AN ASSESSMENT OF FARMERS' ATTITUDES TOWARDS DEER AND DEER DAMAGE IN WEST TENNESSEE

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INTRODUCTION

The Tennessee Wildlife Resources Agency (TWRA) has been involved in white-tailed deer (*Odocoileus virginianus*) restoration since the 1950's. Annual deer harvest summaries of the TWRA reveal a many-fold increase in the number of deer taken by hunters in recent years, reflecting the success of that project. However, that success may be perceived as a mixed blessing by some of Tennessee's farmers, whose crops may be damaged by deer or who may have problems with deer hunters.

Moore and Folk (1978) listed Tennessee as reporting 'slight' crop depredations in 'localized' areas, with damage reported by only 20 to 30 individuals in 1977. Since there are over 95,000 farms in Tennessee (Tennessee Crop Reporting Service 1982), these figures would indicate that only .02% to .03% of the state's farmers were having problems with deer, a figure likely to be considered insignificant by anyone but an affected farmer. Much of the state's farmland is in corn or soybeans (approximately 6% and 17% respectively), both of which are heavily used deer foods (Flyger and Thoerig 1962, Klimstra and Thomas 1964, Korschgen 1954, Mustard and Wright n.d.). The extent of land devoted to these crops, in combination with large areas classified as deer habitat in agricultural counties (over 50% of the land area in most counties - TWRA 1983) and an increasing deer population, create a potential for a number of negative farmer-deer interactions significantly greater than reported by Moore and Folk (1978).

This study of 3 counties in western Tennessee was aimed at developing a current appraisal of Tennessee farmers' attitudes towards deer and deer damage.

METHODS

A mail-back questionnaire (similar to the survey instrument used in New York by Brown et al. [1980]) was used to assess farmers' attitudes towards deer and deer damage in Henry, Montgomery, and Stewart Counties, Tennessee. Farmers were systematically sampled from a list maintained by each county's Cooperative Extension Office.

Farmers' responses to questions concerning their attitudes towards deer and deer damage were analyzed by county, percent of income derived from farm, and hunting and hunter-problem status groups using the Statistical Analysis System (SAS) (SAS Institute 1979) and the Statistical Package for the Social Sciences (SPSS) (Nie et al. 1975) computer packages. Of primary interest were responses related to farmers' perceptions of deer damage to their crops, their feelings about having deer in their area and the future trend of the deer population in their county.

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STUDY AREA

Henry, Montgomery and Stewart Counties are adjacent counties in northwestern Tennessee, bordered to the north by Kentucky. They are rural counties, engaged primarily in agricultural activities. Soybeans, corn and wheat are the most extensively cultivated crops. Approximately 13% of the 3-county land base is forested (US Department of Commerce 1981), significantly less than average for the state. Topography of the region ranges from nearly level to dissected. The climate is warm temperate with long, hot summers, and short, cold winters (Austin et al. 1953).

These counties were chosen for study because of their proximity to an on-going deer repellent study, their intensive cultivation of crops which have the potential for sustaining deer damage, and their relatively high deer population levels.

STUDY AREA DEER POPULATION

As a result of a TWRA restocking program, the deer population level in these counties has grown substantially in recent years. In 1964, 367 deer were harvested in the 3 counties. By 1982, that figure reached 2,008 deer (TWRA 1983).

The Tennessee Wildlife Resources Agency considers 55% of the 3 counties as deer habitat. Henry County's Deer Index (Total deer kill per 1,000 acres of deer habitat) of 7.50 is the eighth highest of Tennessee's 95 counties. Montgomery and Stewart Counties have lower Deer Indices, ranking in the top 25% and 50% of Tennessee counties, respectively (TWRA 1983).

The anticipated 1983 prehunt deer population levels are 3500, 5500, and 7900 animals for Stewart, Montgomery and Henry Counties, respectively (L. Marcum pers. comm.). Population densities for those counties are approximately 1 deer per 24 ha, 11 ha and 7 ha of deer habitat, respectively, placing them in the mid to highest density ranges in Tennessee.

RESULTS

SURVEY RESPONSE RATE

Questionnaires were mailed to 1,010 of approximately 2,775 farmers in Henry, Montgomery and Stewart Counties during February and May, 1983. The useable single-mailing response rate (no follow-up mailings) was 35.1% of the 964 delivered surveys.

