

## Dedication



## Sherman Hammond

1941-2008

This symposium is dedicated to the life and accomplishments of Sherman Hammond, the original “Blues Brother” who passed away on April 19, 2008. Yesterday would have been his 67<sup>th</sup> birthday. I am honored later today to showcase Sherman’s accomplishments relative to managing blue quail on his ranch near Ft. Stockton. Had Sherman been alive today, he would have spoke proudly, and matter-of-factly, about his ideas about range, water, and quail conservation. This past April as I made the trip from San Angelo to the ranch for his funeral, I reminisced about the many things I’d learned from him in the past ten years. Those reflections were published in my “Wildlife by Design” column in the 23 April 2008 edition—a slightly modified version is reprinted here.

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“Dapper” is an adjective sometimes used to describe the blue (scaled) quail. Perhaps you can conjure a rooster now escorting his to-be mate. His crest (“cottontop”) is somewhat erect—it compliments his somewhat cocky stride like a fine derby hat as he sidles down a dirt road somewhere in the Trans-Pecos. Occasionally, he throws his head back and crows his two-note “chip-chur” call. Perhaps he’s professing to other nearby roosters that he’s the cock of the walk; perhaps he just appreciates his surroundings.

The “chip-chur” call of the blue quail is an onomatopoeia—a word that imitates the sound it is describing. Some have interpreted the call as “chu-kar”, or as I often say “suc-ker” as the covey calls its siren song to anyone gullible enough to chase them up a rocky hill while they stay just outside of potshot range. But this past Saturday, I came upon an alternative word. In this case it’s a tribute to a “Blues Brother”, and a dapper one indeed.

Sherman Hammond, the original Blues Brother in my book, was laid to rest under the shade of a bull mesquite on his ranch southwest of Ft. Stockton. From that vantage point, he will undoubtedly enjoy the daily serenades of blue quail that frequent his headquarters.

Back in 1995, I wrote in this column my lamentations about the demise of the blue quail over much of west Texas since December 1987. A few days later, I received a telephone call

from a subscriber identifying himself as Sherman Hammond. He began to tell me that he had “lots of blue quail.”

Yea, right, I figured—I took that to mean this guy had seen a small covey earlier in the week. I filed the conversation in my list of things to follow up on as time permitted, but I was intrigued by the report. I called Zan Matthies, then county Extension agent in Pecos County, and asked if this guy was credible. Matthies assured me he was, so I asked if we could perhaps visit Hammond’s ranch the next time I was in that vicinity.

That July found me touring the 38,000 acre ranch, and indeed seeing a good number of blue quail. We toured the ranch for the better part of the day, and Hammond expounded on his management strategies, and how they benefited blue quail. I was in no position to argue, as the proof was in the pudding.

Hammond professed the cornerstone in his management was as basic as the water cycle. His philosophy was that he sought to catch every inch of rain that fell on his property, and every inch his upstream neighbor yielded to him. To do so, he had constructed “spreader dams” frequently at intervals all across his ranch. He adapted the same practice across the landscape in the form of either spreader dams (on the roads) or small “check dams” across any gullies.

We stopped once to watch a pair of blues stroll in front of the pickup truck headed towards a small pond. In a moment of academic brilliance on my part, I professed “quail don’t really need access to free-standing water.” Then, for the next three minutes we watched the pair drink copiously from the standing water. I spent the rest of the day doing more listening than professing.

As we passed a livestock watering trough, each was filled to the brim—you couldn’t have poured a teaspoon more into it without a teaspoon overflowing onto the ground. A wet spot about the size of a hula hoop was obvious on the leeward side of the trough. I complimented Hammond in having some moist soil at ground level; wild critters prefer to drink from ground level. And besides, damp soils grow little green forbs, and little green forbs grow little insects, which feed little quail.

Hammond told me that it was against the nature of a rancher to intentionally run water on the ground, so he adjusted his floats such that anytime the wind blew (i.e., daily in Ft. Stockton), it would slosh some water out on the ground, yet afford the rancher (Hammond) a clear conscience. I’ve heard that the ranch hand got a stern do-better talk anytime the floats weren’t adjusted accordingly.

As we traveled the ranch, we dissected the various “quail oases”, the pits where runoff had settled. The vegetation was notably more robust and greener than the adjacent uplands. And at each spot either the chip-chur call or the mating “whock” song could be heard. And the oases weren’t an ever-so-often phenomenon—indeed the entire ranch looked like a bombing range by the pockmarked proliferation of oases.

Soon our quail conversation turned to quail conservation. We conspired on a research effort to evaluate the purported impacts of “moist-soil management” through water harvesting strategies. I told him I’d raise half the funding if he and his fellow blue quail enthusiasts would raise the rest. And hence the “Blues Brothers” were hatched. The brotherhood included Jimmy, Harlan, Ernest, Bentley, John, John, and John, Omar D., and a few others.

All were present at Sherman's funeral—the covey minus one.

Over the next two years, graduate student Bobby Buntyn of Angelo State University followed over 160 radio-collared quail hens there. We discovered that the quail oases produced about 25 times more vegetation and six times more insects than the adjacent uplands. The hens selected tobosagrass almost exclusively for nesting sites (no surprise here as it was the most common grass) and enjoyed both a comfortable survival rate and nesting success.

Sherman was a gracious host for two Blue Quail Appreciation Days (including the first ever) and his ranch became a popular tour stop over the past decade. The Hammond Ranch story of water harvesting has graced several regional and national publications. His conservation efforts were recognized by his peers in his receiving a "Lone Star Land Steward Award" from the Texas Parks and Wildlife Department, an "Excellence in Wildlife Conservation" from the Texas Chapter of The Wildlife Society, and a "Friend of SRM" by the Texas Section, Society for Range Management.

But his legacy for blue quail didn't stop in Pecos County. There have been five research studies on blue quail involving radio telemetry over the past fifteen years. Three of those (including subsequent studies at Elephant Mt. WMA and the Armendaris Ranch in New Mexico) have roots to the Hammond Ranch.

I'd be remiss if I didn't acknowledge Sherman for his part in securing the "pride of the A&M fleet," i.e., the "ranch buggy" from Lannom Industries. John Lannom, owner, donated the customized "research buggy" as his contribution to the blue quail research project. Once each year in January, the Blues Brothers gather in their Volkswagen-derived chariots for an annual quail hunt at Hammond's.

As I made the trek last Saturday morning to Ft. Stockton, I savored these, and other memories of Sherman. It was good to see the Blues Brothers, renew acquaintances, and swap memories of hunts past. Much of what we know about blue quail was spawned right there.

