodcock hunters was higher than all other species hunter groups (NCWRC-unpublished data).

Only 16% of woodcock hunters were dissatisfied with how the NCWRC manages woodcock in North Carolina. We note that 56% were either neutral or unsure of their opinion. This is most likely because habitat management conducted by the NCWRC is normally not

directed specifically towards woodcock and management plans and documents prepared by the NCWRC usually do not emphasize woodcock management. Further, because of the relatively few individuals that specifically pursue woodcock, there has been minimal direct communication with woodcock hunters in the past.

Not unexpectedly, most woodcock hunting occurs on private lands. We note however that 41% of woodcock hunters indicated hunting on NCWRC game lands during the last 5 years and 22% indicating that they hunted most often on NCWRC game lands. In comparison, woodcock hunters utilize game lands much more so than waterfowl hunters (7% most often hunt on game lands) and dove hunters (6% most often hunt on game lands). With increasing urbanization, changing land use patterns and ownership, we are interested in seeing if woodcock hunting and land ownership patterns change over time. Increasingly, it is difficult to simply obtain permission to hunt private property and future surveys should track this issue as it relates to woodcock hunting. The majority of woodcock hunters in the Mountains use game lands for woodcock hunting, and a higher percentage of Mountain woodcock hunters use game lands than woodcock hunters in other regions. We suspect that many woodcock hunters in the Mountains are primarily targeting grouse and are using the abundant National Forest acreage as principal hunting areas. Although woodcock hunters in the Piedmont and Coastal Plain use game lands at a much lower rate than Mountain woodcock hunters, woodcock hunters in these 2 regions use game lands at a higher rate than waterfowl and dove hunters in the same regions.

Overall, woodcock populations have declined by 0.8%/year (1968-2012) in the Eastern Woodcock Management Unit as measured by the Singing Ground Survey (Cooper and Rau 2012). Accordingly, lack of huntable numbers of woodcock appears to be the primary barrier to current woodcock hunters. Of the choices provided, difficulty in finding public lands that hold huntable numbers of woodcock and woodcock populations being too low were cited at a higher rate than other options. Although, North Carolina is within the breeding range of woodcock, the principal breeding range for woodcock that winter in North Carolina is the New England states and eastern Canada. Overall, population declines are related to landscape level declines in early successional habitats throughout the breeding range (Kelly et al. 2008). Therefore, habitat management actions undertaken by the NCWRC will likely have limited influence on woodcock breeding populations. However, targeted habitat management on specific game lands may increase wintering concentrations and hunting success. Intensive habitat management (particularly forest management) geared towards quail and grouse already occurs on a number of NCWRC game lands. This management likely benefits woodcock as well. However, we suggest that land managers more fully consider habitat management geared towards woodcock and determine if additional management practices are warranted. Kremenetz and Jackson (2009) provide suggestions for woodcock habitat management in the Southeast.

The NCWRC typically receives few comments (pro or con) regarding woodcock hunting season dates, but we were interested in opinions of woodcock hunters regarding several possible season structure alternatives. From

both statewide and regional perspectives, there was support for retaining the current woodcock season structure in North Carolina. Conversely, there was less statewide or regional support for any of the alternative season structures presented. We were also interested if opinions of “avid” woodcock hunters differed from “incidental” woodcock hunters. For the purposes of this report, we considered an avid woodcock hunter to be an individual who indicated that they specifically hunted woodcock compared to an incidental hunter who hunted/harvested woodcock while primarily in the pursuit of other small game. We detected no differences of opinions on hunting season structure between these two groups of hunters.

Anecdotally we are aware of land use conflicts between small game hunters and deer hunters, and we believe in many cases hunters delay the majority of the seasons’ small game hunting until after deer season has closed. Based on the results of this survey, significant conflicts with other groups would be expected if all or a portion of the woodcock season were held in November. Significant conflicts would appear less likely if all or a portion of the season was held in December.

LITERATURE CITED

- Agresti, A. and B. Finlay. 1999. Statistical methods for the social sciences, Third edition. Prentice Hall, Upper Saddle River, New Jersey, USA.
- Cooper, T.R., and R.D. Rau. 2012. American woodcock population status, 2012. U.S. Fish and Wildlife Service, Laurel, Maryland. 16 pp.
- Delucchi, K.L. 1983. The use and misuse of chi-square: Lewis and Burke revisited. *Psychological Bulletin* 94(1):166-176.
- Dillman, D.A., J. D. Smyth, and L. M. Christian. 2009. Internet, mail, and mixed-mode surveys: the tailored design method. John Wiley & Sons, Inc., Hoboken, New Jersey.
- Fuller, J, D. Howell and D. Palmer. 2011. 2010-2011 Waterfowl Hunter Survey Report. North Carolina Wildlife Resources Commission – unpublished report.
- Kremetz, D.G. and J.J. Jackson. 2009. Woodcock in the Southeast: Natural History and Management for Landowners. The University of Georgia College of Agricultural and Environmental Sciences Cooperative Extension Services.
- Palmer, D. 2009. 2006 Survey of Deer Hunters in North Carolina. North Carolina Wildlife Resources Commission – unpublished report.
- Raftovich, R.V., K.A. Wilkins, S.S Williams and H.L. Spriggs. 2012. Migratory bird hunting activity and harvest during the 2010 and 2011 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland, USA.
- SPSS. 2010. IBM SPSS Statistics, Version 19.0. SPSS Inc., Chicago, Illinois.
- Vaske, J. J. 2008. Survey research and analysis: applications in parks, recreation, and human dimensions. Venture Publishing, Inc., State College, Pennsylvania.
- Kelly, J., S. Williamson, T. R. Cooper. 2008. American Woodcock Conservation Plan. Wildlife Management Institute.
- Winship, C. and L. Radbill. 1994. Sampling weights and regression analysis. *Sociological Methods and Research* 23(2):230-257.

