Wildlife Society Bulletin 36(2):277–285; 2012; DOI: 10.1002/wsb.132

Original Article

Attitudes and Motivations of Tennessee Deer Hunters Toward Quality Deer Management

CRAIG A. HARPER,[1] *Department of Forestry, Wildlife, and Fisheries, University of Tennessee, 2431 Joe Johnson Drive, Knoxville, TN 37996, USA*
CHRISTOPHER E. SHAW, *Department of Forestry, Wildlife, and Fisheries, University of Tennessee, 2431 Joe Johnson Drive, Knoxville, TN 37996, USA*
J. MARK FLY, *Department of Forestry, Wildlife, and Fisheries, University of Tennessee, 2431 Joe Johnson Drive, Knoxville, TN 37996, USA*
JARED T. BEAVER, *Department of Forestry, Wildlife, and Fisheries, University of Tennessee, 2431 Joe Johnson Drive, Knoxville, TN 37996, USA*

ABSTRACT Attitudes and motivations of white-tailed deer (*Odocoileus virginianus*) hunters are important for state wildlife agencies to consider when they are trying to meet harvest goals for the species. In recent years, interest in quality deer management (QDM) has grown, but little is known about hunter support for QDM. We surveyed hunters on private hunting clubs and Wildlife Management Areas where QDM was practiced, as well as statewide sportsman license holders in Tennessee, USA, following the 2004–2005 deer-hunting season to identify characteristics, attitudes, and motivations of these hunter groups. Respondents in all 3 hunter groups identified QDM as a "sensible management strategy for white-tailed deer" and a majority (>76%) of the hunters preferred hunting areas managed under QDM guidelines. Hunter groups varied in their responses related to specific QDM guidelines and implementation. Nonetheless, all 3 hunter groups were primarily interested in herd health and buck quality, wanted a reduction in the buck bag limit, and supported harvest of antlerless deer. Motivations to hunt varied by hunter group, but respondents in all 3 groups indicated that experiencing nature was the number one reason for hunting. Our survey results suggest that though opinions may vary on how QDM might be implemented, the general deer-hunting public in Tennessee has moved away from the traditional deer-management philosophy that allowed buck harvest without age restrictions and restricted antlerless harvest. Using biological justification along with hunter opinion, we recommend that state wildlife agencies consider providing QDM opportunities where appropriate and offer annual education programs to improve hunters' understanding of deer-management strategies. This should help ensure hunter satisfaction and will help state wildlife agencies meet deer-management objectives.

KEY WORDS hunter attitudes, hunter motivations, *Odocoileus virginianus*, quality deer management, white-tailed deer.

Hunter attitudes and satisfaction influence white-tailed deer (*Odocoileus virginianus*; hereafter, deer) management programs (Stedman et al. 2004). Balancing hunter satisfaction with management strategies can be difficult for state wildlife agencies (Woods et al. 1996, Messmer et al. 1998). Deer managers typically depend on hunter harvest to control deer density and meet management goals, and hunter satisfaction can have a considerable influence on harvest levels (Riley et al. 2003).

In recent years, increasing numbers of hunters have expressed interest in quality deer management (QDM; Collier and Krementz 2006)—a management strategy that protects young bucks in an effort to increase buck age structure in the population and promotes harvest of an appropriate number of does in an effort to balance the sex ratio and maintain deer density within habitat constraints (Brothers and Ray 1975, Miller and Marchinton 1995). QDM differs from other management approaches that may allow buck harvest with no restriction related to buck age and fewer opportunities to harvest female deer. As interest in QDM has increased, the amount of land leased and purchased for deer hunting has also increased (U.S. Fish and Wildlife Service 2001, 2006), and a majority of these properties are managed under some type of QDM strategy (Hamilton et al. 1995*b*, Ditchkoff et al. 1997).

Many state wildlife agencies have worked to provide QDM opportunities. At least 22 states have some type of antler restriction, with the intention of helping young bucks reach older age classes before they are eligible for harvest (Adams et al. 2010). All states with open deer seasons now provide opportunities to kill does; some states are more liberal than others, especially when and where deer density reached unacceptable levels (Adams et al. 2010). Some states have imposed these regulations statewide, while others have specific regulations in particular areas or on designated Wildlife Management Areas (WMAs) in an effort to provide hunters

Received: 23 May 2011; Accepted: 24 January 2012;
Published: 3 May 2012

[1]*E-mail: charper@utk.edu*

who have limited access to private lands an opportunity to hunt an area managed under QDM guidelines (Adams et al. 2010).

Because QDM emphasizes hunters as managers, there is increased importance placed on ethics and educational efforts (Hamilton et al. 1995*a*, Wegner 1995), which may produce a subgroup of deer hunters with a greater interest in deer management as opposed to sole interest in deer harvest. Subgroups of deer hunters with different management philosophies could pose challenges for state wildlife agencies trying to manage a deer herd (Riley et al. 2003, Collier and Krementz 2006). Little information, however, has been collected to determine motivations and attitudes of hunters participating in QDM programs (Woods et al. 1996, Enck et al. 2003). Woods et al. (1996) reported that management involvement influenced the satisfaction of hunters who practiced QDM more than buck sign and sightings. It is reasonable to assume this is more commonplace among deer hunters today than ever before because they are inundated with information on deer, deer hunting, and how to manage deer through various media (especially television, magazines, and websites), which likely influences their attitudes and motivations.

