COYOTE DEPREDATION CONTROL IN NEW YORK - AN INTEGRATED APPROACH

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ABSTRACT

The New York State Cooperative Coyote Damage Control Program was established in late 1986 through a cooperative agreement between the New York State Department of Agriculture and Markets (NYSDAM) and USDA, APHIS, ADC in response to escalating complaints of coyote (Canis latrans) depredations on sheep from 1980-85. Ten counties with histories of and/or potential for coyote/livestock conflicts were identified and targeted for publicity and primary program emphasis. Program staff received 58 reports of coyote depredations on 182 sheep from 32 producers in the ten target counties and seven outlying counties from May 1987 through May 1989, and verified 46 complaints from 24 producers with a total loss of 121 sheep. Preventative management recommendations included pasture mowing, carrion removal, night confinement, guard dogs, frightening devices, and electric fencing. ADC constructed two night corrals with permanent and temporary electric fencing materials for demonstration/evaluation purposes, tested experimental scare devices, monitored performance of guard dogs employed by cooperating producers, and entered into operational control agreements with 15 cooperators during this period. From June 1987 through January 1989, twelve coyotes were taken on or near 8 of the 15 cooperator farms. Cooperating producers, who had experienced a collective loss of 105 sheep (an average of 7 sheep per producer over an average period of 20 days) prior to contacting ADC, have reported a total of 35 losses (an average of 2.3 sheep per producer over an average period of 344 days) since initiation of ADC activities.

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INTRODUCTION

The first recognized and reported coyote depredations on sheep in New York were recorded in 1980, and the problem seemed to gradually escalate until 1986, when an estimated 1,920 sheep, valued at $142,800, were lost to coyotes. According to the New York Agricultural Statistics Service, an estimated total of 4,734 sheep, valued at $387,550, were lost to coyotes from 1985-1988. It is suspected that the number of losses which can be attributed to coyotes is considerably larger than indicated by these figures, since reported losses to dogs (4,807 sheep, valued at $394,570, from 1985-1988) are reimbursable through a state indemnity fund while losses to coyotes are not (Fig. 1). The resultant bias in reporting is a serious impediment to the accurate determination of the economic impact of coyote predation on the sheep industry.

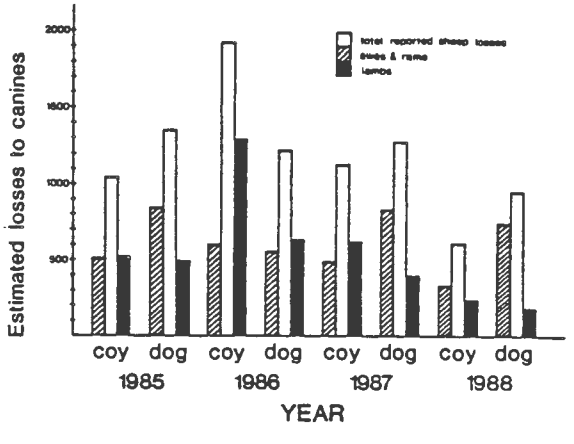

FIG. 1. Estimated sheep losses to coyotes and dogs from 1985-1988.

The growing coyote predation problem was addressed by the New York State Department of Agriculture and Markets, Division of Plant Industry, and the United States Department of Agriculture Animal and Plant Health Inspection Service, Animal Damage Control Program in November of 1986, when the two

agencies joined in a cooperative agreement to create a jointly-funded and administered coyote damage control program. The New York Botanical Garden Institute of Ecosystem Studies (IES), a third party to this agreement through contract with NYSDAM, was to continue research designed to characterize the sheep industry and identify factors influencing livestock predation in New York in conjunction with the ADC program, and assist in regional predator kill investigations. The objective of the program was to reduce or prevent sheep losses to coyotes through educational and operational control efforts, with emphasis on long-term predation control through preventive management practices. In the integrated management approach adopted in New York, lethal control methods are applied in short-term damage control situations to remove offending coyotes until preventive management practices can be developed and implemented. Lethal control methods may also be used in conjunction with preventive management should such practice alone fail to sufficiently reduce predation, or where such practice is not economically feasible.