Appendix A: Survey Instrument/Frequencies

2011-12 North Carolina Woodcock Hunter Survey



This survey is an opportunity for you to let us know about your experiences and opinions about woodcock hunting and management in North Carolina. We need to hear from you even if you rarely or never have hunted woodcock.

General Woodcock Hunting

1. Have you hunted woodcock in North Carolina anytime during the last 5 years? Note: You should answer "Yes" to this question and answer the remaining questions if you sometimes harvest or attempt to harvest woodcock even though you may be primarily targeting other species.
 - 25% Yes (**Continue to question 2**)
 - 75% No (**Please stop here and return the survey**)

2. Which of the following best describes your woodcock hunting in North Carolina? (**check only one**)
 - 21% During most of my woodcock hunting and harvest I am specifically hunting woodcock
 - 79% Most of my woodcock hunting and harvest occurs while I'm hunting other small game (for example – quail or grouse)

3. How important is woodcock hunting to you? (**check only one**)
 - 12% It's one of my least important hunting activities
 - 33% It's less important than my other hunting activities
 - 39% It's no more important than my other hunting activities
 - 15% It's one of my most important hunting activities
 - 1% It's my most important hunting activity

4. When did you start hunting woodcock? (**check only one**)
 - 22% Before 1970
 - 16% 1970 to 1979
 - 19% 1980 to 1989
 - 13% 1990 to 1999
 - 15% 2000 to 2005
 - 16% 2006 or later

5. During which of the last 5 hunting seasons did you hunt woodcock in North Carolina? **(check all that apply)**

- 69% 2011-12
- 80% 2010-11
- 75% 2009-10
- 69% 2008-09
- 65% 2007-08

6. About how many days did you hunt woodcock during the 2011-12 season in North Carolina? **(check only one)**

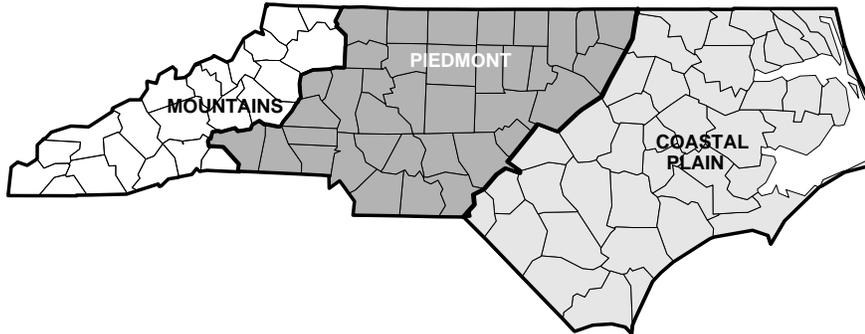
- 21% Did not hunt during 2011-12 season **(skip to question 8)**
- 8% 1 day
- 37% 2 to 5 days
- 16% 6 to 10 days
- 18% More than 10 days

7. About how many woodcock did you personally harvest during the 2011-12 season in North Carolina? **(check only one)**

- 32% 0 woodcock
- 46% 1 to 5 woodcock
- 12% 6 to 10 woodcock
- 7% 11 to 20 woodcock
- 3% More than 20 woodcock

8. Using the map below, please indicate the region in North Carolina in which you woodcock hunted the **most** days during the last 5 years. **(check only one)**

- 15% Mountains
- 41% Piedmont
- 44% Coastal Plain



9. In which 3 counties in North Carolina did you woodcock hunt the most days during the last 5 years?

County Name
1.
2.
3.

10. About how much money did you spend in North Carolina and outside North Carolina on things related to woodcock hunting in the past 12 months (for example – ammunition, gear, lodging, food and transportation costs, dog expenses, hunting leases, habitat management)? (**check only one**)
- 63% \$100 or less
 - 13% \$101 to \$200
 - 13% \$200 to \$500
 - 12% Over \$500

Areas Hunted and Hunting Styles

11. Please indicate **all** the areas where you hunted woodcock in North Carolina in the last 5 years. Note: All national forests in North Carolina are part of the Wildlife Commission game lands program. (**check all that apply**).
- 46% Private property (leased or rented by me or a hunting partner)
 - 50% Private property (owned by me or a hunting partner)
 - 44% Private property (not owned or leased by me or a hunting partner)
 - 41% Wildlife Commission game lands, including national forests
 - 3% Other (please specify): _____
12. In the last 5 years, where did you **most often** hunt woodcock in North Carolina? Note: All national forests in North Carolina are part of the Wildlife Commission game lands program. (**check only one**)
- 22% Private property (leased or rented by me or a hunting partner)
 - 28% Private property (owned by me or a hunting partner)
 - 26% Private property (not owned or leased by me or a hunting partner)
 - 22% Wildlife Commission game lands, including national forests
 - 2% Other (please specify): _____
13. Do you typically use a dog when woodcock hunting?
- 59% Yes
 - 41% No
14. Do you typically keep records of your woodcock hunting trips (numbers of birds flushed, number bagged, etc.)?
- 17% Yes
 - 83% No
15. Which of the following best describes your use of N.C. Wildlife Commission game lands for woodcock hunting during the last 5 years? Note: All national forests in North Carolina are part of the Wildlife Commission game lands program. (**check only one**)
- 64% I do not or very rarely hunt woodcock on Commission game lands
(**skip to question 17**)
 - 22% I have occasionally hunted woodcock on Commission game lands
 - 14% I have frequently hunted woodcock on Commission game lands

16. Please list the 3 game lands that you woodcock hunted most often on during the last 5 years.

Game Land Name
1.
2.
3.