As interest and involvement with QDM continue to increase, it is important for wildlife managers to understand the characteristics, attitudes, and motivations of the growing number of hunters supporting QDM. Further, it is important to identify differences in those hunters practicing QDM on public lands from those practicing QDM on private lands. We surveyed hunters who were members of QDM leases, hunters who hunted on specific WMAs managed under QDM guidelines (hereafter, WMA hunters), and statewide sportsman license holders across Tennessee, USA. Our objectives were to determine 1) characteristics of hunter groups, 2) satisfaction and motivations of hunter groups, and 3) attitudes and knowledge of hunter groups toward various QDM practices. Based on our involvement and interaction with deer hunters and deer-hunting clubs across Tennessee while delivering Extension programs, we hypothesized that characteristics among hunter groups would be similar. However, we predicted club hunters and WMA hunters would display greater knowledge of QDM than would statewide hunters and that their motivations for hunting would differ.

SURVEY POPULATION AND STUDY AREA

We surveyed hunters from 4 private-land hunting clubs (Ames Plantation, Jasper Mountain, Myers Cove, and Rocky River), 3 WMAs with antler restrictions (Catoosa, Oak Ridge, and Yuchi Refuge), and statewide sportsman license holders in Tennessee (Shaw 2008). We selected the 4 hunting clubs for survey because they had been established for several years and they were recommended by Tennessee Wildlife Resources Agency (TWRA) biologists as properties with a good reputation for collecting data and cooperating with the state agency. Importantly for our study, the WMAs were selected and deemed appropriate for our survey because they had been managed under QDM guidelines for several years, giving hunters on those areas time to form an opinion of their hunting experience on those properties.

Ames Plantation was a 7,549-ha property in west Tennessee and had a lease price of US$1,250 per hunter, with a minimum gross Boone and Crockett score antler restriction of 110″ to protect bucks <3 years old from harvest. The remaining clubs were located on or near the Cumberland Plateau and had similar antler restrictions (100 in. min score to protect bucks <3 yr old). Myers Cove was a 984-ha private property and had an annual membership fee of US$650. Both Jasper Mountain (3,475 ha) and Rocky River (1,942 ha) had an annual membership fee of US$525. An annual doe harvest goal was set for all clubs, depending on estimated deer populations in each area. This normally ranged from 1 doe/50 acres (approx. 23 ha) to 1 doe/100 acres (approx. 40.5 ha). Meetings were held annually at each club to review restrictions and guidelines.

Wildlife Management Area hunters were drawn for quota hunts in a given area. During the 2004–2005 season, Oak Ridge (14,974 ha in the Ridge and Valley Physiographic Province) and Yuchi (955 ha in the Ridge and Valley Physiographic Province) Wildlife Management Areas had antler restrictions that required bucks to have ≥4 1-in. (2.5 cm) or greater antler points on one side of the rack or an outside antler spread of ≥15 in. (38 cm). Antlered bucks legal for harvest on Catoosa WMA (32,271 ha on the Cumberland Plateau) during the 2004–2005 season were required to have ≥4 1-in. antler points on one side of the rack. Antler restrictions at WMAs were implemented to protect bucks <2 years old. Deer hunting at Oak Ridge and Yuchi Refuge was by quota hunts (limited no. of drawn permits) only, while Catoosa offered a mixture of quota and nonquota hunts.

Statewide sportsman license holders were surveyed at random (see below) and represented the general Tennessee hunter. These hunters are an important segment of the deer-hunting population because they comprise 85% of WMA quota hunt applicants. Although it was possible for some of the statewide sportsman license holders we surveyed to also have been in the population of WMA hunters we surveyed, subsequent review of survey participants showed there was no overlap. During fiscal year 2004–2005, this group comprised 32% of license sales and contributed >US$6 million in revenue (Tennessee Wildlife Resources Agency, unpublished data). Sportsman license holders also accounted for 43% of the statewide deer harvest and 58% of the WMA harvest during the 2004–2005 season (TWRA 2005).

METHODS

Data Collection

In 2005, we used a modified Dillman mail survey method (survey, reminder, survey; Dillman 1978) to evaluate hunter opinions about deer hunting and management, QDM, and hunter demographic characteristics (Shaw 2008). We developed our survey instrument after considering hunter

attitudes and motivations as reported in the literature (Potter et al. 1973, Kellert 1978, Decker and Connelly 1989, Hammitt et al. 1990, Woods et al. 1996). The instrument was reviewed by biologists with the TWRA and managers of the private hunting clubs. We field tested and refined our survey on a private hunting club for 2 seasons (2003, 2004) prior to implementation. We mailed questionnaires (Shaw 2008) along with a postage-paid return envelope and a cover letter explaining the study and the importance of each hunter's response. After 2 weeks, hunters that did not respond to the initial mailing were sent a reminder card–thank-you letter. Two weeks later, a second questionnaire, cover letter, and postage-paid return envelope were sent to hunters who had not responded to either of the previous mailings. We did not conduct a nonresponse-bias survey.

Because of the relatively small number of members in each hunting club (range = 17–91), all club members received a questionnaire (Table 1). For the WMAs, where the number of permit holders for quota hunts ranged from 297 to 988, simple random sampling was used. After correcting the sample sizes with a finite-population correction factor and an assumed 40% response rate (Kalton 1983, Henry 1990), we drew 3 samples for the WMAs: 1,000 (Catoosa), 900 (Oak Ridge), and 299 (Yuchi). Table 1 shows the number eligible from each sample after excluding those whose address had changed and who, therefore, did not receive the survey by mail. Similarly, we surveyed a random sample of 2004–2005 sportsman license holders (1,422) to measure attitudes representative of the general hunting population in Tennessee, and the final number eligible was 1,396 (Table 1).