So, I proffer that the blue quail's two-syllable note of the blue quail may be interpreted beyond "chip-chur", "chu-kar", or "suc-ker." Perhaps they're saying "Sher-man, Sher-man." Mr. Hammond is smiling to think so anyway, as are the other Blues Brothers. *Cantad amigos!*

- Dale Rollins  
2 October 2008

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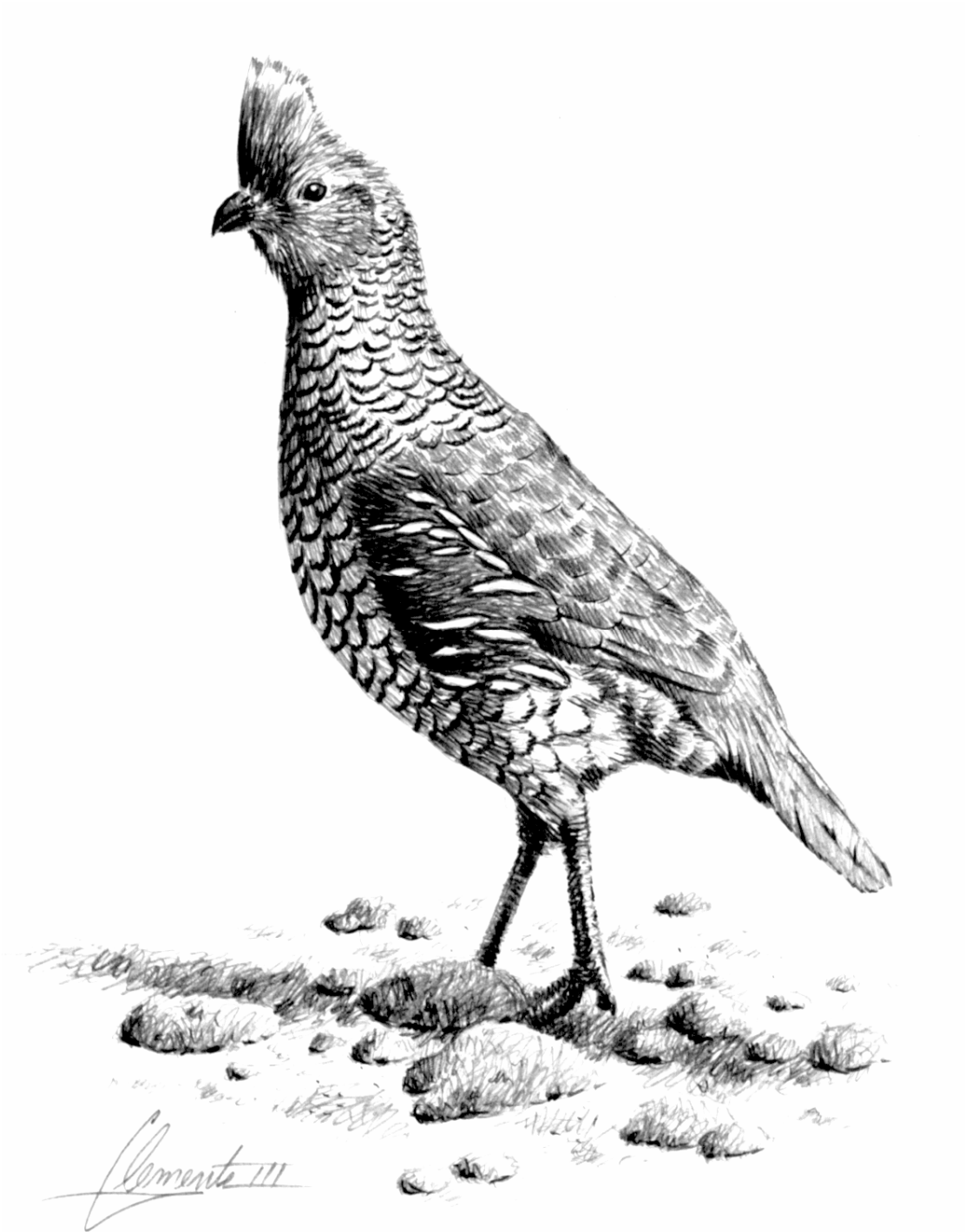
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# SCALED QUAIL BIOLOGY AND MANAGEMENT

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The scaled quail (*Callipepla squamata*), also known as “blue quail” or “cottontops,” is the second most abundant quail found in Texas. Although not as well studied as the northern bobwhite, there is considerable scientific literature on scaled quail. However, most of the information is at least 40 years old (e.g., Wallmo 1956, Schemnitz 1961). Until recently, only meager research attention has been directed at scaled quail in Texas (Rollins 2000).

Scaled quail enjoyed a resurgence of attention about 10 years ago with several concurrent studies including Buntyn (2004), Lerich 2003, Pleasant et al. (2003), and Rollins et al. (2008). More recently, Silvy et al. (2006) and Cantu et al. (2006) compiled the state of the science-art of scaled quail management in Texas. Rather than repeat in detail what was discussed in these outlets, let me just provide some online references which interested readers can retrieve:

*Status, ecology, and management of scaled quail in west Texas* (Rollins 2000) — [http://texnat.tamu.edu/symposia/Status\\_Scaled\\_Quail.pdf](http://texnat.tamu.edu/symposia/Status_Scaled_Quail.pdf);

*Scaled quail in Texas* (Cantu et al. 2006) — [http://www.tpwd.state.tx.us/publications/pwd\\_pubs/media/pwd\\_bk\\_w7000\\_1183.pdf](http://www.tpwd.state.tx.us/publications/pwd_pubs/media/pwd_bk_w7000_1183.pdf).

## PHYSICAL CHARACTERISTICS

Scaled quail are generally bluish gray-brown in color with a white crest and a fish scale-like feather pattern on their breasts. Males and females are similar in appearance, however they can be identified fairly easily “in hand.” Males have a cream-colored throat, whereas the females have faint brown lines running up and down the

throat). The “topknot” (i.e., crest) is only slightly longer (about 1 to 2 mm) in the male. Birds of the year (i.e., juveniles) can be distinguished from adults by the white-tipped primary covert feathers. For aging juvenile birds less than 12 weeks of age in the field, refer to *A Guide for Aging Scaled Quail* (Cain and Beasom 1983) which is available at <http://teamquail.tamu.edu>.

## DISTRIBUTION IN TEXAS

Scaled quail are distributed throughout the western half of Texas but their range has contracted in Texas during the past century, and especially since 1988 (Rollins 2000). Historic specimens have been collected as far east as Wichita, Young, Colman, and Gillespie counties, where they are not found today (Oberholser 1974). Today, scaled quail are found almost exclusively west of the 100<sup>th</sup> meridian in the western portions of the Rolling Plains, Edwards Plateau, and South Texas Plains ecoregions.

Scaled quail populations are declining throughout much of their range in Texas (Fig. 1). Of the various hypotheses proposed to explain scaled quail declines in Texas, the most likely culprit is a confounded combination of rangeland deterioration from overgrazing and changing land use (Bridges et al. 2002). Excessive grazing has caused woody cover to increase over vast areas at the expense of scaled quail habitat.

Scaled quail exhibit irruptive (i.e., “boom-bust”) population behavior. Weather drives annual quail population changes (Bridges et al. 2001). Annual and regional differences in scaled quail abundance are associated with rainfall during the breeding season (Wallmo and Uzzell 1958, Schemnitz 1961, Giuliano and Lutz 1993). However, Campbell (1968) concluded that scaled quail populations in New Mexico

were controlled by spring-summer rainfall. He noted that fall-winter precipitation did not seem to have a major influence on the scaled quail population.

## LIFE HISTORY

The annual cycle of scaled quail can be divided into two 6-month periods (Wallmo 1956): (1) reproductive period (April–September), and (2) social aggregations (October–March). Although he recognized the correlations of behavior to calendar dates were not exact, covey behavior fits closely with fall and winter (21 September–20 March), and reproductive behavior corresponds more or less with spring and summer (21 March–20 September).