17. Which of the following best describes your woodcock hunting outside North Carolina?

(check only one)

71% I have never hunted woodcock outside North Carolina (**skip to question 19**)

22% I occasionally hunt woodcock outside North Carolina

7% I frequently hunt woodcock outside North Carolina

18. If you hunt woodcock outside North Carolina, which of the following best describes your woodcock hunting outside North Carolina? (**check only one**)

16% During most of my woodcock hunting and harvest outside North Carolina I am specifically pursuing woodcock

84% Most of my woodcock hunting and harvest outside North Carolina occurs while I'm hunting other small game (for example – quail or grouse)

Season Preferences and Satisfaction

Currently, federal guidelines allow for a 45 day woodcock season that may begin as early as October 1st and must end no later than January 31st. The season may be split into 2 segments. In recent years, the woodcock season in North Carolina has occurred as late as possible. For example, the season in 2011-12 ran from December 15th through January 28th with no splits.

19. Considering the current woodcock season structure as described above, please indicate how much you disagree or agree with the following statements. (**check one for each statement**) Note: Please review all options before responding.

	Strongly Disagree	Neutral			Strongly Agree	
	1	2	3	4	5	Unsure
The Commission should keep the current woodcock season structure (mid-December to late January)	7%	6%	24%	14%	39%	9%
The Commission should shift the entire season earlier (mid-November to late December with no splits)	32%	14%	27%	6%	9%	11%
The Commission should split the season with some days occurring in November and the rest occurring in January	33%	8%	29%	9%	8%	13%

20. Some things may affect your woodcock hunting experiences and participation. Please indicate which of the following are not barriers, minor barriers, or major barriers to your woodcock hunting in North Carolina. **(check one for each possible barrier)**

	Not a Barrier	Minor Barrier	Major Barrier
Difficult to find areas to hunt woodcock on private property	42%	36%	22%
Difficult to find public lands that hold huntable numbers of woodcock	35%	31%	34%
Hunters hunting other species interfere with my woodcock hunting	59%	28%	14%
Woodcock populations are too low	29%	38%	33%
Work or family obligations or health problems	48%	36%	16%
Woodcock hunting is too expensive	84%	13%	3%
Woodcock hunting regulations are too confusing	71%	21%	7%
Other barrier (please specify):			

21. In the areas you most often hunt woodcock, how unlikely or likely are significant conflicts between woodcock hunters and hunters hunting other species in the following situations?

	Conflicts Very Unlikely		Neutral	Conflicts Very Likely		Unsure
	1	2	3	4	5	
If all or some of the woodcock hunting season was in November	18%	6%	24%	12%	34%	5%
If all or some of the woodcock hunting season was in December.	19%	10%	30%	16%	19%	5%

22. Since you began woodcock hunting what changes have you observed in the overall quality of your woodcock hunting in North Carolina? **(check only one)**

- 15% It has gotten much worse
- 21% It has gotten a little worse
- 39% It has stayed about the same
- 10% It has gotten a little better
- 3% It has gotten much better
- 13% Unsure

23. In general, how dissatisfied or satisfied are you with how the N.C. Wildlife Resources Commission manages woodcock in North Carolina? (**check only one**)

- 6% Very dissatisfied
- 10% Somewhat dissatisfied
- 39% Neither dissatisfied nor satisfied
- 18% Somewhat satisfied
- 10% Very satisfied
- 16% Unsure

Background Information

For us to understand people's responses to the previous questions more fully, we need to know a few things about your background. Remember you are volunteering to participate in this study and you can skip any questions you don't want to answer.

24. In what state do you live? (**check only one**)

- 95% North Carolina
- 5% Other _____

25. What is the highest level of formal education you have completed? (**check only one**)

- 5% Less than a high school graduate
- 16% High school graduate or GED
- 22% Some college or trade school
- 12% Associate or trade school degree
- 29% Bachelor's or four-year degree
- 16% Graduate or professional degree

26. Are you male or female?

- Male
- Female

27. Please indicate your age. (**check only one**)

- 0% Under 16
- 10% 16 to 24
- 15% 25 to 34
- 16% 35 to 44
- 23% 45 to 54
- 36% 55 and over

28. Which of the following best represents your gross household income (before taxes) last year? (**check only one**)

- 8% Less than \$20,000
- 18% \$20,000 to \$39,999
- 17% \$40,000 to \$59,999
- 14% \$60,000 to \$79,999
- 14% \$80,000 to \$99,999
- 9% \$100,000 to \$119,999
- 19% \$120,000 or more

Thank you for your participation! If you would like us to notify you when the results of the survey are posted online, please give us your email address:_____

If you have any other comments you would like to share with us, please use the space below or attach additional sheets.

Please use the enclosed postage-paid envelope, or mail this survey to:

**Woodcock Hunter Survey
N.C. Wildlife Resources Commission
1722 Mail Service Center
Raleigh, NC 27699-1722**

Appendix B: Survey Design and Analysis

Table 1. Survey Contacts.

Time (weeks)	Date ^a	Survey Method			
		Mail Exclusive (N = 2,142)	Web Primary (N = 430)	Email Primary (N = 150)	Email Exclusive (N = 150)
0	2/27/2012	Full survey mailing ^b	Letter invitation to complete survey online	Email invitation to complete survey online	Email invitation to complete survey online
1	3/7/2012	Postcard reminder to complete written survey	Postcard reminder to complete survey online	Email reminder to complete survey online	Email reminder to complete survey online
4	3/26/2012	Full survey mailing ^b	Letter reminder to complete survey online	Email reminder to complete survey online	Email reminder to complete survey online
8	4/23/2012	Full survey mailing ^b	Full survey mailing ^c	Full survey mailing ^c	Email reminder to complete survey online

^a Approximate date mailed. Varied slightly for some contacts

^b letter, survey, business reply envelope; no option to respond online

^c letter, survey, business reply envelope; with option to respond online

Table 2. Data Weighting.

