Eastern Wildlife Damage Control Conferences

Proceedings of the Eighth Eastern Wildlife Damage Management Conference (1997)

University of Nebraska - Lincoln *Year* 1997

An Evaluation of Farmer Applications of Deer Damage Controls

Peter Fritzell Jr.* Glenn Dudderar†

R. Ben Peyton‡

*Michigan State University, East Lansing, MI

†Michigan State University, East Lansing, MI

‡Michigan State University, East Lansing, MI

AN EVALUATION OF FARMER APPLICATIONS OF DEER DAMAGE CONTROLS

PETER A. FRITZELL, JR., Department of Fisheries and Wildlife, Michigan State University, East Lansing, MI 48824-1222

GLENN DUDDERAR, Department of Fisheries and Wildlife, Michigan State University, East Lansing, MI 48824-1222

R. BEN PEYTON, Department of Fisheries and Wildlife, Michigan State University, East Lansing, MI 48824-1222

Abstract: Damage to agricultural crops caused by white-tailed deer (*Odocoileus virginianus*) continues to be a significant concern of farmers in Michigan and elsewhere in the United States. Policy changes that promise to reduce deer numbers may be long in coming, but better application of available damage control techniques may be an immediate alternative for farmers awaiting relief. Conversations with farmers, extension agents, and wildlife professionals suggest that some damage control techniques are underutilized by Michigan farmers, whereas other techniques are applied with little success despite promising field trials. We investigated producers' practices to identify common weaknesses in how deer damage controls were being applied so that Michigan Department of Natural Resources and Cooperative Extension personnel could develop programs to improve the effectiveness of these applications. In January 1997, a 6-page questionnaire was mailed to 250 agricultural producers who indicated that they used some form of deer damage control to protect their crops. Producers were queried about specific methods employed, intensity and frequency of applications, fence maintenance, hunting and shooting techniques, deer harvest ratios, integration of techniques, and the perceived effectiveness of controls and/or combinations of techniques. Recreational hunting, shooting permits, and block permits were the control methods used most frequently by respondents. Although 84% of respondents expressed a desire to reduce the deer herd in the vicinity of their farm, most were not contributing effectively to achieving such a reduction through their own hunter management and deer harvest. Results suggest that educational and management opportunities do exist to encourage producers to more systematically apply and integrate available deer damage controls in Michigan.

Key Words: agricultural crop damage, deer damage controls, efficacy, *Odocoileus virginianus*, survey, white-tailed deer

Proc. East. Wildl. Damage Manage. Conf. 8:108-119

BACKGROUND

Damage to agricultural crops caused by white-tailed deer has received a great deal of attention among farmers, deer hunters, university researchers, and Cooperative Extension and Department of Natural Resources (MDNR) personnel in Michigan (Dudderar et al. 1989, Nelson and Yuan 1991, Nelson and Schomaker 1996, Fritzell et al. 1997). These studies document attitudes and beliefs of stakeholders about crop damage, trends in depredation permit use, stakeholder perceptions of deer numbers, and the effectiveness of block permits. These studies also suggest that farmers may not be using deer controls available to them, may not recognize that such controls are available to them, or may not be implementing controls effectively. Although MDNR managers attempt to limit conflicts between farmers and deer through liberalized deer hunting seasons and increased availability of antlerless licenses in deer management units (DMUs) where deer numbers are above desirable herd densities, farmers want the agency to do more without regard to the limitations of the agency. In January 1997, the Michigan Farm Bureau threatened to file suit against MDNR to recover costs lost to deer if the agency did not reduce the state's deer population to MDNR's stated goal of 1.3 million deer within three years.

The adjustments agencies often make to deer harvest, such as extended seasons and extra antlerless tags, may not reduce herds or crop depredation problems in all areas in a timely fashion (Hauge 1997). For instance, the preference hunters display for taking antlered male deer (Maedke and Anderson 1994, Fritzell 1998) or the increasing number of areas closed to hunting (Fritzell 1998) may create areas of high deer density that can not be reduced solely with extended seasons or additional tags. Thus, farmers may find that the burden of controlling crop depredation caused by deer rests, in a large part, on them, especially where these "refuges" for deer exist adjacent to their properties. For these reasons, farmers must make effective use of available damage control techniques and not wait for some hoped for change.

Research has shown that producers do not always exercise effective deer damage control. Horton and Craven (1997) found that producers often do not use shooting permits effectively because of taboos against shooting pregnant does or does with dependent fawns. They also indicated that many farmers in Wisconsin did not recognize recreational hunting as a damage control tool. Beringer et al. (1994) believed that a landowner's initiative often determined the ultimate effectiveness of the control techniques used. In Michigan, wildlife professionals and extension agents both agreed that farmers could do much more to reduce crop losses to deer. Unfortunately, little is known about what producers currently are doing to control deer depredation, how they are doing it, and what damage control needs they have.

