DEER DAMAGE CONTROL IN PENNSYLVANIA AGRICULTURE

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Deer damage to crops has been and continues to be a serious problem for many Pennsylvania farmers. In 1978 wildlife scientists at Penn State began a 4-year study on deer damage to Pennsylvania agriculture. The research project was funded by the PA Department of Agriculture. The objectives were to determine the extent and distribution of the damage, and to evaluate methods of damage control.

For the first time there are statewide estimates of the magnitude of crop losses to deer. The annual agriculture loss to deer damage is between 16 and 30 million dollars. This loss estimate was determined by mail-questionnaire surveys of farmers; field studies were conducted in several situations to verify claims of deer damage. Approximately one half of the respondents indicated deer-caused economic damage. Questionnaire surveys of County Extension Directors, District Game Protectors, and Conservation District Directors confirmed the amount and location of deer damage. Major losses occur in corn, forages, and small grain, all of which are grown commercially throughout the state. Special high-value crops, such as orchards, nurseries, and vegetables, grown in restricted areas, also had substantial losses. Deer damage was listed as the cause for change or termination of a farm operation by 20% of the damage respondents.

Of farmers with damage, about 35% reported trying many deer control methods, and success was reported for less than one half of these attempts. In most damage situations no control was used, in part because of poor success experienced with existing methods. Investigation of deer damage control methods included chemical repellents and fencing; the tests included those reported to work and some new, potentially more effective methods.

Fourteen deer repellents were tested in studies with captive deer. All repellents were treated equally in experiments designed to allow statistical analyses of resulting data. Only Big Game Repellent (also known as Deer-Away) was significantly different ($P < 0.05$) from no treatment at all. Limited field studies support these findings. Additional testing, under field conditions, is needed to fully evaluate its effectiveness before widespread use can be recommended. This repellent may have limited use with ornamentals and dormant fruit trees. Big Game Repellent, like many repellents, cannot be used on food crops. For most deer damage in Pennsylvania, repellents are impractical because of limitations in use, cost, and variable effectiveness.

The goal in testing fences was to develop a low-cost alternative to conventional 8-foot woven-wire deer fence. Six experimental fence designs were evaluated with captive deer, and 2 of them selected for further field testing: the Modified New Hampshire Figure-4 Electric Deer Fence and the Penn State 5-wire Electric Deer Fence.

The fences utilize new fence technology developed for sheep ranches in New Zealand and Australia. These fence systems are built with pressure-treated, pine posts, high-tensile wire (200,000 psi, 12½ gauge), special accessories to maintain 250 pounds wire tension, and are charged with a high-voltage low-impedance energizer. These materials eliminate many of the problems associated with maintenance of conventional electric fences. High-tensile wire can absorb the impact of deer, trees or limbs, and farm equipment without stretching or breaking. The 250 pounds of tension on the wires insure good contact with deer for shocking power. The high-voltage low-impedance energizer does not ground out easily on vegetation and provides sufficient voltage to turn deer. These fence systems will last at least 30 to 40 years.

The New Hampshire Figure-4 Electric Fence was modified by using a double row of posts rather than the post and bracket to support the wires. This fence design, using soft wire, has been used for about 30 years in various situations in the northeast. In field tests we found moderate success in alleviating deer damage. This fence requires more land space to build, is costlier to construct, and has greater problems with weed and brush maintenance; because of the limitations, in addition to deer penetration, we have decided not to recommend use of the Figure-4 design.

The Penn State 5-wire Electric Deer Fence uses a vertical design, and was named because it was developed on this project and to avoid confusion with other electric fence designs. The components, configuration, and construction or our fence differ from any other fence that we know of. This fence design has fewer maintenance and deer penetration problems than the Figure-4 design. At this time, the Penn State 5-wire design built with modern materials and components, is a practical solution in the search for low-cost effective deer fencing.

Penn State 5-Wire Fences were tested at 10 agricultural field sites. In addition, Hammermill Paper Company is testing a 5-wire fence at sites in forest regeneration situations. U.S. Forest Service personnel have constructed the Penn State 5-wire

fence around clearcuts in the Allegheny National Forest.

The Penn State 5-wire Electric Deer Fence was an effective deer control fence at field site exclosures on alfalfa, small grain, corn, vegetables, orchards, and Christmas trees. Cost-benefit relationships provided by cooperating growers showed that additional alfalfa harvested paid for the fence materials in one growing season. On other crops, the benefits were as high as 8 times the cost of materials for the fence. Materials costs vary with length of fencing from $.30 per foot for a 10-acre square field to $.23 per foot for a 100-acre square field.

Deer damage to Pennsylvania agriculture is a serious problem. Although it is widespread, damage is variable by crop and often localized in nature. Most farmers accept some deer damage as part of normal operations. Control by individuals should be viewed as a short-term solution, with long-term relief in the form of integrated programs executed by appropriate state agencies and groups of private landowners.