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PROGRAM ACTIVITIES

Ten counties with histories of and/or potential for coyote/livestock conflicts were identified and targeted for publicity and program emphasis prior to the establishment of the new ADC District. Contact information for reporting suspected coyote kills was mailed to active sheep producers in each of the ten counties in 1987. ADC and IES personnel received 58 reports of coyote depredations on 182 sheep from 32 producers in the ten target counties and seven outlying counties from May 1987 through May 1989, and verified 46 complaints from 24 producers with a total loss of 121 sheep (Fig. 2). Most complaints were received during the months of April through September, the period during which the two seasonal ADC Specialists were employed (Fig. 3). In addition, ADC received complaints of coyote damage to beef and dairy cattle, horses, ranched deer, goats, poultry, and household pets, and of coyote-aircraft collision hazards on two major airports (1 commercial, 1 military).

Damage Control Recommendations/ Operations

In general, coyote damage control methods, including preventive management and lethal control techniques, were presented to sheep producers as options where disadvantages as well as advantages could be associated with their use. Specific techniques were more strongly recommended where disadvantages appeared to be negligible and application was determined to be appropriate to the particular situation. Damage control recommendations made by ADC personnel in response to coyote depredation complaints from May 1987 through May 1989, include the following — regular flock inventory, pasture mowing, carrion removal, night confinement, guard dogs, predator frightening devices, predator-resistant electric fencing, and lethal control (trapping and shooting). More detailed information on the use of various control techniques by sheep producers suffering losses is given below and in Table 1.

Regular flock inventory — Regular (daily, or at least weekly) flock inventory was strongly recommended to all producers suffering losses. Previously, many producers had found it necessary to inventory only 2 or 3 times during the season (lambing, tail docking, medication, etc.). Lack of regular flock inventory resulted in undetected losses over periods ranging from several days to several weeks for at least two cooperating producers. One producer lost more than 20 ewes and lambs over a 3-4 week period before discovering his loss and contacting ADC.

