September 1985

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Mark R. Ellingwood
The New York Botanical Garden

Jay B. McAninch
The New York Botanical Garden

Michael J. Fargione
The New York Botanical Garden

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by Mark R. Ellingwood,* Jay B. McAninch and Michael J. Fargione
Institute of Ecosystem Studies, The New York Botanical Garden
Millbrook, New York 12545

ABSTRACT

The recent development of high tensile electric fencing for controlling deer damage has led to the installation of these fence designs throughout the Northeast. In May 1984, 55 surveys were sent to individuals in 10 states who were known to have recently constructed deer fences. Sixty-seven percent of the surveys were returned and a variety of fence-related data were generated. These include information on deer damage, a general description of fence designs being utilized, information concerning fence voltage, data on fence maintenance and several questions on fence performance, owner satisfaction, and the cost/benefits of deer damage control. The majority of fences in this study were either 5-strand vertical (40%) or 7-strand slant (33%). Slanted fences enclosed more acreage and longer rotational crops than vertical fences. Most fence owners indicated that maintenance activities were routinely carried out and that fence performance was excellent. However, the majority of fence owners reported that deer penetration did occur. The results of the survey contradicted, to some extent. data and field observations collected by the authors in southeastern New York over the past five years. An unpublished study of 12 high-tensile fences, most of which were also reported on in the survey, revealed significant differences in wire tension, bottom wire height, and voltage between and within these fences. This study indicates that many fences are actually in poor operating condition and are in need of better maintenance. Possible reasons for the widespread owner satisfaction with fences which appear to be operating at below-optimum levels are discussed.

*Current address: Connecticut Department of Environmental Protection, North Franklin, CT 06254.

INTRODUCTION

Until recently, fencing recommendations for deer damage control emphasized woven wire fences and considered electric fences unreliable and inefficient (Caslick and Decker, 1979). Technological developments in the fencing industry and recent advances in research on fences to control deer have resulted in several new electric fence designs (McAninch, 1980). The use of low impedance, high voltage energizers and high tensile wire in fencing systems has reduced costs of fence installation and maintenance while providing effective deer damage control (Brenneman, 1983; McAninch et al., 1983; Palmer et al., 1983).

The growth in popularity of high tensile electric deer fencing has led to the installation of these designs throughout the Northeast. Unfortunately, after the initial installation, little effort has been made to monitor the performance of these fences.

This study was designed to determine the status of high tensile, electric fences recently constructed in the Northeast and to contrast the responses of owners concerning fence condition against fence evaluations conducted in the field.

We acknowledge the contributions of Carol Dowden, Raymond Winchcombe, Robert Mungari, Julie Morgan and the fence-owners who participated in the project. This project was a contribution to the program of the Institute of Ecosystem Studies, the New York Botanical Garden. Financial support was provided by the New York Department of Agriculture and Markets.

METHODS

In May 1984, surveys were sent to 55 individuals in 10 states who were known to have recently invested in deer fencing. These individuals were identified from mailing lists provided by fencing companies in the eastern United States, and through lists

obtained by various groups. Thirty-seven (67%) of the surveys were returned and a variety of fence-related data were generated. Each survey consisted of 31 multiple choice questions. These included a general description of the fence and crops protected, as well as data on voltage, wire tension and vegetation control, data on maintenance practices and information on deer damage, fence performance, owner satisfaction and the cost/benefits of deer damage control. Survey results were summarized to allow for a contrast between popular fence designs.

RESULTS

Analysis revealed that 72% of the respondents to this survey had a single deer fence, while 19% owned a second fence. The majority of the 36 fences reported in this study were either 5-strand vertical (N=14) or 7-strand slanted (N=12) designs. Only 2 respondents reported constructing 6-8-foot woven-wire fences. One-half of the slanted fences were locatd in New York, while 57% of the vertical fences were concentrated in Pennsylvania. All fences were built between 1978 and 1983, with 38% and 29% being constructed in 1980 and 1982, respectively (Figure 1). Over 54% of the respondents indicated they had built their own fences.

