STROBE LIGHT AND SIREN DEVICES FOR PROTECTING FENCED-PASTURE AND RANGE SHEEP FROM COYOTE PREDATION

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ABSTRACT: The effectiveness of frightening devices for reducing coyote predation on domestic sheep has not been adequately studied. Portable, battery-operated strobe light/siren devices protected pastured sheep from coyotes for a mean of 53 nights (10 trials) and 91 nights (5 trials). Results of ongoing tests of the devices for reducing predation on herded sheep on summer range in western Colorado have so far been encouraging. Future research needs are outlined.

Visual and sound-emitting devices have been used by livestock producers for many years to reduce livestock predation on sheep. Vehicles, scarecrows, electric lights, radios, and propane exploders have been placed in or near pastures, corrals, or bedgrounds to "frighten" coyotes. Meduna (1977) examined the management practices of 110 sheep producers in a nine-county area of south-central Kansas during 1975-76. Using data from personal interviews, he compared coyote predation rates on farms having lighted and unlighted corrals. Another analysis compared kill rates of belled and unbelled sheep. He observed that in some instances lights and bells reduced predation levels. Schaefer (1978) made a survey of coyote and dog predation on sheep in lighted and unlighted dry lots in southern Iowa. He indicated that the percent of sheep killed in lighted areas was less than in unlighted areas; however, the difference was not statistically significant. Rock (1978) reported data on the efficacy of acetylene exploders for reducing coyote predation of sheep on a single ranch in Saskatchewan. He concluded that exploders stopped predation for six weeks, but by mid-July coyotes were seen among the sheep. Twenty lambs had been killed by late August; 13 kills occurred when exploders malfunctioned. Pfeifer and Goos (1982) obtained information from 26 North Dakota sheep ranchers who used propane exploders. Ranchers were advised by predator damage control specialists to activate exploders from before dark until daybreak, to change exploder locations every 4-5 days, and to set exploder timers to "fire" every 7-8 minutes. Exploders deterred coyote depredations on sheep for an average of 29 days (range 1-180 days). The authors concluded that the most important factor determining exploder efficacy was their proper use and maintenance by producers. Even though frightening devices are widely used, aside from the above observations, their effectiveness has not been studied.

The Denver Wildlife Research Center (DWRC) recently completed field tests to assess the effectiveness of DWRC-fabricated, portable, battery-operated, strobe light/siren devices for reducing coyote predation on pastured sheep (Linhart et al. 1984). The original prototype device and the second-generation, smaller, less expensive unit ($100-125 ea) both consisted of an electronic timer and photocell wired to a commercial strobe light or a warbling-type siren or both and a 12vDC rechargeable battery. Unlike propane exploders that produce a repetitive explosion at regular intervals, several of the DWRC devices, deployed around a pasture or bedground, emitted a varying and irregular sequence of light and sound stimuli originating from different locations. We believe this technique minimized habituation to the stimuli by depredating coyotes and prolonged the period of repellency.

From 1979-1982, 15 field trials of these devices were conducted with sheep in fenced pastures on ranches located in Colorado, Idaho, South Dakota, and Oregon. Following a 2- to 3-week pretest period to document baseline coyote kill rates (i.e., controls), the original prototype device (10 trials, 1-2 devices per pasture) provided a mean of 53 nights of protection ($\leq$ 2 losses) whereas the newer model (5 trials, 3-6 devices per pasture) protected sheep for a mean period of 91 nights. The encouraging results obtained from these tests suggested that the devices might have application for open rangeland situations, particularly in areas where alternate means of controlling predation are not suitable or their use is prohibited.

Large numbers of domestic sheep are grazed on unfenced rangeland in the western U.S. Many are moved onto Forest Service (FS) and Bureau of Land Management (BLM) allotments during spring and summer. For example, about 850,000 ewes and lambs went onto FS allotments in Colorado and Wyoming in 1982 (J. Free, USFS, Denver, CO pers. commun.) where they were herded for an 8- to 10-week period (approximately July 1 - September 15). Predation by coyotes is frequently a problem; up to 10 percent of the lamb crop may be lost to coyotes while on FS allotments (G. Rowley, USFWS, Craig, CO, pers. commun.).

