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Coping with Coyotes

Management Alternatives for Minimizing Livestock Losses

Texas Agricultural Extension Service
The Texas A&M University System

Texas Agricultural Extension Service • Zerle L. Carpenter, Director • The Texas A&M University System • College Station, Texas

TEXAS SHEEP & GOAT COMMODITY BOARD

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Coping with Coyotes

Management Alternatives for Minimizing Livestock Losses

Dale Rollins

The coyote is as much a part of the Texas landscape as the familiar mesquite tree. Like the mesquite, the coyote is locally abundant, well-established, adaptable, and resilient to forces aimed at its control. Up to a point, both the mesquite and the coyote are compatible with most livestock ranching, but when the population of either species becomes too dense, livestock production can suffer.

Livestock losses to predators, primarily coyotes, can and do occur statewide, but the sheep and goat industry suffers the greatest impact. In 1988, the loss of sheep and goats to predators in Texas was about $12 million. Predation is the number-one cause of death to sheep and goats in the Edwards Plateau region. The rangelands of other areas of Texas are well suited for sheep and goat production, but ineffective means of preventing predatory losses preclude large-scale grazing by sheep and/or goats. Additional losses occur in the cattle, poultry, swine, and melon industries.

Minimizing livestock losses to coyote predation requires:

- understanding the coyote's ways,
- learning to interpret coyote sign and recognize coyote kills,
- reducing the exposure of susceptible livestock,
- learning how to control problem coyotes, and
- developing a plan of action before the problem reaches a crisis level.

The objective of this publication is to increase your awareness of these required skills and, in doing so, to help minimize your livestock losses to coyotes.

Coyotes: Up Close and Personal

Coyotes are not as large or heavy as many people believe; the typical adult male tips the scales at about 30 pounds. They are predominantly grayish to brownish in color with lighter-colored bellies. Color varies, however, ranging from nearly black to red to almost white in some individuals and local populations.

Figure 1. Coyotes are not as large as most people think. Few weigh more than 35 pounds.

Coyotes are most active at night and during twilight hours. They bed in areas of tall grass or brush, but do not use dens except for raising young (from April to June). Coyotes possess good eyesight and hearing and a highly developed sense of smell. They can run at speeds of up to 40 miles per hour for short distances and travel over fairly large home ranges (from 2 to 20 square miles).

Coyotes are basically solitary and do not form packs as wolves do, although family groups may be seen occasionally. A family group may include a mated pair, nonbreeding offspring from the

*Extension Wildlife Specialist, The Texas A&M University System.

previous year, and pups from the current year. The coyote's society consists of two kinds of individuals: territorial animals and transients. Territorial coyotes tend to be mature breeding animals, while transients are typically yearlings or very old individuals. In South Texas, about two-thirds of the population are territorial and the rest are transients. Coyotes establish and maintain territories through direct means (aggressive encounters with intruders) and indirect means (howling, scent posts). Recent studies suggest that transient coyotes occupy the buffer zones between existing territories until they are able to establish a territory of their own.

Coyotes occupy a wide range of habitats and may be found within the city limits of metropolitan areas or in the remote stretches of West Texas. One reason for this success is their ability to subsist on a varied diet, including rodents, rabbits, carrion, insects, fruits, wild game, garbage, and domestic livestock (Figure 2). Coyotes are highly opportunistic, and individual diets are dictated to a large degree by the seasonal availability of different foods.

Coyotes are monogamous and breed only once per year. They usually breed during February and March and have a gestation period of about 63 days. Average litter size is 5 to 7 pups, but larger litters are not uncommon (as many as 19 pups have been observed). In areas of low coyote density or where food is abundant, litters tend to be larger than in areas of high coyote density or food scarcity. Dens may be located in steep banks, rock crevices, thick underbrush, or relatively open areas. Both parents share in raising the litter. Pups remain in or near the den until they are about 2 months old, when they may accompany the parents on short trips. Adults and pups usually remain together until late summer, when the pups tend to disperse. Coyotes and dogs will interbreed (rarely), and such "coydogs" are fertile. Hybrids usually are larger and darker than the typical coyote, although size and color vary with the breed of dog involved. Annual mortality rates average about 60 percent for young coyotes, and few coyotes live beyond about 6 years of age. People cause most coyote deaths, but coyotes also are susceptible to canine diseases such as distemper, hepatitis, mange, parvovirus, and rabies. Hookworms are the only comon parasite which frequently cause mortality in coyotes, and those mortalities are most common inpups.