Most fences (54%) ranged from 1000 to 5000 feet in length. The majority (71%) protected areas of 50 acres or less. Most vertical fences (58%) enclosed 10 or less acres, while most slanted fences (50%) surrounded 11 to 50 acres (Figure 2). Sixty percent of the slanted fences were established to protect fruit trees, while vertical fences were about equally distributed among fruit trees, vegetables, and forage crops (Figure 3).

Respondents chose to use plug-in chargers on 100% of the slanted fences and on 64% of the vertical fences. The remaining vertical fences were electrified, using battery-operated chargers.

Regular structural maintenance checks were reportedly conducted at least once each month by 84% of the respondents. Similarly, 73% of the fence owners reportedly checked line voltages 1 or more times each month (Figure 4). An equal number of vertical fence owners checked voltage levels using digital and light voltmeters, while slanted fence owners used digital meters almost exclusively (92%). Fifty-nine percent of reported fence problems were electrically related. Seasonal wire tension adjustments were reportedly made to 64% of the vertical fences and 92% of the slanted fences.

Herbicides were used exclusively to control fence-line vegetation by 43% and 33% of vertical fence and slanted fence owners, respectively. The remaining respondents controlled vegetation by mowing, hand cutting, or a combination of methods (Figure 5). Most vertical fences (50%) received 2 herbicide applications annually, with 33% of the applications occurring during spring and summer and 25% during spring and fall. By contrast, the majority of slanted fences (58%) received a single herbicide application, usually during the spring (45%). The success of herbicide applications was rated good by 57% of the owners of vertical fences and by 75% of the slanted fence owners. Herbicide applications were rated to provide excellent vegetation control by 21% of the vertical fence owners and 8% of the slanted fence owners.

Owners of both vertical and slanted fences reported a wide range of deer damage prior to fencing (Figures 6 and 7). After fence construction, less than 1% damage was noted in 42% of the slanted fences (Figure 6), as compared with comparable damage in 8% of the vertical fences (Figure 7). All fence designs resulted in less than 25% of the enclosed crops being damaged. Deer penetrations were reported for both fence designs (Figure 8), with the majority (56%) occurring during the winter.

Seventy-five percent of the slanted fence owners and 64% of the vertical fence owners reported fence performance to be excellent (Figure 9). Almost 80% of all fence owners felt their fences would pay for themselves in 1 to 3 years, while 100% of high-tensile fence owners indicated they would not hesitate to invest in deer fencing again. Most respondents (42%) would choose the

slanted 7-strand design for additional fencing. If necessary, 35% of the owners would invest in a 5-strand vertical fence, while 13% would use a 6-strand vertical fence, if available.

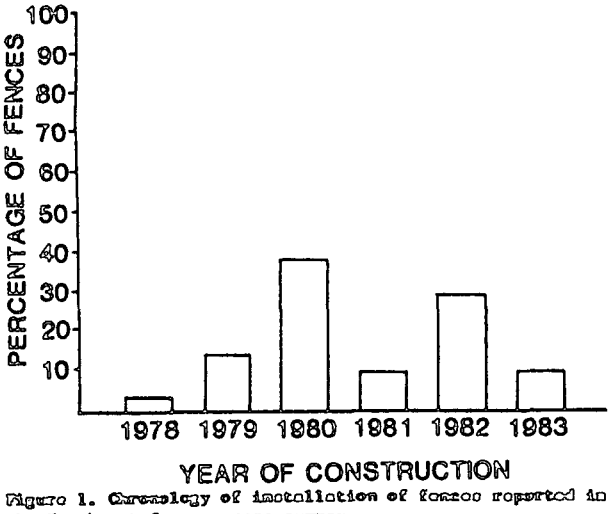

Figure 1. Chronology of installation of fences reported in the Northeast fence owners survey.