The location and structure of scaled quail nests are extremely variable. Nests are commonly placed under plants such as tobosa grass (*Hilaria mutica*), prickly pear (*Opuntia* spp.), and yucca (*Yucca* spp.) in Texas (Rollins 2000, Lerich 2002). Lerich (2002) found 6 of 11 nests in Brewster County, Texas were associated with javelina bush (*Condalia ericoides*).

Nest success for scaled quail has typically been observed to be low. Data on nest success summarized by Schemnitz (1961) may not be indicative of nest success in areas undisturbed by humans. Causes of nest failure (Schemnitz 1961) were depredation (25.0%), human activities (38.9%), abandonment (19.4%), weather (2.8%), and unknown (13.9%).

Wallmo (1956) noted that reneesting was probably common in scaled quail. He based this on the common occurrence of late broods, with hatching dates in late August and early September. These late dates provide indirect evidence of reneesting, based on the assumption that earlier nesting attempts had occurred between April and August. An alternative hypothesis could be that the first nests occurred late in the breeding season. Wallmo (1956) noted second nesting (starting a second nest after successfully bringing off a first brood) was probably less common. However, Wallmo

(1956) observed a case where a pair raised one brood the male tended, while the female, identified by a deformity, started laying a second clutch. Second nesting has been observed in Irion and Pecos counties, Texas using radiomarked scaled quail (Carter 1995, Rollins 2000). Pleasant et al. (2004) observed 31 hens produced 50 nests in 1999 of which 11 hens produced 2 nests and 4 hens produced 3 nests. All reneesting occurred after loss of a previous nest or loss of young prior to 21 days of age.

## HABITAT USE AND DIET

*Nesting Cover* – Scaled quail nests are usually located under shrubs or some other protected site (Table 3). Carter (1995) found sympatric northern bobwhites and scaled quail selected prickly pear for nesting sites. Eight of 12 scaled quail nests and 12 of 21 bobwhite nests were situated in prickly pear. Subsequently, Slater et al. (2001) documented that nests situated in prickly pear survived at about twice the rate of more conventional nest sites (i.e., bunchgrasses). Thus, prickly pear appeared to provide some measure of protection against nest predators.

*Covey Habitat* – Breeding and non-breeding habitat are generally similar (Schemnitz 1994) in that the birds have a strong affinity for large areas of grassland with relatively few shrubs. Campbell et al. (1973) found that areas with a dense understory of forbs and shrubs were not optimal scaled quail habitat. Brown (1989:145) advocated clearing dense brush on hilltops to improve scaled quail habitat. Where northern bobwhites and scaled quail are sympatric (i.e., their ranges overlap), scaled quail tend to prefer more open (lower grass height, more bare ground) sites (Rollins 1980, Lehmann 1984:229). Smith et al. (1996) reported no scaled quail on a climax Chihuahuan Desert site dominated by black grama. Saiwana (1990) indicated shrub-grass habitat was important to maintain scaled quail populations in New Mexico. He also noted that grassland

communities near the climax provided less suitable habitat for scaled quail than early seral communities dominated by shrubs and forbs. Campbell et al. (1973) observed scaled quail used moderately grazed ranges, which supported a variety of forb species for food and a moderate amount of brush for cover. Dense, unbroken stands of grass or brush with abundant forbs were less likely to be used.

Cropland interspersed with rangelands provides suitable scaled quail habitat (Schemnitz 1961, Snyder 1967, Rollins 1980); abandoned homesteads often served as covey headquarters (Schemnitz 1961).

**Loafing Cover** – Loafing (i.e., resting) coverts are key components of scaled quail habitat. Desirable loafing coverts should be at least 3 feet tall and be dense above, yet open at ground level (Schemnitz 1994, Rollins 2000). In west Texas, preferred loafing coverts include lotebush (*Ziziphus obtusifolia*), sandplum (*Prunus angustifolia*) thickets, and catclaw mimosa (*Mimosa biunciferae*) (Rollins 2000). Cholla cactus (*O. imbricate*) was used as resting cover during spring and winter in the Texas Panhandle (Stormer 1981). Schemnitz (1961, 1964, 1994) and Snyder (1967) found that scaled quail used numerous human structures (e.g., corrals, feedlots, buildings, farm machinery, old car bodies, post and board piles, cattle guards, windmills, and culverts) as loafing cover when natural habitats were limited.

**Diet** – Foods primarily eaten by scaled quail include: seeds, herbaceous vegetation, and grains, with seeds and grains a main fall and winter food (Schemnitz 1994, Rollins 2000). Rollins (1981) observed that scaled quail consumed about 4 times more green vegetation by volume than did northern bobwhites on the same range. Scaled quail also utilize a larger proportion of insects in their diet than other quail (Kelso 1937). Lehmann (1984) reported scaled quail in Duval County, Texas, consumed more

greens and fewer grass seeds than bobwhites on the same range.

Little is known about the diet of scaled quail chicks. Howard (1981) examined 21 scaled quail chicks, aged 1 to 13 weeks, and compared foods they had eaten to adults. Chicks at 1 week of age had a high animal-low seed diet, and gradually changed to a low animal-high seed diet by 13 weeks of age.

## SURVIVAL

Until recently, there were few band-recovery or radiotelemetry studies conducted to estimate scaled quail survival. Rollins (2000) divides the knowledge of scaled quail survival into 2 eras: (a) “BT” (*before telemetry*) and (b) “AT” (*after telemetry*).

Like other quails, scaled quail are short lived. Survival of subadult birds from hunted sites in New Mexico based on band recoveries was estimated to be 14% with a mean annual survival of 17% for the entire population (Campbell et al. 1973). They also observed that females survived at a lower rate than males, and this held for both young (females 10.9% and males 17.6%) and adult birds (females 25.0% and males 36.4%). Rollins et al. (2008) summarized survival of female scaled quail at 3 sites and found survival to be relatively high compared to the same time interval for bobwhites in west Texas. Information on brood survival is lacking. Pleasant (2003) observed that 46% of 33 hens had chicks present with them three weeks after hatch during 2000, whereas during 1999 only 10% of 21 hens had chicks present with them 3 weeks after hatch.

Survival of radiomarked scaled quail hens from April to August in Pecos County, Texas was high (averaged 80% in 1999 and 69% in 2000) (R. J. Buntyn, unpublished data). Lerich (2002) reported survival rates (February through August) of scaled quail (males and females) ranged from 50 to 64%. Pleasant (2003) noted that survival was not different between subadults and

adults, and found hen survival from 18 February until 15 August was about 75% in 2000 but only 35% in 1999.

The number of birds of the year in the fall is an index to reproduction in a quail population. Reproductive success can be evaluated by comparing the number of juvenile birds bagged relative to adult birds during the hunting season. A higher percentage of juveniles in the hunter's bag (e.g., 70 percent or more) suggests a successful breeding season and good chick survival, whereas a low incidence of juveniles (e.g., less than 30 percent) suggests poor reproductive success.