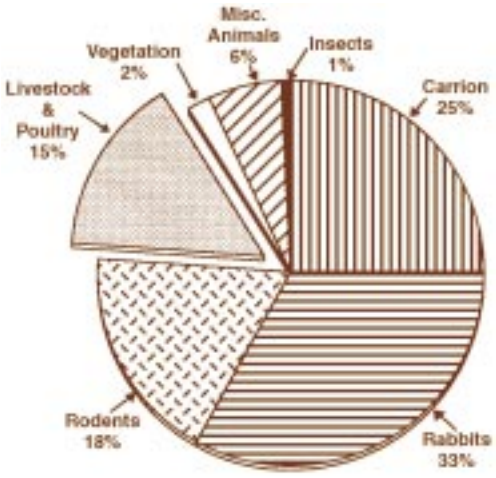


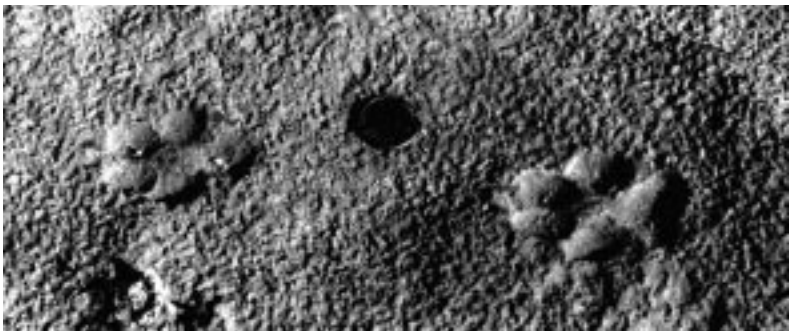
Figure 2. This chart of an "average coyote diet illustrates how adaptable coyotes are. These data were assembled from more than 8,000 coyotes collected from 17 western states.

Coyotes are perhaps the wariest and most intelligent animals found in Texas rangelands. They are difficult to trap, a tribute to their intelligence and keen sense of smell. Coyotes may become educated or "trap-shy" by unsuccessful attempts at control. As with other species, survival of the fittest applies. In areas where coyote control has been practiced diligently for many years (such as the Edwards Plateau), the coyotes that remain are extremely wary animals.

Recognizing and Interpreting Coyote Sign

The ability to read the landscape and interpret sign is essential in assessing coyote presence and population trends. You should be able to identify coyotes by their tracks, droppings (scats), howls, and "slides" where they pass under fences. Coyote howls are easily identified, but, in areas of heavy control pressure, coyotes rarely howl.

Next to seeing the animal, identifying tracks is the best way to determine a coyote's presence. Coyote tracks usually can be distinguished from those of a dog by the shape and impressions of claws (Figure 3). Coyote tracks are usually longer than they are wide, while dog tracks are usually as wide as they are long. In most situations only



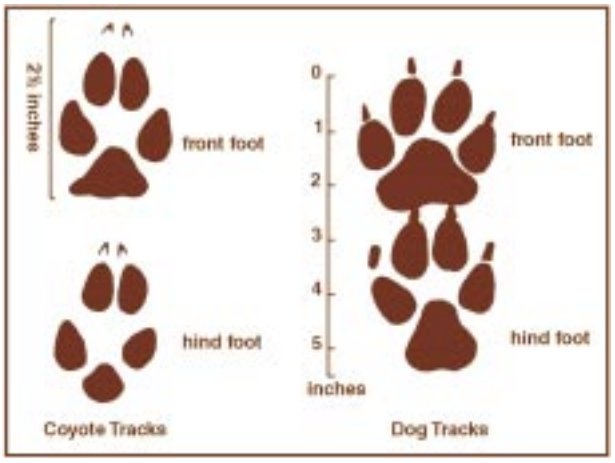


Figure 3. Coyote tracks are similar in size to a medium-sized dog's, but are usually more narrow with only the two inside claw marks visible.

the front two claw marks are visible on coyote tracks, as opposed to all four claw marks on dog tracks. Good areas in which to search for tracks include stock trails, ranch roads, sandy draws, and watering points.

Another sign is the presence of scats. Coyote scats are typically about the diameter of a cigar and will vary in appearance depending on the animal's diet. The scat may contain hair, wool, feathers, bones, or other animal parts, as well as plant material. The color of the scat varies from black to light gray, or even pink when watermelon is the main component of the diet. Scats are often deposited along ranch and county roads or near trapsets.