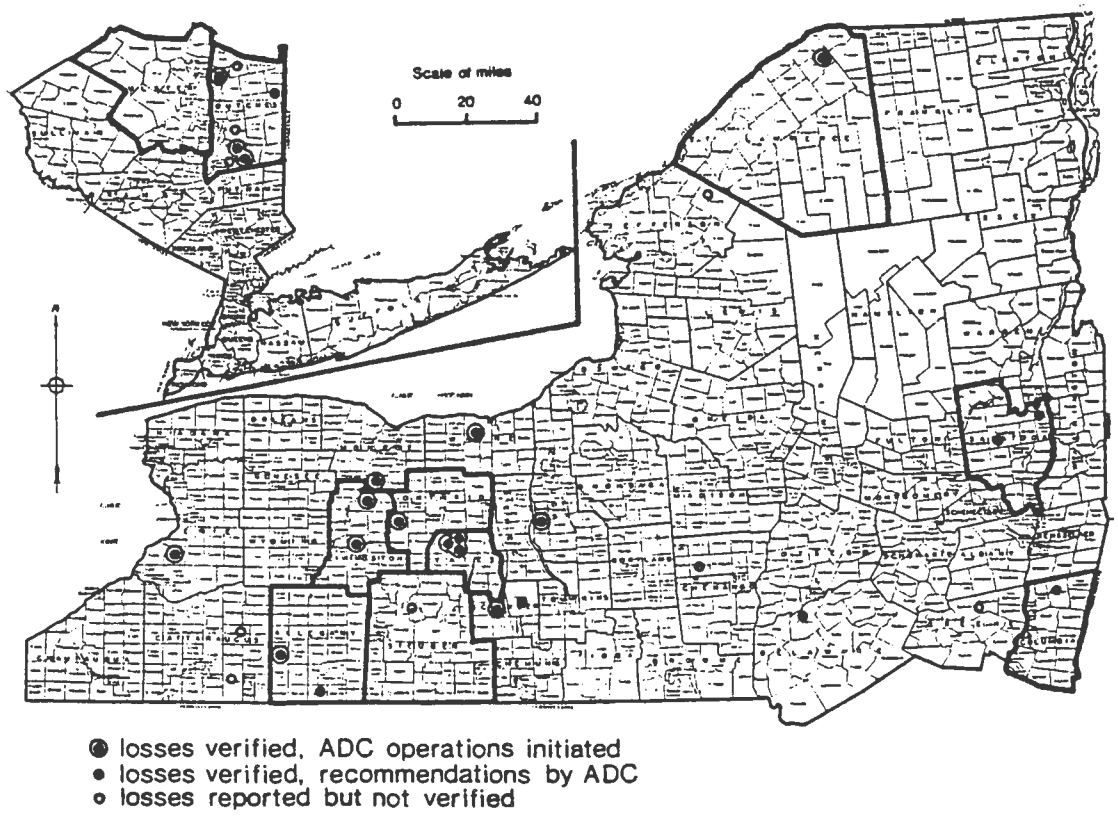

FIG. 2. Distribution of verified and unverified coyote damage complaints and ADC operation sites in New York from May 1987 through May 1989.

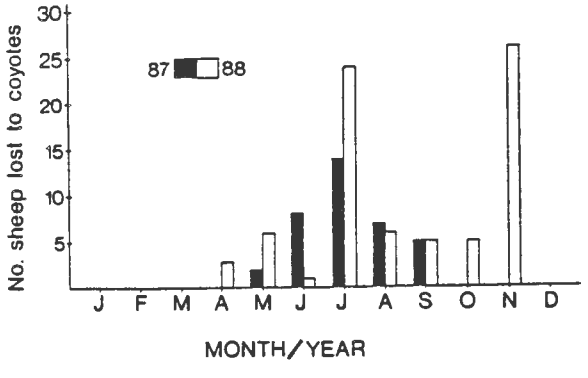

FIG. 3. Number of sheep losses to coyotes reported to ADC by month and year.

Sheep producers with verified losses	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Sheep losses prior to ADC recommend./operations	18	5	13	11	7	9	1	3	5	1	21	2	0	4	1	2	3	0	2	3	8	2	1	0
FLOCK INVENTORY	o	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
PASTURE MOWING		●	●								●				●				●				●	
CARRION REMOVAL	●	●	●	●	●	●	●	●	●	●	●	●			●	●	●	●		●	●	●	●	
NIGHT CONFINEMENT	●	o	o	●	●		o						●	o	o								o	●	●
GUARD DOG	●		o				o											●							
SCARE DEVICE	●			●	●			o																	o
ELECTRIC FENCE	●		●		●	o	o						o	o				●	●		●			●	
TRAP/SHOOT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	o					●	o	●	●
Sheep losses since ADC recommend./operations	30	o	o	3	1	o	o	1	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o

● ADC operations ● ADC recommendations ○ Independent practice ● Modifications recommended

TABLE 1. Use of various damage control techniques by sheep producers and numbers of verified losses previous to and prior to ADC activities/recommendations.

Pasture mowing -- Pasture mowing was strongly recommended to six sheep producers in situations where pasture vegetation made it difficult or impossible to conduct flock inventories or to detect the presence of coyotes or the remains of dead sheep. On at least two operations where pasture vegetation was sufficient to serve as cover to depredating coyotes, attacks on sheep were known to have occurred in mid-afternoon.

