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PREDATION IMPACTS AND MANAGEMENT STRATEGIES FOR REDUCING COYOTE DAMAGE TO CATTLE

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Abstract: Loss of cattle to predators influences productivity of many livestock operations. Statistics indicate that coyote (*Canis latrans*) predation is a principle threat. Impacts to livestock resources by coyotes are appraised. Implementation of control strategies which capitalize on coyote dispersion and social interactions are discussed. Predator management to reduce livestock losses and promote a younger age structure in coyotes is suggested as a long term solution.

Coyotes have been part of rangeland ecosystems for thousands of years. Historically, their predatory niche took a subordinate position to larger predators such as wolves (*Canis* spp), large cats (e g., mountain lions, *Felis concolor*) and bears (*Ursus* spp.). Land use within the last 125 years has altered predator composition, favoring the highly adaptable coyote This intelligent animal has flourished in the absence of competition with larger predators.

Behaviorally, the coyote has succeeded as an opportunist, exploiting a variety of food sources made available by man's agriculture and habitation. During this century, eastern habitats have supported high deer populations commingled with human settlement situated throughout agricultural and forested landscapes These factors have contributed to a greater food base for coyotes (Thurber and Peterson 1991).

Presently, coyotes are expanding across much of continental North America. In Texas, coyotes continue to populate intensely-managed, low predator density areas through normal population dispersion and compensatory reproduction.

Predation impacts on cattle

Since 1970, numerous studies have been conducted to determine the magnitude of livestock losses to predators, particularly coyotes (Andelt 1987). Texas leads the nation in cattle, sheep, and goat production According to the Texas Agricultural Statistic Service (1995), there were 15.1 million total cattle in Texas in December, 1994 The calf crop for 1994 totaled 6.2 million head.

Cattle production in Texas occurs among diverse operations which include range cattle, fed cattle (in feedyards), and dairy cattle. Overall, cattle distribution across the state is fairly uniform

According to a survey by the National Agricultural Statistics Service (1992), calf losses in Texas to predators during 1991 totaled 23,400 head. This represents an estimated $7.84 million loss to Texas producers. Predators accounted for 106,400 head of cattle and calves lost in the United States during 1991. Texas lost 26,400 head of cattle and calves to all predators accounting for an estimated value of $9.865 million The value of the 17,200 cattle and calves lost in Texas to coyotes alone was $6.102 million (NASS 1992, Texas ADC Service 1993).

Predation to cattle occurs statewide with heavier impacts felt in the areas of high coyote densities. Generally speaking, higher coyote densities are found within the ecological areas surrounding the Edwards Plateau. Ranching operations within the Edwards Plateau principally support more sheep, goats, and exotic wildlife than cattle, as compared to the rest of the state. Consequently, intensive predator management is necessary to curb livestock losses. As a result, cattle production within this area benefits from a lower coyote population and is less likely to be impacted by predation than in areas of higher

coyote density

The South Texas Plains, Trans-Pecos, Cross Timbers, Rolling Plains, and the High Plains typically support more coyotes These areas are home to many large ranching operations. Cattle production is generally cow-calf and seasonal stocker/yearling operations. Obviously, calving operations are more vulnerable to predation Historically, cow-calf operators managed herds for early spring or fall calving during milder weather. Today, modern ranching operations vary in management strategies from seasonal to year round calving.

Coyotes preying on cattle generally attack newborn to 500 pound calves. However, most calves killed by coyotes are within the first few weeks of birth. Adult cows are occasionally killed or seriously damaged by coyotes during complications arising from calving. Problems associated with calving can hinder a cow's defense abilities (e.g , temporary paralysis), increasing vulnerability to predation Livestock husbandry practices (e.g., close confinement during calving) have the potential to reduce coyote predation (Voigt and Berg 1987). However, practicality of range cattle management often precludes protection from predation (i e , large pastures, remote areas)

Prey selection

Factors that influence prey choice by predators are absolute abundance, relative abundance, and relative value of potential prey types (Estabrook and Dunham 1976, Windberg and Mitchell 1990) Winter calving, which usually occurs during normal declines of natural prey (i e , late winter), increases vulnerability of calves to coyotes. Decreases in natural forage stress coyotes into alternate feeding patterns. Winter diet contains larger items such as deer (either prey or carrion), livestock carrion, or locally abundant lagomorph species (Voigt and Berg 1987). Extended winter stress periods place high nutritional demands on coyotes and often result in cattle depredation and carcass scavenging.

