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Assessment of Negative Economic Impacts from Deer in the Northeastern United States

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Assessment of Negative Economic Impacts from Deer in the Northeastern United States

Abstract

We conducted a survey and literature review to identify affected stakeholders and gauge economic impacts from unwanted deer-human interactions in the northeastern United States. We estimated an annual economic impact from deer-vehicle collisions and deer depredation to select high-value agricultural, grain, and nursery crops, and residential and commercial landscaping for 13 northeastern United States at nearly \$640 million. Our results can be used by Extension and wildlife professionals to inform and involve stakeholders participating in deer management decisions, tailor management strategies to mitigate deer-human conflicts, and assist policy makers when weighing the benefits against the negative impacts from deer.

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Introduction

White-tailed deer (*Odocoileus virginianus*) are perhaps the most recognizable wildlife species in the United States. The economic benefits of hunting, viewing, and photographing deer are in the hundreds of millions of dollars annually (United States Fish and Wildlife Service, 2002). Deer provide numerous ecological benefits as well (Putman, 1988).

Evidence suggests that deer are also causing negative impacts. For example, Conover, Pitt, Kessler, DuBow, and Sandborn (1995) estimated that more than one million deer-vehicle collisions occur annually in the United States, costing over \$1.1 billion in repair costs and resulting in 29,000

human injuries and 211 human fatalities. Nationwide, deer have been recognized to cause more damage to agricultural crops than any other vertebrate wildlife species (Conover & Decker, 1991), costing farmers more than an estimated \$100 million each year (Conover, 1997; Conover, 1998).

It is critical that stakeholders experiencing unwanted deer interactions be included and involved in management decisions if deer management is to be successful (Messmer, Cornicelli, Decker, & Hewitt, 1997). Arming decision makers with factual information is also vital because many deer management decisions are made in the policy arena or are politically influenced (Curtis & Hauber, 1997).

Therefore, the objective of our study was to identify affected stakeholders and the extent of negative impacts resulting from unwanted deer-human interactions in the northeastern United States. Understanding affected groups and impacts will enable Extension and wildlife professionals to tailor outreach, research, and management options to better manage overabundant deer populations. Increased understanding of the stakeholders and impacts will also aid policy makers who need to evaluate the magnitude of issues as they weigh one constituency group against another.

Methods

During the fall of 2001 we gathered secondary data for 13 northeastern states: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia. We surveyed, via e-mail and telephone, Extension specialists, wildlife biologists at state wildlife agencies, and personnel at state Departments of Transportation. Our survey asked recipients for economic data on deer-vehicle collisions, deer damage to high-value agriculture (i.e., fruits and vegetables), grain crops, nursery stock, and commercial and residential landscaping. We had a 100% response rate because we contacted survey recipients until they either responded with data or informed us that no data existed. We also performed a literature review and gathered data from each state's agricultural statistic service to supplement data on impacts from the e-mail and phone surveys.

We reported straight loss figures for deer-vehicle collisions and residential/commercial landscape depredation. For example, we gathered data on the number of deer-vehicle collisions from each state of interest and multiplied number of collisions by a nation-wide average repair cost to arrive at a total estimated cost per state from deer-vehicle collisions. To determine the cost of deer depredation to high-value agriculture, grain, and nursery crops, we gathered data from each state of interest and calculated an average total production value for specific crops. For states where we had no basis for a loss estimate, we subtracted 1% from the average total production value. We chose a 1% loss estimate because it was as conservative a loss estimate (whole number) as possible but still allowed for nominal levels of depredation. A higher loss estimate was used for states where we either had published research or personal knowledge from wildlife professionals to support higher loss estimates.

Results

Deer-Vehicle Collisions

The total estimated annual vehicle damage from deer-vehicle collisions for the 13 states surveyed was \$390,594,000, ranging from a low of \$592,000 for Delaware to a high of \$150,000,000 for Pennsylvania. All states except Connecticut, Vermont, and West Virginia reflect collision data for 2000. Due to availability, 1986 data were used for Connecticut, and 1991 data were used for Vermont and West Virginia. An average repair bill of \$2,000 per collision was used to estimate the economic impact from deer-vehicle collisions, according to the Insurance Information Institute <<http://www.iii.org/individuals/auto/lifesaving/deercar/>>. The data do not include costs of human fatalities associated with deer collisions or costs associated with disposal of deer carcasses.