FARMER CHARACTERISTICS

A plurality of farmers (34.2%) derived more than 75% of their income from farming (Table 1). A significant

Table 1. Percentage of income derived from farming by west Tennessee farmers.

Percent income derived	Percent of farmers reporting	
1-10	19.6	(N=64)
11-25	17.4	(N=57)
26-50	14.7	(N=48)
51-75	14.1	(N=46)
76-100	34.2	(N=112)
	100.0	(N=327)

difference ($p<0.05$) in attitudes was displayed among income groups towards deer and deer damage. The proportion of farmers reporting damage to crops was greater in the highest income-derived group compared to the lowest group in 2 different questions relating to their perceptions of crop damage (Table 2).

We emphasize that these are the farmers' qualitative estimates of damage, not objective appraisals. However, it was the farmers' perceptions and estimates that were of primary interest in this study.

There was also a significant difference ($p<0.05$) among income groups relating to their interactions with hunters. The proportion of farmers in the highest income group reporting substantial problems with hunters was almost double that of the lowest group (Table 3). It should be noted that farmers reporting higher incomes derived from their farms also reported significantly larger farm sizes ($p<0.01$) than did lower income-derived groups. The larger land base may attract more hunters, thus increasing the likelihood that higher income farmers will encounter more hunters, perhaps increasing the likelihood of negative interactions between them.

Twice the proportion of farmers in the highest income group desired some level of decrease in the deer

Table 2. The effect of percentage of income derived from farming upon west Tennessee farmers' estimates and opinions of deer damage.

	Percent income derived				
	1-10%	11-25%	26-50%	51-75%	76-100%
Amount of deer damage sustained	(N=62)	(N=57)	(N=47)	(N=46)	(N=112)
	percemt				
No damage	56.5	56.1	36.2	32.6	31.3
Light	32.3	33.3	34.0	37.0	42.0
Moderate	8.0	7.0	17.0	15.2	16.1
Substantial	3.2	0.0	8.5	13.0	8.0
Severe	0.0	3.6	4.3	2.2	2.6
	$\chi^2=27.015$	DF=16	$p<0.05$		
Feelings about deer damage	(N=63)	(N=56)	(N=45)	(N=43)	(N=106)
Not aware of damage	57.1	58.9	37.8	23.3	38.7
Negligible	19.1	17.9	26.6	32.5	26.4
Tolerable	17.5	19.6	20.0	30.2	22.6
Unreasonable	6.3	3.6	15.6	14.0	12.3
	$\chi^2=21.616$	DF=12	$p<0.05$		

Table 3. The effect of percentage of income derived from farming upon west Tennessee farmers' perceptions of past relations with hunters.

	Percent income derived				
	0-10%	11-25%	26-50%	51-75%	76-100%
Farmers' relations with hunters	(N=63)	(N=54)	(N=45)	(N=46)	(N=111)
	percent				
o problems	44.4	50.0	24.4	34.8	32.4
Minor problems	42.9	44.4	44.5	41.3	46.0
Substantial problems	12.7	5.6	31.1	23.9	21.6
	$\chi^2=17.225$	DF=8	$p\leq0.05$		

population, and over 3 times the proportion of that same group felt that deer were a nuisance, compared to farmers in the lowest income group (Table 4).

Farmers who hunted were more likely to favor an increase in the deer population level and had more positive feelings about the aesthetic value of deer than non-hunting farmers (Table 5).

Farmers who reported past problems with hunters expressed significantly more negative feelings about deer and were more likely to have posted their land than farmers who reported no past problems (Table 6).

Approximately 41% of all respondents reported no damage to their crops, 50% reported light to moderate damage, and 9% reported substantial to severe damage (Table 7). The majority of farmers (62%) reported that they enjoyed having deer in their area, but 15.4% felt that deer were a nuisance. About 58% of the farmers felt that there were more deer now than 5

Table 4. The effect of percentage of income derived from farming by west Tennessee farmers upon their opinions on deer population size and aesthetic value.

