February 1989

Coyote Control in Alberta

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Abstract.--A historical review of coyote damage to livestock, early control measures and the development of Alberta's coyote damage control program is provided, including provincial and federal legislation, provincial policy, research and field testing initiatives, extension and control methodology.

INTRODUCTION

I would like to outline Alberta's coyote damage control program by chronicling its development from early times to the present.

HISTORY OF COYOTE CONTROL

Predator damage control in Alberta and specifically coyote control, had its earliest beginnings when European immigrants settled this province less than 100 years ago. Prior to that, Hudson Bay Company's records document profitable and sizeable catches of "prairie wolf" until the time of settlement on the Canadian prairies (Newman 1985).

Bounty System

Prairie homesteaders describe protecting poultry and young livestock from coyotes by leghold traps, coyote poison, horse and hound chasing. Prior to and during World War I, homesteaders and local governments unified their resources and funds to support a bounty on coyotes. Local municipal records in 1921, for instance, show 6500 pairs of coyote ears turned in for the $2.00 bounty paid in south central Alberta. The bounty system (fig. 1) for coyotes flourished almost continuously until withdrawal in 1948 (Todd and Geisbrecht 1979).

Figure 1. COYOTE BOUNTY 1943-1948

Division of Responsibility

In 1941 game law enforcement and regulatory services of Alberta Agriculture were transferred to the Department of Lands and Forests. Thereafter, fish and wildlife management and game enforcement were the mandate of the Lands and Forest for all species, except those recognized as agricultural pests such as the black-billed magpie, Norway rat, coyote and field rodents. Alberta Agriculture continued to control the coyote in agricultural areas. Control of sport hunting and trapping coyotes, province wide, was and is, the responsibility of Fish and Wildlife (Annual Report 1946).

Early Legislation

In 1948, the unregulated and indiscriminate use of snares, traps and poisons on private land ended with the introduction of legislation that regulated the use and distribution of poisons for coyote control. The Agricultural Pests Act identified persons who could use or issue poisons. In the same year, coyote getters and 1080 poison were acquired by Alberta Agriculture from the USBSFW and used for coyote control. Prior to 1948, strychnine was the primary poison for coyote control.

1 Paper presented at the Ninth Great Plains Wildlife Damage Control Workshop. (Colorado State Unive5sity, Ft. Collins, April 19-20, 1989).

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RABIES EPIZOOTIC

In the early 1950's, positive diagnoses of rabies was confirmed in red foxes in northern Alberta when fox populations were at their apex. In 1952, rabies was enzootic in red fox in northern Alberta and the disease was very quickly transmitted to other carnivora including coyotes, wolves, bears and lynx. An intensive vector control program was soon underway; the major control agents and animal removal methodology was fashioned after the coyote damage control program. Over 2 million strychnine baits were used for rabies control during 1952-1956. When the campaign terminated nearly four years later, records indicate 150-170 thousand coyotes and 10-15 thousand wolves were destroyed (Ballantyne 1958).

COUNTY COYOTE CONTROL PROGRAM

At this time, Alberta Agriculture and rural counties were entering a new age of post war agricultural production, advanced agronomy, harv-est-mechanization production and changes in land use practices. To deal with the agriculture issues, rural counties hired and trained agricultural fieldmen to conduct cooperative programs and enforce legislation and policy. All county agriculture programs were cost shared 60:40 with Alberta Agriculture. Included in the government and county agreement, was the county responsibility of coyote control (Annual Report 1953).

Alberta Agriculture established procedures and standards of conduct for coyote control, trained county fieldmen and supplied poisons and materials for coyote control. In 1953, Alberta Agriculture began purchasing from the USBSFW its third toxicant, 140 mg strychnine tablets.

Partly as a result in changes in agricultural management practices and new developments in the livestock industry, cattle numbers increased rapidly while sheep and lamb numbers declined. In 1940, there were 1.36 million cattle and .88 million sheep. By 1960 these numbers changed to 2.7 million cattle and .55 million sheep and by 1980 3.73 million cattle and .2 million sheep.