Data Analyses

Hunters were divided into 3 groups (club, WMA, and sportsman) for statistical comparisons of demographic characteristics, knowledge and attitudes pertaining to deer hunting and QDM, satisfaction levels, and rankings of motivations for deer hunting. We analyzed categorical data using Pearson Chi-square tests. An alpha level of 0.05 was used to detect differences among hunter groups, while an adjusted residual value of ± 2 indicated tendencies between groups. Because there was a significant (Wilks' $\lambda < 0.001$) difference in the 2-factor repeated-measures analysis of variance (ANOVA) among hunter groups when ranking the reasons for hunting deer, reasons for hunting deer were analyzed separately within hunter groups using a single-factor repeated-measures ANOVA. We used an alpha level of 0.05 to indicate differences, with a Bonferroni adjustment used for multiple comparisons. For questions specific to hunter groups and areas, descriptive statistics or Pearson Chi-square tests were used when appropriate. We analyzed responses to open-ended questions within the WordStat 5.0 content analysis module within the QDA Miner software program (Provalis Research, Montreal, QC, Canada). We used the phrase finder function within WordStat to classify phrases with a minimum of 2 words and frequency of >3 occurrences into appropriate categories within dictionaries.

Table 1. Response rates for club hunters, sportsman license holders, and Wildlife Management Area (WMA) hunters surveyed following the 2004–2005 deer-hunting season in Tennessee, USA.

Hunter group	*n*, eligible	*n*, returned	Response rate (%)
Clubs			
Ames Plantation	71	52	73.2
Jasper Mountain	91	58	63.7
Myers Cove	17	14	82.4
Rocky River	81	56	69.1
Sportsman License Holders	1,396	714	51.1
Wildlife Management Areas (WMAs)			
Oak Ridge	892	492	55.2
Catoosa	988	534	54.0
Yuchi Refuge	297	189	63.6

RESULTS

A total of 2,109 surveys were returned with response rates ranging from 51.1% to 82.4% (Table 1). We considered our response rates adequate to reflect the general opinion of the hunter groups surveyed. However, a nonresponse bias check may have provided better confidence in the results. We acknowledge that our results pertain only to those who responded and are not intended to include the opinions of those who did not respond. Most sportsman license holders (99%) reported hunting deer $\geq$1 day during the 2004–2005 season and 96% of those hunted in Tennessee. The majority of club (89%) and WMA hunters (80%) reported hunting $\geq$1 day on each of their respective study areas during the 2004–2005 season.

The average age of survey participants among groups was 44. The majority of hunters were male (98%) with no differences ($P = 0.534$) among hunter groups (club, sportsman, and WMA). The highest level (6 levels provided in the survey; Shaw 2008) of education completed differed among hunter groups ($\chi^2 = 55.42$, df = 10, $P = 0.001$). The plurality of club hunters (35%) listed some college as the highest level of education completed; an additional 36% graduated from college. The plurality of sportsman license holders (33%) and WMA hunters (32%) were high school graduates or Graduate Equivalence Diploma recipients; an additional 24% and 21% of sportsman license holders and WMA hunters, respectively, graduated from college. Although the plurality of each hunter group lived in a rural area (but not on a farm), differences existed among hunter groups ($\chi^2 = 57.69$, df = 10, $P = 0.001$), with club hunters more likely to live in cities with >100,000 people. Differences in 2004 household income levels (8 levels provided in the survey; Shaw 2008) existed among hunter groups ($\chi^2 = 95.25$, df = 14, $P = 0.001$), with the greatest percentage of club hunters (33%) reporting a higher income level (>US$100,000) than the greatest percentage of sportsman (31%) and WMA hunters (30%; which was US$50,000–74,999).

The majority of hunters rated themselves at least "somewhat knowledgeable" about QDM, though differences existed among hunter groups (Table 2). Of hunters who considered themselves somewhat to very knowledgeable, the

Table 2. Knowledge and attitudes toward Quality Deer Management by club hunters, sportsman license holders, and Wildlife Management Area (WMA) hunters surveyed (% of responses) following the 2004–2005 deer-hunting season in Tennessee, USA.

