

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

---

3 - Third Eastern Wildlife Damage Control  
Conference (1987)

Eastern Wildlife Damage Control Conferences

---

October 1987

## PERCEPTIONS AND MANAGEMENT PREFERENCES OF GAME WARDENS AND EXTENSION AGENTS TOWARDS DEER DAMAGE TO SOYBEANS

Linda A. Lyon

*Virginia Polytechnic Institute and State University, Blacksburg, Va*

Patrick F. Scanlon

*Virginia Polytechnic Institute and State University, Blacksburg, Va*

Follow this and additional works at: <https://digitalcommons.unl.edu/ewdcc3>



Part of the [Environmental Health and Protection Commons](#)

---

Lyon, Linda A. and Scanlon, Patrick F., "PERCEPTIONS AND MANAGEMENT PREFERENCES OF GAME WARDENS AND EXTENSION AGENTS TOWARDS DEER DAMAGE TO SOYBEANS" (1987). *3 - Third Eastern Wildlife Damage Control Conference (1987)*. 35.  
<https://digitalcommons.unl.edu/ewdcc3/35>

This Article is brought to you for free and open access by the Eastern Wildlife Damage Control Conferences at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in 3 - Third Eastern Wildlife Damage Control Conference (1987) by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

PERCEPTIONS AND MANAGEMENT PREFERENCES OF GAME WARDENS  
AND EXTENSION AGENTS TOWARDS DEER DAMAGE TO SOYBEANS

Linda A. Lyon and Patrick F. Scanlon<sup>1/</sup>

ABSTRACT

We conducted mail-back questionnaire surveys in 1985 of game wardens and agricultural extension agents in eastern Virginia. Our objectives were to examine perceptions of deer damage, particularly on soybean crops, and deer management preferences of these two groups. Extension agents generally reported greater yield losses of crops from deer damage than did game wardens, but the average difference per crop between groups were not significantly different. For example, game wardens estimated that loss of soybean yield due to deer damage was 2.9% (SD = 1.96) and extension agents reported 4.9% loss (SD = 5.01, P = 0.31). The proportion of game wardens (72%) receiving requests from farmers for advice concerning damage was greater (P = 0.06) than the proportion of extension agents (45%) receiving similar requests. However, both respondent groups recommended similar methods for controlling deer damage, including lethal (i.e., via crop damage permits or antlerless deer tags) and nonlethal (i.e., chemical repellents, fencing, and techniques to frighten deer) methods. The estimates of deer densities within counties provided by extension agents (median = 10 deer/mi<sup>2</sup>) and game wardens (median = 8 deer/mi<sup>2</sup>) were

not statistically different (P = 0.51). The preferences for future management of deer populations was similar between the two groups in that they generally found that average county deer popu-

lations were optimal, but local population reductions were needed where deer damage was greatest. Both groups found that groundhog (Marmota monax) was often a significant vertebrate pest to soybeans, while birds generally were not.

INTRODUCTION

The juxtaposition of agricultural land and wildlife habitat often fosters conflicting management objectives when wildlife species affect agricultural production. This situation is exemplified by white-tailed deer (Odocoileus virginianus) use of soybean fields where the deer is perceived as a pest species.

For most agricultural pests, such as insects and weeds, farmers have numerous lethal and nonlethal options for managing the pest to minimize crop loss. Farmers seeking advice concerning agricultural pests and production are generally familiar with services offered through their county agricultural extension office. The agricultural extension agents are typically a ready source of information on pest identification, damage assessment, and crop management. However, when farmers consider wildlife species as crop pests, they might also turn to wildlife management personnel for advice.

In Virginia, the category of wildlife field personnel approximating a county extension agent is the game warden. In general, the training and orientation of extension agents and game wardens with respect to crop-wildlife

---

<sup>1/</sup> Department of Fisheries and Wildlife Sciences, Virginia Polytechnic Institute and State University, Blacksburg, Va. 24061. Present address (LAL): U.S. Environmental Protection Agency, Office of Pesticide Programs TS 769C, Washington, D.C. 20460

interactions differs. That is, the extension agents more typically are focused on crop management while game wardens are more involved with wildlife management.

As part of a broad project to examine the role of the white-tailed deer in soybean production, we conducted mail-back questionnaire surveys of agricultural extension agents and game wardens. Our objectives were to compare assessments between extension agents and game wardens concerning estimates of deer damage to crops, especially soybeans, and recommendations regarding control of deer damage to soybeans.