LIVESTOCK PRODUCTION

In the 1970's, livestock production and parti-cularly cattle production, in Alberta increased steadily and continuously. This was due in part to government incentives, low cost breeding animals and availability of low cost marginal land. Also, production of other livestock and poultry increased substantially but for slightly different reasons. As expected, predator complaints and reported losses paralleled industry growth (Annual Report 1970). Also, wolf predation on livestock was reported in the 1970's, something almost unheard of since wolf populations were believed to be still recovering from the rabies depopulation campaign twenty years earlier.

NEW PROGRAM

To reduce off producer complaints, Alberta Agriculture hired ten predator specialists in 1972. Fish and Wildlife also hired **or transferred staff** to deal with carnivore predation in the forested areas. (Alberta Energy & Natural Resources 1976). Alberta Agriculture predator specialists provided additional assistance to county fieldmen to aid in resolving coyote predation. Until 1972, most coyote control was conducted by county personnel.

Compensation

In 1974 Alberta Agriculture implemented a compensation program to indemnify producers for livestock and poultry losses attributed to predation. Owners of confirmed predator killed animals were recompensed at 80% market value at time of damage. Annually some 500-1000 complainants receive about two $250,000 for coyote losses. Confirmed poultry losses account for about lOX of the total monies paid out (Annual Report 1987).

Federal-Provincial Legislation

Authority to use predacides is under both federal and provincial laws. The Agricultural Pests Act establishes who may issue and set out poisons, while the federal Pest Control Products Act specifies toxicant storage, disposition, toxicological data, worker safety, first aid and specific uses. Prior to 1984 provincial governments could use predacides without federal registration.

Coyote Control Techniques

Lethal neck snares were permitted as a control device was completed in 1984. Lethal neck snares are not classified as restrictive, therefore, do not require federal registration. Also in 1984 140 mg strychnine, 760 mg sodium cyanide, 5 mg 1080 tablet, 5 mg liquid 1080 and 600 mg liquid 1080 were registered with the federal government. Other techniques used in coyote control include leghold traps, guard dogs, electric fences, den hunting and shooting. Aerial shooting is not allowed in Alberta.

PROGRAM OPERATIONS

During the last five years the focus of Alberta's coyote damage control program has shifted from direct assistance to producer training and extension. Part of this change was due to fiscal restraint. Other factors include increased government demand for safer use, care and welfare for the user of restricted devices. This has resulted in a reduction in provincial predator specialists, more work done by counties, greater restriction on use of poisons and fewer toxicants used. To counter this, greater extension efforts have resulted in promotion of preventive techniques and general producer education.

Long term program objectives include promotion of preventative and non lethal control measures. Attaining these goals is made easier by the new era livestock producer, particularly the sheep farmer who is younger, better educated, more experienced and a little more affluent than the previous generation. This results in many innovative and creative producers willing to risk new off-farm ideas.

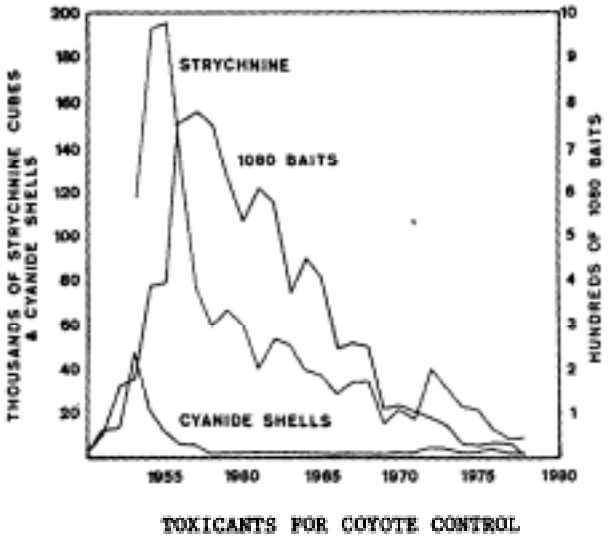
In training producers, the primary consideration in establishing a predation free operation is appropriate and adequate animal husbandry. Many coyote-sheep conflicts occur as a result of poor or unsuitable livestock management practices. Predation would decline if producers constructed sound barrier fences, properly disposed of livestock remains and followed closer herding regimes of their flocks.