Response	Club	Sportsman	WMA
How would you rate your knowledge of Quality Deer Management?			
($\chi^2 = 18.722$, df = 4, $P = 0.001$)	$n = 176$	$n = 679$	$n = 1{,}194$
Not at all knowledgeable	2.3	13.3	11.0
Somewhat knowledgeable	80.7	74.7	76.2
Very knowledgeable	17.0	12.1	12.8
The following responses are only from hunters who consider themselves at least somewhat knowledgeable of Quality Deer Management.			
Where possible, Quality Deer Management is a sensible management philosophy.	$n = 167$	$n = 532$	$n = 939$
($\chi^2 = 3.057$, df = 2, $P = 0.217$)	98.2	96.1	95.3
I prefer to hunt areas under QDM restrictions.	$n = 159$	$n = 461$	$n = 913$
($\chi^2 = 15.659$, df = 2, $P < 0.001$)	90.6	76.4	77.3
What is the primary objective of a QDM program?[a]			
Sex ratio	$n = 63$; 22.1%	$n = 138$; 17.5%	$n = 265$; 18.7%
Age structure	$n = 53$; 18.6%	$n = 82$; 10.4%	$n = 183$; 12.9%
Herd quality and health	$n = 44$; 15.4%	$n = 140$; 17.7%	$n = 225$; 15.8%
Herd control	$n = 43$; 15.1%	$n = 95$; 12.0%	$n = 132$; 9.3%
Buck quality	$n = 36$; 12.6%	$n = 119$; 15.1%	$n = 235$; 16.5%
Food resources	$n = 27$; 9.5%	$n = 132$; 16.7%	$n = 216$; 15.2%
Antler restrictions	$n = 17$; 6.0%	$n = 49$; 6.2%	$n = 107$; 7.5%
Hunting experience	$n = 2$; 0.7%	$n = 8$; 1.0%	$n = 12$; 0.8%
Genetics	$n = 0$; 0.0%	$n = 24$; 3.0%	$n = 33$; 2.3%
Stop poaching	$n = 0$; 0.0%	$n = 3$; 0.4%	$n = 12$; 0.8%
What is the primary benefit of a QDM program?[a]			
Healthier herd	$n = 74$; 43.0%	$n = 221$; 39.5%	$n = 358$; 36.3%
Buck quality	$n = 40$; 23.3%	$n = 206$; 36.8%	$n = 382$; 38.7%
Older (mature) deer	$n = 18$; 10.5%	$n = 36$; 6.4%	$n = 100$; 10.1%
Balance sex ratio	$n = 19$; 11.0%	$n = 28$; 5.0%	$n = 44$; 4.5%
Bigger deer	$n = 5$; 2.9%	$n = 31$; 5.5%	$n = 50$; 5.1%
Quality hunting experience	$n = 10$; 5.8%	$n = 22$; 3.9%	$n = 31$; 3.1%
Genetics	$n = 0$; 0.0%	$n = 8$; 1.4%	$n = 14$; 1.4%
Herd size	$n = 3$; 1.7%	$n = 5$; 0.9%	$n = 6$; 0.6%
Improve habitat	$n = 3$; 1.7%	$n = 3$; 0.5%	$n = 2$; 0.2%
How many years should it take before QDM objectives are realized?			
($\chi^2 = 10.160$, df = 6, $P = 0.118$)	$n = 173$	$n = 566$	$n = 1{,}047$
≤3 yr	23.7	35.2	32.7
4 yr	23.1	17.5	17.3
5 yr	35.8	32.0	32.3
≥6 yr	17.3	15.4	17.8
Which is the most important factor in the success of a QDM program?			
($\chi^2 = 43.701$, df = 4, $P < 0.001$)	$n = 172$	$n = 564$	$n = 1{,}033$
Age	61.6	37.2	35.7
Nutrition	22.7	32.6	35.2
Genetics	15.7	30.1	29.0
How old should a buck be before it is "legal" to harvest in a QDM program?			
($\chi^2 = 17.471$, df = 6, $P = 0.008$)	$n = 172$	$n = 561$	$n = 1{,}029$
2 yr	20.3	23.9	26.6
3 yr	68.6	55.1	56.3
4 yr	9.9	19.1	14.6
>4 yr	1.2	2.0	2.5
What do you think is the best antler restriction in a QDM program?			
($\chi^2 = 828.952$, df = 10, $P < 0.001$)	$n = 166$	$n = 489$	$n = 940$
Antler point	11.4	49.5	58.7
Spread	2.4	6.5	5.6
Main beam length	0.0	0.8	1.1
Gross score	65.7	2.7	1.2
Depends on average characteristics of bucks in that area	18.7	23.9	16.8
No antler restriction, but impose a 1-buck limit	1.8	16.6	16.6

[a] Open-ended question that requires hunters to list responses.

majority (among all 3 hunter groups) thought QDM was a sensible management philosophy (Table 2).

The majority of hunters preferred to hunt areas under QDM guidelines, but club hunters (91%) were more likely to prefer hunting QDM areas than did other hunters (Table 2).When asked open-ended questions about the primary objectives and benefits of a QDM program, hunters from all 3 groups identified multiple factors related to deer quality and health (Table 2). Sex ratio, age structure, and deer health and quality were the most common responses (Table 2). All 3 hunter groups listed a healthier herd and buck quality as the primary benefit of a QDM program

(Table 2).When asked how long it should take before QDM objectives are realized after initiation of a QDM program, all generally agreed ≤5 years (Table 2).

The most important factor in the success of a QDM program from the hunters' perspective was age; however, differences existed among groups (Table 2). In a question related to factors influencing QDM success, a majority of hunters (86%) from all 3 groups ($\chi^2 = 5.39$, df = 2, $P = 0.068$) expected deer to weigh more on properties managed under QDM guidelines.

When asked how old a buck should be before it is "legal" to harvest in a QDM program, the majority (>55%) of hunters responded "3 years old," though opinions differed among hunter groups (Table 2). When asked what the best antler restriction was for a QDM program, WMA hunters and general sportsman license holders favored antler-point restrictions, while club hunters favored gross Boone and Crockett antler score (Table 2).

Most hunters were in agreement that antler-point restrictions should be implemented statewide in Tennessee, however, opinions differed by hunter groups (Table 3). Club hunters (73%) were more likely to say antler restrictions should be implemented statewide than were the other 2 hunter groups. More than half of hunters thought the statewide antlered buck limit in Tennessee should be ≤2; however, opinions differed by hunter group (Table 3). Hunter groups differed ($\chi^2 = 13.65$; df = 4; $P = 0.008$) in their preference for shooting antlered bucks, does, or fawns; however, the majority of hunters in all 3 groups preferred to shoot antlered bucks. The majority of hunters agreed that a "quality" buck and a "trophy" buck were not the same thing, and no differences were observed among groups (Table 3).

Few hunters agreed that spike bucks should be killed intentionally or that buck fawns should be legal for harvest (Table 4). Club hunters were less likely to believe spike bucks should be killed intentionally when compared with the other groups (Table 4). Hunter opinions about harvesting older bucks with poor racks differed among groups (Table 4). Sportsman license holders were more likely to think older bucks with poor racks should be culled than the other 2 groups. Most hunters supported including does in the harvest, but club hunters were more likely to support doe fawns in the harvest than were sportsman license holders or WMA hunters (Table 4).