License Name	Age (yrs.)	Sampling Frame		Respondents		Weight ^a
		Count	%	Count	%	
Age 65 Sportsman	16 to 24	0	0%	0	0%	-
Comprehensive Hunt	16 to 24	21	5%	4	3%	5.250
County Hunt (Basic)	16 to 24	4	1%	1	1%	4.000
Disabled Combo H/F/CRFL Basic	16 to 24	0	0%	0	0%	-
Disabled Sportsman w CRFL	16 to 24	0	0%	0	0%	-
Disabled Sptm	16 to 24	0	0%	0	0%	-
Hunt/Inland Fish (basic)	16 to 24	5	1%	1	1%	5.000
Ltime Comprehensive Hunt	16 to 24	1	0%	1	1%	1.000
NonRes Sportsman Adult	16 to 24	0	0%	0	0%	-
NonRes Sportsman Adult w CRFL	16 to 24	0	0%	0	0%	-
NonRes State Hunt (Basic)	16 to 24	4	1%	1	1%	4.000
NonRes State Hunt 6-Day	16 to 24	4	1%	1	1%	4.000
Res Ltime Over 70 Sportsman	16 to 24	0	0%	0	0%	-

License Name	Age (yrs.)	Sampling Frame		Respondents		Weight ^a
		Count	%	Count	%	
Res Ltime Over 70 Sportsman w CRFL	16 to 24	0	0%	0	0%	-
Res Sportsman Adult	16 to 24	8	2%	3	2%	2.667
Res Sportsman Adult w CRFL	16 to 24	9	2%	7	5%	1.286
Res State Hunt (Basic)	16 to 24	67	15%	18	12%	3.722
Res Uni Sptm/CRFL Adult	16 to 24	6	1%	3	2%	2.000
Sportsman	16 to 24	158	36%	37	25%	4.270
Sportsman Infant w CRFL	16 to 24	87	20%	43	29%	2.023
Sportsman Youth	16 to 24	2	0%	2	1%	1.000
Sportsman Youth w CRFL	16 to 24	26	6%	12	8%	2.167
Uni Disabled Vet Sptm/CRFL	16 to 24	0	0%	0	0%	-
Uni Totally Disabled Sptm/CRFL	16 to 24	0	0%	0	0%	-
Unified Age 65 Sptm/CRFL	16 to 24	0	0%	0	0%	-
Unified Sptm/CRFL	16 to 24	33	8%	12	8%	2.750
Unified Sptm/CRFL Youth	16 to 24	3	1%	2	1%	1.500
Age 65 Sportsman	25 to 34	0	0%	0	0%	-
Comprehensive Hunt	25 to 34	13	3%	5	3%	2.600
County Hunt (Basic)	25 to 34	7	2%	3	2%	2.333
Disabled Combo H/F/CRFL Basic	25 to 34	0	0%	0	0%	-
Disabled Sportsman w CRFL	25 to 34	0	0%	0	0%	-
Disabled Sptm	25 to 34	0	0%	0	0%	-
Hunt/Inland Fish (basic)	25 to 34	13	3%	5	3%	2.600
Ltime Comprehensive Hunt	25 to 34	2	0%	0	0%	-
NonRes Sportsman Adult	25 to 34	1	0%	1	1%	1.000
NonRes Sportsman Adult w CRFL	25 to 34	1	0%	0	0%	-
NonRes State Hunt (Basic)	25 to 34	2	0%	2	1%	1.000
NonRes State Hunt 6-Day	25 to 34	6	1%	1	1%	6.000
Res Ltime Over 70 Sportsman	25 to 34	0	0%	0	0%	-
Res Ltime Over 70 Sportsman w CRFL	25 to 34	0	0%	0	0%	-
Res Sportsman Adult	25 to 34	7	2%	2	1%	3.500
Res Sportsman Adult w CRFL	25 to 34	23	5%	14	9%	1.643
Res State Hunt (Basic)	25 to 34	66	15%	19	12%	3.474
Res Uni Sptm/CRFL Adult	25 to 34	6	1%	2	1%	3.000
Sportsman	25 to 34	190	43%	50	32%	3.800
Sportsman Infant w CRFL	25 to 34	30	7%	18	11%	1.667
Sportsman Youth	25 to 34	0	0%	0	0%	-
Sportsman Youth w CRFL	25 to 34	31	7%	14	9%	2.214
Uni Disabled Vet Sptm/CRFL	25 to 34	1	0%	0	0%	-
Uni Totally Disabled Sptm/CRFL	25 to 34	0	0%	0	0%	-
Unified Age 65 Sptm/CRFL	25 to 34	0	0%	0	0%	-
Unified Sptm/CRFL	25 to 34	45	10%	21	13%	2.143
Unified Sptm/CRFL Youth	25 to 34	0	0%	0	0%	-
Age 65 Sportsman	35 to 44	0	0%	0	0%	-