While coyotes have been know to climb or jump fences, they tend to use slides to crawl under netwire fencing (Figure 4). Note any slides under or through fencing and check for the presence of coyote hairs that may be caught in the wire above the slide. Other animals such as deer, javelina, raccoons, and rabbits also use slides, but

Figure 4. This is a "slide" used by coyotes to crawl under a netwire fence.

a close inspection of hair and other sign (like tracks) may identify the animal.

The manner in which a predator kills its prey is often characteristic for that particular species. The publication B-1492, "Procedures for Evaluating Predation on Livestock and Wildlife," available for $10 from the Texas Agricultural Extension Service, is an excellent field guide for determining what type of predator (if any) was responsible for an animal's death. Only some general comments on interpreting kill signs are presented here.

Coyotes usually kill adult sheep or goats by biting the throat just behind the lower jaw, which kills the victim by suffocation and shock (Figure 5). Smaller prey such as kid goats, lambs, or rabbits are killed by biting through the head or neck. The victim usually displays puncture wounds in the throat region. Upon skinning, the throat area may exhibit considerable bleeding below the skin. In contrast to coyotes, dogs usually kill sheep or goats by attacking the hindquarters, flanks, and head, and rarely kill as cleanly as coyotes. However, inexperienced coyotes may kill in a manner more typical of dogs, and some dog kills can be mistaken for coyote kills. For this reason, it is important to look for additional evidence such as tracks to confirm your identification of the predator.

Animals killed by bobcats often have claw marks on the carcass and subcutaneous hemorrhaging. Kills made by mountain lions will have tooth punctures about 2 inches apart and will usually have claw marks on the neck and/or shoulders. Also, lion kills (and sometimes bobcat kills) may be dragged some distance from the

Figure 5. The typical attack behavior of adult coyotes is to grab the animal at the throat behind the jaw (photograph courtesy of Guy Connolly, Denver Wildlife Research Center).

point of attack and partially or entirely covered by dirt, leaves, and twigs.

The appearance of the prey animal is not always an adequate means of determining which predator species is responsible for the kill. As mentioned before, inexperienced coyotes may behave atypically when making a kill. Also, don't assume that every dead animal you find is a result of a predator, as livestock die for a variety of reasons. Carcasses are often fed upon by coyotes or other scavenging animals. As a rule, animals dying from "natural" causes do not show signs of bleeding and will not have external wounds.

Observing vultures will help you find livestock carcasses. Make it a point to investigate all livestock deaths and gather as much information from each one as possible. Just as a coroner looks at a body for clues as to cause of death, so should the livestock producer observe and assemble information. The basic information that should be noted includes the kind (species) and class (age, sex, breed) of livestock. Try to determine first if the animal was killed or if it died from natural causes. Then, for predatory kills, try to identify the predator responsible. Kid goats and lambs are usually most susceptible to coyotes, bobcats, and other small predators. By contrast, mountain lions can handle much larger animals such as yearling cattle and colts. Knowing whether livestock have been harassed, attacked, and injured or killed outright also may help to identify the predator species. Dogs are among the least discriminating and least efficient (in terms of killing) of the predators.

Make note of when and where kills are occurring to determine whether there is a pattern. Coyotes kill more livestock during early summer because the demands of rearing pups increase the parents' food needs and because more lambs and kids are available during this season. Discuss predator problems with your neighbors to find out if they are also suffering losses. Exchange information about predation on your herds, sightings of coyotes or their sign, and the direction of predator travel.

Coyote control falls into one of two categories: (a) livestock husbandry and management; and (b) manipulation of the coyote population, either by lethal or nonlethal methods. Each situation is unique and may call for a combination of methods. Some practices may not be suitable in certain situations, while others may not be practical or economical. It is important to evaluate all available information and options carefully before choosing control methods.

Livestock Husbandry and Management

Total confinement of livestock usually prevents losses to coyotes, but confinement is not practical for most ranchers who produce livestock by grazing pasture or rangeland. Likewise, penning at night can be an effective means of limiting predation, but it may not be feasible in many situations. Furthermore, some coyotes may enter pens and

corrals and continue killing. Shed-lambing or kidding is usually effective in preventing predation while the animals are in confinement, but such management schemes also increase production costs in terms of buildings, labor, and feed. Also, parasite problems are usually greater when sheep or goats are confined to pens. Restricting livestock to certain pastures that tend to be less vulnerable to coyotes, either because of more open country or proximity to people, may decrease losses. However, because sheep and goats are susceptible to coyotes throughout the year, selective use of pastures could prevent the use of some pastures entirely.

