Development of the West Virginia Integrated Predation Management Program to Protect Livestock

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ABSTRACT: The West Virginia Integrated Predation Management Program was created in 1996 due to increasing livestock losses to coyotes and the inability of producers to solve the problem themselves. The eastern coyote arrived in West Virginia in the early to mid-1980s. By the early 1990s, coyote depredations were recognized as a serious threat to West Virginia's livestock industries. At a June 26, 1995 public meeting in Riverton, West Virginia, livestock producers expressed to their state delegates and senators their concerns and frustrations with their inability to control coyote predation on sheep. This meeting provided the impetus for the creation of the West Virginia Integrated Predation Management Program as carried out by USDA APHIS Wildlife Services (WS). Wildlife Services predator management specialists in West Virginia integrate and apply or assist the producer in applying a combination of non-lethal and lethal alternatives to minimize coyote predation on sheep, goats, and calves. Wildlife Services has provided predation control workshops, on-site recommendations, and a guard dog cost-share program to encourage producers to implement non-lethal methods on their farms. Lethal control strategies directed at depredating coyotes have been either preventive or corrective. Preventive control has been initiated by WS prior to the onset of actual depredations in areas where historic losses due to coyote depredation have been documented and where there has been an imminent threat of loss of livestock. Corrective control by WS was directed at depredating coyotes in response to ongoing losses with the goal of removing the offending coyotes(s). In this paper, we discuss the development and success of the West Virginia Integrated Predation Management Program to protect livestock.

KEY WORDS: *Canis latrans*, coyote, guarding dogs, livestock, predation, sheep, West Virginia

Proc. 21st Vertebr. Pest Conf. (R. M. Timm and W. P. Gorenzel, Eds.)
Published at Univ. of Calif., Davis. 2004. Pp. 70-74.

INTRODUCTION

The populations of coyotes (*Canis latrans*) have increased dramatically in the eastern United States since the early 1900s (Hilton 1978, Chambers 1987, Hill et al. 1987, Witmer and Hayden 1992). The expansion of the coyote range into eastern North America has been summarized by Parker (1995) and characterized as two distinct geographical events: 1) the northern front moving across Southern Ontario and the Great Lakes region, and 2) the southern front colonizing the southeastern United States from Arkansas and Louisiana. These two fronts expanded throughout the northeastern and southeastern United States during the 1960s and 1970s, finally converging during the mid-1980s in the central Appalachian mountains of West Virginia.

Across the western United States, coyotes have been the primary predator of domestic livestock (Terrill 1986). There has been concern that coyote depredations in the eastern United States could also cause significant impacts on sheep and other livestock industries (Slate 1987, Witmer and Hayden 1992, Witmer et al. 1995). During the summer of 1995, West Virginia shepherds participated in a survey designed by Thomas McConnell of the West Virginia University Cooperative Extension Service to evaluate the effect of predation on West Virginia livestock producers. The survey indicated that during the 1994-1995 season shepherds lost an estimated 4,630 lambs and ewes to coyote predation, for a total economic loss of $329,050. On a percentage basis, sheep inventories in West Virginia have declined at a higher rate during the past 10 years than any other time in recent agricultural history. The 1995 survey also found that 51% of the shepherds that left the sheep business did so because of sheep losses to predators (McConnell 1995). In this report we discuss the development and effectiveness of the West Virginia Integrated Predation Management Program to protect livestock.

DEVELOPMENT OF THE WEST VIRGINIA INTEGRATED PREDATION MANAGEMENT PROGRAM

On June 26, 1995, a meeting was held with representatives from state and federal agencies, elected officials, and the public to discuss coyote predation of livestock. At this meeting, producers expressed to their state delegates and senators their concerns and frustrations with their inability to control coyote predation on sheep. These state representatives directed Gus Douglass, Commissioner of the West Virginia Department of Agriculture, to establish the West Virginia Coyote Control Committee. Commissioner Douglass charged the Committee with the responsibility of developing a predation management plan to address the growing problem of coyote depredation on sheep.