License Name	Age (yrs.)	Sampling Frame		Respondents		Weight ^a
		Count	%	Count	%	
Comprehensive Hunt	35 to 44	13	2%	6	3%	2.167
County Hunt (Basic)	35 to 44	6	1%	0	0%	-
Disabled Combo H/F/CRFL Basic	35 to 44	0	0%	0	0%	-
Disabled Sportsman w CRFL	35 to 44	0	0%	0	0%	-
Disabled Sptm	35 to 44	0	0%	0	0%	-
Hunt/Inland Fish (basic)	35 to 44	23	4%	13	6%	1.769
Ltime Comprehensive Hunt	35 to 44	9	2%	3	1%	3.000
NonRes Sportsman Adult	35 to 44	1	0%	1	0%	1.000
NonRes Sportsman Adult w CRFL	35 to 44	2	0%	2	1%	1.000
NonRes State Hunt (Basic)	35 to 44	6	1%	1	0%	6.000
NonRes State Hunt 6-Day	35 to 44	6	1%	3	1%	2.000
Res Ltime Over 70 Sportsman	35 to 44	0	0%	0	0%	-
Res Ltime Over 70 Sportsman w CRFL	35 to 44	0	0%	0	0%	-
Res Sportsman Adult	35 to 44	7	1%	4	2%	1.750
Res Sportsman Adult w CRFL	35 to 44	75	14%	44	20%	1.705
Res State Hunt (Basic)	35 to 44	46	9%	12	5%	3.833
Res Uni Sptm/CRFL Adult	35 to 44	8	2%	2	1%	4.000
Sportsman	35 to 44	246	46%	86	39%	2.860
Sportsman Infant w CRFL	35 to 44	0	0%	0	0%	-
Sportsman Youth	35 to 44	0	0%	0	0%	-
Sportsman Youth w CRFL	35 to 44	19	4%	14	6%	1.357
Uni Disabled Vet Sptm/CRFL	35 to 44	0	0%	0	0%	-
Uni Totally Disabled Sptm/CRFL	35 to 44	2	0%	2	1%	1.000
Unified Age 65 Sptm/CRFL	35 to 44	0	0%	0	0%	-
Unified Sptm/CRFL	35 to 44	62	12%	27	12%	2.296
Unified Sptm/CRFL Youth	35 to 44	0	0%	0	0%	-
Age 65 Sportsman	45 to 54	0	0%	0	0%	-
Comprehensive Hunt	45 to 54	11	2%	7	2%	1.571
County Hunt (Basic)	45 to 54	2	0%	1	0%	2.000
Disabled Combo H/F/CRFL Basic	45 to 54	0	0%	0	0%	-
Disabled Sportsman w CRFL	45 to 54	3	1%	2	1%	1.500
Disabled Sptm	45 to 54	1	0%	1	0%	1.000
Hunt/Inland Fish (basic)	45 to 54	28	5%	12	4%	2.333
Ltime Comprehensive Hunt	45 to 54	11	2%	10	3%	1.100
NonRes Sportsman Adult	45 to 54	0	0%	0	0%	-
NonRes Sportsman Adult w CRFL	45 to 54	5	1%	4	1%	1.250
NonRes State Hunt (Basic)	45 to 54	10	2%	2	1%	5.000
NonRes State Hunt 6-Day	45 to 54	6	1%	5	2%	1.200
Res Ltime Over 70 Sportsman	45 to 54	0	0%	0	0%	-
Res Ltime Over 70 Sportsman w CRFL	45 to 54	0	0%	0	0%	-
Res Sportsman Adult	45 to 54	7	1%	5	2%	1.400
Res Sportsman Adult w CRFL	45 to 54	138	24%	88	29%	1.568

License Name	Age (yrs.)	Sampling Frame		Respondents		Weight ^a
		Count	%	Count	%	
Res State Hunt (Basic)	45 to 54	30	5%	11	4%	2.727
Res Uni Sptm/CRFL Adult	45 to 54	4	1%	3	1%	1.333
Sportsman	45 to 54	261	45%	112	37%	2.330
Sportsman Infant w CRFL	45 to 54	0	0%	0	0%	-
Sportsman Youth	45 to 54	0	0%	0	0%	-
Sportsman Youth w CRFL	45 to 54	0	0%	0	0%	-
Uni Disabled Vet Sptm/CRFL	45 to 54	4	1%	4	1%	1.000
Uni Totally Disabled Sptm/CRFL	45 to 54	3	1%	1	0%	3.000
Unified Age 65 Sptm/CRFL	45 to 54	0	0%	0	0%	-
Unified Sptm/CRFL	45 to 54	60	10%	34	11%	1.765
Unified Sptm/CRFL Youth	45 to 54	0	0%	0	0%	-
Age 65 Sportsman	≥55	147	17%	81	15%	1.815
Comprehensive Hunt	≥55	9	1%	6	1%	1.500
County Hunt (Basic)	≥55	3	0%	0	0%	-
Disabled Combo H/F/CRFL Basic	≥55	4	0%	3	1%	1.333
Disabled Sportsman w CRFL	≥55	25	3%	20	4%	1.250
Disabled Sptm	≥55	8	1%	1	0%	8.000
Hunt/Inland Fish (basic)	≥55	32	4%	18	3%	1.778
Ltime Comprehensive Hunt	≥55	13	1%	11	2%	1.182
NonRes Sportsman Adult	≥55	0	0%	0	0%	-
NonRes Sportsman Adult w CRFL	≥55	9	1%	7	1%	1.286
NonRes State Hunt (Basic)	≥55	14	2%	8	1%	1.750
NonRes State Hunt 6-Day	≥55	6	1%	5	1%	1.200
Res Ltime Over 70 Sportsman	≥55	9	1%	7	1%	1.286
Res Ltime Over 70 Sportsman w CRFL	≥55	32	4%	16	3%	2.000
Res Sportsman Adult	≥55	6	1%	6	1%	1.000
Res Sportsman Adult w CRFL	≥55	224	26%	173	32%	1.295
Res State Hunt (Basic)	≥55	22	3%	8	1%	2.750
Res Uni Sptm/CRFL Adult	≥55	3	0%	2	0%	1.500
Sportsman	≥55	161	18%	80	15%	2.013
Sportsman Infant w CRFL	≥55	0	0%	0	0%	-
Sportsman Youth	≥55	0	0%	0	0%	-
Sportsman Youth w CRFL	≥55	0	0%	0	0%	-
Uni Disabled Vet Sptm/CRFL	≥55	0	0%	0	0%	-
Uni Totally Disabled Sptm/CRFL	≥55	10	1%	5	1%	2.000
Unified Age 65 Sptm/CRFL	≥55	89	10%	61	11%	1.459
Unified Sptm/CRFL	≥55	49	6%	25	5%	1.960
Unified Sptm/CRFL Youth	≥55	0	0%	0	0%	-