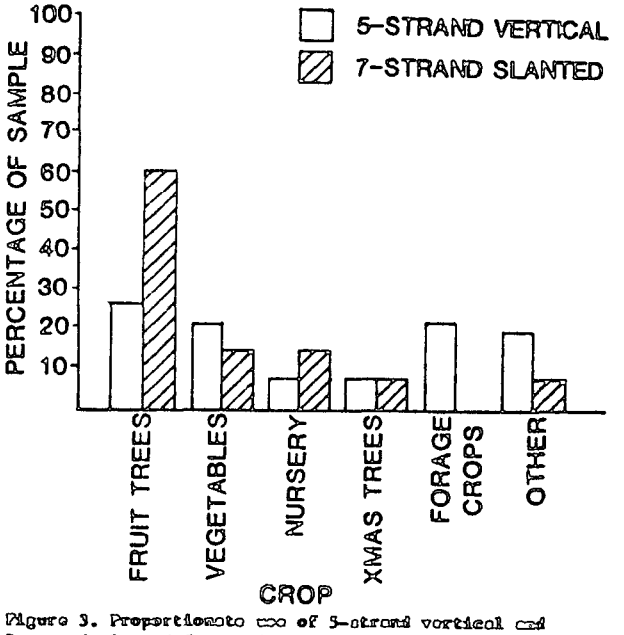

Figure 3. Proportionate use of 5-strand vertical and 7-strand slanted fences in protecting various crops as reported by Northeast fence owners.

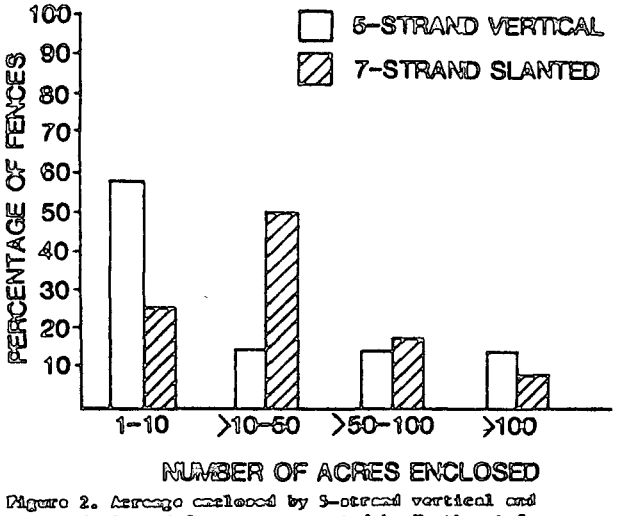

Figure 2. Acreage enclosed by 5-strand vertical and 7-strand slanted fences as reported by Northeast fence owners.

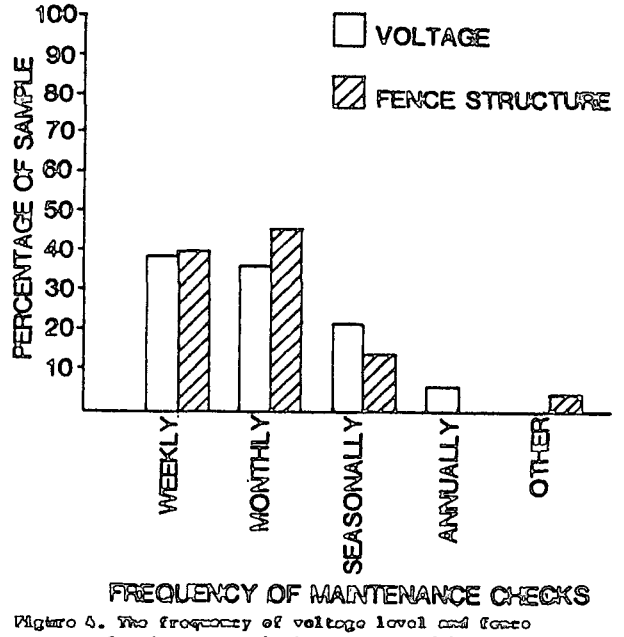

Figure 4. The frequency of voltage level and fence structural maintenance checks as reported by Northeast fence owners.

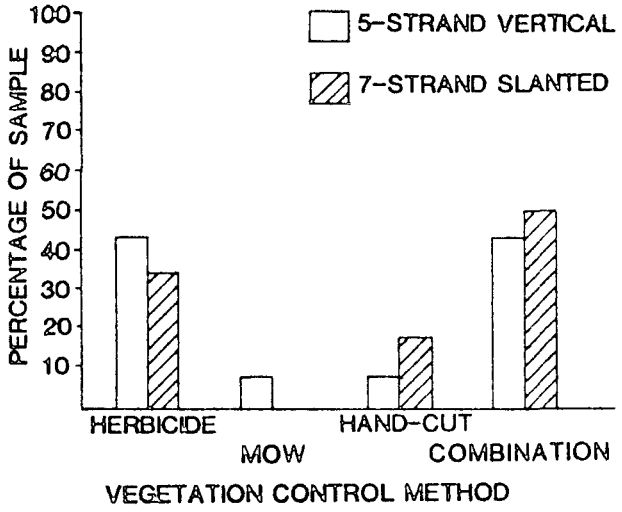

Figure 5. The proportionate use of different vegetation control methods on 5-strand vertical and 7-strand slanted fences as reported by Northeast fence owners.