The West Virginia Coyote Control Committee consisted of representatives from a broad spectrum of local, state, and federal agencies, organizations, and individuals. The committee consisted of representatives from:

- West Virginia Department of Agriculture
- West Virginia Division of Natural Resources
- West Virginia University Cooperative Extension Service
- West Virginia Farm Bureau
- West Virginia Shepherds Federation
- USDA APHIS Wildlife Services (WS)
- County Commissioners from affected counties
- Livestock producers from affected counties

The Coyote Control Committee adopted a plan that incorporates the principles of integrated predation management. To fully implement the principles of integrated management, the Coyote Control Committee recommended the following plan of action:

1) Directed WS and the West Virginia University Cooperative Extension to develop training workshops to enable livestock producers to minimize coyote predation.
2) Directed West Virginia Department of Agriculture, Plant Industries Division, Pesticide Section, to register the Livestock Protection Collar (LPC) and the M-44 device in West Virginia for use by trained and certified employees of WS. In addition to registering these products, the West Virginia Department of Agriculture and WS developed an approved instructional program to train and certify WS employees to use the LPC and the M-44 devices.
3) Directed that a program budget be developed for an Integrated Predation Management Program that incorporates the principles of Integrated Wildlife Damage Management (IWDM) (sometimes referred to as Integrated Pest Management or IPM). IWDM uses and recommends a combination of methods to reduce wildlife damage and is described in USDA (1994).

WS prepared the budget proposal for the Integrated Predation Management Program. The Integrated Predation Management Program plan was approved by the West Virginia legislature and funded for the 1997 fiscal year (beginning July 1, 1996) to address coyote predation in three West Virginia counties. This appropriation was unable to address coyote predation on livestock prior to July 1, 1996. Because of the severity of West Virginia's coyote predation on sheep and goats, and the urgent need to initiate the Integrated Predation Management Program during the 1996 spring lambing season, the State of West Virginia provided interim funding to initiate the Integrated Predation Management Program beginning in March 1996 in the West Virginia counties of Pendleton, Pocahontas, and Randolph.

Educating People about Coyotes and Providing Technical Assistance

Education and technical assistance has been a primary emphasis of the West Virginia Integrated Predation Management Program. This approach has allowed WS to provide technical assistance to 383 different producers in 30 of West Virginia's 55 counties and to educate the public about impacts coyotes have on livestock production. The West Virginia Integrated Predation Management Program has accomplished this objective through educational programs and a guard dog cost-share program.

Educational Programs

WS conducted annual educational programs for livestock producers, livestock groups, concerned citizens, county Animal Control officers, and state wildlife biologists. The educational programs focused on 1) how to identify coyotes and coyote sign, 2) how to distinguish between coyote and dog depredation, 3) what producers can do to help themselves, and 4) methods available to alleviate coyote predation on livestock. WS taught 9 - 18 educational programs per year to a total of 10,481 people from June 1995 through September 2003 (Table 1).

Guard Dog Cost-Share Program

Guard dogs have had a negative reputation among many West Virginia livestock producers because of past experience and discussion among producers. In the past, dogs have been the most significant predator of sheep in Appalachia, which seems to bias producers against guard dogs. WS and the West Virginia Department of Agriculture believe livestock guarding dogs can be an important part of an integrated program. During FY1999, increased funding through a federal directive allowed for the creation of a guard dog cost-share program. The West Virginia University Cooperative Extension and the West Virginia Department of Agriculture cooperated with WS to present two seminars. The USDA livestock guarding dog specialist, Jeff Green, was the guest speaker. These seminars were designed to encourage farmers to consider a livestock guarding dog as a first line of defense against depredating coyotes. WS and West Virginia Department of Agriculture cooperated to reprint USDA Bulletin #588, *Livestock Guarding Dogs: Protecting Sheep from Predators* (Green and Woodruff 1998), for distribution to farmers interested in the livestock guarding dog cost-share program. WS and West Virginia Department of Agriculture also offered to reimburse farmers $100 toward the purchase price of a livestock guarding dog. Prices paid by farmers for a guarding dog ranged from $100 to $700 and averaged $275. Since the livestock guarding dog share program was initiated in FY1999, a total of 59 dogs have been approved for cost-share reimbursement. Unfortunately, a reduction in funding during FY2002 resulted in the

Table 1. Technical assistance and educational programs held by the West Virginia Integrated Predation Management Program FY1996 - FY2003.