^a Weight calculation = (Sampling Frame Count/Respondents Count)*1

Table 3. Interpretation of effect sizes (adapted from Vaske 2008, p. 108).

Test	Minimal Relationship	Typical Relationship	Substantial Relationship
Cramer's <i>V</i>	.10	.30	.50
<i>eta</i>	.10	.243	.371
Cohen's <i>d</i>	.20	.50	.80

Table 4. Final disposition of contacts and response rates.

	Survey Method						Overall
	Mail Exclusive		Web Primary		Email Primary	Email Exclusive	
	No Email in ALVIN	Email in ALVIN	No Email in ALVIN	Email in ALVIN	Email in ALVIN	Email in ALVIN	
Total sent	1992	150	252	178	150	150	2872
Responded	895	115	88	116	100	56	1370
Incorrect address	30	2	2	1	0	0	35
Deceased	2	0	0	1	1	0	4
Ineligible	0	0	0	0	0	0	0
Refusal	9	0	2	0	0	0	11
No response	1056	33	160	60	49	94	1452
Adjusted response rate	46%	78%	35%	66%	67%	37%	48%

**Appendix C: Cross-tabulations
& statewide disagreement/agreement scores**

Table 1. Opinions on importance of woodcock hunting (Question 3) by description of woodcock hunting in North Carolina (Question 2).

How important is woodcock hunting to you?	Which of the following best describes your woodcock hunting activity in North Carolina? ^a	
	During most of my woodcock hunting and harvest I am specifically hunting woodcock	Most of my woodcock hunting and harvest occurs while I'm hunting other small game (for example – quail or grouse)
It's one of my least important hunting activities	2% ^c	13% ^b
It's less important than my other hunting activities	17% ^c	39% ^b
It's no more important than my other hunting activities	36%	40%
It's one of my most important hunting activities	40% ^b	8% ^c
It's my most important hunting activity	4% ^b	0% ^c

^a $\chi^2 = 80.36$; $df = 4$; $P = < .001$; Cramer's $V = .44$

^b Adjusted residual ≥ 2

^c Adjusted residual ≤ -2

Table 2. Number of days hunting woodcock during the 2011-12 season (Question 6) by description of woodcock hunting (Question 2) as reported during a 2012 survey of North Carolina woodcock hunters.

About how many days did you hunt woodcock during the 2011-12 season in North Carolina?	Which of the following best describes your woodcock hunting in North Carolina? ^a	
	During most of my woodcock hunting and harvest I am specifically hunting woodcock	Most of my woodcock hunting and harvest occurs while I'm hunting other small game (for example - quail or grouse)
Did not hunting during the 2011-12 season	10% ^c	24% ^b
1 day	5%	9%
2 to 5 days	47% ^b	34% ^c
6 to 10 days	16%	16%
More than 10 days	22%	17%

^a $\chi^2 = 12.11$; $df = 4$; $P = .017$; Cramer's $V = .17$

^b Adjusted residual ≥ 2

^c Adjusted residual ≤ -2

Table 3. Number of woodcock personally harvested during the 2011-12 season (Question 7) by description of woodcock hunting (Question 2) as reported during a 2012 survey of North Carolina woodcock hunters.

About how many woodcock did you personally harvest during the 2011-12 season in North Carolina?	Which of the following best describes your woodcock hunting in North Carolina? ^a	
	During most of my woodcock hunting and harvest I am specifically hunting woodcock	Most of my woodcock hunting and harvest occurs while I'm hunting other small game (for example - quail or grouse)
0 woodcock	27%	33%
1 to 5 woodcock	35% ^c	52% ^b
6 to 10 woodcock	21% ^b	9% ^c
11 to 20 woodcock	10%	5%
More than 20 woodcock	8% ^b	1% ^c

^a $\chi^2 = 22.31$; $df = 4$; $P < .001$; Cramer's $V = .27$

^b Adjusted residual ≥ 2

^c Adjusted residual ≤ -2

Table 4. Area woodcock hunted (Question 12) by woodcock hunting region (Question 8) as reported during a 2012 survey of North Carolina woodcock hunters.

In the last 5 years, where did you most often hunt woodcock in North Carolina?	Please indicate the region in North Carolina in which you woodcock hunted the most days during the last 5 years. ^a		
	Mountains	Piedmont	Coastal Plain
Private property (leased or rented by me or a hunting partner)	3% ^c	19%	28% ^b
Private property (owned by me or a hunting partner)	19%	31%	32%
Private property (not owned or leased by me or a hunting partner)	22%	31%	24%
Wildlife Commission game lands	52% ^b	19%	13% ^c
Other (please specify):	3%	0% ^c	3%

^a $\chi^2 = 52.93$; $df = 8$; $P < .001$; Cramer's $V = .264$

^b Adjusted residual ≥ 2

^c Adjusted residual ≤ -2

Table 5. Mean statewide disagreement/agreement scores regarding statements about the woodcock season structure in North Carolina (Question 19). (1=strongly disagree, 5=strongly agree)

Statement	Mean Score
The Commission should keep the current woodcock season structure (mid-December to late January).	3.8
The Commission should shift the entire season earlier (mid-November to late December with no splits).	2.4
The Commission should split the season with some days occurring in November and the rest occurring in January.	2.4

Table 6. Mean disagreement/agreement^a with woodcock season structure options (Question 19) by region most often hunted (Question 8) as reported during a 2012 survey of North Carolina woodcock hunters. Means within rows with the same letter were significantly different at $P < .05$ based on Tukey or Tamhane's T2 methods.