Hunters indicated experiencing nature was the most important reason for hunting deer, though differences (Wilks' $\lambda < 0.001$) existed among groups for all remaining reasons (Table 5). The least important reasons to hunt deer for all hunters were to shoot deer and to reduce the deer population.

DISCUSSION

Respondents from all 3 hunter groups clearly displayed interest and satisfaction in QDM as a "sensible management strategy." Although we found several statistical differences among hunter groups, they were not substantial enough to suggest wide separation in knowledge, motivations, or level of satisfaction among groups. We believe most of the differences that were related to knowledge of deer biology and management among groups were attributable to annual educational programs held for club hunters, which provided them with biological justification for the guidelines in place at club properties.

Demographics in our study were consistent with others (Enck et al. 2000). Middle-aged males dominated our survey populations. Our surveys also substantiated that hunt leases provide increased opportunity for more educated and affluent hunters because club members generally had a higher level of education and annual income than did other hunters.

Hunters believed the primary objectives of QDM centered on deer quality and health, both from a social and an individual animal perspective. Sex ratio, herd health, buck quality, and nutrition were the most commonly used words–phrases when they answered an open-ended question regarding hunter objectives. All 3 groups of hunters clearly showed interest in managing deer and deer habitat and were not solely interested in harvesting deer. The objectives and perceived benefits of QDM were intrinsically related; herd health and buck "quality" (i.e., age and size of bucks) were the primary benefits listed by all 3 hunter groups. This is a deviation from traditional deer management, which often allows harvest of any buck, regardless of age or size (Hamilton et al. 1995*b*, *c*).

None of the hunter groups had unrealistic expectations about the time required before QDM objectives might be realized. Hamilton et al. (1995*b*) noted that it may take 5 years before results are realized in a QDM program, but significant results have been documented within 3–4 years (Shaw and Harper 2008). The willingness of

Table 3. Beliefs pertaining to antler restrictions, bag limits, and quality/trophy bucks for club hunters, sportsman license holders, and Wildlife Management Area (WMA) hunters surveyed (% of responses) following the 2004–2005 deer-hunting season in Tennessee, USA.

Response	Club	Sportsman	WMA
Antler restrictions should be implemented statewide in TN.	$n = 169$	$n = 601$	$n = 1{,}105$
($\chi^2 = 17.177$, df = 2, $P < 0.001$)	72.8	64.1	57.7
How many antlered bucks should be allowed per individual in the Tennessee statewide bag limit?			
($\chi^2 = 45.902$, df = 6, $P < 0.001$)	$n = 164$	$n = 607$	$n = 1{,}097$
1	10.4	16.8	18.6
2	55.5	36.9	34.7
3	24.4	26.4	33.5
≥4	9.8	19.9	13.2
A "quality" buck and a "trophy" buck are the same thing.	$n = 176$	$n = 676$	$n = 1{,}195$
($\chi^2 = 0.943$, df = 2, $P = 0.624$)	28.4	26.3	28.4

Table 4. Support of harvesting practices by club hunters, sportsman license holders, and Wildlife Management Area (WMA) hunters surveyed (% of responses) following the 2004–2005 deer-hunting season in Tennessee, USA.

Response	Club	Sportsman	WMA
Spike bucks should be killed intentionally (i.e., culled).	$n = 155$	$n = 472$	$n = 968$
($\chi^2 = 24.942$, df = 2, $P < 0.001$)	5.8	22.9	23.2
Older bucks with poor racks should be culled.	$n = 140$	$n = 508$	$n = 943$
($\chi^2 = 70.808$, df = 2, $P < 0.001$)	49.3	83.1	68.8
Does should be included in the harvest.	$n = 167$	$n = 575$	$n = 1{,}107$
($\chi^2 = 5.363$, df = 2, $P = 0.068$)	95.2	96.0	93.3
Buck fawns should be "legal for harvest."	$n = 173$	$n = 556$	$n = 1{,}110$
($\chi^2 = 13.964$, df = 2, $P = 0.001$)	5.2	8.6	13.1
Doe fawns should be "legal for harvest."	$n = 168$	$n = 547$	$n = 1{,}091$
($\chi^2 = 36.841$, df = 2, $P < 0.001$)	50.0	31.3	26.9

hunters interested in QDM to wait 3–5 years to see changes in the deer herd should be encouraging for state wildlife agencies.

We believe the tendency for club hunters to list age of deer as the most important factor in the success of a QDM program was influenced by educational meetings at clubs, which expressed the importance of correcting the age structure in herds that have received heavy yearling buck harvests in past years. All 3 groups thought deer should weigh more on properties managed under QDM guidelines. This common belief could be attributed to either of the factors they thought most important to program success: increased weight at an older age and/or increased weight with increased available nutrition. All 3 hunter groups recognized that protecting young bucks could help increase buck age structure. The majority of respondents in each hunter group chose the 3-year-old age class as the minimum "legal" age for buck harvest. Antler restrictions and bag limits favored by different hunter groups were reflective of the areas in which they hunted; this again suggested that hunters' opinions are influenced by educational efforts and regulations of state agencies and club managers where they hunt. On club properties, data indicated gross Boone and Crockett antler-score restrictions were most effective at protecting bucks <3 years old, while allowing bucks ≥3 years old to be eligible for harvest (Shaw 2008, Shaw and Harper 2008). Club hunters were presented with these data and were taught how to estimate gross antler score at annual club meetings, which likely influenced their choice for a gross score restriction. Antler restrictions in the WMAs were antler-point and/or spread restrictions designed to protect yearling bucks, which likely influenced the preference for antler-point restrictions among WMA hunters and sportsman license holders. A considerable number of WMA hunters (17%), club hunters (19%), and sportsman license holders (24%) thought the average characteristics of bucks in a particular area should be identified before recommending an antler restriction, which indicates they recognized different restrictions may be appropriate for different areas.

