PREDATOR CONTROL AND GAME BIRD MANAGEMENT IN THE EDWARDS PLATEAU OF TEXAS

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Abstract: The removal of potential nest predators for the benefit of game bird production in the Edwards Plateau and adjacent ecological areas has yielded contradictory results. More effective than the implementation of a single management practice may be the use of an integrated approach (with predator control as one component), acknowledging and dealing with all of the factors possible that may be limiting game bird numbers. Additional studies are needed to identify the limiting factors, and to ascertain which can be practically addressed.

The Edwards Plateau, commonly known as "the hill country", is a region of over 39,000 square miles in west central Texas that has for generations been devoted primarily to cattle, sheep, and goat ranching, small grain and hay farming. It is a deeply dissected hilly, stony plain composed of shallow limestone soils and dominated by live oak (*Quercus virginiana*), ash juniper (*Juniperus ashei*), Texas oak (*Quercus texana*), shinnery oaks (*Quercus spp.*), and mesquite (*Prosopis glandulosa*). The understory is typically mid- or tall-grass species. The northwestern portion of the region is largely composed of a mesquite-tobosa (*Hilaria mutica*) community. The Stockton Plateau portion in the west typically supports a semi-desert grassland. Brush species in the Edwards Plateau are generally considered invaders, with the vegetative climax considered to be grassland or open savannah (Gould 1975). Elevation ranges from near 1200 to over 3,000 feet. Average annual rainfall measures from 12 inches in the west to 32 in the east (Godfrey et al. 1977).

WILDLIFE MANAGEMENT IMPORTANT TO RANCHING

In recent years in the Edwards Plateau wildlife management has risen to an unprecedented level of importance on many operations, especially since the completed phasing-out of the wool incentive program in 1996 and the loss of associated income. Producers have developed a keen interest in understanding the basic needs of wildlife in order to attempt to remedy the financial shortfall. By increasing population densities they hope to make their individual operations more attractive from a commercial hunting or wildlife viewing standpoint.

Many Edwards Plateau ranches derive a substantial portion of their income from white-tailed deer (*Odocoileus virginianus*) and/or exotic ungulate hunting. Somewhat fewer realize a significant addition to ranch income from game birds.

GAME BIRD POPULATION LEVELS

Rio Grande turkey (*Meleagris gallopavo*) exist in appreciable numbers and

hunting and viewing of them is important to many operations. Scaled quail (*Callipepla squamata*) are found in greater numbers in the Edwards Plateau than in the neighboring Rolling Plains and South Texas Plains, for example, while bobwhites (*Colinus virginianus*) exist at notably lower densities (Table 1).

This disparity in bobwhite production may be explained partially by the relative lack of abundant, high quality quail food plants in the Edwards Plateau, possibly due to the preponderance of clayey and calcareous soils in the region. These soils are typically not conducive to the production of many of the grass and shrub plants commonly considered to be essential for a healthy bobwhite quail population. Heavy grazing pressure which was commonplace from early settlement days until the mid to late 20th century played a role in changing the vegetative composition from bunchgrasses, which are preferred by bobwhites and turkeys for nesting cover, to an abundance of grasses such as the introduced King Ranch bluestem (*Bothriochloa ischaemum*) which offer little nesting cover.

On a state-wide basis bobwhite quail numbers have fallen an average of 4.7% per year since 1981 (Sauer et al.1999). In response to this decline Rollins and Carroll (2000) reviewed the literature relative to predation on quail and found predation to be the major source of mortality for nests, young, and adult quail. Medium-size mammals (mesomammals) were the most important group of nest predators. Besides predation land use changes, fire ants, and disease were also cited as notable causes of mortality and overall long-term population decline.

PREDATORS IDENTIFIED

Studies of predation on game birds in or near the Edwards Plateau have documented several species responsible for losses. Tolleson et al. (1993) studied bobwhite quail and feral hog (*Sus scrofa*) interactions in the Rolling Plains. Using artificial nests composed of 3 chicken eggs placed in suitable quail nesting cover he found that feral hogs were the leading cause of nest depredation on four study sites (28% of 192 nests). Opossums (*Didelphis virginiana*) and raccoons (*Procyon lotor*) were secondary. On another study area which involved 360 nests coyotes (*Canis latrans*) were found to be the primary nest predator (32%), followed by skunks (*Mephitis mephitis*) (23%), various snakes (16%), and feral hogs (8%).

In his study of 58 radio-collared bobwhites in the Edwards Plateau Carter (1995) found predation to be the major cause of bobwhite quail mortality. Sixty-four percent was caused by mammals, probably gray fox (*Urocyon cinereoargenteus*) and feral cats, 28% by raptors. Of 21 quail nests monitored 4 were destroyed by unidentified predators.

Hernandez et al. (1997), working in the northern portion of the plateau showed raccoons to be the most frequent destroyer of simulated turkey nests (80%), while skunks accounted for 7.1%. The predator responsible for the highest percentage of simulated quail nest destruction was also raccoon (91%), followed by bobcats (*Lynx rufus*) at 2.6%. Hernandez (1995) stated that "if increasing quail or turkey nest success was the objective of land managers in Tom Green County, my research clearly shows that raccoons would be the target

species".