Predation losses are often highest in spring and summer correlating to pup-rearing Pup-rearing may stimulates predation on larger prey during a time of high nutritional demands of adult and juvenile coyotes. In some instances, group behavior (i e , pack formation) can be related to pup-rearing, predation on large prey that may require group hunting strategies, or defense of carrion (Camenzind 1978, Bowen 1981, Voigt and Berg 1987)

During whelping season, parents consume high protein food items which are returned to the pups and regurgitated for their consumption. In areas experiencing calf losses, body parts may be discovered at den sites. Such evidence is key to identifying and removing offending coyotes. High nutritional demands on coyotes during spring and summer pup-rearing normally coincide with the peak of natural prey availability (e g , fawns, rodents) Additionally, cattle operations employing spring and summer calving schedules augment natural prey choices and scavenging opportunities through the calving process

It is presumable that cattle may be a preferred prey choice by depredating coyotes as related to abundance, and reduced avoidance strategies common of domestic prey. In many situations, a depredated calf more efficiently feeds a coyote family, as compared to feeding on smaller prey Additionally, the exploitation of larger prey animals decreases hunting and foraging intervals Further, larger prey allow adult coyotes more time to safeguard pups and denning areas against threats

Indirect influences

Because of the opportunistic behavior of coyotes, predation to cattle can occur year round Predation by coyotes in a diverse prey community has not been evaluated in relation to fluctuations in abundance of prey (Windberg and Mitchell 1990). However, factors influencing natural prey availability other than weather (e g , diseases to rodent populations and other decimating variables) are probable indirect influences contributing to livestock depredation in some circumstances.

Coyotes in certain situations can depend heavily on fruit production of native plants Meinzer et al. (1974) evaluated the diet of coyotes in the Rolling Plains ecological area during 1971-73 They observed that fruits of native shrubs, as a group, were the coyote's major dietary item. They further concluded that coyote predation on cattle or calves

might be a problem in years when high coyote density coincided with low native fruit production.

Undoubtedly, natural forage abundance and nutritional value can buffer or minimize livestock depredation However, habitual livestock depredation by coyotes can be a *specialized behavior* that must be dealt with on an individual basis. Extreme livestock depredation situations (i.e., surplus killing) provide additional evidence of aberrant behavior that defy the norm. Although such behavior is more prevalent involving resources other than cattle (i.e., sheep and goat), evidence to support this behavior involving cattle has been observed

Population dynamics and interactions

Much of what is known today about coyote populations and movement is due to research conducted within the past twenty-five years Knowledge gained in studies during the 1970s has resulted in a much better understanding of the variability and adaptability of coyotes across North America (Voigt and Berg 1987). Population density, home range, dispersal and reproduction questions continue to be studied to refine damage management objectives Social behavior and coyote demographics (specifically population age structure) have become key factors influencing damage management strategies for protecting cattle resources.

Observations across high coyote density areas of the High and Rolling Plains have revealed that middle (3 to 5 years old) and older (>5 years old) age classes of coyotes are primarily responsible for cattle depredations. This is further supported by examination of target coyotes removed from within and near areas of confirmed calf losses. Aerial hunting observations of coyotes attacking or consuming freshly killed calves are common. Further ground truth examination of stomach contents and aging by tooth wear (Gier 1957) corroborate age of offending coyotes To simplify classification, age groupings of young (<3 years), middle age (3 to 5 years) and old (>5 years) are commonly used among management technicians.

The size and weight of coyotes are commonly overestimated, perhaps because their long pelage masks a bone structure that is lighter than that of dogs (Voigt and Berg 1987). Adult coyotes normally weigh 20 to 35 pounds, with males usually about 4 pounds heavier than females (Gier 1968, Andrews and Boggess 1978, Berg and Chesness 1978, Todd 1978, Voigt and Berg 1987). Predation of large animals such as calves, often defended by aggressive cows, require considerable strength, agility and execution of skillful tactics Coyotes that successfully prey on cattle have attained the necessary predatory prowess and strength through age.

Post-mortem examinations of fresh quarry often indicate masterful kills by coyotes that are much smaller than their prey. Subcutaneous hemorrhaging from attacks in the throat region is further evidence of kills made by experienced coyotes. In contrast, incidence of bobbed tails on calves and mutilation associated with inept, rear end attacks is often indicative of younger, inexperienced coyotes or domestic dogs Such evidence is construed as an indicator of impending losses. Rampant occurrences may further indicate a maturing and threatening population of coyotes in problem areas.

Management Implications

Presuming that coyotes $\geq$3 years of age are responsible for most calf losses, it reasons that damage management objectives should initially focus control efforts toward middle- and older-aged coyotes Control efforts that specifically target older coyotes in areas of calf losses have a demonstrated effectiveness of resolving conflicts. However, targeting and removing specific, offending coyotes can be challenging In addition to aerial hunting, proper application of control methods that entice dominant behavioral responses has been used successfully

Implementing general population suppression can assist long term damage management objectives. The removal of coyotes from high density problem areas can influence population dispersion The dynamics of coyote populations depend on natality, mortality, emigration and immigration (Knowlton 1983, Voigt and Berg 1987) Dispersal is generally from high to low density areas but is complex (Davison 1980, Knowlton 1983, Voigt and Berg 1987). Knowlton (1972) suggests that dispersal of animals seeking to establish themselves in new areas is perhaps the most important movement pattern in management schemes. It is further stated that

immigration (i.e., a one-way movement into an area) provides the mainspring for restocking where removal has been the primary objective of coyote management Recurring control efforts that remove primarily subadult and young adult coyotes (<3 years of age) imply immigration by younger coyotes.

Conclusions and Recommendations

It concludes that the older, more experienced segment of the coyote population is responsible for most calf losses. Therefore, losses may be significantly reduced by initially targeting those animals. A maintenance program of general population suppression which consequently influences dispersion of younger, less threatening coyotes into lower density areas is often necessary to ensure long term reductions of livestock losses.

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