Since our initial field test ten years ago, electric fences (Dorrance and Bourne 1980) are now the primary control agent on nearly 257 of all major sheep operations. The rapid growth of electrical technology in fence energizers and other equipment and materials, along with new designs and configurations, have made electric fences very attractive to sheep producers.

Other proven preventative measures are guard animals (including dogs), special herding regimes, routine den removal and a continuum of home variations and remedies of the above.

This has resulted in a significant decrease in and more efficacious use of toxicants (fig. 2). Since 1984 overall toxicant use has decreased and toxicant choice has shifted from strychnine to 1080 (table 1).

Single dose 1080 tablets and liquid 1080 has all but replaced strychnine and the large winter 1080 meat baits.



Cgure 2.--(illustrates total toxicant use in Alberta since regulatory authorization began in 1953)

Table 1. TOXICANTS DISTRIBUTED FOR COYOTE CONTROL

Year	Cyanide Shells	Strychnine Cubes	Single Dose 1080	Large 1080 Baits
1978	1549	6610	-	0
1979	1453	6100	-	14
1980	1041	3840	-	14
1981	1672	3700	-	13
1982	1642	3700	-	13
1983	1278	3593	-	16
1984	1175	4184	147	15
1985	873	2609	346	16
1986	482	2166	558	8
1987	565	1567	1769	8

Today, predator specialists spend four and one-half man years investigating about 500 coyote complaints in 65 counties (table 2). Generally predator specialists, working with producers and in many cases with county fieldmen, spend about 20 hours resolving each coyote predation complaint. This is about double the time spent 15 years ago, however, the number of return visits is less than 50%. Predator specialists and county fieldman provide direct control assistance to about 75% of the reported coyote predator claims for compensation (Rodtka, 1989). About 25% of coyote complaints are handled independently by the producer.

Alberta Agriculture produces a number of multimedia articles, slide tape productions and hands-on training workshops for producers to enhance awareness of and need for sound principles of coyote predation control.

Table 2. NUMBER OF CASES **AND TOXICANTS SET**

Year	Number of Cases	**Number of** Toxicants Issued	**Number** of Toxicants Per Case
1984	520	4125	7.9
1985	528	2933	**5.6**
1986	**398**	**1945**	4.9
1987	513	2530	4.9

CONCLUSION

Given the support, cooperation and assistance shown by producers, municipalities, the general public and other agencies such as Fish and Wildlife, Alberta's coyote damage control program appears secure and in tact. I regret that I can not provide an inspired personal vision for the future. Like others, I can only gaze into that

munificent crystal ball. Unfortunately this will not help, for as our former minister once lamented, one can not look into a crystal ball unless one is able to eat ground glass.

No doubt there will be further challenges of budget expenditures and fiscal policy, but with strong leadership, political will and continued support, coyote damage control will prevail in Alberta. There will probably be:

1. Reduced use of poisons and more restric tions on their use.

2. Greater emphasis on non-lethal preventative techniques, particularly electric fences which work very effectively on most operations in Alberta.

3. Greater concern for humane methods of control.

4. More pressure from environmental groups and other organizations concerned with animal rights and humane treatment of wild and domesticated animals.

Alberta Agriculture attempts to make changes in coyote control policy and programs before there is public pressure to do so. It attempts to strike a balance between the real and perceived needs of the farmer and the concerns of environmental and animal welfare groups.