Table 1.
Economic Impact from Deer-Vehicle Collisions for 13 Northeastern United States, 1986-2000

State	Economic Impact from Deer-Vehicle Collisions (\$)	Source
Connecticut	4,846,000	Romin and Bissonette, 1996
Delaware	462,000	Delaware Dept. of Natural Resources and Environmental Control, 2001 ¹

Maine	9,000,000	Maine Dept. of Inland Fisheries and Wildlife, 2001 ²
Maryland	28,000,000	Maryland State Highway Commission, 2001 ³
Massachusetts	6,000,000	Massachusetts Dept. of Fish and Wildlife ⁴
New Hampshire	2,400,000	New Hampshire Dept. of Fish and Game, 2001 ⁵
New Jersey	38,000,000	New Jersey Dept. of Transportation, 2001 ⁶
New York	120,000,000	Cornell Cooperative Extension, 2001 ⁷
Pennsylvania	150,000,000	Penn State Cooperative Extension, 2001 ⁸
Rhode Island	1,400,000	Rhode Island Division of Fish and Wildlife, 2001 ⁹
Vermont	3,028,000	Romin and Bissonette, 1996
Virginia	8,354,000	Virginia Dept. of Game and Inland Fisheries, 2001 ¹⁰
West Virginia	19,030,000	Romin and Bissonette, 1996
Total	390,520,000	

¹ K. Reynolds, personal communication, October, 2001.

² G. Lavigne, personal communication, October, 2001.

³ B. Branch, personal communication, October, 2001.

⁴ B. Woytek, personal communication, October, 2001.

⁵ K. Adams, personal communication, October, 2001.

⁶ C. Griggs, personal communication, October, 2001.

⁷ D. J. Decker, personal communication, October, 2001.

⁸ G. J. San Julian, personal communication, October, 2001.

⁹ L. Suprock, personal communication, October, 2001.

¹⁰ M. Knox, personal communication, October, 2001.

High-Value Agricultural Depredation

The estimated annual loss to high-value agricultural crops for the 13 states was \$94,374,840, ranging from a low of \$27,450 for Rhode Island to a high of \$48,205,006 for New York. High-value agricultural crops included fresh market and processed vegetables, including but not limited to

snap beans, sweet corn, leafy vegetables, tomatoes, and peppers. Apples and peaches were also included as a high-value crop.

An average total production value for high-value crops of interest for the years 1998-2000 was compiled for most states. Due to data availability, total production values were averaged for the years 1994-1999 for Delaware and 1997-1999 for New Jersey, and single years were used for Maryland (1996) and Pennsylvania (1995). Once total production values were compiled, economic losses from deer ranging from 10% to 20% were subtracted for Maryland (McNew & Curtis, 1997), New Jersey (Drake & Grande, 2002), New York (P. D. Curtis, personal communication, December 12, 2001) and Pennsylvania (G. J. San Julian, personal communication, December 12, 2001). For the other states, where documentation about deer depredation was lacking, a 1% damage estimate was subtracted from each state's total production value.

Table 2.
Average Estimated Economic Impact from Deer Depredation to Select High-Value Agricultural Crops for 13 Northeastern United States, 1994-2000

State	Deer Depredation to Select High-Value Ag. Crops (\$)	Source
Connecticut	136,934	New England Agricultural Statistics, 2002
Delaware	375,966	Delaware Agricultural Statistics Summary, 2001
Maine	138,813	New England Agricultural Statistics, 2002
Maryland	11,464,000	McNew and Curtis, 1997
Massachusetts	329,454	New England Agricultural Statistics, 2002
New Hampshire	114,287	New England Agricultural Statistics, 2002
New Jersey	15,155,270	2000 New Jersey Agriculture Annual Report, 2001
New York	48,205,006	New York Agricultural Statistics, 2001
Pennsylvania	17,506,294	Pennsylvania Agricultural Statistics, 2001
Rhode Island	27,450	New England Agricultural Statistics, 2001
Vermont	105,523	New England Agricultural Statistics,

		2002
Virginia	580,100	Virginia Agricultural Statistical Service, 2002
West Virginia	208,743	West Virginia Agricultural Statistics, 2001
Total	94,347,840	

Grain Crop Depredation

The estimated annual loss to grain crops for the 13 surveyed states was \$77,213,417, ranging from a low of \$14,270 for Rhode Island to a high of \$26,476,000 for Maryland. Grain crops included corn (silage and grain), soybeans, wheat, and oats.

An average total production value for the grain crops of interest was compiled for the years 1998-2000 for most states. Due to data availability, total production values were averaged for the years 1997-1999 for New Jersey and 1995-1996 for Pennsylvania, and a single year's production value was used for Maryland (1996). A 5% loss value was subtracted from the total production value for New Jersey (Drake & Grande, 2002), New York (P. D. Curtis, personal communication, December 12, 2001), and Pennsylvania (G. J. San Julian, personal communication, December 12, 2001). The loss value for Maryland was cited from McNew and Curtis (1997). For all other states where documentation about deer depredation was lacking, a 1% loss estimate was used.