*Weather influences on Annual Production* – Bridges (1999) used a 21-year (1978-1998) Texas Parks and Wildlife Department data set to analyze the influence of weather (rainfall and drought index) on the abundance on scaled quail within three ecological regions of Texas. He concluded that wet weather conditions generally resulted in increased abundance of scaled quail. He observed correlations between scaled quail abundance and weather conditions were stronger in drier as opposed to wetter ecological regions. Brown et al. (1978) observed a significant correlation between the previous year's October-August precipitation and hunting success. Leyva-Espinosa (2000) noted precipitation occurring in July–September played an important role in scaled quail populations located in the Rolling Plains and in the distributional range for the species. She suggested that in general, precipitation was the variable that best described scaled quail population changes in Texas.

Scaled quail are thought to be more drought-tolerant than northern bobwhite (Schemnitz 1964, Giuliano et al. 1999, Rollins 2000). Giuliano et al. (1998) found scaled quail required less water and food (relative to body mass) to successfully reproduce than northern bobwhite. Hatch (1975) noted that a year with an unusually wet breeding season resulted in either a high population of northern bobwhites or a low population of scaled quail. In areas

where their ranges overlap, scaled quail typically do not “boom” as greatly during good years, nor “bust” as badly during dry years as bobwhites (Rollins 2000).

## MORTALITY FACTORS

Scaled quail die from various natural causes including malnutrition, parasites, disease, toxic substances, weather events, predators, hunters, and other human-related causes. Few scaled quail probably die of old age. Campbell et al. (1973) estimated only 0.1% of scaled quail were still alive at the start of their fifth year of life.

*Predation* – Predators can adversely affect scaled quail populations in two direct ways (Silvy 1999). First, they can feed on eggs. Second, they can prey on young and adult quail. Indirectly, they can affect quail populations by preying (or not preying) on species that may be in competition with scaled quail for limited resources.

Predation is the largest proximate cause of nest loss. Important predators of scaled quail nests include coyotes (*Canis latrans*), raccoons (*Procyon lotor*), striped skunks (*Mephitis mephitis*), domestic cats, and snakes (Schemnitz 1961; Tharp 1971; Evans 1997, Rollins 1999, 2000; Rollins and Carroll 2001). Other nest predators common in scaled quail range include gray foxes (*Urocyon cinereoargenteus*), corvids (Slater 1996), and increasingly feral hogs (*Sus scrofa*) (Tolleson et al. 1998).

Predation is the proximate cause of most scaled quail mortalities (Rollins and Carroll 2001). Neither Wallmo (1957), Schemnitz (1961), nor Campbell et al. (1973) cited predation as a management concern; in fact, predation was hardly mentioned as a source of mortality. Rollins and Carroll (2001) reasoned that mortality rates of scaled quail from predation have been poorly documented because of the paucity of telemetry studies, even though use of telemetry may exacerbate mortality in scaled quail. Earlier investigations of scaled quail (Wallmo 1957, Schemnitz 1961,

Campbell et al. 1973) were either unaware of, or dismissed, the incidence of predation because they lacked the technology to study it (i.e., radiotelemetry).

Scaled quail have been observed to be "somewhat smarter" than bobwhites on the same range (Lehman 1984), and are apparently less susceptible to predators than bobwhites. Scaled quail survived at higher rates from March - August than bobwhites on a site in Irion County. Jackson (1947) reported that evidence of predation on scaled quail was light and that scaled quail were apparently less vulnerable to avian predation than were bobwhites.

Lerich (2002) reported predation accounted for 29 of 32 (91%) scaled quail mortalities in Brewster County, Texas. Of those, mammals accounted for 14 kills, raptors accounted for 4 kills, and unknown predators accounted for 10 kills. P. S. Carter (Angelo State University, unpublished data) radiomarked 27 scaled quail in west-central Texas (Irion County) and documented 9 scaled quail mortalities; 5 by mammals, 2 by raptors (1 by a great horned owl), and 1 by a western diamondback rattlesnake (*Crotalus atrox*).

The fact that predators account for most of the mortality of chicks and adults, and the preponderance of disrupted nests, is indisputable. But is predation a management concern? What are the impacts of predation on scaled quail abundance? The former is easy to document; the latter is inherently more difficult to assess.

Predation on quail nests has been proposed as a factor limiting quail abundance (Rollins 1999). There has been much speculation that predator communities have changed over the last 20 years do to the demise of the fur market in the 1980's (Rollins 1999, Rollins and Carroll 2001). Under this hypothesis, the collapse of the fur market in the 1980's has led to high predator densities which in turn has led to decreased quail numbers. Silvy et al. (2000) addressed these hypotheses for the Rolling Plains, Edwards Plateau, and South Texas Plains ecological regions. They found no

increase in the abundance of furbearing animals during this period, and fur prices, furbearer harvest, and abundance of furbearing animals were not correlated with scaled quail abundance.

The potential role of predation as a suppressing agent in quail populations needs additional study (Rollins and Carroll 2001). It is crucial to understand how landscape-level changes in land use might influence relationships between quail and their predators, as well as change both predator and prey communities. Experimental research is needed to define more clearly the relationships between quail and their predators within the context of current land use and habitat management.

*Hunting* – Quail harvest at broad spatial scales is probably self-regulating (Peterson and Perez 2000). As Texas scaled quail population increase, hunter numbers also increase. Peterson and Perez (2000) found about twice as many hunters hunted quail in Texas during boom years as opposed to bust quail years. Peterson (2001) noted that reducing the daily bag limit of scaled quail from 15 to 8 would impact only 7% of scaled quail hunters in Texas. This reduction would only reduce scaled quail harvest by about 15%. Whereas, a six quail bag limit would reduce scaled quail harvest 35%. Peterson (2001) noted that reducing the season length would have little effect as few hunters spent more than 10 days hunting quail.

#### *Other Human-related Mortality –*

Lerich (2002) found 3 radio-tagged scaled quail hens drowned in the same water trough in Brewster County, Texas. Buntyn (2004) found 3 hens with broods had drowned following a flash-flooding event in Pecos County.

Campbell (1950) found a dead scaled quail with lead shot in the gizzard, and Campbell et al. (1973) noted that about 3% of fall-winter scaled quail crops contained lead shot. Best et al. (1992) found lead in only 1 of 226 scaled quail gizzards examined, and lead content of liver was <8 ppm for all but three birds sampled. Twelve

of 101 scaled quail gizzards from Harmon County, Oklahoma contained spent shot (D. Rollins, unpublished data). Accumulations of spent shot would most likely be encountered around ponds that focus on waterfowl and dove hunting.

## MANAGEMENT STRATEGIES

Because of the limits imposed by their range (arid and semiarid climates), most management for scaled quail tends to be “extensive” (e.g., grazing and brush management) versus “intensive” (e.g., food plots, feeders) in scope.

*Extensive management strategies* – It is clear that livestock grazing influences scaled quail populations in Texas. Heavily grazed early-seral rangelands and lightly or ungrazed climax Chihuahuan Desert rangelands supported fewer scaled quail than those grazed moderately and maintained in mid- or late-seral condition (Saiwana et al. 1998, Joseph et al. 2003). Little consensus exists in the literature about which grazing methods are best for scaled quail management (Campbell et al. 1973, Campbell-Kissock et al. 1984). Campbell-Kissock et al. (1984) found higher densities of scaled quail on areas under a short-duration grazing system than on a continuously grazed site in South Texas Plains. Rollins (2000) suggested moderate- (37 acre/animal-unit) to light- (>75 acres/animal-unit) stocking rates should be used as one goes from east to west, respectively, to improve range condition. Saiwana (1990) noted high-fair to low-good range condition (45-55% of climax) provided optimum habitat for scaled quail on upland sandy areas in south-central New Mexico. Pleasant (2003) concluded that preventing overgrazing in scaled quail habitat was probably the single most important thing a manager could do to help this species.