Acknowledgments: We thank W. Allen and J. McLaughlin, who provided necessary authorization and assistance to implement the extension agent and game warden surveys, respectively. We are grateful to C. Heiser and S. MacPherson for survey processing and data entry. We appreciate the efforts of numerous colleagues who reviewed draft versions of the surveys. This research was supported by the Virginia Commission of Game and Inland Fisheries (VCGIF).

## METHODS

These surveys were done in counties and independent cities (hereafter counties) of the Eastern and Southeastern agricultural districts of Virginia. These districts produced 47% and 34%, respectively, of the 1984 soybean crop (Virginia Crop Reporting Service 1985). The survey area is 21,828 km<sup>2</sup>, with most (65%) of the area forested. The principal crop rotation scheme in the survey area includes soybeans, corn, and small grains, usually winter wheat and winter barley (McPherson et al. 1981). Peanuts are also grown in 11 of the southeastern survey counties. The amount of deer habitat, defined as forested area, ranges from 23 - 79% ( $x = 65$ ,  $SD = 2.4$ ; Virginia Commission of Game and Inland Fisheries 1984) per county. The estimated deer densities in the survey counties range from 2.5 to 11.5 deer/km<sup>2</sup> ( $\bar{x} = 7.4$ ,  $SD = 2.39$ ; Virginia Commission

of Game and Inland Fisheries unpubl. data).

According to a survey we conducted of soybean farmers in the area (Lyon, in preparation), crop land and woods accounted for 53% and 44%, respectively, of all farm land reported. The principal crops, comprising 81% of the crop land reported, were soybeans, corn, small grains, and peanuts. Minor crops included vegetables, tobacco, and hay. Non-crop uses, defined here as pasture, idle, and woods, accounted for 48% of the total land reported.

In February we sent mail-back questionnaire surveys to all agricultural extension agents ( $N = 28$ ) and game wardens ( $N = 32$ ) in the survey area. The questionnaire formats were modified after other surveys designed to assess deer damage and population in agricultural areas (Brown et al. 1977, Stoll and Mountz 1983, Tanner and Dimmick 1983). With the exception of a question regarding 5-year deer population trend, all survey questions referred to the 1984 growing season.

We used  $\chi^2$  contingency table analysis (Sokal and Rohlf 1969) for comparisons of categorical data. We used the t-test (Sokal and Rohlf 1969) for comparisons between game wardens and extension agents of normally distributed data. We did not always have replies from both game wardens and extension agents for a given county. Therefore, we were unable to use paired comparisons in our statistical analyses. The Wilcoxon rank sum test (Conover 1980) was used for comparisons of non-normal data.

## RESULTS

The response rates were 82% for extension agents and 81% for game wardens. The number of years experience for extension agents (median = 20) was significantly greater ( $z = 3.577$ ,  $P = 0.0003$ ) than for game wardens (median = 9).

Extension agents generally perceived greater yield losses to crops from deer damage than did game wardens,

but the differences were not statistically different (Table 1). The perceived average yield losses were low for all crops, ranging from 1.2% for vegetables reported by game wardens to 4.9% for soybeans reported by extension agents. There was considerable variability in yield loss estimates by crop as reflected by coefficient of variation values. While most estimated losses were less than 5% per crop, there were reports of up to 21% loss. Several respondents of each survey commented that the yield loss varied considerably among fields, with most fields incurring no damage while the crops in some fields was destroyed.

Subjective estimates of deer damage to soybeans were similar between extension agents and game wardens (Table 2,  $\chi^2 = 1.118$ ,  $P = 0.57$ ). Most (72%) respondents categorized damage as light, while 11% and 17% of the respondents considered damage to be absent or moderate, respectively. No game wardens or extension agents described deer damage to soybeans as substantial or severe.

The proportion of game wardens (72%) receiving requests for advice concerning deer damage to soybeans was greater ( $\chi^2 = 3.424$ ,  $P = 0.06$ ) than the proportion of extension agents (45%) receiving similar requests. However, for those extension agents whose advice was sought, the average number of requests received per agent ( $\bar{x} = 14$ ) was similar to the mean number of requests received by individual game wardens ( $\bar{x} = 15$ ,  $t = 0.786$ ,  $P = 0.44$ ).

The most frequently reported control methods were lethal, crop damage permits and antlerless deer permits (Table 3). Only game wardens are authorized to issue these permits, but some extension agents did recommend to farmers that they seek appropriate permits. Other control methods recommended by game wardens and extension agents were chemical repellents, fencing, and techniques to frighten deer. Sample sizes pertaining to these methods were too small for meaningful statistical comparisons.