Our study was conducted to determine what knowledge and information the Michigan State University Cooperative Extension (MSUCE) and the MDNR might be able to offer to farmers to better control losses and effectively reduce deer numbers.

OBJECTIVES

The objectives of our study were to 1) determine to what extent farmers in Michigan employed effective damage control strategies to minimize deer damage to crops, and 2) identify informational needs that MSUCE and MDNR could fulfill to help farmers improve applications of deer damage controls.

METHODS

Survey Construction Assumptions

Because we wanted to determine if farmers were implementing "effective" deer damage control, our initial task was to evaluate the "probable effectiveness" of producers' applications. To do this, we devised a survey instrument that would generate quantifiable information about producers' applications of deer damage controls. In constructing the survey, we assumed that standard wildlife damage management principles hold for deer and that the efficacy of techniques documented in the literature were valid. Based on these assumptions, we then attempted to evaluate "probable effectiveness" of farmers' applications of deer damage controls using the following criteria: selection of appropriate control techniques, use and integration of a variety of techniques, rigorous application, monitoring and evaluation, and adaptability. This paper presents our findings on the variety of control techniques employed by farmers and the rigor with which they applied them.

Sample Frame

Farmers who responded to an earlier survey (Fritzell 1997), who had implemented some form of damage control, and who indicated that they would be willing to respond to another survey regarding their application of controls formed our initial survey pool. Additional participants were recruited while visiting a booth operated by the primary author at an agricultural exposition held at Michigan State University during the summer of 1996. Prospective participants also were identified through referrals from other farmers. Each participant's willingness to participate in this study was confirmed by their written response to a letter and postage-paid postcard sent to them asking them about their desire to participate. In all, 252 individuals agreed to participate.

Our sample of producers adequately represented the 7 counties involved in our earlier survey (Fritzell 1997), but we recruited additional producers from 3 other counties. Deer density estimates varied tremendously among counties (from 15 to 60 deer per square mile in 1996)

(pers. commun. MDNR personnel), but all participants believed that some form of deer damage control was needed regardless of the estimated number of deer in their county.

Survey Protocol

All participants received by first-class mail a cover letter, a 6-page questionnaire, and a postage-paid return envelope in January 1997. Approximately 3-4 weeks after the initial mailing, we sent a reminder letter to non-respondents encouraging their participation. No further mailings or requests were made and no non-response follow-up was conducted.

RESULTS AND DISCUSSION

Although all participants had agreed to participate, only 178 usable returns were received from the 252 individuals originally sent a questionnaire (a 70.6% response rate). Some producers apparently changed their mind, were out of town, or were too busy. The resulting sample was composed primarily of dairymen, cattlemen, fruit and vegetable growers, and cash grain operators.

Because of the nature of our sampling frame, our results should not be interpreted as being representative of all farmers in Michigan nor all farmers in the counties we studied. We believe the sample may be biased toward individuals who already use more rigorous controls, but we made no effort to document such a bias. Regardless, our data do suggest a need for improvement in application by producers and further assistance from wildlife agencies and Cooperative Extension.

Estimated Annual Losses and Costs of Control

To understand producers' needs relative to crop damage caused by deer, we asked producers to estimate their annual loss attributed to deer by providing us a range of dollar values from "at least ___" to "no more than ___." Responses varied tremendously, but they clearly indicated that farmers perceived these losses to be costly enough to warrant control (Table 1). We also asked respondents to estimate what they typically invested in deer damage control, on an annual basis, for both equipment outlays and labor costs. Producers who used deer damage control reported spending an average of $1,267 on control equipment and 87 hours of paid labor to reduce their losses. Based on these figures, it appears that MDNR and MSUCE would be justified to evaluate the cost-effectiveness of the methods producers were using and to provide additional information on effective methods to producers (Table 1). For example, these agencies could help producers select appropriate control techniques and encourage them to use a diversity of control methods.

Types of Deer Damage Control Applied by Respondents

Respondents used a diversity of deer damage controls, ranging from fences to lethal controls (Table 2). Based on our past experience and a review of the literature, the techniques they selected should provide some benefit. The majority of respondents reported using recreational hunting as a primary means of control. A large number of fruit growers in our sample also reported using repellents together with out-of-season shooting permits.