Fiscal Year	1996	1997	1998	1999	2000	2001	2002	2003	*Total*
Number of Programs	13	9	15	18	9	11	13	15	***103***
Persons in Attendance	296	1,472	1,828	1,357	1,150	1,825	975	1,578	***10,481***

Table 2. The number of sheep killed per farm of sheep producers participating in the West Virginia Integrated Predation Management Program, FY1996 - FY2003.

Year	Number Sheep Operations[a]	Number of Producers Assisted (%)	Number of Sheep Killed	Sheep Killed / Farm	Number of WS Specialists
1995	1,600	40[b]	1,111[b]	27.8	
1996	1,400	40 (2.9)	101	2.5	3.0
1997	1,300	56 (4.3)	240	4.3	3.0
1998	1,100	85 (7.7)	460	5.4	3.0
1999	1,000	104 (10.4)	385	3.7	3.5
2000	1,000	110 (11.0)	288	2.7	3.5
2001	1,000	142 (14.2)	490	3.5	4.0
2002	1,100	124 (11.3)	283	2.3	4.0
2003	1,100	122 (11.0)	365	3.0	2.5

[a] source: National Agricultural Statistics Service state livestock inventories for West Virginia, 1995-2003

[b] number of livestock producers contacted from April through September 1996, and their reports of sheep lost to coyotes in the 12 months prior to April 1996 (before WS initiated predation management)

cancellation of the livestock guarding dog cost-share program.

Direct Control Services

Farmers and ranchers throughout the United States spent an estimated $8.8 million on non-lethal methods during 1999 to prevent predator loss of sheep and lambs (NASS 2000). However, non-lethal strategies alone often do not stop all livestock depredations by coyotes. The West Virginia Integrated Predation Management Program assists producers by removing coyotes on sheep farms that continue to have losses.

Management Strategies

When the West Virginia Integrated Predation Management Program was initiated in 1996, the program focused on removal of offending coyotes after livestock depredations had occurred. This approach to stopping or reducing damage is often referred to as a corrective. WS continues to use this approach from late spring through fall. As data on the extent, location, and seasonality of coyote predation on livestock in West Virginia has accumulated, WS has been able to increasingly apply preventive control measures in areas of historic livestock depredation. Preventive control efforts have focused on removing coyote pairs in denning areas during late winter/early spring adjacent to areas of historic loss. This approach has resulted in a steady reduction in sheep/lamb losses on farms participating in the West Virginia Integrated Predation Management Program (Table 2).

Methods

The West Virginia Integrated Predation Management Program uses a combination of methods to remove offending coyotes including: M-44s, traps, snares, Livestock Protection Collars, shooting, and gas cartridges (Figure 1). M-44s and Livestock Protection Collars are Restricted Use Pesticides that are highly regulated by the Environmental Protection Agency, a federal agency. The use of these tools was deemed critical to integrate methods and provide cost-effective and efficient coyote control. M-44s can operate in severe wet or winter weather which would disable traps. Additionally, by state regulation M-44s require a 7-day check whereas snares and traps require a daily check. The use of Livestock Protection Collars further improved program efficiency by providing an additional tool for situations where other legal methods were deemed inappropriate or ineffective.

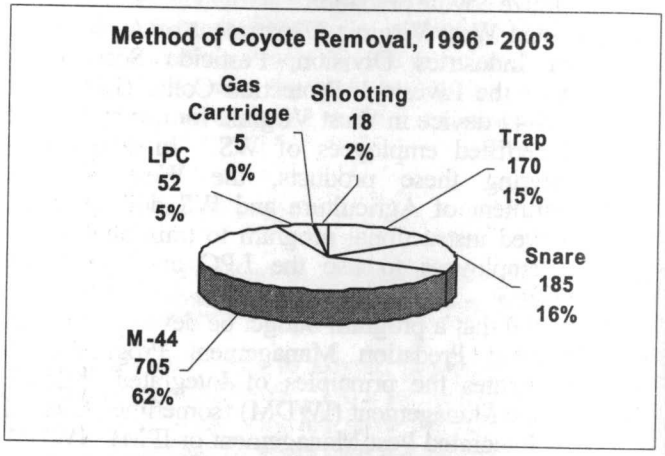

Figure 1. The methods used and number of coyotes removed by the West Virginia Integrated Predation Management Program, 1996 - 2003.

PROGRAM EFFECTIVENESS

The objectives of the West Virginia Integrated Predation Management Program are to reduce coyote depredations to a level that allows individual livestock operations to remain profitable, and to administer the program in a cost-effective manner.