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Texas Department of Agriculture Predator Management Program'

Murray T. Walton [2]

Abstract.--In 1988, the Texas Department of Agriculture initiated predator management training and certification for sodium monofluoroacetate (Compound 1080) Livestock -Protection Collar applicators and recertification of M-44 sodium cyanide applicators. Training included alternative methods and promoting livestock guard animals. Fifty-four training sessions had an attendance of 879 persons. M-44 applicators were reduced from approximately 5000 to fewer than 700. One hundred twenty-eight individuals obtained Livestock Protection Collar licenses and 43 purchased collars. Results of collar use and measures to increase effectiveness of training and application are discussed.

INTRODUCTION

Texas ranks first in the nation in production of cattle, sheep, and goats and in the top 10 in poultry production (Texas Agricultural Statistics Service 1986). Unfortunately, predators take about 1% of the annual calf crop (Stalcup 1988) and approximately 190,000 sheep and goats each year (Mulder 1988).

Lesser but significant numbers of poultry and adult sheep and goats are also lost to predators. Annual losses are valued at approximately $30 million. Coyotes account for a majority of the damage (Clay 1987). Other predators of primary concern are eagles, bobcats, gray and red foxes, dogs, and feral hogs.

As the state agency with regulatory responsibility for pesticides, the Texas Department of Agriculture (TDA) administers a certification and training program for use of the 2 poisons, M-44 sodium cyanide and sodium fluoroacetate (Compound 1080) Livestock Protection Collars (LPC), registered for predator control in Texas.

TDA seeks to achieve a balance between the valid concerns over livestock losses and the equally valid need to protect wildlife and the environment. Due to the hazards of pesticide use and the limited applicability of M-44s and Livestock Protection Collars, TDA encourages the use of non-lethal methods of predation management where possible. In particular, TDA promotes the use of "Texas bred" livestock guard animals.

The M-44 is a patented spring-operated device used with a toxicant (Shult 1976). Its use in Texas with sodium cyanide capsules is registered as a state-limited-use pesticide for use in controlling coyotes, foxes, and feral dogs preying on livestock and poultry. The method of operation and bait used the with M-44 make the device highly selective for canids.

The Livestock Protection Collar is a rubber bladder containing a toxicant with straps for attachment to the neck of sheep or goats (Rancher's Supply Inc. N.D.). LPCs containing Compound 1080 are registered as a state-limiteduse pesticide for taking coyotes attacking sheep and goats by bites to the throat. Only the small collar for use on animals from 15 to 50 pounds is registered for use in Texas. The LPC is the most specific device developed for taking offending animals.

TRAINING AND CERTIFICATION

TDA has conducted a program since 1977 for training and certification of M-44 sodium cyanide applicators. The turmoil over

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registration of the LPC caused TDA to reevaluate its program and work with the Texas Agricultural Extension Service, Texas Animal Damage Control Service, National Audubon Society, Lone Star Chapter of the Sierra Club, Animal Rights Kinship, Inc., the Humane Society of the United States, the Texas Farm Bureau, and the Texas Sheep and Goat Raisers Association to develop a comprehensive predator management approach. Especially helpful to the effort were State Senator Bill Sims, Executive Secretary of the Texas Sheep and Goat Raisers Association, and State Representative Dudley Harrison, Chairman of the Texas House Agriculture and Livestock Committee. This comprehensive approach was key to collar registration for use in Texas and has avoided public controversy.

TDA's training program leading to certification of M-44 and LPC applicators includes instructions on identification of predation, legal alternative methods of predator control both non-lethal and lethal, as well as proper use, safe handling, emergency first aid, recordkeeping, and reporting requirements for M-44 and LPC applicators as required by pesticide label use restrictions. Lecture, slide/tape, and demonstration are used as teaching methods. All participants are provided a manual developed by TDA for M-44 only training or M-44 and LPC training. Manuals contain an outline of all materials covered during training sessions including pesticide label(s), reporting forms, and first aid treatment. The training program relies heavily on material developed by the Texas Agricultural Extension Service for identifi a~ion of predation and use of collars. Seven TDA staff members are trained and equipped to conduct the sessions.