Please indicate the region in North Carolina in which you woodcock hunted the most days during the last 5 years.						
Please indicate how much you disagree or agree with the following statements about the woodcock season structure. (1=Strongly Disagree; 5=Strongly Agree	Mountains	Piedmont	Coastal Plain	<i>F</i>	<i>P</i>	<i>eta</i> ^b
	The Commission should keep the current woodcock season structure (mid-December to late January). ^a	3.6	3.8	3.8	0.93	.394
The Commission should shift the entire season earlier (mid- November to late December with no splits). ^b	2.8	2.3	2.4	2.54	.081	-
The Commission should split the season with some days occurring in November and the rest occurring in January. ^c	2.8 ^A	2.5	2.2 ^A	3.85	.022	.16

^a Mean disagreement/agreement was based on a five point scale: Strongly Disagree = 1, Strongly Agree = 5. Unsure responses were not included in the mean calculations.

^b *Eta* not reported when $P \geq .05$.

Table 7. Mean disagreement/agreement^a with woodcock season structure options (Question 19) by description of woodcock hunting (Question 2) as reported during a 2012 survey of North Carolina woodcock hunters.

Please indicate how much you disagree or agree with the following statements about the woodcock season structure. (1=Strongly Disagree; 5=Strongly Agree)	Which of the following best describes your woodcock hunting in North Carolina?		<i>t</i>	<i>P</i>	<i>Cohen's d</i> ^b
	During most of my woodcock hunting and harvest I am specifically hunting woodcock	Most of my woodcock hunting and harvest occurs while I'm hunting other small game (for example – quail or grouse)			
The Commission should keep the current woodcock season structure (mid-December to late January).	4.0	3.7	1.90	.059	-
The Commission should shift the entire season earlier (mid-November to late December with no splits).	1.9	2.5	-3.48	.001	-0.459
The Commission should split the season with some days occurring in November and the rest occurring in January.	2.1	2.5	-1.97	.049	-0.259

^a Mean disagreement/agreement was based on a five point scale: Strongly Disagree = 1, Strongly Agree = 5. Unsure responses were not included in the mean calculations.

^b *Cohen's d* not reported when $P \geq .05$.

Table 8. Opinions on changes in woodcock hunting quality (Question 22) by region most often woodcock hunted (Question 8).

Please indicate the region in North Carolina in which you woodcock hunted the most days during the last 5 years. ^a			
Since you began woodcock hunting what changes have you seen in the overall quality of your woodcock hunting in North Carolina?	Mountains	Piedmont	Coastal Plain
It has gotten much worse	15%	14%	16%
It has gotten a little worse	34% ^b	17%	20%
It has stayed about the same	31%	41%	41%
It has gotten a little better	3%	15% ^b	5% ^c
It has gotten much better	3%	3%	2%
Unsure	14%	9%	15%

^a $\chi^2 = 21.01$; $df = 10$; $P = .021$; Cramer's $V = .16$

^b Adjusted residual ≥ 2

^c Adjusted residual ≤ -2

Table 9. Barriers to woodcock hunting (Question 20) by woodcock hunting region (Question 8) as reported during a 2012 survey of North Carolina woodcock hunters.

Please indicate which of the following are not barriers, minor barriers, or major barriers to your woodcock hunting in North Carolina		Please indicate the region in North Carolina in which you woodcock hunted the most days during the last 5 years.		
		Mountains	Piedmont	Coastal Plain
Difficult to find areas to hunt woodcock on private land ^a	Not a Barrier	22% ^f	41%	47% ^e
	Minor Barrier	44%	39%	34%
	Major Barrier	33% ^e	19%	19%
Difficult to find public lands that hold huntable numbers of woodcock ^b	Not a Barrier	9% ^f	36%	42% ^e
	Minor Barrier	36%	36%	28%
	Major Barrier	55% ^e	28%	30%
Hunters hunting other species interfere with my woodcock hunting ^c	Not a Barrier	66%	52%	59%
	Minor Barrier	23%	29%	28%
	Major Barrier	11%	19%	13%
Woodcock populations are too low ^d	Not a Barrier	13% ^f	29%	34% ^e
	Minor Barrier	30%	42%	38%
	Major Barrier	57% ^e	29%	28%

^a $\chi^2 = 12.28$; $df = 4$; $P = .015$; Cramer's $V = .13$

^b $\chi^2 = 25.13$; $df = 4$; $P < .001$; Cramer's $V = .18$

^c $\chi^2 = 5.36$; $df = 4$; $P = .253$

^d $\chi^2 = 20.17$; $df = 4$; $P < .001$; Cramer's $V = .16$

^e Adjusted residual ≥ 2

^f Adjusted residual ≤ -2

Table 10. Opinions on conflicts with other hunters (Question 21) by woodcock hunting region (Question 8) as reported during a 2012 survey of North Carolina woodcock hunters.