Changing the date of the lambing-kidding-calving season may reduce exposure of young animals to coyotes. This strategy is most useful for calves as they are most vulnerable to coyotes shortly after birth, especially during late winter (February to March). Sheep and goats are vulnerable to coyote predation at all ages, so a change in lambing or kidding seasons is less effective in preventing losses.

Population Control

Nonlethal Coyote Control

In recent years, public opinion opposing the killing of predators has focused attention on nonlethal control methods, but many, if not most, situations will require some removal of coyotes to stop depredation. Nonlethal approaches can be used as a first line of defense, with lethal methods applied as necessary.

Fencing. Different combinations of conventional netwire, barbed wire, and electrical wires can help keep coyotes away from livestock. However, there is probably no such thing as an economically feasible "coyote-proof" fence.

Figure 6. Coyotes will often craw under and may even jump over a netwire fence (photograph courtesy of Guy Connolly, Denver Wildlife Research Center).

Figure 7. The addition of an electric "trip" wire, placed just outside the existing fence, helps deter coyotes from digging under.

The traditional sheep and goat fence of netwire with two strands of barbed wire on top, if kept in good repair, will prevent most dogs from entering a pasture, but coyotes will dig under, pass through a hole in the fence, climb, or even jump over some fences (Figure 6). Nevertheless, a good netwire fence will funnel coyote activities in such a manner that their travel can be monitored more easily. Good fencing also facilitates certain control techniques such as snaring and trapping. For maximum effectiveness, a netwire fence should be at least 5 feet high and have mesh no larger than 6 inches wide, a buried wire apron to deter digging under, and an electrified wire on top to prevent climbing over. These specifications make for an expensive fence.

Improvements in electric fencing technology (energizers, fiberglass posts, wire), coupled with the fact that electric fences can cost less than conventional fencing, have prompted many producers to use these "hot" fences for deterring coyotes. Unlike conventional fences, electric fences are more of a psychological than a physical barrier, and coyotes must be trained to respect them. The use of seven to twelve charged and ground wires, alternately spaced 4 to 6 inches apart, has excluded coyotes in some situations. In one Texas study, coyotes were shocked as they passed through an electric fence into the pasture and became trapped inside the fenced pasture. Thus, when using electric fences, it may be helpful to incorporate both a physical barrier (a strand of barbed wire at ground level) as well as a psychological barrier. The addition of an electric "trip" wire located 8 to 10 inches away from the fence at a height of 6 to 8 inches increased the effectiveness of the fence (Figure 7).

Modifying existing netwire fences with one or more electric wires has been effective, provided the existing netwire fence is in reasonably good condition. The addition of a single electric trip wire is probably the single best investment that can be made to reduce coyote passage. However, the trip wire should be placed outside the fence, and this often presents a problem if fenceline brush interferes with placement of the wire. As with all electric fencing, maintenance is a chronic problem. In a recent nationwide survey, 95 percent of the ranchers surveyed said that "shorted-out" fences were a recurring problem.

Repellents. Strange sounds and the presence of people tend to frighten coyotes to varying degrees. Various sonic visual devices, including propane cannons, sirens, distress calls, radios, lights, and scarecrows have been tried from time to time. For the most part, these methods have been ineffective, as coyotes adapt readily to them. Best results have been observed when several devices are used together and when the type and location of devices are changed frequently. To date, none of them, singly or in combination, can be relied upon for consistent or long-term protection from coyotes.

Chemical methods of repelling coyotes through the use of livestock body sprays, collars containing odorous chemicals, or odor stations placed in livestock areas have shown only limited and short-term effects. Insecticides approved for lice control may temporarily reduce predation. Other chemicals, such as lithium chloride, have been injected into meat to make coyotes ill in an attempt to make them avoid sheep. This technique has also failed to be effective.

Reproduction Inhibitors. Because predator losses tend to be most severe during the pup-rearing months, various experiments to sterilize adult coyotes have been attempted. While specific chemicals do inhibit coyote reproduction, they have not been consistently effective, and no chemicals are registered for this purpose. Another limitation is that there is no effective method of getting the chemosterilant into the coyote. Recent advances in reproductive inhibitors have focused on the use of "immunocontraception." This technique uses hormones or anti-fertility vaccines either to keep the female fro ovulating or to inhibit the egg from becoming fertilized. While these techniques appear to have merit, it will probably be some time before their usefulness for field applications is realized.