Rollins (2000) suggested that managers should learn to recognize the structure and places that support high densities of scaled quail, and seek to maintain the integrity of these sites. He

recommended leaving at least 10% of the brush canopy intact, and suggested mechanical control methods were preferred over chemical methods because of the forbs produced by soil disturbance. He also noted that mechanical methods offered greater selectivity in which individual plants should be killed.

*Intensive Management Strategies* – Wallmo (1956, 1957), Wallmo and Uzzell (1958), and Campbell (1960) summarized their efforts on enhancing scaled quail range with guzzlers and concluded there was no relationship between water availability and scaled quail population size. Providing supplemental water has sometimes been recommended, however no research has shown conclusively that water developments have increased scaled quail populations (Wallmo and Uzzell 1958, Rollins et al. 2008). Campbell (1960) indicated water developments had little value for scaled quail. Campbell (1959) speculated that supplemental feeding was ineffective, but his study was confounded with availability of water. However, Rollins et al. (2008) reported higher survival of scaled quail hens in areas with feeders and water in New Mexico. Rollins (2000) observed scaled quail readily used quail feeders, and therefore, become more available to hunters. He also photographed scaled quail chicks <3 weeks old at feeders.

Jackson (1969) observed and Rollins (2000) promoted the concept that soil disturbance caused by winter disking, and livestock grazing would stimulate early successional plant species (e.g., buffalobur [*Solanum rostratum*]) and provided the bulk of the diet for scaled quail. They suggested that disking should be done from December–February in proximity to suitable woody cover.

*Predator Control* – Rollins (2000) stated that for predator control to be effective it should be directed at nest predators. Guthery and Beasom (1977) conducted intensive removal of mammalian predators (e.g., coyotes [*Canis latrans*],

striped skunks [*Mephitis mephitis*] in the western Rio Grande Plains of Texas but did not find a treatment effect on either scaled quail or northern bobwhite populations. Their conclusion was that, if predator removal was effective at all, it would be by allowing quail populations on poorer areas to be similar to better habitats.

## ECONOMICS

Unlike conditions observed decades earlier by Wallmo and Uzzell (1958), the economics of leasing scaled quail hunting opportunities today should provide landowners an incentive to manage their lands for scaled quail. A comprehensive research program that examines the economic aspects of effective scaled quail management, and how scaled quail habitat management impacts other arid land wildlife would be a fundamental contribution to wildlife science in Texas.

## SUMMARY

Scaled quail management is often different than bobwhite management because of limitations imposed by an arid

environment. Accordingly, most management practices are “extensive” rather than “intensive” in nature. In the western one-third of Texas where droughts are common, fluctuations in scaled quail populations are considered normal. Land managers interested in maintaining the highest quail populations possible during drought years should consider quail habitat requirements when contemplating livestock stocking decisions.

Several habitat management options are available; however, the primary tools available to the land manager in scaled quail range are grazing management and brush management. Quail production is highly dependent on timely rainfall, a factor over which we have no control. However, by proper range management, we can maximize the effect of the rain received.

Scaled quail management assistance is available free of charge to interested land managers through wildlife biologists of Texas AgriLife Extension Service, the Texas Parks and Wildlife Department, and the USDA’s Natural Resources Conservation Service. An online source of information for quail managers is available at <http://teamquail.tamu.edu>.