Evaluation of Selected Control Applications

Fencing—In this category, use of a variety of fencing techniques was reported by producers. For example, among producers who reported using fences, half of the respondents used electric fences, whereas half used only non-electric fences. Although different heights and construction designs complicated our evaluations, we used the frequency with which producers reported conducting an inspection of the condition and maintenance of their fences as an index. The frequency of fence inspections varied from once per day to once every 2-4 weeks for electric fences and once per month to once per year for non-electric fences. Among those who used non-electric fences, 46% inspected their fences once per month, whereas 30% inspected fences less than once every 3 months. Among those who used electric fences, 25% inspected their fences at least once every 3 days, whereas 25% inspected fences less than once per week. Although less frequent inspections of electric fences designed to keep horses and/or cattle within a pasture may be adequate, our research indicates that more frequent inspections are necessary to monitor the charge on fences designed to keep deer away from edible crops,

especially when storms, wind, snow, or general plant growth threaten to short the electrical system. Thus, 25% of respondents were not inspecting their fences adequately and inadvertently may be giving deer opportunity to breech these barriers and increase the amount of browsing damage observed within fenced areas.

Harassment—No single harassment technique was used widely by respondents, but they reported using a variety of techniques and demonstrated distinct personal preferences (Table 3). In fact, producers apparently rely almost exclusively on a single harassment technique and choose not to integrate active and passive harassment techniques, which typically would increase the effectiveness of their total program (Fig. 1). Effectiveness also could have been improved by assuring adequate coverage of fields with a suitable number of harassment devices and by relocating devices frequently to prevent habituation. Not all respondents appeared to understand harassment application procedures. Only 12 producers reported using propane exploders for deer harassment. Of these, 9 producers used <1 cannon per 10 acres and none used >2 cannons per 10 acres. Seven producers located the cannon(s) in the center of fields rather than at the perimeter or outside of the fields; only one producer relocated his cannon(s) more than once per week to prevent habituation. These results suggest that respondents were not aware that cannons should be placed within 90 meters of cover to effectively deter deer from their preferred browsing locations (Bender and Haufler 1987). The results also suggest that producers who chose exploders are not aware of the need to use 1 cannon per 5 acres and to daily relocate these devices, as recommended by the MSUCE.

Out-of-Season Shooting Permits—Respondents also relied on several available applications of out-of-season shooting permits, the permits that allow a producer to kill deer causing damage outside the normal hunting season. Interestingly, few producers use baited stands while shooting under such a permit, despite the recognized effectiveness it displays during the regular fall hunting season and in urban deer reduction programs (Fig. 2). This especially was interesting given that these same producers indicated that baited stands were used frequently by hunters on their lands during fall hunting seasons (Fig. 3). We expected that they would consider using bait when shooting under permit, but this was not the case. Use of baited stands might be a good addition to any shooting permit program, especially where local herd reduction is the ultimate goal.

Recreational Hunting—In 1997, a majority of respondents (86%) believed that the size of the deer herd needed to be reduced in their area if crop losses were to be controlled. We believe this sentiment was based on their assumption that fewer deer will result in less crop loss, but this may not be true in all cases (Braun 1996). The key questions we wished to answer were whether the 86% of respondents who believed the herd needed to be reduced acted in ways consistent with their belief in 1996, and did they effectively achieve a level of harvest sufficient to reduce that deer herd? One way to look at this would be to determine whether respondents maximized their probability of killing deer by utilizing all available days to hunt deer. Although pulse hunting (i.e., periodic rest days and hunt days) may produce higher harvests than those where people are in the field day in day out, we believe the probability of killing a deer is directly related to whether anyone is out attempting to kill a deer on any particular day.

Respondents reported that their farms were hunted, on average, 54% of the 93 days that encompass Michigan's deer seasons, or approximately 3.8 days per week. This means that farms were being hunted more than just on weekends, but we also believe there were times when there were few or no hunters in the field. Based on the numbers of hunters reported for each season, some farms were hunted most intensely during the general firearms season (Fig. 4). Several farms had no hunters during muzzleloader and late bow seasons, which indicates that additional opportunities to harvest deer exist on those farms. In fact, only 49% of respondents had hunters active during all 4 seasons, whereas 18% had no hunters during at least 2 of 4 seasons.

Another measure of how rigorous a farmer used hunting as a control was the proportion of hunters who possessed antlerless tags and were allowed to hunt on farms. All hunters in Michigan get a buck tag, but antlerless tags must be obtained through a lottery. There are 2 types of tags: general, which can be used on all lands in a Deer Management Unit; and private lands landowner preference tags, which allow landowners and individuals invited by the landowner to receive a permit to shoot antlerless deer on private property. If a greater proportion of the hunters given access by a farmer to hunt on the farm had applied for an antlerless tag, we believe that indicates good hunter management on the part of the farmer and a sincere intention to focus the harvest on female deer. Farmers with "significant damage" also may request and purchase additional block permit tags to shoot additional antlerless deer. Block permits are large blocks of bonus antlerless tags sold directly to farmers with qualifying losses to help them reduce deer populations in localized areas during the regular deer hunting seasons.