We found the high percentage of hunters supporting a statewide antler restriction to be of concern. As many hunters indicated, harvest criteria in a QDM program should protect young bucks, including those with relatively large antlers. Yearling antler characteristics largely depend on local herd and habitat conditions (Demarais and Strickland 2011). Strickland et al. (2001) found lower antler scores in older age classes when they ran a simulation model that selectively removed larger antlered younger males, and they noted a decline in cohort antler size in one region of Mississippi, USA following implementation of a 4-point selective-harvest criterion. This suggests a need for educational efforts that explain the potential negative effects of selective-harvest criteria that are not based on regional, age-specific antler size (Strickland et al. 2001). An alternative way of protecting young bucks is to reduce the antlered-buck bag limit. This should be considered by state wildlife agencies, especially because a majority of all hunter groups supported reducing the current statewide bag limit (3) to no more than 2.

Table 5. Rankings of reasons for hunting deer by club hunters, sportsman license holders, and Wildlife Management Area (WMA) hunters surveyed following the 2004–2005 deer-hunting season in Tennessee, USA.

	Club		Sportsman		WMA	
Reasons for hunting deer	$\bar{x}$[a]	Rank	$\bar{x}$[a]	Rank	$\bar{x}$[a]	Rank
Experience nature	4.170a	1	4.336a	1	3.795a	1
A place to hunt (club and WMA only)	3.909ab	2			3.263cd	5
Challenge of the hunt	3.806bc	3	4.219a	2	3.565b	3
Solitude	3.673bc	4	3.637bc	4	3.026e	7
To kill a buck with a large rack	3.539bc	5	3.518c	6	3.779a	2
Social interaction	3.479c	6	3.807b	3	3.330c	4
To see lots of deer	3.061d	7	3.584c	5	3.171de	6
To get venison for food	2.588e	8	3.458c	7	2.804f	8
To shoot deer	2.182f	9	2.180e	9	2.345g	9
Deer population reduction	1.994f	10	2.775d	8	2.056h	10

[a] Scale: 1 = not at all important, 2 = slightly important, 3 = moderately important, 4 = very important, 5 = extremely important. Within a hunter group, means are similar if followed by the same letter.

It is not surprising that hunters preferred shooting antlered bucks; however, we found it interesting that nearly 75% of all 3 hunter groups distinguished a "quality" buck from a "trophy" buck. We believe this indicates that most hunters who responded to our survey realize QDM is not about "trophies" (Van Brackle and McDonald 1995), but is more about a management strategy that enables them to hunt older age-class animals (Hamilton et al. 1995*b*). This is an important consideration when evaluating hunter motivations for QDM. Green and Stowe (2000) identified trophy deer management as a subset of QDM and stressed the importance of distinguishing the two because trophy deer management is more likely to be met with opposition by the nonhunting public. We believe society will accept QDM as a deer-management strategy, especially as they learn that hunters involved in QDM are not necessarily driven by rack size and that the objectives of QDM practitioners are centered on deer herd health and associated habitat. Of course, there will always be some deer hunters who are primarily concerned with "trophies," but the message promoted by the Quality Deer Management Association focuses on healthy deer herds and healthy deer habitat (Adams et al. 2010), which is consistent with the interests of the majority of hunters we surveyed. Providing an accurate message concerning QDM will be important for state wildlife agencies.

In a related question, club hunters were less likely to support culling spike bucks, as well as older bucks with "poor" racks, which indicated they better understood the goals of QDM versus trophy-deer management and how the trophy-deer management strategy is fundamentally flawed in areas where cooperative landholdings are not sufficiently large (Brothers and Ray 1998, McCoy et al. 2005, Webb et al. 2007). This suggests hunters who have attended educational programs may better understand the role of age, nutrition, and genetics in deer management and thus do not judge a buck solely on antler size, but more on age. This could be important with regard to societal acceptance of the QDM strategy. Age, not antler size, should be the determinant for defining "legal" bucks in a QDM program (Strickland et al. 2001, Demarais et al. 2005, Adams et al. 2010).

All 3 hunter groups realized the importance of an adequate doe harvest to correct skewed sex ratios and to lower deer density where needed. This deviates from past deer-management paradigms, where killing does was discouraged regardless of deer density (Woods et al. 1996).

Although factors that contribute to hunter motivation and satisfaction may vary with location and/or hunting method (Potter et al. 1973, Hammitt et al. 1990, Hayslette et al. 2001), reasons among hunters for hunting deer in our study illustrate the importance of considering nonharvest motivations when evaluating hunter satisfaction. For the hunter groups we surveyed, the top motivation to hunt was experiencing nature. Similar findings have been reported for other hunters across the country (Gigliotti 2000, Grilliot and Armstrong 2005). Decker and Connelly (1989) grouped wildlife recreationists into 3 groups based on motivational orientations: affiliative-oriented (i.e., social interaction with family friends), achievement-oriented (i.e., meat or trophy hunting), and appreciative-oriented (i.e., sense of peace or enjoying natural environment). Our results suggest that, on average, Tennessee hunters are primarily appreciative oriented. Kellert (1978) suggested appreciative-oriented hunters may have a stronger commitment to deer hunting than do utilitarian-meat hunters or dominionistic-sport hunters. However, appreciative-oriented hunters are more likely to pass up shots at does when compared with other hunter groups (Decker and Connelly 1989). Encouraging appreciative-oriented hunters to harvest antlerless deer may be necessary to help ensure the success of deer-management programs that require population reduction.