Guard Animals. In recent years, there has been a surge of interest in the use of guard animals to protect livestock from coyotes. Several species have been used, including dogs, donkeys, ostriches, emus, llamas, and mules (Figure 8). The use of different breeds of guard dogs, including Komondor, Great Pyrenees, Anatolian Shepherds, Akbash, mongrels, and others, has increased greatly in the past 5 years. Researchers and producers agree that guard dogs can effectively prevent livestock losses to coyotes. According to a 1986 survey, 71 percent of those polled considered their guard dog to be "very effective" at protecting livestock; 21 percent indicated they were "somewhat effective"; 8 percent said that guard dogs were "not effective." In the same study, 81 percent of the producers considered their dogs to be an economic asset to livestock production. No particular

Figure 8. Guarding animals, especially dogs, have become more popular in recent years.

breed of dog was deemed to be most effective, suggesting that the manner in which the dog was reared was of equal or greater importance than bloodline. Success is usually greater when the dogs are reared with livestock from an early age (about 2 months). A list of guard-dog breeders is available from the Texas Department of Agriculture. Bonding of the dog to the sheep or goats, and vice versa, is important for success with an guard animal. Guard dogs tend to most effective in smaller pastures of less than 1,000 acres and when used in conjunction with other control methods such as electric fencing. When dogs are used, care must be taken not to endanger them with lethal control techniques intended for predators. Livestock protection collars and M-44 devices should **not** be used with guard dogs, while techniques such as aerial gunning may be used without endangering the guard dogs.

There is testimonial evidence that donkeys and mules also decrease coyote predation on sheep and goats. At this time, there is insufficient evidence to determine the guarding abilities of other animals such as ostriches, emus, and llamas.

Lethal Control Methods

Lethal methods are used to reduce the coyote population or remove individuals that may be causing damage. These methods may be preventive (used beforehand to reduce expected damage) or corrective (initiated after damage starts). The conditions and history of damage in a particular place dictate the type of approach to be used. When the population is reduced for only a short time or in a limited geographical area (such as on one ranch within a count), the results are typically short-term. In general, population suppression becomes more effective with increased effort and duration of control, and with increased size of the area under control. Buffer zones also can be effective on a large scale to prevent infiltration by coyotes. The Edwards Plateau region is an example of an area where intensive and extensive coyote control efforts provide livestock protection. From about 1930 to 1970, much of the Edwards Plateau was virtually free of coyotes because of concerted predator control efforts and the use of toxicants. In recent years, however, coyotes have infiltrated this area in many locations, suggesting that the buffer zone around the Edwards Plateau no longer exists. Changes in land-use practices, loss of certain predator-control tools, increased sympathy for predators on the part of the general public, and the resourcefulness of the coyote suggest that coyote populations in this area will probably continue to increase.

Lethal control methods need to be not only effective, but selective as well. To the degree possible, control efforts should be directed towards coyotes in particular, and ultimately only toward the offending individual coyotes. Selectivity refers to a technique's ability to take only the target species (such as aerial gunning), while specificity refers to the ability to remove only the offending individual (such as Livestock Protection Collars). Other factors that determine the control method of choice include safety, humaneness, environmental impact, cost, and operator skill required. Rating control methods as to their selectivity, specificity, effectiveness, safety, and humaneness is subjective by nature, and open to interpretation by each individual.

Shooting. Shooting coyotes, either from the ground or from aircraft, can be an effective, selective means of reducing coyote numbers. While the use of bounties for coyotes is not recommended, the value of pelts during times of high fur prices acts as an incentive to increase the number of coyotes taken annually. However, coyote pelts are only prime from about December through February, and not even that long over the southern half of the state.

Coyotes can be attracted within shooting range by various distress calls (like that of a rabbit), either electronic or mouth-blown (Figure 9), or by simulating coyote barks and howls. The caller lures the coyote within a range where it can be shot with either a centerfire rifle or a shotgun loaded with No. 4 or larger shot. While calling can be effective in some areas, coyotes tend to become "call-shy" in areas where calling is frequently used. As a result, few problem coyotes can be removed by calling. Calling and shooting require special skills and experience to be effective.