The range of estimates of number of deer/mi<sup>2</sup> was greater for extension agents (1 - 65) than for game wardens (1 - 25). The largest estimate by an extension agent (65) was much greater than the estimate by the game warden in the same county (5) and more than 3 times greater than the second highest estimate by an extension agent (20). In counties for which both the extension agent and game warden provided an estimate of the deer population size, there was no apparent pattern. That is, neither group consistently reported higher or lower estimates than the other group. The median estimate by extension agents (10) was greater than the value for game wardens (8), but this difference was not significantly different ( $z = 0.6538$ ,  $P = 0.51$ ).

The qualitative perceptions in the 5-year (1969-1974) trend in the local deer population size was significantly different ( $P = 0.03$ ) between extension agents and game wardens (Table 4). While most (55%) of the game wardens estimated that the population size did not change, half of the extension agents estimated that the population size had increased.

We asked both survey groups to indicate their preferred management plan for the deer population in their county on a scale ranging from greatly decrease the population to greatly increase the population (Table 5). More wardens ( $N = 6$ ) than extension agents ( $N = 1$ ) favored increasing the deer population. Notwithstanding this, there was no overall difference in preferred management plan between the two groups ( $\chi^2 = 4.659$ ,  $P = 0.588$ ). Nearly half (48%) of all respondents favored maintaining the deer population at present levels.

#### Other Vertebrate Species

We asked both survey groups to identify other species that cause notable damage to soybeans. Both groups cited groundhogs and rabbit most frequently. However, more extension agents reported damage by each of the wildlife categories more often than game wardens (Table 6).

## DISCUSSION

There were few differences between game wardens and extension agents in their assessments of deer damage to crops, perceptions and management preferences regarding the local deer populations, and recommendations regarding control of deer damage to soybeans. On average, both extension agents estimate that there is little loss of soybean yield from deer damage in Virginia. However, both groups acknowledge that farmers in some areas incur significant loss of soybean yield due to deer. This is consistent with patterns of wildlife damage to crops described in other questionnaire survey studies (Brown et al. 1977, Stoll and Mountz 1983, Tanner and Dimmick 1983), as well as findings based on actual field data (Dolbeer 1980, Rivest and Bergonon 1981).

Both respondent groups provided similar estimates of deer population size and preferred similar management plans. However, more extension agents than game wardens estimated that the county deer population was increasing in size. Extension agents were also more likely to report notable damage to soybeans by wildlife other than deer.

While farmers asked both extension agents and game wardens about methods to control deer damage to soybeans, game wardens were more frequently approached. This may be, in part, because farmers view game wardens as a more appropriate source for information concerning wildlife species.

Alternatively, farmers may more often consult game wardens because game wardens are authorized to issue crop damage permits and antlerless deer tags. Other methods of control, such as chemicals and scaring techniques, have uncertain effectiveness in mitigating deer damage to crops. Fencing is generally not considered a viable option for protecting field crops, as the cost can be prohibitive. Therefore, in absence of consistent nonlethal controls of deer damage to crops, it appears that farmers

contact game wardens for the necessary permits to cull the deer herds on their farms. Our analysis of deer damage permits issued in Virginia indicated that most permits are issued in the same counties that these surveys were conducted (Lyon and Scanlon 1985).

The utility of conducting questionnaire surveys of agriculture and wildlife personnel is similar to that of surveying farmers. These surveys provide a general indication of the extent and location of problems within the survey area. Such information can be used to focus resources on particular areas for actual field evaluations. In addition, these surveys indicate interactions among the various social components involved in agricultural production. The results also suggest that both wildlife and agriculture personnel should be targeted when publications concerning wildlife damage to crops are developed.

## LITERATURE CITED

- Brown, T. L., Decker, D. J., and C. P. Dawson. 1977. Farmer willingness to tolerate deer damage in the Erie-Ontario Lake Plain. *Nat. Resour. Res. and Ext. Ser.* 8, Col. of Agr. and Life Sci., Cornell Univ., Ithaca, NY. 33pp.
- Conover, W. J. 1980. *Practical nonparametric statistics.* John Wiley & Sons, New York. 493pp.
- Dolbeer, R. A. 1980. Blackbirds and corn in Ohio. *U.S. Fish and Wildl. Serv. Resource Publ.* 136. Washington, DC. 18pp.
- Lyon, L. A. and P. F. Scanlon. 1985. Evaluating reports of deer damage to crops: implications for wildlife research and management programs. *Proc. Eastern Wildl. Damage Conf.* 2:224-231.