	Percent income derived				
Deer population trend seen over past 5 years	1-10% (N=64)	11-25% (N=57)	26-50% (N=48)	51-75% (N=46)	76-100% (N=112)
	percent				
More deer now	42.2	43.9	62.5	60.9	69.6
Fewer deer now	12.5	14.0	6.2	8.7	8.9
Same number	37.5	36.8	29.2	26.1	17.9
Don't know	7.8	5.3	2.1	4.3	3.6
	$\chi^2=20.134$	DF=12	$p<0.10$		
Deer population trend desired	(N=61)	(N=54)	(N=47)	(N=46)	(N=112)
Great increase	19.7	5.6	6.4	4.3	11.6
Moderate incr.	9.8	14.8	10.6	15.2	11.6
Slight increase	14.8	22.2	6.4	10.9	10.7
Remain the same	37.7	44.4	42.6	35.1	30.4
Slight decrease	11.5	0.0	10.6	2.1	9.8
Moderate incr.	3.3	11.1	8.5	13.0	11.6
Great decrease	3.2	1.9	14.9	19.4	14.3
	$\chi^2=41.827$	DF=24	$p<0.05$		
Opinions about deer	(N=63)	(N=57)	(N=47)	(N=45)	(N=109)
I enjoy deer	74.6	75.5	46.9	57.8	56.0
Enjoy but worry	6.4	7.0	25.5	11.1	15.6
Deer are nuisance	6.3	3.5	17.0	26.7	22.0
No opinion	12.7	14.0	10.6	4.4	6.4
	$\chi^2=35.437$	DF=12	$p<0.05$		

years ago. A slight plurality of the farmers wanted the deer population level to remain the same (Table 8).

DISCUSSION

Fifty-nine percent of the farmers surveyed in West Tennessee incurred some level of deer damage to their crops. Almost 70% of the farmers deriving 75-100% of their income from their farm indicated that deer had damaged their crops to some extent, and over 12% of that group felt that the amount of damage was unreasonable.

Brown et al. (1977, 1978) found that less than one-third of New York farmers reported deer damage to their crops, and that only 2% felt that the damage was unreasonable. While only 2% of the farmers in New York felt that deer were a nuisance, 22% of the Tennessee farmers in the highest income-derived bracket and over 15% of all farmers surveyed felt that deer were a nuisance. Only 6.6% of the New York farmers wanted some level of decrease in the deer population level, compared with 27.6% of the Tennessee farmers.

Table 5. The influence of hunting status upon west Tennessee farmers opinions on deer population size and aesthetic value.

	Farmers' deer hunting status		
Deer population trend desired	Hunted in 1982 (N=95)	Hunt, but not 1982 (N=43)	Do not hunt (N=192)
	percent		
Great increase	15.8	16.3	6.3
Moderate increase	24.2	9.3	6.8
Slight increase	16.8	18.6	9.9
Remain the same	29.4	37.2	41.0
Slight decrease	5.3	2.3	9.9
Moderate decrease	3.2	11.6	12.0
Great decrease	5.3	4.7	14.1
	$\chi^2=44.889$	DF=12	$p<0.01$
Opinions about deer	(N=93)	(N=43)	(N=190)
I enjoy deer	81.7	67.4	51.0
Enjoy but worry	8.6	9.3	16.3
Deer are nuisance	7.5	14.0	19.5
No opinion	2.2	9.3	13.2
	$\chi^2=26.931$	DF=6	$p<0.01$

Table 6. The impact of past experience with hunters upon west Tennessee farmers' attitudes toward deer and deer hunting on their lands.

	Farmers' experience with hunters		
Deer population trend desired	No problems (N=120)	Minor problems (N=146)	Substantial problems (N=62)
	percent		
Great increase	14.2	9.6	3.2
Moderate increase	13.3	12.3	9.7
Slight increase	15.0	14.4	6.5
Remain the same	39.2	39.0	29.0
Slight decrease	5.0	7.5	12.9
Moderate decrease	7.5	10.3	11.3
Great decrease	5.8	6.9	27.4
	$\chi^2=35.025$	DF=12	$p<0.01$
Opinions about deer	(N=120)	(N=143)	(N=61)
I enjoy deer	67.5	65.7	40.9
Enjoy but worry	10.8	12.6	19.9
Deer are nuisance	6.7	14.0	36.0
No opinion	15.0	7.7	3.2
	$\chi^2=37.488$	DF=6	$p<0.01$
Posting status	(N=120)	(N=140)	(N=61)
Yes, land posted	32.5	59.3	75.4
No, land not posted	67.5	40.7	24.6
	$\chi^2=34.657$	DF=2	$p<0.01$

Table 7. Responding west Tennessee farmers' opinions about amount of deer damage sustained and estimates of amount of crop damage by deer.