Prior to 1973, large meat bait stations impregnated with sodium monofluoroacetate (Compound 1080) were placed on rangeland in the fall and removed and destroyed the following spring. These stations were apparently effective in reducing coyote numbers and lowering sheep losses to predation on western National Forests during the summer (Lynch and Nass 1981). Small strychnine-treated tallow or lard baits were also used to destroy coyotes before or during the grazing season. In 1972, by Executive Order and withdrawal of all predacide registrations by EPA, only non-chemical methods remained. In 1975, the M-44, a spring-activated sodium cyanide ejector (a modification of the original "coyote getter") was registered and is now available for use by certified applicators. M-44s are used throughout the western U.S., but FS Forest and District Supervisors are often unwilling to have them used because of perceived or real hazards to humans and nontarget species and associated public relations problems.

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Several factors make coyote damage control on FS lands particularly difficult. Vehicular access to allotments is often limited and many access roads have been closed to motorized traffic in recent years. Fish and Wildlife Service (FWS)-supervised predator damage control specialists sometimes have difficulty responding to depredation complaints because horseback may be the only means of travel and allotments with problems are often widely scattered. Aerial hunting is expensive and has only limited application in mountainous terrain. Steel traps may be only marginally effective under these conditions; they must be checked frequently, pulled and reset as sheep are moved within an allotment, and may be sprung by nontarget species. In western Colorado, calling and shooting by FWS field personnel is the only method extensively used for taking coyotes on FS allotments.

The DWRC has completed five of 15-20 proposed field trials of newer prototype strobe light/siren devices on unfenced range where herded sheep were being attacked by coyotes. The tests were conducted in summer 1982-83. Four trials were conducted on FS grazing allotments on the Gunnison and Routt National Forests in western Colorado and the fifth was conducted on a nearby privately leased area. Each herder was provided with four devices; two with warbling-type sirens and two with strobe lights (Figure 1). Devices were activated each evening by a photocell and the timer "fired" the siren or light for 10-second bursts at 7- or 13-minute intervals from dusk until 1-1/2 to 2 hours after dawn. Devices were placed on or adjacent to sheep bedgrounds from the time sheep arrived on the summer range (June-July) until lambs were shipped to market in late September. All other types of control were withheld for the duration of the tests. The percent of lambs estimated as killed by coyotes was compared with the percent killed the previous year with "normal" predator damage control in effect. Estimated lamb losses to coyotes on the five areas the summer devices were used ranged from 44.0 to 95.0% lower than those that occurred during the previous summer. No evidence was found that the devices caused coyotes to move onto adjacent allotments and kill unprotected sheep. Elk and mule deer were frequently seen near sheep bedgrounds and devices, indicating that the sound and light stimuli did not adversely impact these species. Results obtained so far are encouraging but a number of questions remain unanswered and merit study:

1. Which stimuli (i.e., sound, light, movement) and in what combinations and sequences most effectively cause coyotes to avoid prey?

2. What are the relations between frequency of presentation, time (i.e., weeks, months), maximum effectiveness, and habituation to the stimuli by depredating coyotes?

3. How does effectiveness relate to the number of devices deployed, the size of pasture or flocks of sheep being protected, differing sheep management practices, alternate prey available, coyote densities, and season of year?

4. To what extent do vegetative cover, topography, and other physiographic features influence the effectiveness of devices?

5. Do the devices alter coyote movement, behavior, habitat utilization, and home range? Do these changes occur after prolonged exposure to the devices?

6. Is a nonlethal technique that "teaches" resident coyotes to avoid sheep more effective than removing coyotes from the area by lethal procedures?

7. Will the devices deter other predatory species such as wolves, bears, and mountain lions from killing livestock?

8. How do the DWRC units compare in effectiveness with commercially available devices such as propane exploders, the "Electronic Shepherd" (B&B Enterprises, P.O. Box 77, Fortuna, CA 95540), and Av-Alarm products (675-D Conger St., Eugene, OR 97402)? [1]

9. What are the best electronic and mechanical components for use in the devices? How does component type and cost relate to effectiveness?