Although the primary motivation to hunt for all hunters was to experience nature, there were important differences in rankings within hunter groups. The second-highest motivation for each hunter group was not ranked second for any other group. A place to hunt was as important to club members as was experiencing nature. This is not surprising because they paid considerable money to hunt club land. The importance of a place to hunt among this group also is likely related to the fact that club members tended to live in urban areas where access to hunting lands is more limited. It is interesting that social interaction was not ranked higher among club members. We expected social interaction would have been more important to the club members than to the WMA or sportsman license hunters. Social interaction at "deer camp" has traditionally been considered an extremely important motivation for deer hunters (Wegner 1995) and continued to be at least moderately important for all 3 hunter groups. The challenge of the hunt was as important to sportsman license holders as was experiencing nature, which suggests those hunters did not necessarily expect to kill a deer during each hunt, and that some minimal probability of success is required to keep them hunting.

Deer population reduction was the lowest-ranked motivation for all 3 hunter groups. Although population reduction can be an important aspect of QDM where deer density approaches or exceeds nutritional carrying capacity (NCC; Adams et al. 2010), abundant forage and healthy forest understories suggested deer density did not approach NCC on any of the club lands or on 2 of the 3 WMAs we surveyed. Nonetheless, the willingness of QDM practitioners to kill an appropriate number of does is an important consideration for state wildlife agencies where deer density presents ecological or cultural concerns (Riley et al. 2003).

MANAGEMENT IMPLICATIONS

Given the interest and satisfaction of the hunters we surveyed regarding QDM in Tennessee, we encourage state wildlife agencies that do not offer public QDM opportunities to survey hunters and consider this approach on appropriate management areas. As land and hunting opportunities are continually lost to development, acquisition and management of lands to maintain hunting opportunities will become even more important in the future. Club lease rates may prevent membership by certain economic classes of hunters.

Providing opportunities for QDM on public lands allows all hunters interested in QDM to avoid financial barriers that may exist with private land leases. Guidelines for QDM (buck restrictions, doe harvest) must be based on characteristics of the deer in that area, and hunters have shown acceptance of this requirement.

Periodic surveys monitoring hunter motivations and satisfaction can be most useful for state wildlife agencies when planning regulations and for identifying educational programming needs. Educational programming is critical to help hunters understand the biological justification of regulation changes. State wildlife agencies should consider offering annual seminar and/or workshop events, particularly on areas implementing QDM, to provide hunters with data and explain management proposals and decisions. When hunters are aware of program goals and the management timeline, they can form realistic expectations, which should lead to increased hunter satisfaction.

ACKNOWLEDGMENTS

Funding for our study was provided by the Department of Forestry, Wildlife, and Fisheries at the University of Tennessee, Hobart Ames Foundation, Sequatchie Forest and Wildlife, Quality Deer Management Association, and Tennessee Wildlife Resources Agency. We thank the University of Tennessee Human Dimensions Research Lab for assisting with survey delivery and analysis. We thank A. Houston, M. Black, B. Hanna, and B. Layton for helping with survey delivery. We also thank J. Hamilton, K. Adams, and 3 anonymous reviewers for providing constructive comments to a previous version of the manuscript.

LITERATURE CITED

Adams, K., J. Hamilton, and M. Ross. 2010. Quality Deer Management Association's whitetail report 2010. Quality Deer Management Association, Bogart, Georgia, USA.

Brothers A., and M. E. Ray, Jr. 1975. Producing quality whitetails. Fiesta, Laredo, Texas, USA.

Brothers A., and M. E. Ray, Jr. 1998. Spikes. Pages 69–76 *in* C. McTee, editor. Producing quality whitetails. Revised edition. Texas Wildlife Association, San Antonio, USA.

Collier B. A., and D. G. Krementz. 2006. White-tailed deer management practices on private lands in Arkansas. Wildlife Society Bulletin 34:307–313.

Decker D. J., and N. A. Connelly. 1989. Motivations for deer hunting: implications for antlerless deer harvest as a management tool. Wildlife Society Bulletin 17:455–463.

Demarais S., and B. K. Strickland. 2011. Antlers. Pages 107–145 *in* D. G. Hewitt, editor. Biology and management of white-tailed deer. CRC Press, Boca Raton, Florida, USA.

Demarais, S., B. K. Strickland, and L. E. Castle. 2005. Antler regulation effects on white-tailed deer on Mississippi public hunting areas. Proceedings Annual Conference of Southeastern Association of Fish and Wildlife Agencies 59:1–9.

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

Ditchkoff, S. S., E. R. Welch, Jr., W. R. Starry, W. C. Dinkines, R. E. Masters, and R. L. Lochmiller. 1997. Quality deer management at the McAlester Army Ammunition Plant: a unique approach. Proceedings of the Annual Conference Southeastern Association of Fish and Wildlife Agencies 51:389–399.

Enck, J. W., T. L. Brown, and D. Reihlman. 2003. Landowner and hunter response to implementation of a Quality Deer Management (QDM) cooperative near King Ferry, New York. Cornell University Human Dimensions Research Unit Series Report 03-7, Ithaca, New York, USA.

Enck, J. W., D. J. Decker, and T. L. Brown. 2000. Status of hunter recruitment and retention in the United States. Wildlife Society Bulletin 28:817–824.