- McPherson, R. M., W. A. Allen, and J. C. Smith. 1981. Soybean insect pest management for Virginia. Va. Coop. Ext. Serv. Pest Management Guide 32: Virginia Polytechnic Institute and State University, Blacksburg, VA. 10pp.
- Rivest, P. and J. M. Bergonon. 1981. Density, food habits, and economic importance of raccoons (Procyon lotor) in Quebec agroecosystems. Can J. Zool. 59:1755-1762.
- Sokal, R. R. and F. J. Rohlf. 1969. Biometry. W.H. Freeman and Company, San Francisco. 776pp.
- Stoll, R. J. and G. L. Mountz. 1983. Rural landowner attitudes toward deer and deer populations in Ohio. Ohio Fish and Game Report 10. Columbus, OH. 18pp.
- Tanner, G. and R. W. Dimmick. 1983. An assessment of farmers' attitudes towards deer and deer damage in west Tennessee. Proc. Eastern Wildl. Damage Conf. 1:195-199.
- Virginia Commission of Game and Inland Fisheries. 1984. Virginia Wildlife Investigations: Annual Report. Richmond, Va.
- Virginia Crop Reporting Service. 1985. Virginia Agricultural Statistics. Virginia Crop Reporting Service Bull. No. 49.

Table 1. Crop yield losses (%) in 1984 attributed to deer as reported by game wardens and extension agents in Virginia.

Crop	Percent of Crop Lost							
	Game Wardens			Extension Agents			Comparisons	
	N	Range	X(SD)	N	Range	X(SD)	z	P
Soybeans	21	0 - 5	2.9(1.96)	22	0 - 21	4.9(5.01)	1.006	0.31
Corn	16	0 - 10	1.9(2.56)	15	0 - 5	1.5(1.64)	0.353	0.72
Small grains	16	0 - 5	1.7(1.78)	16	0 - 5	1.7(1.61)	0.118	0.91
Peanuts	14	0 - 5	1.7(2.23)	5	1 - 10	3.0(3.94)	1.156	0.25
Vegetables	15	0 - 2	1.2(1.37)	13	0 - 8	1.9(2.47)	0.468	0.64
Tobacco	1	1		3	0 - 5	2.3(2.31)		
Hay				8	0 - 5	1.3(0.67)		

Table 2. Numbers of game wardens and extension agents in eastern Virginia providing qualitative description of average amount of deer damage to soybeans during the 1984 growing season.

Damage category	Respondent group (N)	
	Game Wardens	Extension Agents
None	3	2
Light	19	14
Moderate	3	5
Substantial	0	0
Severe	0	0

$\chi^2 = 1.118, P = 0.57$

Table 3. Number of game wardens (N = 25) and extension agents (N = 22) in eastern Virginia reporting methods authorized and recommended to soybean farmers in 1984 for control of deer damage.

Control method	Respondent group	
	Game Wardens	Extension Agents
Advised farmer to seek crop damage permit	-	7
Issued antlerless deer permits	24	-
Advised farmer to seek antlerless deer permit	-	5
Issued crop damage deer kill permits	12	-
Advised farmer about chemical control methods	9	5
Advised farmer about fencing methods	2	1
Advised farmer about scaring methods	7	2

Table 4. Qualitative perceptions of 5-year (1979-1984) trend in deer population.

Observed trend	Respondent group (N)	
	Game Wardens	Extension Agents
Fewer	3	6
Same	13	5
More	8	11

Table 5. Numbers of game wardens and extension agents in eastern Virginia recommending various management plans for the deer population in their respective counties based on 1984 surveys.

Preferred plan	Respondent group (N)	
	Game Wardens	Extension Agents
Greatly decrease population	1	3
Moderately decrease population	3	2
Slightly decrease population	4	3
Maintain current population level	11	10
Slightly increase population	3	1
Moderately increase population	2	0
Greatly increase population	1	0

$\chi^2 = 4.659, P = 0.59$

Table 6. Percent of respondents reporting notable damage to soybean crops by wildlife other than deer during 1984 in eastern Virginia.

Wildlife Taxa	Respondent Group (%)	
	Game Wardens N = 25	Extension Agents N = 22
Waterfowl	4	27
Blackbirds or Starlings	8	32
Crows	12	32
Woodchuck	24	68
Rabbit	32	45
Raccoon	0	14