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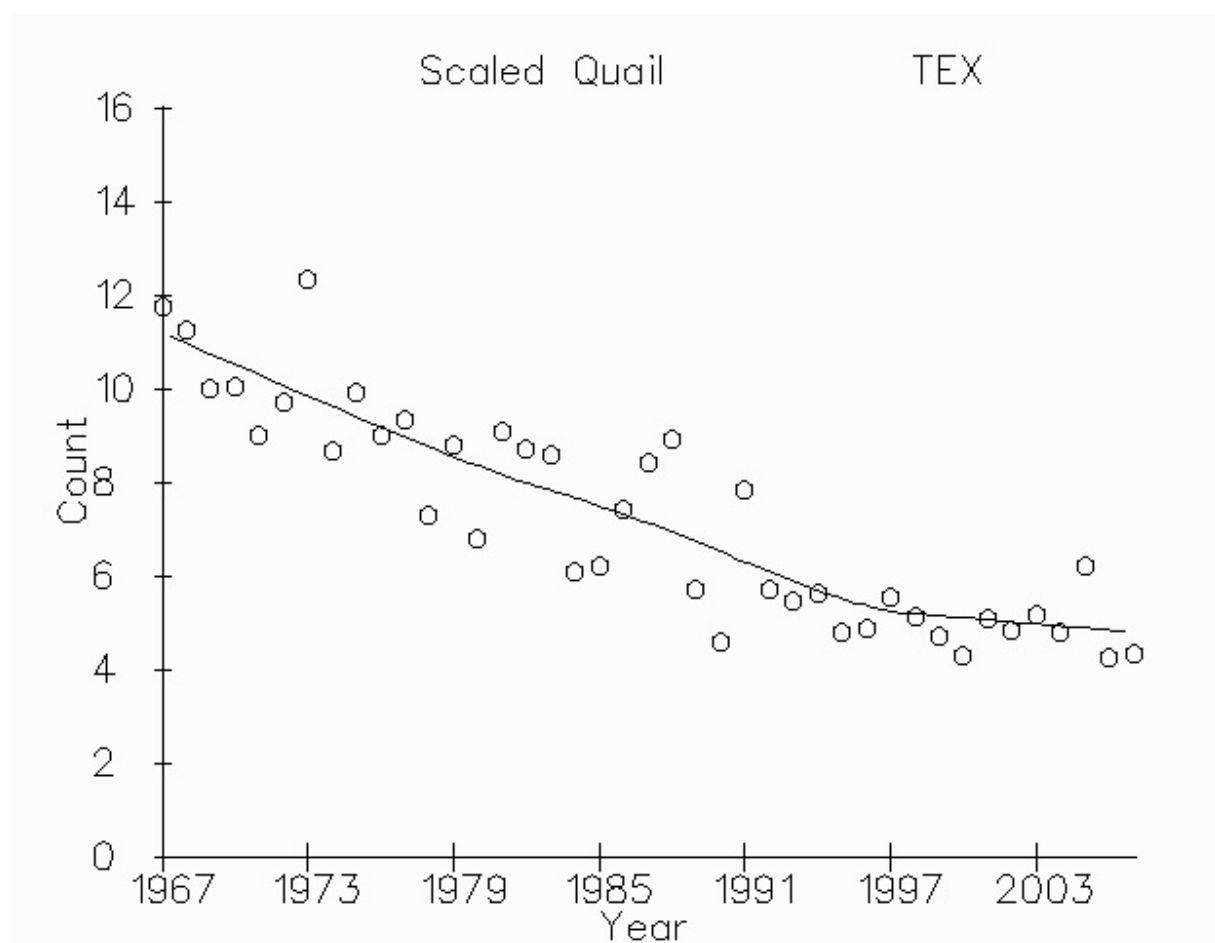
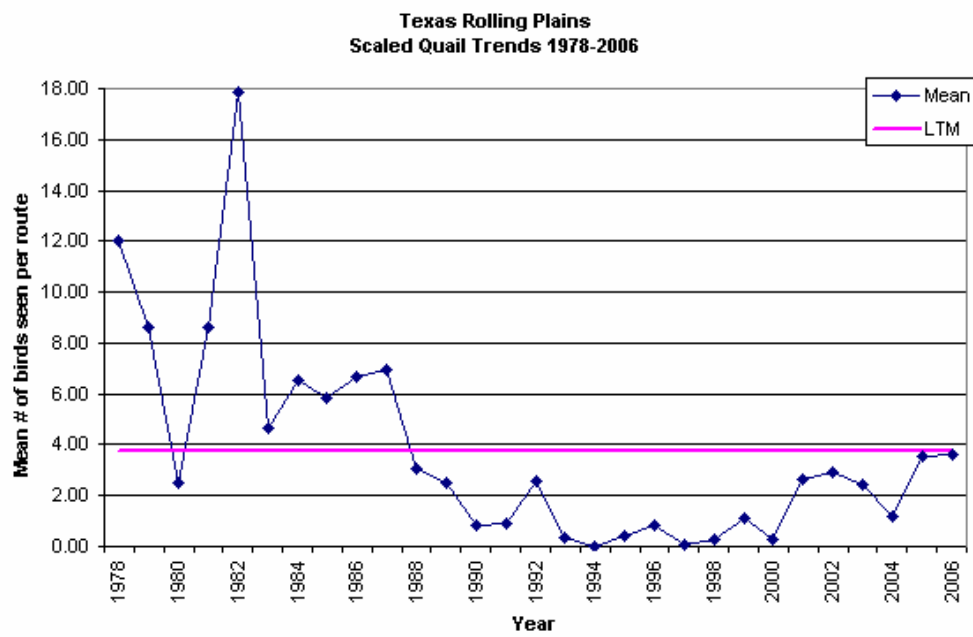
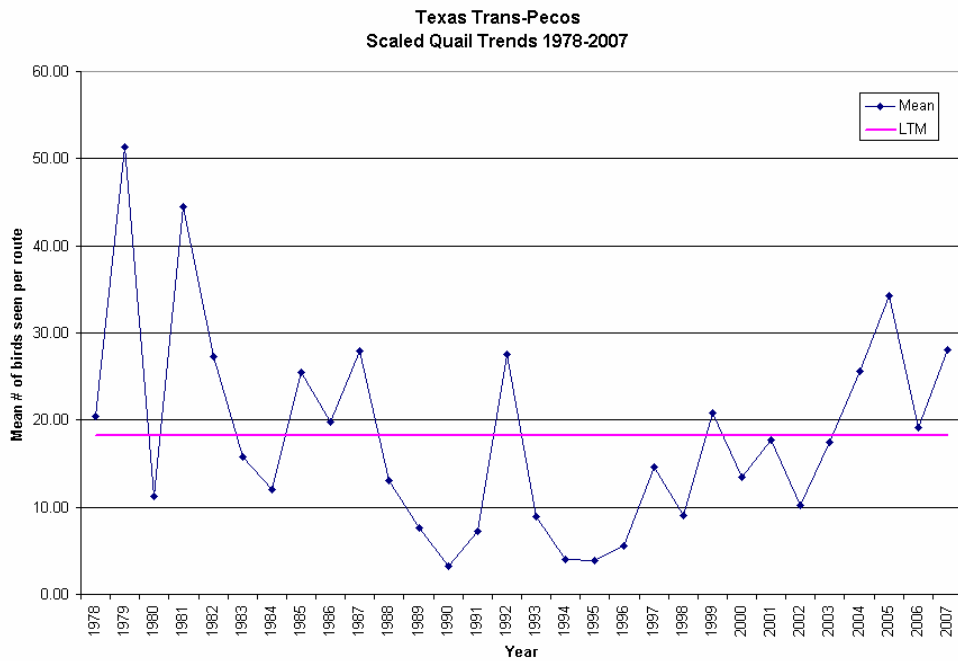
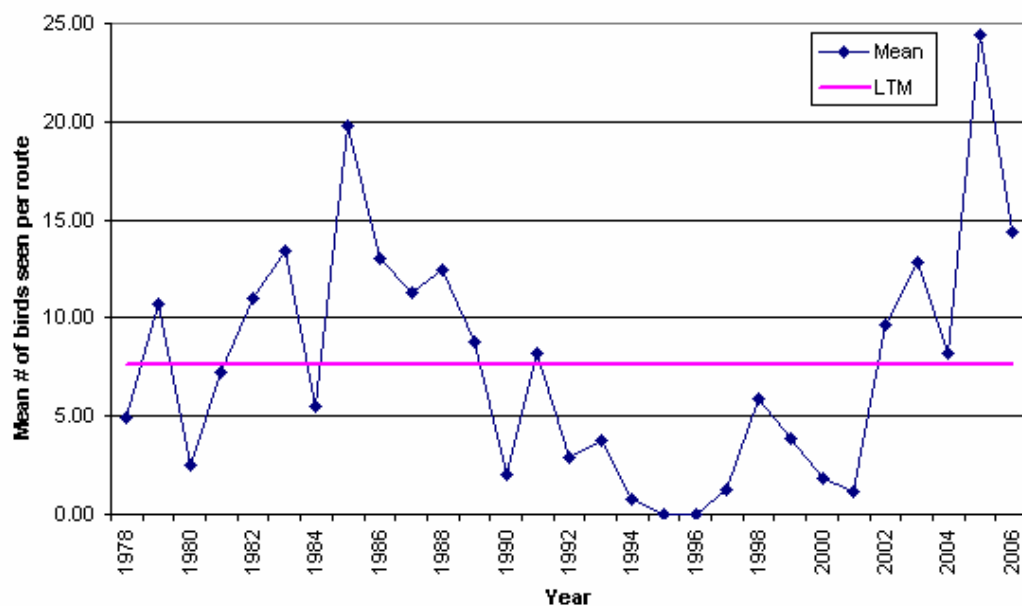