		Please indicate the region in North Carolina in which you woodcock hunted the most days during the last 5 years.		
In the areas you most often hunt woodcock, how unlikely or likely are significant conflicts between woodcock hunters and hunters hunting other species in the following situations? (1=conflicts very unlikely, 5=conflicts very likely)		Mountains	Piedmont	Coastal Plain
If all or some of the woodcock hunting season was in November ^a	1	29%	12% ^f	23%
	2	13% ^e	5%	5%
	3	16%	22%	24%
	4	9%	16%	12%
	5	25%	40% ^e	30%
	Unsure	7%	3%	6%
If all or some of the woodcock hunting season was in December ^b	1	30%	12%	23%
	2	16%	13%	8%
	3	25%	31%	28%
	4	13%	17%	16%
	5	11%	24%	18%
	Unsure	5%	3%	6%

^a $\chi^2 = 20.69$; $df = 10$; $P = .023$; Cramer's $V = .17$

^b $\chi^2 = 17.70$; $df = 10$; $P = .060$

^e Adjusted residual ≥ 2

^f Adjusted residual ≤ -2

Appendix D: Frequency distributions of County most often woodcock hunted and Game Land most often woodcock hunted

Table 1. Percent frequency of county listed as top 3 counties woodcock hunted the most days during the last 5 years.

County	% of total responses		County	% of total responses		County	% of total responses
Pender	6.9%		Alamance	2.3%		Mecklenburg	0.8%
Anson	5.9%		Transylvania	2.1%		Henderson	0.8%
Richmond	5.9%		Forsyth	2.1%		Warren	0.8%
Bladen	5.1%		Bertie	2.0%		Gaston	0.8%
Granville	4.8%		Randolph	2.0%		Haywood	0.8%
Carteret	4.7%		Wake	2.0%		Tyrrell	0.7%
Caldwell	4.4%		Macon	2.0%		Hoke	0.7%
Montgomery	4.3%		Watauga	1.9%		Wilson	0.7%
Davie	4.3%		Robeson	1.9%		Perquimans	0.6%
Hyde	4.1%		Wayne	1.9%		Lenoir	0.6%
Craven	4.0%		Northampton	1.8%		Martin	0.6%
Brunswick	3.9%		Avery	1.8%		Greene	0.4%
Duplin	3.8%		Franklin	1.7%		Pasquotank	0.4%
Rowan	3.6%		Alexander	1.7%		Swain	0.4%
Beaufort	3.5%		Pitt	1.7%		Catawba	0.3%
Halifax	3.3%		Johnston	1.6%		Chatham	0.2%
Burke	3.3%		Surry	1.6%		Polk	0.2%
Guilford	3.2%		Alleghany	1.6%		Cherokee	0.2%
Ashe	3.2%		Cleveland	1.5%		Dare	0.2%
Orange	3.2%		Iredell	1.5%			
Edgecombe	3.1%		Jackson	1.4%			
Durham	3.0%		Graham	1.4%			
Stanly	3.0%		New Hanover	1.4%			
Wilkes	2.9%		Stokes	1.4%			
Jones	2.8%		Nash	1.4%			
Columbus	2.8%		McDowell	1.3%			
Caswell	2.8%		Cabarrus	1.3%			
Clay	2.7%		Washington	1.3%			
Person	2.7%		Buncombe	1.2%			
Davidson	2.7%		Currituck	1.2%			
Onslow	2.6%		Madison	1.2%			
Moore	2.5%		Cumberland	1.2%			
Sampson	2.5%		Mitchell	1.1%			
Yadkin	2.5%		Rockingham	1.0%			
Union	2.5%		Gates	1.0%			
Scotland	2.4%		Camden	1.0%			
Pamlico	2.3%		Yancey	1.0%			
Hertford	2.3%		Harnett	0.9%			
Lincoln	2.3%		Rutherford	0.8%			

Table 2. Percent frequency of game lands listed as the top 3 game lands woodcock hunted the most often in the last 5 years.

Game Land	% of total responses		Game Land	% of total responses
Pisgah National Forest	14.2%		Columbus County	1.2%
Nantahala National Forest	12.2%		Goose Creek	1.2%
Croatan National Forest	11.1%		Pungo River	1.1%
Pee Dee River	10.7%		Pond Mountain	0.8%
Sandhills	10.5%		North River	0.8%
Butner Falls of Neuse	10.2%		Angola Bay	0.7%
Holly Shelter	9.9%		Hyco	0.7%
Uwharrie National Forest	8.1%		Kerr Scott	0.7%
Perkins	7.1%		Nicholson Creek	0.7%
Alcoa	5.8%		Rockfish Creek	0.7%
Sandy Mush	4.5%		Carteret County	0.6%
Jordon	4.2%		Green River	0.6%
Three Top	3.7%		Green Swamp	0.6%
R. Wayne Bailey- Caswell	3.6%		Gull Rock	0.6%
Thurmond Chatham	3.2%		Juniper Creek	0.6%
Chowan Swamp	3.0%		Sampson County	0.6%
Roanoke River Wetlands	2.8%		Tillery	0.6%
Brunswick County	2.4%		Van Swamp	0.6%
Elk Knob	2.3%		Stones Creek	0.6%
South Mountains	2.3%			
Needmore	2.2%			
Linwood	2.1%			
White Oak	2.1%			
Neuse River	2.1%			
Bertie County	1.8%			
Cape Fear River Wetlands	1.5%			
Lantern Acres	1.5%			
Mayo	1.5%			
Mitchell River	1.4%			
Buffalo Cove	1.4%			
Alligator River	1.4%			
Johns River	1.4%			
Harris	1.4%			
Second Creek	1.3%			
Pisgah WRC	1.2%			
Bladen Lakes State Forest	1.2%			