Requirements for M-44 certification include attendance at a training session (2 1/2 - 3 hours) and possession of a private applicator license or certified applicator license for purchase and use of state-limited-use or restricted-use pesticides. Training, M-44 certification, and private applicator license were available with no fee.

In order to obtain a non-commercial certified applicator license to use the Compound 1080 Livestock Protection Collar, a person must complete the training (approximately 6 hours), score 70 or above on the prescribed test and obtain a license. A $20 testing fee must be collected before a person may take the test (2 opportunities to pass the test are allowed without retraining). The annual license fee is $50 for a non-commercial LPC applicator's license. State and federal agency personnel acquiring a non-commercial license to perform official duties are exempt from fees. For a commercial LPC applicator license, a person must complete the training, pass the test, provide proof of financial responsibility and pay an annual license fee of $150.

During 1988, the Texas Agricultural Extension Service assisted TDA in holding 54 predator management training sessions, and TDA conducted an additional 5 sessions for small groups. Twenty-eight of the sessions included LPC training. The first 11 LPC training sessions in the Spring of 1988 were scheduled within weeks of approval of the TDA certification proqram by the U. S. Environmental Protection Agency in April 1988. Training was made available within a 2-hour driving distance of 90% of the sheep and goats in Texas to provide an opportunity for producers to use collars in 1988.

During the summer of 1988, all certified M-44 applicators were mailed a notice of recertification requirements and provided a reply card for requesting a schedule of training sessions. Amore extensive state-wide schedule of training was then held in the Fall of 1988 to recertify M-44 applicators as required by Texas pesticide regulations.

Total attendance at the 59 predator management training sessions was 879 persons with 829 receiving credit for M-44 training and 280 receiving credit for LPC training. Fewer than 700 subsequently satisfied all requirements for M-44 certification. Of those completing LPC training, 194 took the LPC examination with only 4 failures. One person failing the examination subsequently retested and passed. One hundred twenty-eight of those passing the exam acquired licenses.

Due to the start of LPC **training well after** Spring lambing and kidding, the attendance and resulting number of licensed LPC applicators was considered excellent. The 700 M-44 applicators represents a considerable reduction from the nearly 5,000 certified applicators on record prior to the November 1, 1988 date required for recertification to continue use. However, this drop in applicator numbers is not surprising. Only 100 to 150 applicators purchased M-44 Sodium Cyanide capsules in 1986, 1987, or 1988. Furthermore, a survey of Texas sheep and goat producers conducted in 1978 found that only 14% used the M-44 and rated it the least effective of all control methods reported (Texas Crop and Livestock Reporting Service 1979).

3Wade, Dale A. and James E. Bowns, 1985. Procedures for evaluating predation on livestock and wildlife. Texas Agricultural Extension Servi;e, B-1429, 42p.

"Wade, Dale A., 1985. Applicator manual for Compound 1080 in Livestock Protection Collars. Texas Agricultural Experiment Station, B-1509, 50p.

All participants at training sessions are provided an evaluation form to rate the program and offer suggestions. A vast majority have rated it good to excellent.

LIVESTOCK GUARDING ANINALS

Many Texas sheep and goat raisers are successfully using livestock guarding animals, particularly donkeys and guarding breeds of dogs. A number of Texans are now raising livestock guarding animals. TDA promotes the marketing of livestock guarding animals as a cost effective and socially acceptable alternative to poisons and other lethal control methods. The Department maintains a list of Texas Livestock Guarding Animal Breeders. Prospective purchasers of livestock guarding animals may obtain a copy of the list by contacting the Department. This list is also included in the Department's predator management training manuals for M-44 and LPC applicators.

Promotional activities in 1988 included a press conference on the State Capitol grounds featuring Texas Agriculture Commissioner Jim Hightower along with 3 guarding dog breeds, a donkey, a llama, and their owners present for testimonials. This event in January 1988 received statewide and national press coverage. Further media coverage was afforded through three television appearances, and production of a short television news story featuring a goat raiser/great pyrenees producer, and several radio interviews.