One-half of respondents who desired a herd reduction had no knowledge of the proportion of hunters on their farm who had applied for a general antlerless tag. Similarly, one-third of respondents had no knowledge of how many hunters on their farm had applied for a landowner preferences tag despite the fact that a producer's tax identification number is required when applying for such a tag. Among respondents who were able to enumerate the proportion of hunters who applied for a general antlerless tag, one-half indicated that only 50% of the hunters had done so. Among respondents reporting on the proportion of hunters who applied for a landowner preference tag, 60% indicated that <½ of the hunters had done so. Farmers should be communicating to hunters the need to shoot does and require them to apply for anterless tags. Our data suggests that producers are not placing this responsibility on these hunters.

Some hunters who received permission to hunt on a farm may not have applied for lottery tags believing the producer would receive block tags. It may be more effective and less costly for farmers to simply encourage hunters to purchase their own antlerless tags rather than purchasing block tags. More importantly, by requiring hunters who intend to hunt on a farm to apply for an antlerless tag, the farmer reinforces the message that antlerless deer need to be taken and makes hunters cognizant of the producer's problems and costs.

Buck:Antlerless harvest ratios—We also evaluated harvest effectiveness by looking at the number of antlerless deer and bucks reportedly shot on respondents' farms in 1996. Current deer density, buck/doe ratio, and productivity of females in an area can influence the harvest rate of antlerless deer; so will the behavior of hunters on lands adjacent to the farm. In Michigan, 25% of deer hunters personally will not shoot an antlerless deer (Fritzell 1998). In Wisconsin, 33% reportedly will not shoot an antlerless deer (Maedke and Anderson 1994). If a farmer truly intends to reduce the deer herd, then 1 to 2 antlerless deer must be harvested for each antlered buck taken; this number will be higher if hunters on neighboring properties do not shoot antlerless deer. Harvest data for 1996 obtained from respondents ($\bar{X}$ =2.63+2.88 S.D. antlerless deer per buck taken) appear consistent with their attitude that the herd needed to be reduced. However, 19% of respondents did not keep track of or know the deer harvest from their farm. Just as accurate records are important to wildlife managers, they also should be to farmers who are trying to reduce deer numbers on their farms. This mean harvest rate (2.63 antlerless deer per buck taken) conceals the fact that >50% of respondents who stated a desire to reduce the herd reported a harvest rate below 2 antlerless deer per buck taken.

The majority of the harvest clearly occurred during the firearms season, followed by the muzzleloader season, and then the bow season. One possible explanation may be the heavy use of block permits during the firearms season (Fig. 5). We found that block permits have a substantial impact on the ability of producers to obtain a favorable harvest ratio. Producers who lack block permits have difficulty achieving a harvest rate >1 antlerless deer per buck killed. However, even among those producers who obtained block permits, 40% failed to achieve a harvest rate of

>2 antlerless deer per buck taken in 1996 (Fig. 6). We suspect that not all block permits issued to a producer are filled by people hunting the farm. Block permits can be used during any of Michigan's deer seasons, but they are used primarily during the firearms season and often are reserved for family members. These permits might be better utilized if late season muzzleloader and archery hunters were encouraged to hunt on farms still possessing block permits and where producers were encouraged to allow greater access to non-acquaintances (Fig. 7).

SUMMARY

We found that producers invest significant time and money in efforts to control deer damage and that these producers rely heavily on 1 or 2 damage control techniques. However, these efforts do not appear to be reducing losses adequately. Also, producers are not encouraging the hunters who hunt on their property to apply for antlerless tags or to take full advantage of all hunting seasons. Producers are not monitoring the harvest of deer on their farm and are not shooting enough antlerless deer (aside from the block permit program) to achieve the desired reduction in local deer density.

IMPLICATIONS

Our data suggest that agencies should help producers evaluate and improve the efficacy of their control efforts by (1) informing them of the errors commonly being made in implementation of controls, (2) reducing reliance on only one control technique, (3) identifying and eliminate practices that promote habituation of deer to harassment devices, and (4) encouraging more frequent and regular inspections of fences. Agencies should help producers better understand the implications of population dynamics, the need to harvest antlerless deer, and the necessity to keep accurate annual harvest records if they are to successfully achieve local herd reduction on their farm. Furthermore, agencies should identify producers who possess unfilled block permits so that interested late season muzzleloader and archery hunters can assist these producers fill these permits after the regular firearms season closes. Finally, our data suggests that participation in block permit programs may be needed if producers are to achieve the desired harvest ratios that will lead to local herd reduction in the area of their farm.

LITERATURE CITED

Bender, L.C., and J.B. Haufler. 1987. A white-tailed deer habitat suitability index for in the Upper Great Lakes region. Department of Fisheries and Wildlife, Michigan State University, East Lansing, Michigan. Unpublished Report.

Beringer, J., L.P. Hansen, R.A. Heinen, and N.F. Giessman. 1994. Use of dogs to reduce damage by deer to a white pine plantation. Wildlife Society Bulletin 22:627-632.