Farmers' opinions about amount of damage sustained	%	N
ot aware of damage	43.2	139
egligible	24.2	78
Tolerable	22.4	72
Unreasonable	10.2	33
10 20 30 40 50 Percent of farmers reporting	100.0	322

Farmers' estimates of crop damage by deer	%	N
o damage	41.0	137
ight	37.4	125
Moderate	12.6	42
Substantial	6.6	22
Severe damage	2.4	8
10 20 30 40 50 Percent of farmers reporting	100.0	334

Table 8. Responding west Tennessee farmers' opinions about deer, estimates of population trend for past five years, and opinions on future population trend.

Farmers' opinions about deer	%	N
I enjoy deer	62.0	206
Enjoy but worry	13.0	43
Deer are nuisance	15.4	51
No opinions	9.6	32
10 20 30 40 50 60 Percent of farmers reporting	100.0	322

Farmers' estimates of deer population trend–past 5 years	%	N
More deer now	57.7	195
Fewer deer now	9.8	33
Same number	27.8	94
Don't know	4.7	16
10 20 30 40 50 60 Percent of farmers reporting	100.0	338

Farmers' opinions on future deer population size	%	N
Great increase	10.3	34
Moderate incr.	12.1	40
Slight increase	12.9	43
Remain the same	37.1	123
Slight decrease	7.6	25
Moderate decr.	9.4	31
Great decrease	10.6	35
10 20 30 40 Percent of farmers reporting	100.0	321

Farmers in western Tennessee appear to be much less tolerant of deer and deer damage than their New York counterparts, especially those farmers deriving 75-100% of their income from farming. However, the fact that Tennessee farmers reported more damage than New Yorkers should be taken into consideration when interpreting this conclusion.

Our finding that farmers who derived higher levels of income from their farm were more intolerant of deer and deer damage than their counterparts in lower income groups corresponds with that of Kellert (1981), based on his studies of Americans' attitudes towards wildlife. He stated, "...somewhat discouragingly, a direct relationship was found between size of private property ownership, economic dependence on the land, and a willingness to sacrifice wildlife and natural habitat protection to maintain or enhance various human benefits."

Farmers who had a history of problems with hunters expressed significantly more negative attitudes towards deer than their peers with no such previous problems. As Burger and Teer (1981) noted, "Wildlife was a nuisance to some ranchers (farmers) because it forces them to deal with people who wish to hunt."

Significant yearly increases in the deer population level may have affected the number of deer damage complaints reported between 1978 and 1983. The annual deer harvest in the 3 counties doubled between 1978 and 1982 (TWRA 1983). However, some of the disparity in damage reported to our survey and that reported to Moore and Folk (1978) may be related to farmers' attitudes regarding the agencies conducting the study. Kirby et al. (1981) stated that "farmers...have not aligned themselves with wildlife agencies because of uncertainty about whether agency staffs can understand farmers' problems and values." Karbon and Trent (1977) (in Kellert 1981) found that staff of the Department of Natural Resources (Wisconsin) were often inaccurate in assessing citizens' concerns and views about wildlife. Thus, farmers in Tennessee may have been less reluctant to report problems to an agency with which they shared a working relationship (the Agricultural Experiment Station) than one less familiar to them (TWRA).

Brown et al. (1978, 1979) cited the inequities of "management on the principle of least complaint" (i.e., deer may be managed in order that wildlife agencies receive the fewest farmer complaints about deer). Their data indicated that farmers in New York may be interested in having more deer in their areas than management by least complaint suggests. In western Tennessee, however, farmers may actually be sustaining more damage than is perceived by deer managers, so that "least complaint" management is working against these farmers in a manner diametrically opposed to the New York farmers.

The incentives for a farmer to cope with wildlife are ethereal and few: aesthetic values, sporting opportunities, perhaps an important source of food. The disincentives, however, are glaring and many: damage to crops and/or livestock, nuisance animals, negative interactions with fellow citizens (e.g., hunters, animals'-rights groups) and the myriad social, legal and economic entanglements that may arise from these problems.