Aircraft (airplanes and helicopters) can be used to locate dens for subsequent control and/or for shooting coyotes with shotguns directly from the air (Figure 10). Aerial hunting of coyotes is regulated by state and federal authorities, and a permit must be

Figure 9. Imitating the calls of a distressed rabbit or other small animal may entice coyotes into shooting range. Both electronic and mouth-blown calls are available.

Figure 10. Aerial gunning can be an effective, selective way of reducing coyote populations quickly.

obtained from the Texas Parks and Wildlife Department. Where livestock losses are severe and weather, terrain, and cover conditions are favorable, aerial hunting can be highly effective in reducing local populations quickly. Furthermore, aerial hunting can be highly effective in reducing local populations quickly. Furthermore, aerial hunting often can be used to remove coyotes that have become trap-shy or otherwise educated to control efforts. However, coyotes also can become shy of aircraft. Helicopters are generally preferred to airplanes because of their greater maneuverability. A 12-gauge automatic shotgun loaded with No. 2, BB, or buckshot is recommended for aerial hunting. Aerial hunting is done at low altitudes (less that 150 feet above ground level) and, as such, can be hazardous. Aerial gunning generally costs from $70 to $300 per hour of flight time, and costs for helicopters are about three times higher than for fixed wing aircraft.

Hunting with Dogs. In open, flat country, typical of some farming regions of Texas, coyotes can be taken with greyhounds and other dogs that hunt by sight. Fences, brush, and rough terrain reduce their effectiveness, however. In some areas, trail hounds may be used to track and hunt coyotes. However, neither of these methods is employed in areas that suffer the most from coyote predation. Dogs may be helpful in locating dens.

Denning. Denning is the practice of removing the pups and/or parents from the den during late spring. Experience has shown that, if the pups are killed, depredation losses by the parents usually cease, even if the parents are not killed. Denning is useful only for specific situations, but it is an important technique for resolving some predation problems. However, locating a den is a difficult, time-consuming task that requires special tracking skills.

Trapping. The steel leghold trap is one of the oldest and most widely used tools for controlling coyotes (Figure 11). It is very effective and the

Figure 11. Steel leghold traps remain one of the most effective tools for removing problem coyotes. Live-traps (box traps) are ineffective.

most versatile tool available. Opponents of trapping claim that is non-selective, but the selectivity of a steel trap can be greatly enhanced by the addition of tension devices on the pan, selection of trapping sites and sets, and the use of relatively species-specific lures and scents.

The major advantage of traps is that they can be used under a wide variety of conditions and in remote country. Establishing and maintaining effective trap sets are time-consuming tasks. Considerable skill and expertise are required to catch problem coyotes. As mentioned before, coyotes are adept at digging up or otherwise avoiding steel traps, and such trap-shy coyotes can be extremely difficult to remove. If you don't have the time, patience, and willingness to learn how to trap coyotes correctly, trapping is an art best left to the expert. A casual attempt at trapping may do more harm than good in the long run. Trapping sometimes results in some coyotes losing a foot, and these "peg-leg" coyotes are often notorious livestock killers. Traps should be monitored routinely to minimize the loss of such coyotes.

Leghold traps (typically Nos. 3 or 4) are the only types of traps effective for coyotes. Live traps (box-type traps which catch the animal unharmed) may be effective for dogs, bobcats, and raccoons, but are ineffective for coyotes.

Snaring. In areas with netwire fencing, the use of wire cable snares is common, effective means of coyote control. Snares can be positioned in holes in the fence or in slides where coyotes are crawling under the fence (Figure 12). Snares also can be placed independently of a fence along a trail, but these are less effective than sets in conjunction with a barrier fence. Snares are easily set and maintained and do not require the same level of user skill as steel traps. However, snares are not selective for coyotes only, and nontarget catches (deer, javelina, raccoons) are common. Also, fencing must be in good condition (that is, there should be only a limited number of holes that allow passage through the fence) in order for snaring to be most effective.

M-44 Devices. The M-44 is a mechanical device that propels sodium cyanide powder into the mouth

Figure 12. Snares are most effective when used in conjunction with netwire fences in good condition.