Braun, K.F. 1996. Ecological factors influencing white-tailed deer damage to agricultural crops in Northern Lower Michigan. Thesis, Department of Fisheries and Wildlife, Michigan State University, East Lansing, Michigan.

Dudderar, G., J. Hanson, J. Haufler, R.B. Peyton, H. Prince, and S. Winterstein. 1989. Michigan's deer damage problems: analysis of the problems with recommendations for future research and communication. Agricultural Experiment Station Report, Michigan State University, East Lansing, Michigan.

Fritzell Jr., P.A., D.L. Minnis, and R.B. Peyton. 1997. A comparison of deer hunter and farmer attitudes about crop damage abatement in Michigan: messages for hunters, farmers, and managers. Proceedings of the Eastern Wildlife Damage Control Conference 7:153-161.

Fritzell Jr., P.A. 1998. A survey of Michigan agricultural producers' attitudes, perceptions, and behaviors regarding deer crop damage to fruits, vegetables, and field crops. Thesis, Michigan State University, East Lansing, Michigan.

Hauge, T. 1997. Zone T report to Natural Resources Board. Bureau of Wildlife Management, Wisconsin Department of Natural Resources, Madison, Wisconsin.

Horton, R.R., and S.R. Craven. 1997. Efficacy of shooting permits for deer damage abatement in

Wisconsin. Proceedings of the Eastern Wildlife Damage Control Conference 7:162-171.

Maedke, B.K., and R.K. Anderson. 1994. 1992 quality deer management survey: a study of Wisconsin deer hunters. Thesis, University of Wisconsin-Stevens Point, Stevens Point, Wisconsin.

Nelson, C.M., and T.F. Yuan. 1991. Deer crop damage block permit study: final report. Michigan Department of Natural Resources, Wildlife Division Report No. 3151.

Nelson, C.M., and A. Schomaker. 1996. Characteristics, attitudes, preferences and behaviors of private, non-industrial southern Michigan landowners of $\geq$10 acres concerning white-tailed deer. Department of Parks, Recreation, and Tourism Resources, Michigan State University, East Lansing, Michigan.

Table 1. Respondent estimated annual costs of deer damage and estimated labor hours and equipment costs of deer damage control efforts on farm.

Estimated minimum annual losses to deer per farm	Mean = $6,349 (s.d. = 12,107)
Estimated maximum annual losses to deer per farm	Mean = $14,773 (s.d. = 27,628)
Estimated annual deer damage control equipment expenses per farm	Mean = $1,267 (s.d. = 3,161)
Estimated annual deer damage control paid labor hours per farm	Mean = 87 hours (s.d. = 179)

Table 2. Proportion of respondents who reported use of selected types of deer damage controls.

	Proportion of respondents using control technique
Deer fences	25%
Repellents	64%
Cultural techniques	40%
Harassment	33%
Lethal Controls	94%
Shooting Permits	53%*
Recreational hunting	99%*
* Proportion of those using lethal controls	

Table 3. Distribution of harassment techniques employed by respondents who attempted to control deer damage through use of harassment means.

Active harassment	Proportion of respondents using the control
Non-lethal gunfire	39%
Shellcrackers	30%
Other active harassment means	19%
Passive harassment	**Proportion of respondents using the control**
Propane exploders	36%
Sirens	6%
Scarecrows / human effigies	34%
Other stationary devices	12%

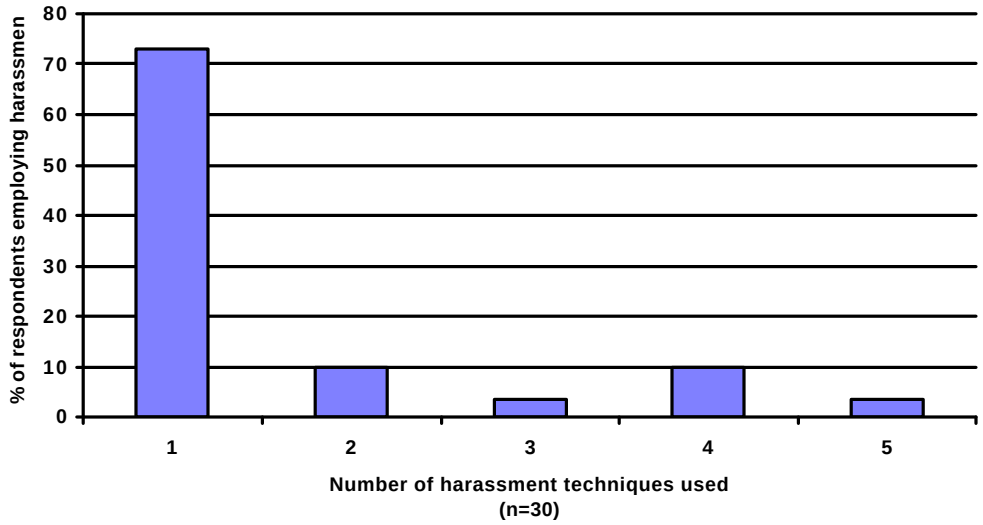

Figure 1. Proportion of respondents who employed harassment and the number harassment techniques used to haze deer in 1996.