Methodologies and resources are obviously not available to answer all of these questions but more information is needed to better define the parameters within which frightening devices can be used to protect livestock. So far, results of studies have been encouraging to the extent that further research effort is justified. As with all other predator damage control practices, frightening devices will be most effective when used in combination with good livestock management procedures and alternative lethal and nonlethal techniques.

[1] Use of trade name does not imply endorsement by the federal government.

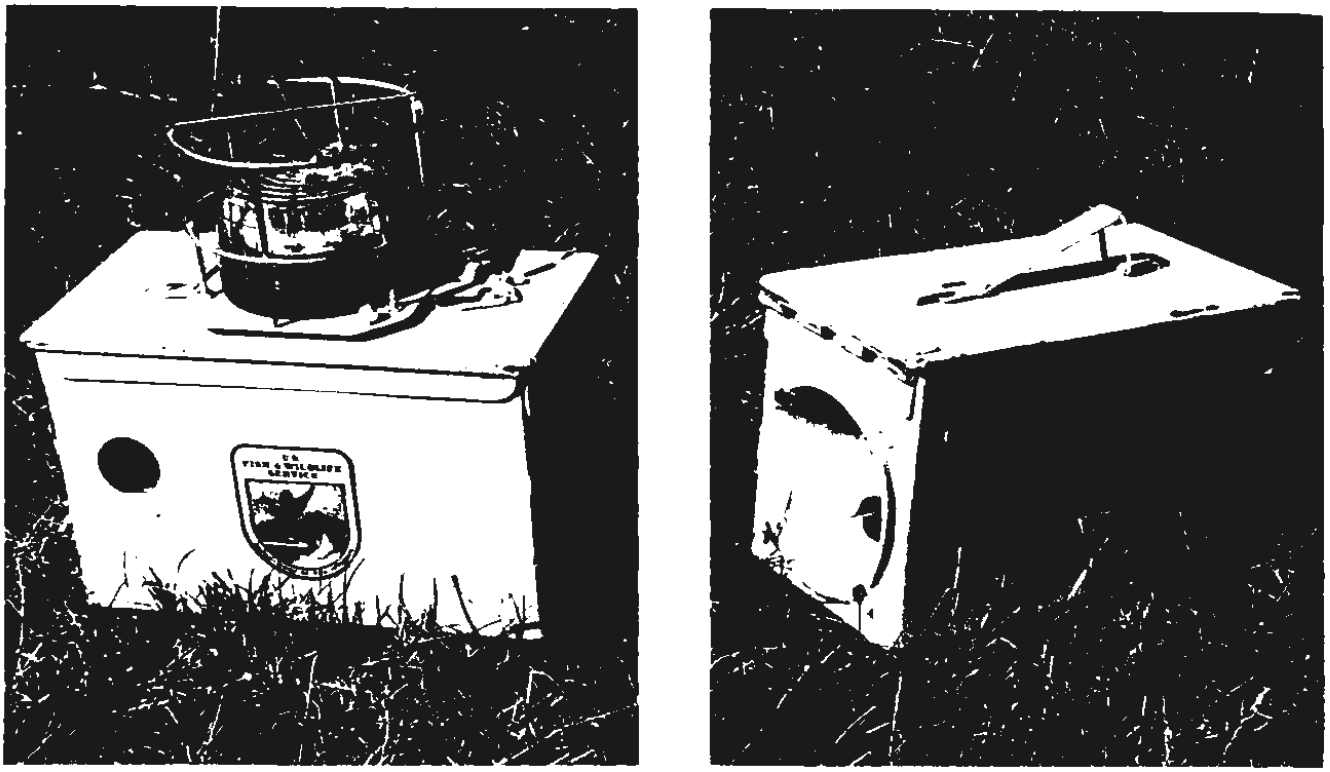

Figure 1. Portable battery-operated strobe light unit (left) and warbling-type siren unit (right).

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