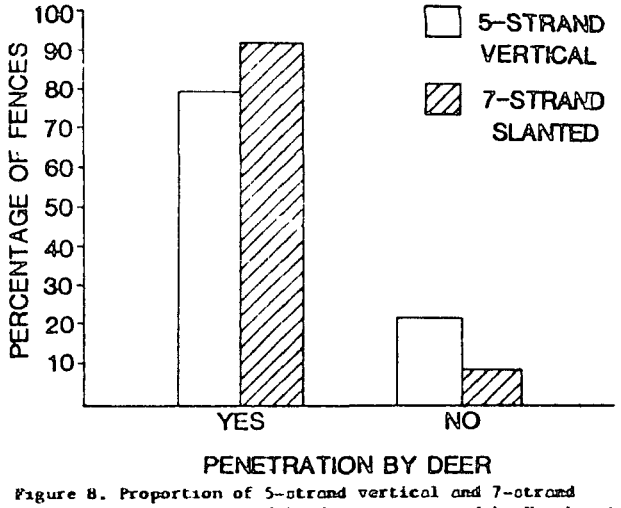

Figure 8. Proportion of 5-strand vertical and 7-strand slanted fences penetrated by deer as reported by Northeast fence owners.

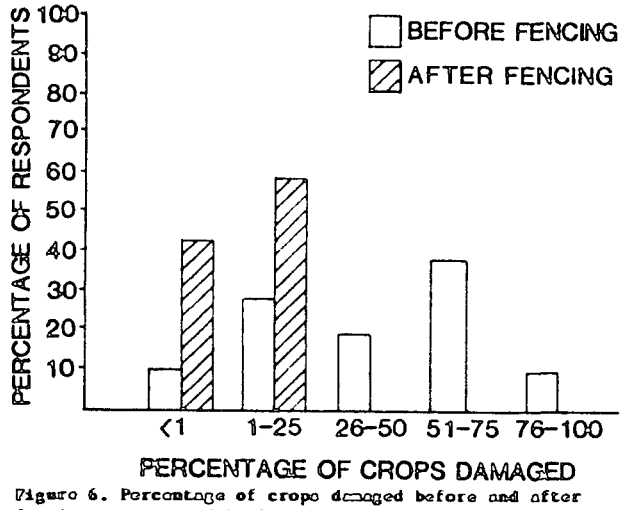

Figure 6. Percentage of crops damaged before and after fencing as reported by 7-strand slanted fence owners.

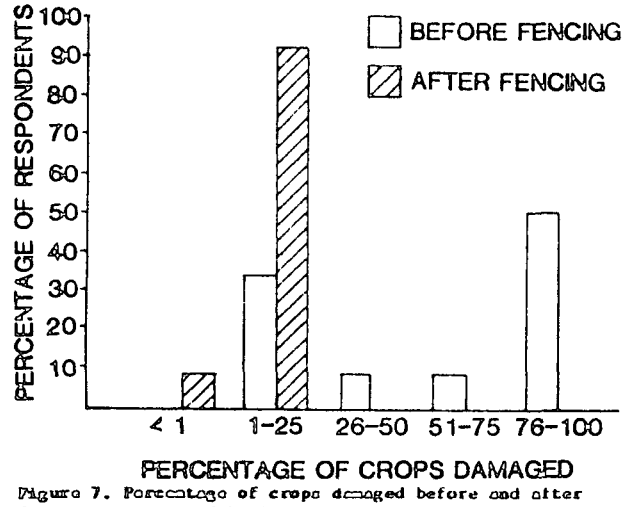

Figure 7. Percentage of crops damaged before and after fencing as reported by 5-strand vertical fence owners.