The reply card sent to 4,700 M-44 applicators about recertification also had boxes to check for those wanting to attend LPC training, to attend a livestock guard animal field day, or to receive a guard animal producer list. Eighty-seven wanted LPC training, 121 responded that they wanted to attend a guard animal field day, and 79 requested the guard animal producer list. Other program requirements have resulted in the field day remaining in the planning stages.

1988 LIVESTOCK PROTECTION COLLAR-USE

During 1988, 43 licensed Livestock Protection Collar applicators purchased a total of 827 collars. Counties with applicators possessing collars are shown on Figure 1. Nine applicators with 20 collars each (180 total collars) kept collars in storaqe in 1988 and reported no use. The remaining 34 applicators used 524 of the 647 collars in their possession.

Of the 524 collars actually used by applicators, 30 were reported as punctured by coyotes, 39 were reported as missing/lost as of December 31, 1988, 15 were pierced or torn by vegetation, 4 were ruptured from unknown causes and 1 was torn during removal. The only reported instance of suspected non-target Compound 1080 induced mortality involved a lamb with a collar ruptured from an unknown cause. Other verified mortality (excluding kills with collar punctures and collared animals lost) involving collared animals included 4 livestock deaths from unknown causes, 1 collared animal killed by a predator without the collar being punctured, 1 collared animal broke a leg while caught in a leg-held trap and was destroyed, and 1 animal was destroyed after being contaminated by Compound 1080 from a collar ruptured during removal.

Minimum, maximum and average Livestock Protection Collar use-days were calculated from "Livestock Protection Collar Quarterly Applicator Data Report" forms submitted by applicators. Minimum collar use-days were determined by adding the number of days from attachment to the last collar inspection on which collars were found to be in good condition. Maximum use-days were determined by adding the intervening period between the last date on which collars were in good condition until the date on which collars were detected to be lost, punctured, torn, or rendered unsuable. An average estimate of 25,694 collar use-days for 1988 was calculated from the maximum and minimum use-days.

Eighteen licensed collar applicators suspected taking from 1 to 5 coyotes with a total estimate of 37 coyotes taken with collars. This estimate was based on collar punctures which resembled coyote tooth marks, finding dead coyotes with dye stained teeth, missing collared livestock, cessation of predation, and other factors. At a minimum, 7 dead coyotes suspected to have been killed by collars were found. Two of the coyotes found dead were suspected to have been killed from puncture of a single collar.

Considerable variation was recorded among applicators in collar use-days required to take coyotes. Results were achieved in 1 night to several months with 4 to 48 collars in use. The lowest average number of use-days per puncture suspected of taking a coyote recorded by an applicator for 1988 was 35 use-days. This applicator placed only 8 collars on goats, recorded 5 punctures and found 2 dead coyotes in less than one month's time. Overall use-days per suspected coyote kill averaged 697 use-days.

These results compare very favorably with tests performed by the Texas Agricultural Experiment Station (1983) from August 1980 through April 1983. Data was collected for 55,735 collar days on an "intensive" site and 35,552 collar days on a "rancher-use" site with 67 and 26 collars, respectively, known to be punctured by predator attacks. This translates to 832 use days and 1,367 use-days per suspected coyote kill. The Texas Agricultural Experiment Station study recorded a number of attacks (63) where collars were not punctured. TDA only had 1 non-puncture attack on a collared animal reported, however, 39 animals were reported as missing or lost. In 1 instance of a missing