Carrion removal -- Although Todd and Keith (1976) suggested that reducing the availability and use of agricultural carrion by coyotes in winter could shift coyote distributions out of livestock areas, it is unlikely that the presence or absence of carrion could influence coyote distributions during the summer months when prey is widely available. Only one or two instances of coyotes returning to feed on previous kills were observed by sheep producers of ADC personnel in 1987 and 1988. Nevertheless, prompt removal of carrion, to reduce the possibility of odor attraction or acclimation to feeding on livestock (Boggess et al. 1980), was strongly recommended to all producers suffering losses.

Night confinement -- Night confinement was recommended to six producers and was already in practice by six producers who contacted ADC after suffering losses in 1987-89. The disadvantages associated with night confinement (labor, space, and supplemental feeding requirements, etc.) were found to be less significant to small producers who were less dependent on income from market lambs. Producers who practiced some form of night confinement (usually barn and/or small attached pen), or to whom ADC recommended night confinement, handled an average of 41 ewes and 33 lambs over the course of a year and derived an average of approximately 10% of their income from sheep production. Producers who were not receptive to night confinement handled an average of 190 ewes and 206 lambs annually, and derived an average of approximately 56% of their income from sheep production. Five of the six sheep producers who had previously practiced night confinement contacted ADC after experiencing daytime losses. One of the coyotes taken by ADC personnel was shot while chasing sheep in mid-afternoon on a farm where the sheep were confined to the barn each night.

The use of night corrals consisting of electric fencing to confine and protect larger flocks while allowing some opportunity for grazing, particularly on market lamb operations, was explored by ADC and is discussed under the heading "Predator-Resistant Electric Fencing."

Livestock guardian dogs -- The use of guard dogs to protect sheep was attempted and abandoned by three cooperating producers, in one case prior to and in two cases subsequent to cooperative status with ADC. In each case use of the dog was discontinued due to one or more of the following: inattentiveness, harassing or injuring sheep, chasing deer, or leaving the farm. The breed and origin of the dog which was terminated prior to the producer's contact with ADC are unknown. One of the two dogs monitored by ADC, an Anatolian Shepherd which was placed with the producer by the Hampshire College Livestock Guarding Dog Project, was found to be suffering from a degenerative illness, which may have contributed to its inattentive, sluggish behavior. The dog died within a year. The second dog monitored by ADC, a Komondor/Great Pyrenees cross, was produced by a novice breeder in New York. Although the sheep producer was encouraged initially, the dog developed the undesirable behaviors listed above within a year, and was returned to the breeder. It was later learned that another dog from the same litter was returned to the breeder by another producer as a result of similar behavior.

It is unfortunate that these and other failures have prejudiced many sheep producers in New York and elsewhere against the use of livestock guarding dogs, especially since a number of these failures might have been prevented had better controls on

dog production and training been in place. The ADC program now has the benefit of well-established guarding dog programs, both internally and through a contractual relationship with Hampshire College Farm Center. Maintenance of performance records, selective breeding, and training expertise assure that dogs produced under the auspices of these programs have the greatest possible potential for success. This level of "quality control" may not always operate on the production and distribution of dogs by non-affiliates of the ADC or Hampshire College programs. If the use of guard dogs to control livestock depredations is to reach its potential and gain wider acceptance among the livestock industry it will become necessary for regional ADC programs to develop a system of performance records and a registry of breeders who adhere to acceptable standards for breeding and training (Lorenz and Coppinger 1986), and to assist livestock producers in training dogs that are obtained as pups. Such controls may help to reduce failures attributable to inappropriate breeding and inadequate training, which may result from a lack of knowledge or be activated by profit potential.

Predator frightening devices -- Attempts at frightening coyotes from sheep pastures were made by two producers prior to their contact with ADC. One individual rotated two propane exploders between five large pastures, but found that their effectiveness diminished after 1 to 2 weeks of operation. Use of the exploders also created conflicts with nearby residents. Another felt that a simple six-volt highway flasher placed in his pasture reduced the number of losses he experienced over the course of a season. In the summer and fall of 1987, the ADC staff tested four experimental strobe-siren devices developed by the Denver Wildlife Research Center on three sheep operations where losses were being suffered. Results were mixed. On two pastures where devices were placed in response to losses, no further losses were experienced over the operating periods (6 weeks, 4 months). At two other locations, 3 and 10 sheep were lost over periods of 2 weeks and 3 months, respectively, during which the devices were operating. At a fifth location, one lamb was killed by coyotes during the first night of operation of the device. No further losses were experienced over the operating period of 15 weeks.