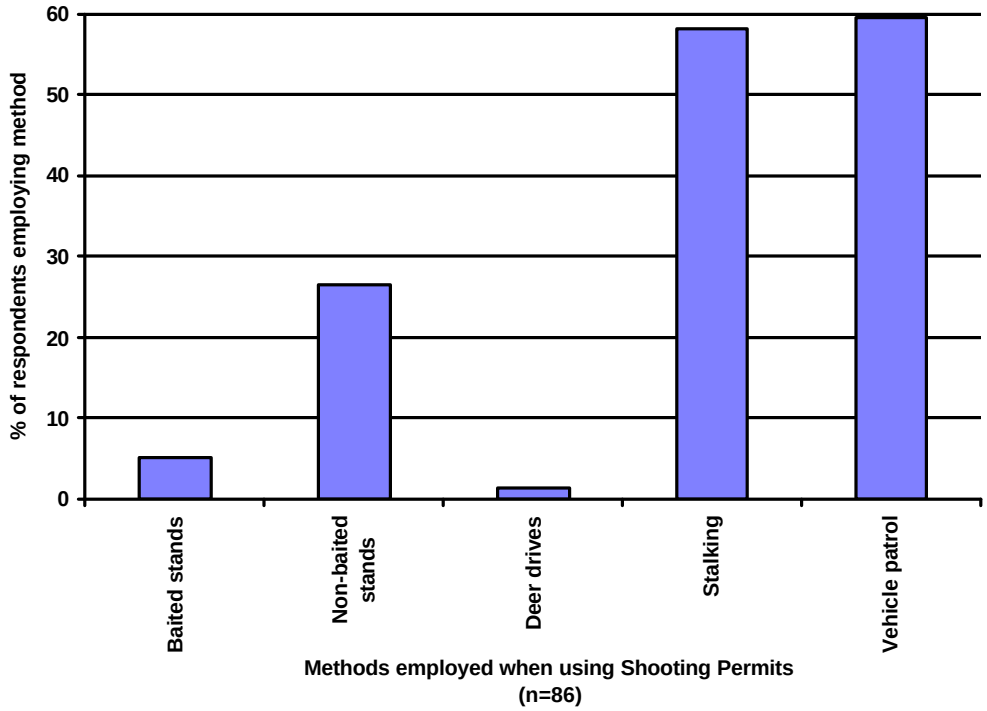

Figure 2. Proportion of respondents who used shooting permits and the specific methods employed when attempting to take deer under a shooting permit.

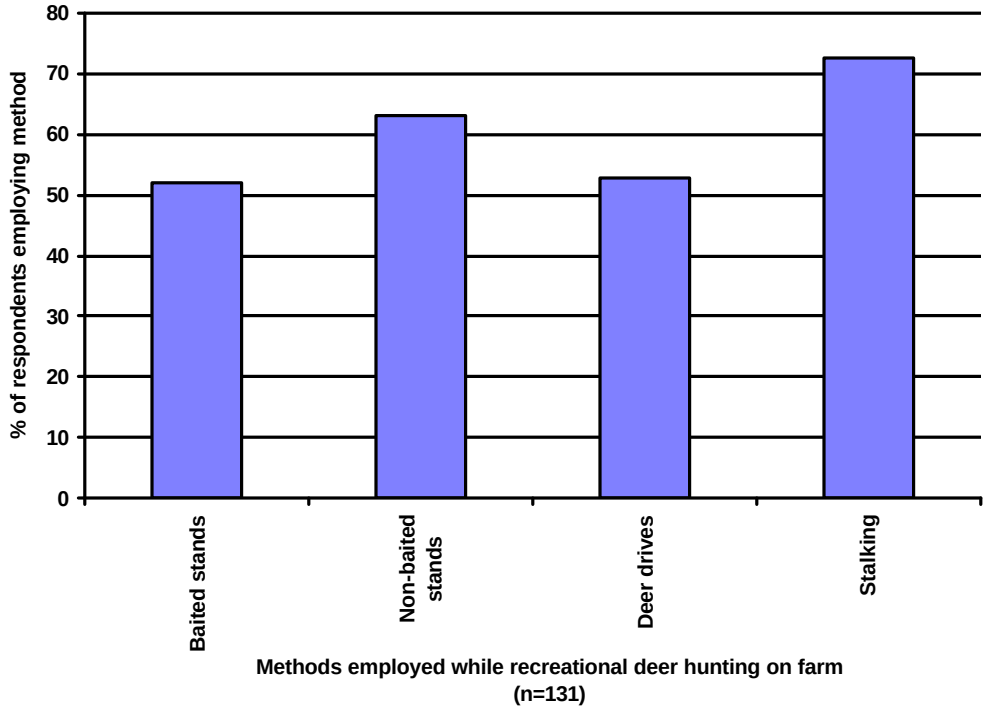

Figure 3. Proportion of respondents who allowed recreational deer hunting and the specific methods employed when attempting to take deer.