Slater (1996) employed infrared-activated cameras to monitor simulated nest transect lines in 7 Edwards Plateau and Rolling Plains counties to identify nest predators. Coupled with track evidence, droppings, and egg fragments in the nest vicinities he established raccoons, feral hogs, skunks, and Chihuahuan ravens (*Corvus cryptoleucus*) to be likely nest predators.

To seemingly compound the game bird predation problem in this region, coyotes have been intensively trapped and removed for decades in attempts to reduce livestock losses, especially sheep and goats. Nunley (1977) observed that apparently there is an inverse relationship between coyote population levels and other carnivores of equal or lesser size, such as raccoons, skunks, and foxes. In other words, when coyote numbers are low in an area, the density of raccoons, skunks, and foxes tend to be higher than when coyotes population levels are high. It has been observed that in areas where coyotes were abundant depredation of nests was lower, perhaps as a result of such changes in the predator community (Slater 1996).

Guthery (1995), while acknowledging that coyotes destroy nests and individual bobwhites and wild turkeys, stated that in many situations the removal of coyotes would have little effect on game bird recruitment and population dynamics. He expected that this "counter-intuitive" outcome would result because "1) re-nesting reduces the hen failure rate; and 2) loss sources other than coyotes become stronger when coyotes are removed from the predator-prey system.". In short, a nest saved from a coyote is not necessarily a nest saved because it becomes available to other nest predators.

EFFECTS OF PREDATOR CONTROL ON GAME BIRD POPULATIONS

The obvious question comes to mind- Will control efforts aimed at nest predators be rewarded with an increase in game bird production? Since game birds in the Edwards Plateau are lost to mammalian and avian predation, one would think that reducing the numbers of predators involved (those legally permissible) might enhance game bird production, thereby improving the quality of the hunting or viewing experience. Three studies (Table 2) conducted in or near the Edwards Plateau are briefly reviewed here.

Intensive short-term predator removal was tested as a game management tool in the South Texas Plains (Beasom 1974). After removing 457 potential game bird predators he found a moderate increase in abundance of bobwhites and a large increase in turkey productivity, based on poult:hen ratios.

A study aimed at documenting the response of herbivore and quail populations to predator control in South Texas was conducted by Guthery and Beasom (1977). The removal of 227 predators had no significant effect on the population trends and abundance of scaled or bobwhite quail.

Frost (2000) removed a total of 217 mesomammals on 4 study sites on the northern edge of the Edwards Plateau in the 30 day period immediately preceding the onset of bobwhite nesting. The relative abundance of mesomammals was similar

before and after trapping, probably due to the rather small study areas involved. As numbers were reduced immigration quickly built the numbers back up to previous levels. Trapping did not improve nesting success or quail survival on any site.

CONCLUSIONS

Game bird production has not always been enhanced by removal of potential predators. Studies have shown various responses of game bird populations to predator control. Perhaps over-riding variables are at play that confound efforts to isolate a single management tool that would be significantly effective. Further research in the Edwards Plateau could help identify the manageable factors most likely to be affecting game bird populations.

Predator control has been described as "applied ecology", with the caveats that it requires careful consideration and planning, and an understanding that 1) all wild species have both positive and negative values, 2) the primary purpose of control is to alleviate loss or damage (population control is secondary), and 3) a careful assessment of the costs of control and the benefits derived is advisable (Wade 1983). An integrated approach with the above requirements in mind, possibly utilizing control of nest predators as one of the various management tools employed simultaneously and long-term, may be the most likely course to yield positive results. The future of game birds in the Edwards Plateau, especially bobwhites, may depend on it.

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Table 1. Annual mean number of quail observed per 20-mile roadside survey line 1978-2000 by selected ecological region (TPWD 2000).

	Bobwhite	Scaled
Gulf Prairies and Marshes	11.92	
Cross Timbers and Prairies	16.96	
South Texas Plains	22.58	9.57
Edwards Plateau	6.71	14.82
Rolling Plains	23.33	
Trans-Pecos Mountains and Basins		12.88

Table 2. Partial results of selected studies undertaken in the Edwards Plateau and adjacent ecological regions that have dealt with game bird-predator interactions.

	Study		
Variable	Beasom (1974)	Guthery and Beasom (1977)	Frost (2000)
Size of study area	9 sq. mi.	6 sq. mi.	1 sq. mi. x 4
Duration of study	2 yr.	2 yr.	1 yr.
Region	South Texas Plains	South Texas Plains	Edwards Plateau / Rolling Plains
Coyotes removed	188	132	none
Other mesomammals removed	269	95	217
Effect on quail	moderate increase in bobwhite abundance	no effect on density of bobwhites or scaled quail	no effect on nesting success or survival of bobwhites
Effect on turkey	strong increase in production based on poult:hen ratio	n/a	n/a