Predator-resistant electric fencing -- ADC recommended construction of high tensile electric fencing in pasture perimeter applications on 2 new sheep operations and in night corral applications where conventional woven-wire perimeter fencing was already in use (3 producers). In all cases, use of alternating charged and ground wire systems in conjunction with high-voltage, low-impedance New Zealand energizers was recommended (Shelton 1984, Henderson and Spaeth 1980). In addition, ADC recommended conversion to alternating wire systems in two situations where producers experienced losses within the perimeters of all-charged high-tensile wire fences, which had been advertised as "predator-proof." The experiences of these producers and ADC personnel indicate that the effectiveness of the all-charged system may be diminished significantly when soil moisture becomes inadequate to ensure proper grounding, and although New York's climate is far from arid, some problems may be experienced in drier areas or during extended dry periods. Unfortunately, a number of dealers of high-tensile fencing products in New York promote and sell only all-charged wire systems.

The ADC staff constructed two predator-resistant night corrals, one permanent and one portable (temporary), for demonstration/evaluation purposes. The permanent corral consisted of an alternately charged and grounded 8-wire high-tensile fence, powered by an alternating current, high-output New Zealand energizer, and enclosed approximately 3 acres of a 100 acre pasture. Fence height was 48", with the first (ground) wire at ground level and subsequent wires spaced at 4", 4", 4", 6", 8", 10" and 12". Construction of the

fence required approximately 300 hours of staff time (Cooperator time was not recorded) and materials cost approximately $1,900 ($.95/linear foot). The temporary night corral, which was erected on an adjacent 146 acre pasture and enclosed approximately one acre, consisted of 42" electro-plastic netting with 4" x 6" mesh and a 12-volt battery-powered charger. Construction required approximately 12 hours staff time and materials cost approximately $750 ($.75/linear foot).

Following the completion of the two enclosures in August and September of 1988, sheep in each pasture were moved into the corrals nightly and turned out each morning. Although coyote tracks had been observed around the fence perimeters on several occasions, no sheep losses from within the corrals were reported. Within a month, however coyotes began killing sheep on pasture during daylight hours. Eight sheep were lost and one coyote was killed by the producer during at least 3 daylight attacks that occurred in October and November, 1988.

Lethal control (shooting and trapping) -- ADC personnel conducted operational control activities pursuant to control agreements with 15 cooperating producers from June, 1987, through January, 1989, taking 12 coyotes on or near 8 of the 15 cooperator farms. Ten of these were trapped on or near 6 farms as a result of 3,419 trap-nights of effort over 13 months of active trapping. In addition, two coyotes were taken incidentally by shooting while trapping activities were being conducted on 2 farms. Coyote trapping success was calculated at 1 coyote per 342 trap-nights, comparable to the average effort (approximately 370 trap-days) calculated for adult and pup coyotes in Maine (Litvaitis et al. 1983) but greater than the average effort of 225 trap-days per coyote reported by Persons in a Vermont study (pers. comm.). It should be noted that in the Maine and Vermont studies, trapping was conducted where concentrations of tracks, scats, and sightings were found, while trapping in New York was limited to the vicinity of each depredation site. Using an estimate of $6.10 per trap-night (based on wages, mileage, and materials), the cost per farm and total cost of trapping during this period were calculated to be $1,490 and $20,086, respectively. The overall cost per coyote trapped was determined to be $2,086. Six additional producers utilized the services of private trappers as a result of personal choice or limited availability of ADC personnel. No attempt was made to monitor trapping success in these situations.