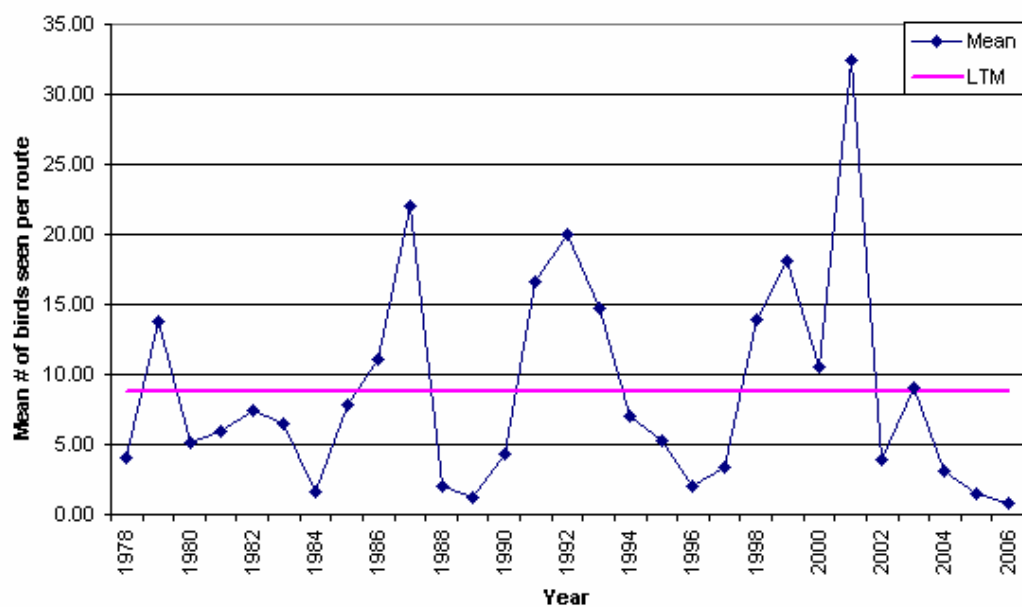
Figure 1. Scaled quail trends in Texas based on Breeding Bird Survey data, 1967-2006 (Sauer et al. 2006).



**Texas Edwards Plateau  
Scaled Quail Trends 1978-2006**



**South Texas Plains  
Scaled Quail Trends 1978-2006**



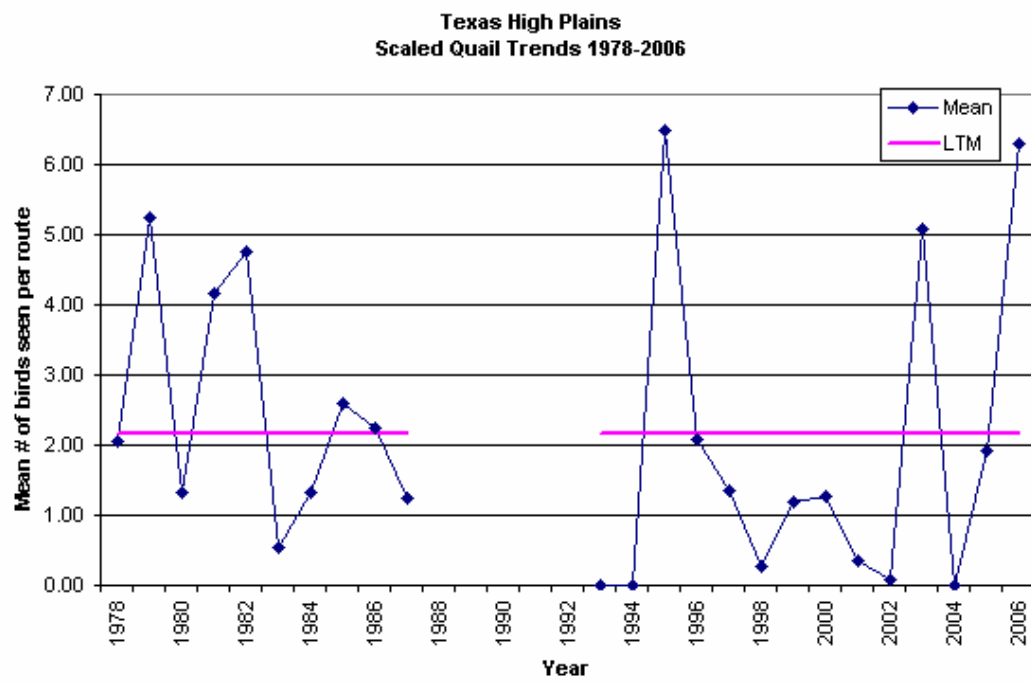


Figure 2. Scaled quail trends in 5 ecoregions of Texas based on summer roadside counts (TPWD 2007).

## TEXAS' OTHER QUAILS: ECOLOGY AND MANAGEMENT OF MONTEZUMA AND GAMBEL'S QUAIL

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**Abstract:** Texas is blessed with a diversity and abundance of quails that is second to none. Only Arizona has the same number of quail species ( $n = 4$ ) as Texas. Northern bobwhite (*Colinus virginianus*) can be found throughout the state including the eastern portion of the Trans-Pecos region. Scaled quail (*Callipepla squamata*) are ubiquitous to the Trans-Pecos, Rolling and High Plains, and found to a lesser extent in the western portion of the Edwards Plateau and Brush Country. The other 2 quails of Texas--Gambel's quail (*Callipepla gambelii*) and Montezuma quail (*Cyrtonyx montezumae*)--are more restricted in their distribution and occur primarily in the desert mountains of west Texas. My purpose is to review the ecology and management of these lesser known species.

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### MONTEZUMA QUAIL

#### Taxonomy and Distribution

Montezuma quail are known by a variety of common names including Mearns's, harlequin, crazy, fool's, and black quail and are more closely related to the wood quail of Central America as opposed to the variety of Texas quails (Stromberg 2000). Male Montezuma can easily be distinguished from females much like bobwhites where males have more ornate plumage and striking white and black faces. Although hunted in Arizona and New Mexico, Montezuma quail in Texas are classified as a game bird with a closed season (e.g., no hunting). Because of this unique status, Montezuma quail are commonly mistaken as a nongame bird rather than a game bird (Harveson 2008).

Montezuma quail are restricted to the Trans-Pecos region and portions of the eastern Edwards Plateau where they occur in desert grassland and woodland communities (Harveson et al. 2007). Typical habitat for Montezuma quail has been described as pine-oak woodlands (Stromberg 2000). Historically, Montezuma quail ranged as far east as Bexar County and north to Tom Green County. They have been extirpated from much of their former

range in Texas and occur in isolated populations.

#### Life History

Montezuma behavior is poorly understood, but they are believed to have an extended pairing season that commences as early as February and runs into the breeding season of July-September. Their nesting season coincides with the monsoonal rains and our understanding of their nesting ecology is based on a few anecdotal accounts from early naturalists. Incubation is thought to be 24-26 days where 6-16 eggs are laid in nests located in bunchgrasses (Leopold and McCabe 1957). Males and females have been observed participating in brooding, but the role males play in incubation is unknown.

Montezuma are thought to have one of the strongest covey attachments of gallinaceous birds. Covey sizes in fall and winter are atypically low with ~6 birds/covey (Leopold and McCabe 1957). Only 1 study has been published on movements of Montezuma quail (Stromberg 1990). In that study, range size for Montezuma quail average between 2-125 acres, depending on the season (Stromberg 1990).

## Habitat

Unlike the other quail “generalists”, Montezuma quail are thought to be habitat specialists. The primary component in habitat is that they require an abundance of grass cover, whether it occur in pine-oak woodlands or grassland habitats (Brown 1982). Other habitat characteristics that have been identified as important for Montezuma quail include elevations >4,000 feet, the presence of rocky outcrops, and abundant foods (Hernandez et al. 2006). Montezuma quail are also foraging specialists that utilize their long claws and strong feet to help them dig for their food. Tubers, corms, and bulbs of various forbs and sedges make up >80% of their diet. Insects are consumed as they become more available during spring and summer months (Harveson et al. 2007).