Considering the financial difficulties of the farming community today, efforts should be made to ensure that farmers do not bear an additional or excessive burden of damage to their crops by a deer herd managed for other special interest groups. Farmers' attitudes and assumptions merit close inspection and consideration, since it is evident from this survey that they may be paying an unwanted price for the recreational opportunities of others.

LITERATURE CITED

Austin, M.E., C.B. Beadles, R.W. Moore, B.L. Matzek, C. Jenkins, and S.R. Bacon. 1953. Soil Survey of Stewart County, Tennessee. US Department of Agriculture, Washington, D.C. 244 pp.

Brown, T.L., D.J. Decker, and C.P. Dawson. 1977. Farmer willingness to tolerate deer damage in the Erie-Ontario Lake Plain. Nat. Res. Research and Ext. Series No. 8. Dept. Nat. Res., Cornell Univ., Ithaca.

———. 1978. Willingness of New York farmers to incur white-tailed deer damage. Wildl. Soc. Bull. 6(4):235-39.

Brown, T.L., and D.J. Decker. 1979. Incorporating farmers' attitudes into management of white-tailed deer in New York. J. Wildl. Manage. 43:236-39.

Brown, T.L., D.J. Decker, and D.L. Hustin. 1980. Farmers' tolerance of white-tailed deer in central and western New York. Search: Agriculture No. 7. Cornell Univ. Ag. Exp. Stn., Ithaca. 16 pp.

Burger, G.V. and J.G. Teer. 1981. Economic and socioeconomic issues influencing wildlife management on private lands. Pages 252-278 *In* Dumke, T.T., G.V. Burger and J.R. March (eds.), Wildlife management on private lands. Wisc. Chapter, The Wildl. Soc., Madison. 568 pp.

Karbon, J. and J. Trent. 1977. Communication and resource management: a coorientation approach to identifying problems. Wisc. Dept. of Nat. Resour. and the Univ. of Wisconsin, Madison. 114 pp.

Kellert, S.R. 1971. Wildlife and the private landowner. Pages 18-34 *In* Dumke, R.T., G.V. Berger, and J.R. March (eds.), Wildlife management on private lands. Wisc. Chapter, The Wildl. Soc., Madison. 568 pp.

Kirby, S.B., K.M. Babcock, S.L. Sheriff, and D.J. Witter. 1981. Private land and wildlife in Missouri: A study of farm operator values. Pages 88-101 *In* Dumke, R.T., G.V. Burger, and J.R. March (eds.), Wildlife management on private lands. Wisc. Chapter, The Wildl. Soc., Madison. 568 pp.

Klimstra, W.D. and K. Thomas. 1964. Effects of deer browsing on soybean plants, Crab Orchard National Wildlife Refuge. Trans. Illinois State Acad. Science 57(3):178-81.

Korschgen, L.J. 1954. A study of the food habits of Missouri deer. Missouri Cons. Comm. 43 pp.

Moore, W.G. and R.H. Folk, III. 1978(1979). Crop damage by white-tailed deer in the southeast. Proc. Ann. Conf. SE Assoc. Game Fish Comm. 32:263-68.

Mustard, E.W. and V. Wright. n.d. Food habits of Iowa deer. Iowa State Cons. Comm. Fed. Aid Proj. W-99-R-3. 35 pp.

Nie, N.H., C.H. Hull, J.G. Jenkins, K. Steinbrenner, and D.H. Bent. 1975. SPSS: Statistical Package for the Social Sciences. McGraw-Hill, New York. 675 pp.

SAS Institute. 1979. SAS User's Guide, 1979 Edition. SAS Institute, Raleigh, NC. 494 pp.

Tennessee Crop Reporting Service. 1982. Tennessee agricultural statistics. Tenn. Crop Reporting Serv. Bull. T-19. Nashville, np.

Tennessee Wildlife Resources Agency. 1983. Wildlife research report: big game harvest data and range surveys 1982-83. TWRA Tech. Report No. 83-1 PCAN 0064/425. 207 pp.

United States Department of Commerce. 1981. Census of Agriculture. Vol. 1. State and County Data. Part 42 Tennessee. 681 pp.