A number of concessions to environmental concerns and resource management agencies may have limited trapping success in particular and the potential for lethal control in general during these first two seasons. Under the Cooperative Agreement with NYSDAM, ADC activities were required to adhere to existing State laws and regulations, which prohibited the use of snares. This was considered a significant handicap, since snares can be the most effective device for capturing individual depredating coyotes in some situations. The decision to withdraw a request by ADC and NYSDAM to register coyote denning cartridges as a pesticide in New York was made in response to objections from several animal welfare organizations, but not before the request was denied by the Department of Environmental Conservation. ADC activities were conducted under politically-imposed geographical restrictions (operations limited to damage location). Research results from the Denver Wildlife Research Center (Knowlton et al. 1985) and Vermont (Persons pers. comm.) indicate that restriction of trapping activities to a small, localized area could be a major hindrance to effective control efforts, especially if the area is within the coyote's territory, where it is least vulnerable to being trapped.

The density of non-target furbearer populations and the lack of a body of knowledge pertaining specifically to eastern coyotes and damage control methods (selective techniques and

attractants) were also considered to be factors which may have limited coyote trapping success. Even though pan tension springs were installed on traps, attractant use was limited almost exclusively to coyote urine and gland scent, and more emphasis was placed on blind (unbaited) sets in an effort to reduce non-target catches, the non-target/target ratio remained high (10.8:1). Although no statewide estimates of population density for any of the non-target furbearers encountered are presently available, regional raccoon (Procyon lotor) population studies in northernmost Pennsylvania (Hayden 1984) and western New York (Clark pers. comm.) indicate that population densities in these areas approach 40 raccoons per square mile. The ratio of raccoons (most frequent non-target capture) to coyotes trapped in 1987 and 1988 was calculated at 6.2:1. Although increasing selectivity should remain a priority, this figure becomes less alarming when relative abundance is considered. Raccoons were up to 100 times as abundant as coyotes, for which a statewide density estimate of 40/100 sq. mi. has been reported (Chambers 1987), in areas where ADC trapping was conducted. Litvaitis et al. (1983) found the raccoon to be the second most frequently captured non-target animal in Maine and Persons (pers. comm.) reported that raccoons were the most frequent non-target capture in Vermont, outnumbering coyote captures by at least 2:1.

DISCUSSION AND SUMMARY

The 24 sheep producers with verified predation complaints in 1987 and 1988 lost a collective total of 121 sheep (an average of 5 sheep over an average period of 27 days) prior to initiation or recommendation of control activities by ADC personnel. Eleven of these producers experienced losses while independently practicing one or some combination of damage control methods, including night confinement, guarding dogs, scare devices, electric fencing, and trapping/shooting. Since initiation or recommendation of control practices by ADC, the 24 producers have lost a collective total of 35 sheep (an average of 1.5 sheep over an average period of 421 days). Although all of the control measures above have the potential to reduce predation, damage control recommendations made by ADC and their acceptance by producers were determined by the significance of the disadvantages which were associated with the use of particular control measures on each operation. For example, night confinement in buildings may be better suited to small farm flocks, where labor requirements are less disruptive, and where the cost of supplemental feeding and weight of market lambs are less critical. High-tensile pasture fencing may also be more feasible on small, single pasture farms than large, multi-pasture market lamb operations. Predator-resistant night corrals offer protection and grazing opportunity for pastured market lambs, but may be cost-prohibitive on multiple pastures. In addition, alternate control measures may become necessary should predator activity shift to daylight hours in response to sheep availability. In general, the need for a wide array of control techniques to maintain flexibility and fairness in responding to various damage situations was recognized. Some specific needs perceived were better controls on livestock guarding dog production, training, and distribution, more education and technical assistance to producers utilizing electric fencing, legal provisions for the use of snares in depredation control situations, and the development of more selective trapping techniques and attractants for use in eastern states.

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