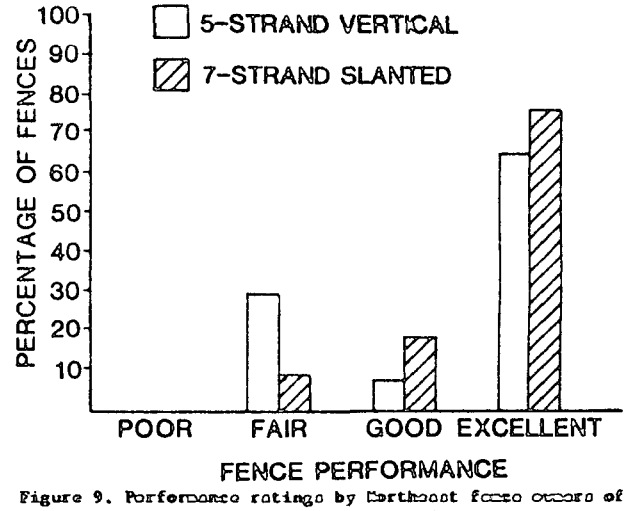

Figure 9. Performance ratings by Northeast fence owners of 5-strand vertical and 7-strand slanted fences.

DISCUSSION

This study found that many new deer fences have been constructed in the Northeast and nearly all were high-tensile, electric designs. As expected the survey revealed that 5-strand vertical and 7-strand slanted fences were the most common types, with several variations of vertical fencing composed of additional wires also reported. Slanted fences enclosed larger acreages than most vertical fences and were used more frequently on long rotation crops such as apples.

Maintenance activities were reportedly performed regularly by nearly all fence owners. Vegetation control, voltage, and wire tension appeared to be maintained at recommended levels. All

high-tensile fence owners reported satisfactory results and a willingness to reinvest in high-tensile fencing.

The data from this study suggested that fences in the Northeast were managed well. For comparison, we conducted an independent study of 12 high-tensile fences, most of which were reported on in this survey. The fences were located in southeastern New York and were rated for adherence to design specifications, wire tension, and electrical system performance. Adherence to design specifications was approximated, using bottom wire height measurements.

Maximum bottom wire height measurements were significantly different between and within fences ($p < .0001$). Nearly 25% of the sections (area between adjacent line stations and/or anchor points) of all fences evaluated had at least 1 potential deer penetration point. Maximum bottom wire heights were highly variable, usually exceeded recommended heights, and were recorded as high as 69 cm. Clearly, deviations from recommended wire heights that could and likely have allowed deer penetrations were both common and potentially costly.

Significant differences ($p < .0001$) in wire tension existed between and within the 12 high-tensile wire fences. Mean tension values ranged from .8 kg to 3.7 kg, while the recommended tension has been 4.5 kg. Mean wire tension was less than 2.0 kg on 6 of the 12 fences evaluated and had resulted in greater wire spacings. These gaps were observed to increase the potential for deer penetrations and the likelihood of electrical problems.

Fence voltage differed between charger types and differed within fences charged by a single energizer. All but 1 fence powered by a standard charger had fair to excellent voltage, while all but 1 bi-polar-powered fence had good to excellent voltage.

In summary, the results of the study briefly outlined above and additional field observations by the authors contradicted the survey results and would warrant the conclusion that most fences appeared in poor operating condition and were in need of better maintenance.

The high level of fence owner satisfaction reported in the survey could have reflected a reluctance to admit damage following control expenditures, failure to accurately detect damage, satisfaction with observed damage rates that (from their experience) do not jeopardize anticipated tree growth and development, or the failure of owners to understand high-tensile electric fence concepts well enough to assess the operating condition of their fences. Regardless of the cause, high-tensile, electric fences have been installed readily by Northeastern farmers and, although high tolerance to damage has been documented, satisfaction has been nearly unilateral. Farmers should be reminded that high-tensile fences are composed of many interrelated components that function in concert with one another, and that the failure of one component adversely affects the entire fence. Finally, continued monitoring of the status of fencing for deer damage control will hopefully result in improved fence maintenance by farmers and thus increase the likelihood for high-tensile electric fences to return the highest possible benefits.

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