Table 3.
Average Estimated Economic Impact from Deer Depredation to Select Grain Crops for 13 Northeastern United States, 1995-2000

State	Deer Depredation to Select Grain Crops (\$)	Source
Connecticut	162,400	New England Agricultural Statistics, 2002
Delaware	867,937	Delaware Agricultural Statistics Summary, 2001
Maine	167,816	New England Agricultural Statistics, 2002
Maryland	26,476,000	McNew and Curtis, 1997
Massachusetts	130,283	New England Agricultural Statistics, 2002
New Hampshire	81,253	New England Agricultural Statistics, 2002
New Jersey	2,073,030	2000 New Jersey Agriculture Annual Report, 2001
New York	18,699,391	New York Agricultural Statistics, 2001
Pennsylvania	25,738,984	Pennsylvania Agricultural

		Statistics, 2001
Rhode Island	14,270	New England Agricultural Statistics, 2002
Vermont	446,703	New England Agricultural Statistics, 2002
Virginia	2,252,124	Virginia Agricultural Statistical Service, 2002
West Virginia	103,226	West Virginia Agricultural Statistics, 2001
Total	77,213,417	

Nursery Stock Depredation

The estimated annual economic loss from deer depredation to nursery stock was \$27,878,180, ranging from a low of \$13,660 for Vermont to a high of \$13,628,950 for New Jersey. An average total production value for nursery stock was compiled for the years 1997-2000. A 5% loss estimate was subtracted from the total production value for New Jersey (Drake & Grande, 2002), New York (P. D. Curtis, personal communication, December 12, 2001), and Pennsylvania (G. J. San Julian, personal communication, December 12, 2001). For all other states where documentation about deer depredation was lacking, a 1% loss estimate was used.

Table 4.

Average Estimated Economic Impact from Deer Depredation to Nursery Stock for 13 Northeastern United States, 1997-2000

State	Deer Depredation to Select Grain Crops (\$)	Source
Connecticut	778,190	New England Agricultural Statistics, 2002
Delaware	No data available	
Maine	35,020	New England Agricultural Statistics, 2002
Maryland	No data available	
Massachusetts	227,650	New England Agricultural Statistics, 2002
New Hampshire	69,010	New England Agricultural Statistics, 2002
New Jersey	13,628,950	2000 New Jersey Agriculture Annual Report, 2001

New York	8,750,000	Cornell University Agricultural Experiment Station
Pennsylvania	4,303,200	Pennsylvania Agricultural Statistics, 2001
Rhode Island	72,500	New England Agricultural Statistics, 2002
Vermont	13,660	New England Agricultural Statistics, 2002
Virginia	No data available	
West Virginia	No data available	
Total	27,878,180	

Residential/Commercial Landscape Depredation

Data were available for only New York and were estimated based on a study by Sayre, Decker, and Good (1992). The estimated annual loss to residential and commercial ornamentals for New York was \$49,000,000.

Discussion

We estimated an annual economic impact from deer-vehicle collisions and deer damage to select agricultural crops, nursery stock, and commercial and residential landscaping for 13 northeastern states at nearly \$640 million. We suggest that this annual estimate is conservative for a number of reasons.

First, for many states and variables of interest where sufficient data were lacking, we used only a 1% loss estimate. The possibility is great that more than 1% of the average total production value for select high-value agricultural, grain, and nursery crops was lost annually. Losses to deer in the northeast are among the largest in the United States (Wywiałowski, 1994; Stromayer & Warren, 1997).

Second, estimates of economic impact to commercial and residential landscaping are lacking for all but one of the 13 northeastern states we surveyed. However, relatively large economic losses are possible. For example, a telephone survey of 500 randomly selected suburban residents in New Jersey discovered that from 1998-2000, 25% of survey respondents experienced landscape damage around their residence as a result of deer (Derr, Maas, & Hartley, 2002).

Finally, because data were lacking we did not estimate damage for all crops. For example, we did not include depredation estimates for strawberries, a high-value crop that can receive heavy deer depredation.

Table 5.