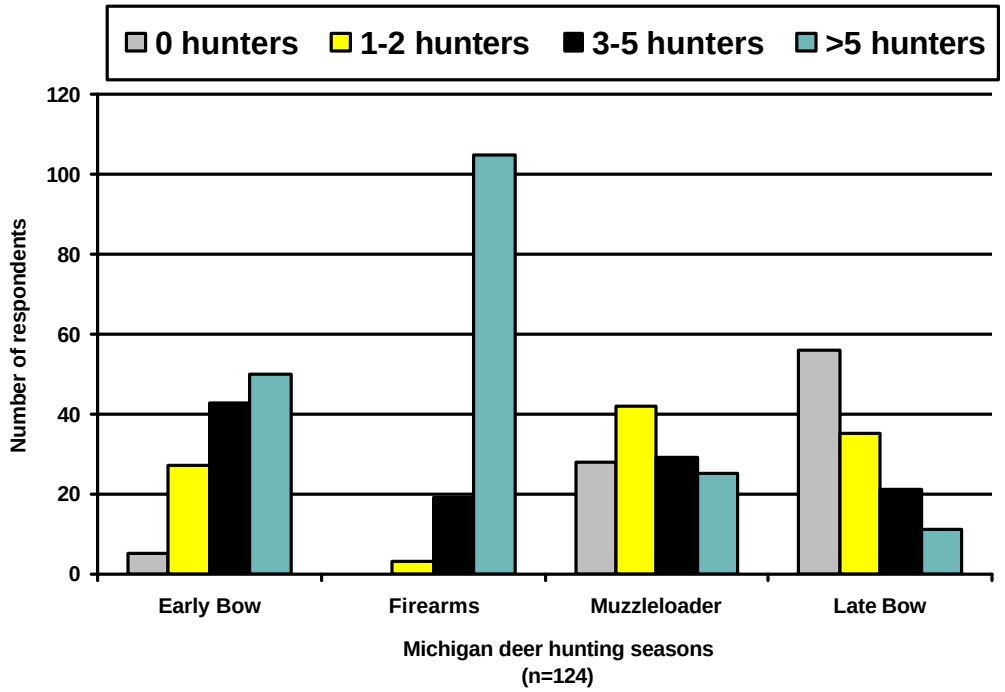

Figure 4. Number of deer hunters on the farm during Michigan's archery, firearms, muzzleloader, and late archery seasons, as reported by respondents who indicated that the deer herd needed to be reduced in the vicinity of their farm in 1996.

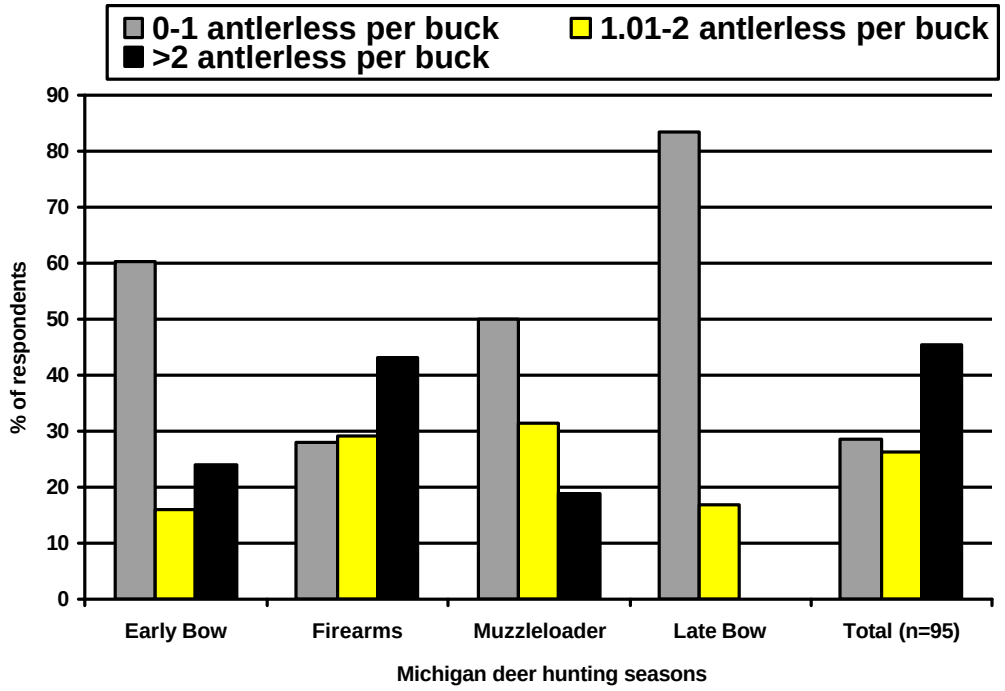

Figure 5. The number of antlerless deer harvested in relation to buck harvest on farms during the 1996 Michigan archery, firearms, muzzleloader, and late archery seasons, as reported by respondents who indicated that the deer herd needed to be reduced in the vicinity of their farm in 1996.