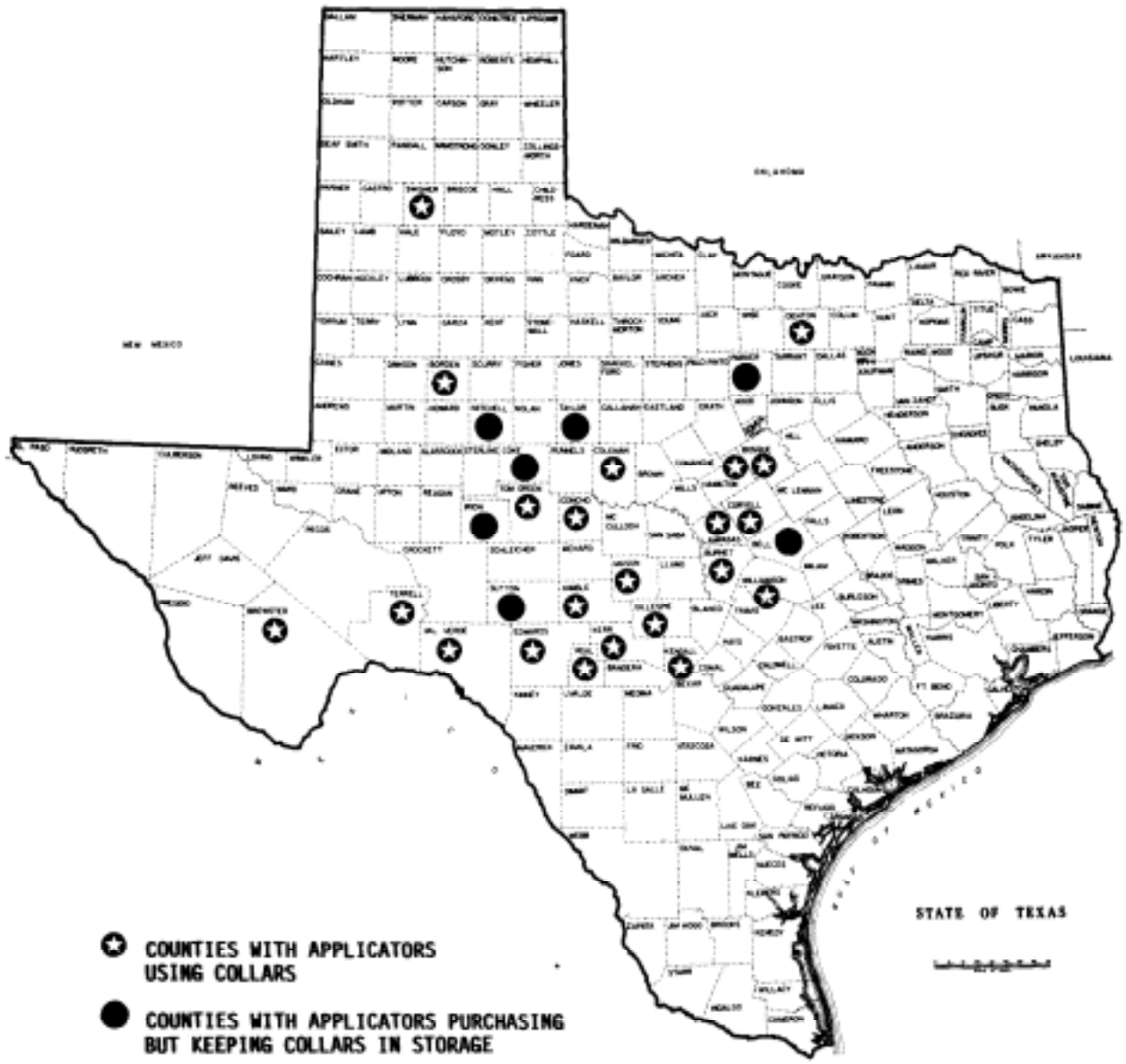

FIGURE 1.--Distribution of applicators purchasing Livestock Protection Collars in 1988

collared animal, a LPC applicator reported to TDA that a dead coyote was located.

Also, the reports of 7 dead coyotes found by Texas LPC applicators in 1988 compares extremely well with recoveries of 3 dead coyotes from 30 collar punctures reported by Connolly (1980).

Inspections of 30 applicators were performed in Calendar Year 1988. Only 1 significant infraction of Livestock Protection Collar use restrictions and TDA regulations has been detected to date. This incident involved use by a non-certified applicator who was provided collars by a licensed applicator. The primary problem encountered was slow reporting of collar use.