Annual Estimated Economic Impact from Deer-Vehicle Collisions and Deer Damage to Select Agricultural Crops, Nursery Stock, and Commercial and Residential Landscaping for 13 Northeastern United States

Type of Impact	Economic Impact (\$)
Deer-vehicle Collisions	390,520,000
High-value Agricultural Depredation	94,347,840

Grain Crop Depredation	77,213,417
Nursery Stock Depredation	27,878,180
Residential/Commercial Landscape Depredation	49,000,000
Total	638,959,437

As Extension and wildlife professionals, we can use these results to develop Web-based, written, and face-to-face outreach programming to inform and recruit affected stakeholders for involvement in the decision-making process and tailor management strategies to mitigate unwanted deer impacts. Furthermore, our results may be used to support lethal management practices where appropriate. These results can also be used by policy makers to weigh the benefits against the negative impacts from deer. More informed and involved stakeholders and policy makers will lead to more productive, coordinated decision-making, and ultimately, reduced numbers of deer-human conflicts.

References

- Conover, M. R. (1997). Monetary and intangible valuation of deer in the United States. *Wildlife Society Bulletin*, 25, 298-305.
- Conover, M. R. (1998). Perceptions of American agricultural producers about wildlife on their farms and ranches. *Wildlife Society Bulletin*, 26, 597-604.
- Conover, M. R., & Decker, D. J. (1991). Wildlife damage to crops: Perceptions of agricultural and wildlife professionals in 1957 and 1987. *Wildlife Society Bulletin*, 19, 46-52.
- Conover, M. R., Pitt, W. C., Kessler, K. K., DuBow, T. J., & Sandborn, W. A. (1995). Review of human injuries, illnesses, and economic losses caused by wildlife in the United States. *Wildlife Society Bulletin*, 23, 407-414.
- Curtis, P. D., & Hauber, J. R. (1997). Public involvement in deer management decisions: Consensus versus consent. *Wildlife Society Bulletin*, 25, 399-403.
- Delaware Agricultural Statistics Service. (2001). *Delaware agricultural statistics summary, 2000-2001*. Dover, DE: Delaware Department of Statistics.
- Derr, D. A., Maas, P. A. Y., & Hartley, M. P. (2002). [New Jersey residents' perception of deer in the suburbs]. Unpublished raw data.
- Drake, D., & Grande, J. (2002). Assessment of wildlife depredation to agricultural crops in New Jersey. *Journal of Extension* [On-line], 40(1). Available at: <http://www.joe.org/joe/2002february/rb4.html>
- McNew, K., & Curtis, J. (1997). Maryland farmers lose bucks on deer-damaged crops. *Deer management and policy options in Maryland--Conference proceedings* (pp. 16-23). Center for Agricultural and Natural Resource Policy, University of Maryland.
- Messmer, T. A., Cornicelli, L., Decker, D. J., & Hewitt, D. G. (1997). Stakeholder acceptance of urban deer management techniques. *Wildlife Society Bulletin*, 25, 360-366.
- New England Agricultural Statistics Service. (2002). *New England agricultural statistics, 2001*. Concord, NH: New England Agricultural Statistics Service.
- New Jersey Agricultural Statistics Service. (2001). *2000 New Jersey agriculture annual report: Agricultural statistics* (Circular No. 556). Trenton, NJ: New Jersey Department of Agriculture.
- New York Agricultural Statistics Service. (2001). *New York agricultural statistics 2000-2001*. Albany, NY: New York Department of Agriculture and Markets.
- Pennsylvania Agricultural Statistics Service. (2001). *Pennsylvania agricultural statistics 2000-2001*. Harrisburg, PA: Pennsylvania Department of Agriculture.
- Putman, R. (1988). *The natural history of deer*. Ithaca, NY: Comstock Publishing.
- Romin, L. A., & Bissonette, J. A. (1996). Deer-vehicle collisions: Status of state monitoring activities and mitigation efforts. *Wildlife Society Bulletin*, 24, 276-283.
- Sayre, R. W., Decker, D. J., & Good, G. L. (1992). Deer damage to landscape plants in New York state: Perceptions of nursery producers, landscape firms, and homeowners. *Journal of*

Environmental Horticulture, 10, 46-51.

Stromayer, K. A. K., & Warren, R. J. (1997). Are overabundant deer herds in the eastern United States creating alternate stable states in forest plant communities? *Wildlife Society Bulletin*, 25, 227-234.

United States Fish and Wildlife Service. (2002). *2001 national survey of fishing, hunting, and wildlife-associated recreation*. Washington, DC: U. S. Fish and Wildlife Service.

Virginia Agricultural Statistics Service. (2002). *Virginia agricultural statistics bulletin and resource directory* (No. 77). Richmond, VA: Virginia Agricultural Statistics Service.

West Virginia Agricultural Statistics Service. (2001). *2001 annual bulletin* (No. 32). Charleston, WV: West Virginia Department of Agriculture.

Wywiałowski, A. (1994). Agricultural producers' perceptions of wildlife-caused losses. *Wildlife Society Bulletin*, 22, 370-382.

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