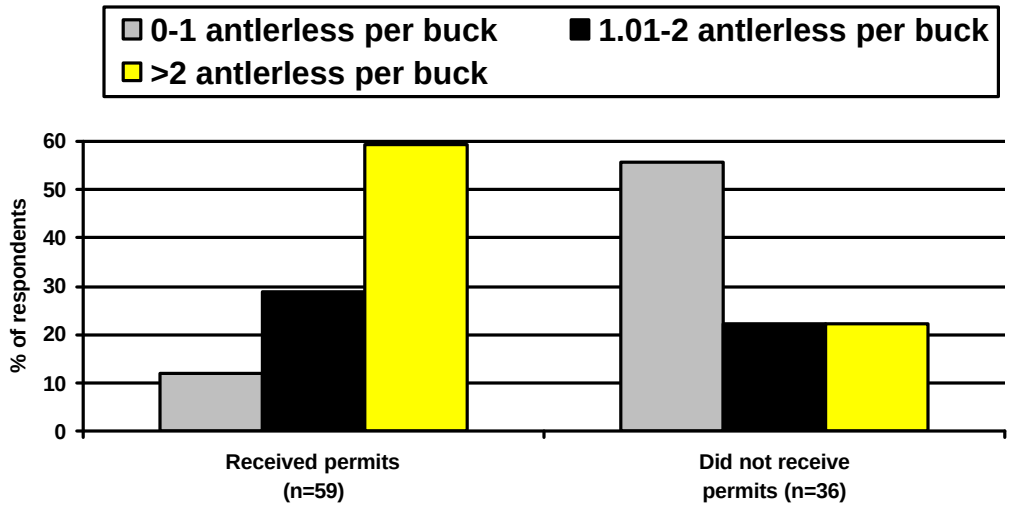

Figure 6. Effect of block permits on proportion of antlerless deer in the harvest (antlerless deer harvested per antlered buck taken), as reported by respondents who indicated that the deer herd needed to be reduced in the vicinity of their farm in 1996.

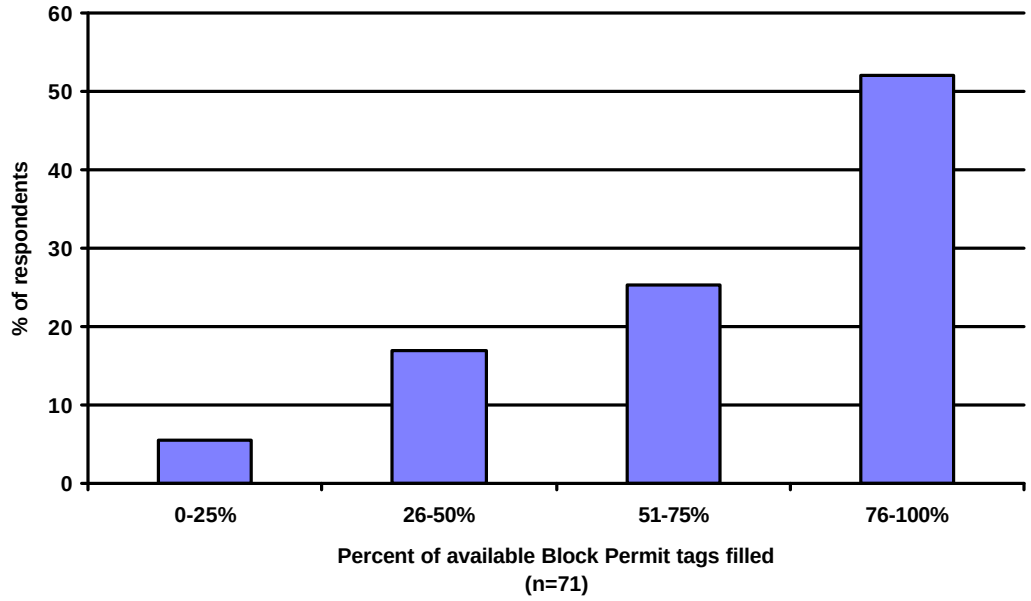

Figure 7. Percent of available block permit tags used by respondents who indicated that the deer herd needed to be reduced in the vicinity of their farm in 1996.