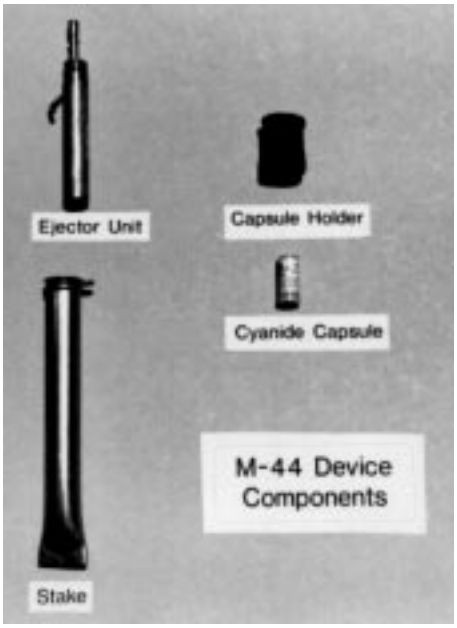


Figure 13. The M-44 device is an effective control tool and is selective for canids. The photograph on the top shows the components of an M-44 while the one at left shows the device in place.

of an animal that pulls on the device with its teeth (Figure 13). When positioned in the field, the M-44 top is baited with a scent attractive to coyotes. When the bait is bitten and pulled upward by the animal, the device ejects sodium cyanide powder into the animal's mouth, resulting in the death of the animal in a short time (unconsciousness usually occurs in less than 90 seconds). The M-44 is highly selective for coyotes and other canids because of the attractants and the ejection method used. In addition to its selectivity for canids, M-44's are environmentally safe and pose little risk to people when used properly. M-44's are most effective during fall and winter and least effective during hot summer months.

Sodium cyanide is a restricted-use pesticide and is available only to individuals trained, certified, and licensed by the Texas Department of Agriculture (TDA). M-44's must be set in accordance with certain specifications as outlined by TDA. For more information refer to MP-1181, "Using the M-44 in Coyote Control," available in English and Spanish from the Texas Animal Damage Control Service.

Livestock Protection Collars. The livestock protection collar (LPC), also referred to as "toxic collar" or "1080 collar," was developed by Roy McBride of Alpine. It consists of two rubber containers filled with Compound 1080 attached with straps to the throat of a sheep or goat (Figure 14). The LPC was designed to take advantage of the killing behavior of coyotes. A coyote generally

Figure 14. The Livestock Protection Collar is the most specific method available for removing coyotes that are attacking livestock. Coyotes that attack at the throat puncture the collar and receive a lethal dose of a toxicant.

kills by attacking at the throat, and in doing so usually punctures one or both of the collar pouches, thus receiving a lethal dose of the toxicant. Collars are placed on highly susceptible animals (lambs and kids), and these individuals are placed in pastures with a history of coyote predation. Because coyotes usually select young animals (if given the opportunity), collars should be placed on lambs (or kids) at a suggested rate of 10 collared lambs (kids) per 100 adults. A large flock of collared individuals will improve the odds of attack by an offending coyote. Recently, regulations have been adopted that allow the "pooling" of collars under certain guidelines. This will enhance the use of LPCs. Other considerations and advice for using LPCs can be found in B-1509, "Applicator Manual for Compound 1080 in Livestock Protection Collars," available for $10 from the Texas Agricultural Extension Service.

LPCs offer several advantages for coyote control. First, they are highly selective for coyotes and are specific for those individual coyotes that kill sheep and goats. Collars may be effective in removing educated coyotes that elude other control methods. They may be used in the presence of other livestock with minimal risk of exposure to the toxicant. Extensive field testing has shown that collars pose minor risks to nontarget animals or people. Finally, specific skills like those required in trapping and formulating baits and scents are not critical for success with LPCs.

However, LPCs also have certain disadvantages, including their cost, the labor involved, and regulations concerning their use. Collars may be punctured by thorns or torn by wire or snags and then must be replaced. Collared animals attacked by coyotes are usually killed during the attack (or must be destroyed because of injuries sustained in the attack). Collars are not effective in removing coyotes that exhibit atypical killing behavior (attacking at sites other than the throat). Frequent inspections of collared animals are required to ensure that collars are maintained in the proper position and that the pouches are intact. In certain situations, coyotes may avoid collared animals and attack other herds or uncollared individuals within the herd.

Compound 1080 is a highly toxic chemical and its use is regulated by state and federal restrictions. Applicators of LPCs must be trained, certified, and licensed by TDA, the state agency responsible for pesticide licensing. Furthermore, detailed records on the use and fate of collars is required.