Individual Farm Reduction in Coyote Depredation

The sheep killed per farm ratio for cooperators in the West Virginia Integrated Predation Management Program has declined since the initiation of the program in 1996, reaching its lowest level in 2003 (Table 2). To determine if this reduction in predation allows sheep production to remain profitable for cooperating producers, lamb losses for the years 1999 and 2003 where analyzed to determine the percent lamb crop available to market (Table 3). The West Virginia lamb crop was below average during 1999 and above the 10-year average in 2003. This analysis

Table 3. The percent lamb crop available to market with and without the West Virginia Integrated Predation Management Program in 1999 and 2003.

	Average WV Sheep Operation			Without Predation Management		With WV Integrated Predation Management Program	
	Adult Sheep	Lamb Crop	Lambing Rate	Expected No. of Lambs Killed	Lamb Crop Available to Market	Lambs Killed per Cooperating Farm	Lamb Crop Available to Market
1999	40 (30 ewes)	36	120%	9.75	87%	3.7	108%
2003	34 (21 ewes)	30	143%	8.15	104%	3.0	129%

Table 4. Savings attributed to USDA APHIS Wildlife Services Integrated Predation Management Program in West Virginia, calculated from published statistics compiled by various agencies.

Sheep and Lambs	Inventory[a]	Reported Losses With WS Program (%)[a]	Projected Losses Without WS Program (%)[b]	Difference	Average 1999 $ Value / Head[c]	Total Saved
WV Sheep	40,000	300 (0.7)	1,720 (4.3)	1,420	$83	$117,860
WV Lambs	36,000	1,800 (5.0)	8,028 (22.3)	6,228		$516,924
Total	76,000	2,100	9,748	7,648		$634,784

[a] source: NASS (2000)
[b] source: McConnell (1995)
[c] source: West Virginia Agricultural Statistics Service (1999)

assumes the loss of an adult sheep would result in the holding back of a potentially marketable lamb as a replacement (e.g., a ewe lamb would be held back to replace an adult ewe killed by coyotes). A lambing rate of 100% is generally considered the break-even point for West Virginia sheep operations (E. Smolder, WV Cooperative Extension Service, pers. comm.). A coyote predation rate of 4.3% of the adult sheep and 22.3% of the lambs was used to determine expected losses without a predation management program (McConnell 1995). In both 1999 and 2003, the West Virginia Integrated Predation Management Program allowed cooperating producers to remain above production cost. However, without predation management services, it is expected that the lamb crop available to market would have fallen below production cost in 1999 and would have been only marginally profitable in 2003. We attribute the reductions in sheep depredation to the use of an integrated approach and implementation of a preventive control strategy.

These results are consistent with several studies in western states, where the rate of predator losses in the absence of a predation management program ranged from 1.4% to 8.1% for adult sheep and from 6.3% to 29.3% for lambs (Henne 1975, Munoz 1977, McAdoo and Klebenow 1978, Delorenzo and Howard 1976). Conversely, sheep and lamb losses to predators are much lower where wildlife damage management is applied (Nass 1977, Tigner and Larson 1977, Howard and Shaw 1978, Howard and Booth 1981).

Program Benefit-Cost

Savings attributed to the West Virginia Integrated Predation Management Program to protect sheep can be calculated using NASS (2000) predation loss survey and state sheep inventory data (Table 4). The West Virginia WS expenditure for predator damage management to protect sheep in FY 1999 was $390,000. The total benefit ($634,784) of the program would indicate a 1.63:1 benefit-cost ratio. This benefit is conservative, since the cost savings do not include projected losses to cattle and goats; the West Virginia Integrated Predation Management Program provided assistance to cattle and goat operations, which was not reflected in this analysis. Additionally, the marketing of animals saved as a result of predation management benefits many segments of the rural economy, not just individuals involved in direct production. Jahnke et al. (1987) reported a three-fold economic multiplier effect for the benefits of predation management in Wyoming. If this factor is applied to the total value of sheep saved in West Virginia, then the value of predation management to businesses not involved in direct agricultural production would be $1,904,352. The gross total benefit to all segments of the West Virginia economy would be $2,539,136. The gross total benefit of the program would indicate a 4:1 benefit-cost ratio.

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