LIVESTOCK PROTECTION COLLAR PURCHASERS

Licensed LPC applicators purchasing collars in 1988 represent a good cross section of the Texas sheep and goat industry. They included producers that had entered the business for the first time in 1988 and representatives of families with generations of experience. More than half of the collar users raised both sheep and angora goats. Herd size varied from

slightly less than 200 animals to about 3,300 head, and acreage used for sheep and/or goat production ranged from about 200 acres to 18,000 acres. Predation losses reported to TDA ranged from a couple of animals per year to 450 head. One producer reported loss of 273 lambs out of a 1988 crop of 280 lambs. Collectively, applicators purchasing collars reported losses of approximately 3,000 sheep and 1,800 goats in the previous two years. They had slightly in excess of 29,000 sheep and 22,000 goats on hand at the time collars were acquired.

Thirty-four returns of a questionnaire sent in December 1988 to 42 applicators with collars showed 27 LPC applicators claiming increased predation in 1988, 4 with predation stable, 2 with a decrease in predation, and 1 new producer without prior experience. All indicated predation on sheep and/or goats by coyotes. Second in frequency was predation by dogs. Other predators of major concern were fox, bobcat and eagle. All respondents to the questionnaire used a variety of predator management methods other than collars. Twenty of the replies indicated that assistance was received from the Texas Animal Damage Control; 13 reported using donkeys as guard animals; and 8 reported using livestock guard dogs.

In response to a question on the adequacy of TDA's training program, 33 of 34 responses indicated it was adequate for effective use of collars. The 1 negative response cited inadequate training in "bookkeeping". In a follow up question on what areas of training should receive more attention, 8 indicated td,,geting/livestock management, 5 checked completing forms, and 2 marked safety. The latter is surprising as safety is stressed throughout training.

The training program is admittedly light in regard to targeting. Collar users were directed to contact Mr. Roy McBride of Rancher's Supply, the collar manufacturer and registrant for Texas, for additional advice on targeting. Recommendations on targeting are also provided on an individual basis by TDA Predator Management Specialists during annual inspections. However, it appears difficult to convince some applicators to use enough collars.

Though instructions for completing forms appear to be a simple matter, it is an area of major difficulty for producers not accustomed to paperwork. To remedy the problems with reporting forms, more attention is being given during training and inspections, completed sample forms are being added to manuals and sent to collar users, and changes have been made in the quarterly report form.

SUMRY/CONCLUSIONS

A comprehensive approach to predator management training that includes non-lethal as well as lethal means engenders less public controversy and better meets the needs of livestock producers because no one method of predator management suites all situations. TDA's predator management program for training and certification of M-44 sodium cyanide applicators and sodium monofluoroacetate (Compound 1080) Livestock Protection Collar applicators along with the promotion of livestock guarding animals attempts to strike a balance between producers concerns over livestock losses and equally valid needs to protect the environment. Reception of the training program by livestock producers has been excellent with more than 800 attending training sessions in 1988. The training program needs improvement in the areas of targeting collar use and completion of reporting forms.

There is a growing interest in the use of livestock guarding animals and training in their use is needed. Use of M-44 sodium cyanide by individual livestock producers remains limited. Few Texas sheep and goat producers (34) availed themselves of the opportunity to use Livestock Protection Collars in 1988. Several producers were highly successful in taking coyotes responsible for thousands of dollars of damage to livestock. Use of collars supplemented other means of predator control and proved effective in some instances where all other efforts failed and continued use is warranted. Efficiency could be improved by using collars only where and when incidence of attack to the throat of sheep and/or goats is high, rather than in a prophylactic manner as practiced by several applicators. Failure of several collar applicators to take coyotes during prolonged periods of predation can probably be attributed to an inadequate number of collared target animals in pastures with greater numbers of uncollared animals of the same size and species. However, targeting was successful even with the use of a small number of collared animals (4 to 8) when small lambs or kids were placed with a larger number of adult animals.

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