The Public and Coyote Control

One's views regarding the relative and absolute merits of coyotes are largely a matter of perspective. Some see the coyote as the devil himself, while others perceive him as a symbol of the wide open spaces. Public opinion related to the need and methods for controlling predators has had considerable impact on the tools available for predator control. Surveys verify that there is a wide difference of opinion between the general public and those whose livelihood is adversely affected by predation losses. For example, in a recent nationwide survey, 91 percent of the sheep producers surveyed favored killing "as many coyotes as possible," whereas only 38 percent of the "informed public" approved of such control levels. Surveys clearly demonstrate that the public tends to favor control methods that are perceived to be "humane" and "specific." In general, nonlethal control methods are viewed more favorably than lethal methods. A 1995 survey indicated that Texas respondents were generally more supportive of predator control for livestock protection than respondents from the rest of the United States, although the overall trends were similar.

Endangered Species

In certain counties in South Texas, some lethal control options are restricted because of the presence of ocelots and jaguarundis. These two cat species are classified as Endangered by the U.S. Fish and Wildlife Service. In such counties, the use of traps, snares, and M-44 devices may be unlawful and/or their use restricted. Check with your local representative of the Texas Animal Damage Control Service, Texas Department of Agriculture, Texas Parks and Wildlife Department, or U.S. Fish and Wildlife Service to see if such regulations exist in your county.

Summary

As mentioned before, coyotes have much in common with the mesquite trees that are so common on Texas rangelands. Viewed by some as a constant problem, both have proven to be resilient and resistant to widespread efforts aimed at controlling their numbers. With both species, human thoughts have evolved from eradication during the 1940s and the 1950s, to control during the 1960s and 1970s, to management during the 1980s and 1990s. Biological resilience, complemented by public concerns over environmental matters, ensures that both mesquite and coyote will endure. From the rancher's viewpoint, increases in coyote populations must be accompanied by an ever-increasing vigilance and diligence, if sheep and goat ranching is to remain at the levels observed today.

Where to Go for Assistance

Several state agencies can assist those suffering from coyote predation on livestock. The Texas Animal Damage Control Service provides technical assistance to such landowners. Contact the State Director, P.O. Box 830337, San Antonio, 78283-0337 for the name of the district office closest to you. The Texas Department of Agriculture is the licensing agency for all pesticides and provides certification for use of the M-44 device and LPCs. Furthermore, TDA compiles a listing of individuals producing guard animals. Contact TDA at P.O. Box 12847, Austin, 78711. Finally, the Texas Agricultural Extension Service, with county offices located statewide, can assist by providing technical and educational materials and advice related to predator management.

Additional Reading Materials

The following is a partial list of booklets, bulletins, etc. pertaining to various aspects of coyote control and predator management in general.

Prevention and Control of Wildlife Damage. Robert M. Timm, editor. Great Plains Agricultural Council Wildlife Resources Committee and the Nebraska Cooperative Extension Service.

B-1509, *Applicator Manual for Compound 1080 in Livestock Protection Collars.* Texas Agricultural Extension Service ($10 per copy).

B-1429, *Procedures for Evaluating Predation on Livestock and Wildlife.* Texas Agricultural Extension Service ($5 per copy).

Impacts, Incidence, and Control of Predation on Livestock in the United States, with particular Reference to Predation by Coyotes. Dale A. Wade. Council for Agricultural Science and Technology, Special Publication No. 10, March 1982.

Livestock Guarding Dogs: Protecting Sheep from Predators. Agricultural Information Bulletin No. 588, USDA.

Building an Electric Antipredator Fence. Extension Publication PNW 225, Oregon, Washington, and Idaho Cooperative Extension Services.

L-1908, *Trapping Coyotes*. Texas Animal Damage Control Service.

L-1917, *Controlling Coyotes with Snares.* Texas Animal Damage Control Service.

Predator Damage in the West: a Study of Coyote Management Alternatives. U.S. Fish & Wildlife Service.

C-578, *Understanding the Coyote.* Kansas Cooperative Extension Service.

Coyotes: Biology, Behavior and Management. M. Bekoff, editor. Academic Press, Sandiego, CA.

Meinzer, W.P. *Coyote*. Texas Tech University Press: Lubbock, 1995.

Coyotes in the Southwest: A Compendium of Our Knowledge. D. Rollins, Editor. Symposium proceedings. Texas Agricultural Extension Service, San Angelo. ($10 per copy).

A Matter of Perspective (A 23-minute video that examines the controversy surrounding coyotes in Texas. Available for $20 per copy from TAEX, 7887 N. Hwy. 87, San Angelo.

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