Gigliotti, L. M. 2000. A classification scheme to better understand satisfaction of Black Hills deer hunters: the role of harvest success. Human Dimensions of Wildlife 5:32–51.

Green D., and J. P. Stowe, Jr. 2000. Quality deer management: ethical and social issues. Human Dimensions of Wildlife 5:62–71.

Grilliot A. L., and J. B. Armstrong. 2005. A comparison of deer hunters with disabilities and nondisabled hunters in Alabama: motivations and satisfactions in deer hunting. Wildlife Society Bulletin 33:243–250.

Hamilton, J., A. Brothers, and R. Wegner. 1995*a*. Ethics for the future. Pages 292–296 *in* K. V. Miller and R. L. Marchinton, editors. Quality whitetails: the why and how of quality deer management Stackpole, Mechanicsburg, Pennsylvania, USA.

Hamilton, J., W. M. Knox, and D. C. Guynn, Jr. 1995*b*. How quality deer management works. Pages 7–18 *in* K. V. Miller and R. L. Marchinton, editors. Quality whitetails: the why and how of quality deer management. Stackpole, Mechanicsburg, Pennsylvania, USA.

Hamilton, J., W. M. Knox, and D. C. Guynn, Jr. 1995*c*. How quality deer management works. Pages 47–57 *in* K. V. Miller and R. L. Marchinton, editors. Quality whitetails: the why and how of quality deer management. Stackpole, Mechanicsburg, Pennsylvania, USA.

Hammitt, W. E., C. D. McDonald, and M. E. Patterson. 1990. Determinants of multiple satisfaction for deer hunting. Wildlife Society Bulletin 18:331–337.

Hayslette, S. E., J. B. Armstrong, and R. E. Mirarchi. 2001. Mourning dove hunting in Alabama: motivations, satisfactions, and sociocultural influences. Human Dimensions of Wildlife 6:81–95.

Henry, G. T. 1990. Practical sampling. SAGE, Newbury Park, California, USA.

Kalton, G. 1983. Introduction to survey sampling. SAGE Beverly Hills, California, USA.

Kellert, S. R. 1978. Attitudes and characteristics of hunters and antihunters. Transactions of the North American Wildlife and Natural Resources Conference 43:412–423.

McCoy, J. E., D. G. Hewitt, and F. C. Bryant. 2005. Dispersal by yearling male white-tailed deer and implications for management. Journal of Wildlife Management 69:366–376.

Messmer, T. A., C. E. Dixon, W. Shields, S. C. Barras, and S. A. Schroeder. 1998. Cooperative wildlife management units: achieving hunter, landowner, and wildlife management agency objectives. Wildlife Society Bulletin 26:325–332.

Miller K. V., R. L. Marchinton , editors. 1995. Quality whitetails: the why and how of quality deer management. Stackpole, Mechanicsburg, Pennsylvania, USA.

Potter, D. R., J. C. Hendee, and R. N. Clark. 1973. Hunting satisfaction: game, guns, or nature? Transactions of the North American Wildlife and Natural Resources Conference 38:220–229.

Riley, S. J., D. J. Decker, J. W. Enck, P. D. Curtis, T. B. Lauber, and T. L. Brown. 2003. Deer populations up, hunter populations down: implications of interdependence of deer and hunter dynamics on management. Ecoscience 10:356–362.

Shaw, C. E. 2008. An evaluation of quality deer management programs in Tennessee. Thesis, University of Tennessee, Knoxville, USA.

Shaw C. E., and C. A. Harper. 2008. Effects of various approaches to quality deer management on white-tailed deer harvest. Proceedings Annual Conference of Southeastern Association of Fish and Wildlife Agencies 62:1–6.

Stedman, R., D. R. Diefenbach, C. B. Swope, J. C. Finley, A. E. Luloff, H. C. Zinn, G. J. San Julian, and G. A. Wang. 2004. Integrating wildlife and human-dimensions research methods to study hunters. Journal of Wildlife Management 68:762–773.

Strickland, B. K., S. Demarais, L. E. Castle, J. W. Lipe, W. H. Lunceford, H. A. Jacobson, D. Frels, and K. V. Miller. 2001. Effects of selective-harvest strategies on white-tailed deer antler size. Wildlife Society Bulletin 29:509–520.

Tennessee Wildlife Resources Agency [TWRA]. 2005. Big game harvest report 2004–05. Tennessee Wildlife Resources Agency, Technical Report 05-01 307, Nashville, USA.

U.S. Fish and Wildlife Service. 2001. National survey of fishing, hunting, and wildlife-associated recreation. U.S. Fish and Wildlife Service.

U.S. Fish and Wildlife Service. 2006. National survey of fishing, hunting, and wildlife-associated recreation. U.S. Fish and Wildlife Service.

Van Brackle M. D., and J. S. McDonald. 1995. Common misconceptions. Pages 58–65 *in* K. V. Miller and R. L. Marchinton, editors. Quality whitetails: the why and how of quality deer management. Stackpole, Mechanicsburg, Pennsylvania, USA.

Webb, S. L., D. G. Hewitt, and M. W. Hellickson. 2007. Scale of management for mature male white-tailed deer as influenced by home range and movements. Journal of Wildlife Management 71:1507–1512.

Wegner, R. 1995. A proud tradition. Pages 253–273 *in* K. V. Miller and R. L. Marchinton, editors. Quality whitetails: the why and how of quality deer management. Stackpole, Mechanicsburg, Pennsylvania, USA.

Woods, G. R., D. C. Guynn, W. E. Hammitt, and M. E. Patterson. 1996. Determinants of participant satisfaction with quality deer management. Wildlife Society Bulletin 24:318–324.

Associate Editor: Rodgers.