## Population Dynamics

The little information we have on Montezuma quail population dynamics comes from Arizona, where they are prized quarry for the elite bird hunter. However, the low densities, inaccessible habitats, and their reluctance to flush and cryptic behavior, few studies have adequately described their population dynamics (Hernandez et al. 2006). Studies have documented that hunting, overgrazing, or severe drought can lead to drastic declines or local extirpation of Montezuma quail populations. In Arizona, Montezuma quail populations have been historically been monitored using hunter success and more recently using time constrained dog surveys (Bristow and Ockenfels 2000).

## Management

Because our knowledge of Montezuma quail is in its’ infancy, proven management techniques are even more scant (Brown 1982). Conservative stocking rates are imperative to the Montezuma quail survival. Several studies have demonstrated that without adequate

screening cover from bunchgrasses, Montezuma quail populations declined. In Texas, Montezuma quail occur in isolated mountain ranges. Efforts to connect historically contiguous habitats need to be addressed if Montezuma quail are to expand their range.

Although viable populations of Montezuma quail likely exist in Texas, several biological and sociological barriers must be overcome before they can be hunted (Harveson 2008). One of the biggest obstacles to an open season is the fact that Montezuma quail have been protected for >30 years resulting in an inadvertent classification of a “nongame bird.” Further, Montezuma quail have been elevated to a flagship species for the ecotourism industry based in the desert mountain of Texas.

## GAMBEL’S QUAIL

### Taxonomy and Distribution

Gambel’s quail are our most “desert quail” in Texas and occur exclusively in riparian washes of far west Texas. The distribution of Gambel’s in Texas is restricted to the Rio Grande and its tributaries in El Paso, Culberson, Hudspeth, Jeff Davis, Presidio, and Brewster counties (Sullins 2006). Male Gambel’s are ornately decorated with a prominent top-knot and black mask on their face. Females have a lesser plume on their head and are drab colored (Brown et al. 1998). The hunting season for Gambel’s quail runs from early October through the end of February.

### Life History

Gambel’s start forming pair bonds in early Spring which is noted by cocks calling from elevated perches throughout their habitat. Following an abbreviated pairing season (March-April), Gambel’s begin breeding in April-July and then nesting from April-August. Gambel’s are reported to have 12-14 eggs/nest and incubate their

nesting about 3 weeks. Males and females typically participate in incubation and brooding activities (Brown et al. 1998).

Covey sizes are reasonably large in fall-winter for Gambel's quail and range from 10-50 birds, but as high as 200 birds. It is not uncommon to see mixed broods during early summer that contain as many as 3 different aged broods in one large covey. Like the closely related scaled quail, Gambel's are known for the fleet-footed escape behaviors as opposed to their holding behavior (Brown et al. 1998).

#### Habitat

Throughout their range in the southwestern United States, Gambel's quail habitat is fairly distinct. Desert riparian areas that occur at lower elevations with mild winters and low precipitations are characteristics of Gambel's quail habitat. In fact, Gray (2005) found that >85% of all Gambel's quail activities occurred in the desert riparian habitats in his study. Shrubs play an important role in these habitats as they provide the primary vegetative cover as well as the primary food source. Desert willow and acacias are dominant plants in these communities. Shade from shrubs has also been shown to be important in their nesting ecology as perennial grasses are rare in these habitats (Sullins 2006, Ortega-Sanchez 2006).

Sullins (2006) provides the most complete description of Gambel's quail diet. In his study, forb seeds were the most consumed food type followed by fruits of woody perennials, seeds of woody perennials, green vegetation, animal

material, and grass seeds. Twenty food items represented the majority (>90%) of the Gambel's quail diet.

#### Population Dynamics

Like other quails, Gambel's quail are subject to the "boom-bust" phenomenon where in wet years more quail are produced than in dry years (Gray 2005). In Arizona, Heffelfinger et al. (1999) documented that recruitment of Gambel's quail is hampered by excessive temperatures during nesting and brooding. Gambel's quail appear to be on the increase in Texas.

Gray (2005) monitored the movements of Gambel's quail in Texas. He reports that ranges of Gambel's quail on the upland study area ranged from 25 to 393 acres and ranges of Gambel's quail on the river study area ranged from 10 to 137 acres. Gray (2006) also documented large scale movements of individuals that exceeded 16 miles.

#### Management

Tarrant (2002) provided the following recommendation regarding Gambel's quail management in Texas: (1) promote forb production with conservative grazing pressure, (2) conserve riparian areas and native vegetation using fencing, (3) increase water infiltration by creating various water catchments and diversions, (4) enhance forb production by discing sandy soils (parallel to land contour), and (5) allowing water sources to overflow during dry periods.

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## BOBWHITES IN THE DESERT

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**Abstract:** Management of northern bobwhite quail (*Colinus virginianus*) populations in arid areas such as the Trans-Pecos eco-region of Texas presents significant challenges, some of which are essentially insurmountable. Bobwhites prefer more mesic conditions than those usually in existence there. Consequently, habitat features are progressively less favorable to bobwhite survival with movement west and the associated decreasing average annual rainfall. Between the eastern extent of scaled (blue) quail (*Callipepla squamata*) range and the western extent of bobwhite quail range the two species are sympatric, their distributions overlapping. In this region managers face the prospect of enhancing one or both species in their management efforts. Successful marketing of quail for consumptive (hunting) and non-consumptive (observation) purposes can be enhanced by the presence of both species on a given piece of land. Rainfall and grazing management largely determine which species is more abundant annually. Compared to scaled quail, bobwhites favor somewhat denser vegetation and less bare ground. Inventory of populations, habitat monitoring, habitat manipulation, and harvest records contribute to varying degrees the success of efforts aimed at concurrently managing for both species.

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### INTRODUCTION

Northern bobwhite quail (*Colinus virginianus*) and scaled (blue) quail (*Callipepla squamata*) distributions overlap (Figure 1) on the eastern edge of the more arid western portion of Texas (Sauer et al 2007). The 100<sup>th</sup> meridian, generally the route of US Highway 83 along the eastern edge of the Texas panhandle, delineates the line east of which mostly bobwhites reside, west of which blues hold force in greater numbers. Bobwhite and blue quail ranges overlap as far west as the Pecos River (Cantu et al 2006, Silvy et al 2007). Blue quail populations are believed to expand eastward into traditional bobwhite range during drought. However they are not as productive during normal precipitation years as bobwhites. Blues tend not to decline as quickly as bobwhites during dry years, but neither do they increase as quickly as bobwhites during wet years (Rollins 2000). Along this varying line both species exist together, sharing the same region or having sympatric ranges.

Over the past few years bobs like blues have suffered overall declines, a trend that continues downward (Sauer et al 2007). Loss of habitat through changing land use and fragmentation, and rangeland deterioration of remaining habitat due to overgrazing are considered the chief causes (Kuvlesky et al 2002, Silvy et al 2007). Little evidence exists to support the hypothesis that changing precipitation patterns are responsible (Silvy et al 2007).

Both species population levels vary in the short term mostly in response to rainfall and resultant habitat condition improvements (Bridges et al 2001). Scaled quail populations in this shared area tend to bounce back more slowly after favorable rainfall conditions return, than do bobwhites which tend to respond more quickly (Rollins 2000).

Bobwhites are blamed for effectively out-competing blues and taking over their habitat, moving farther west over time. On study sites in the South Texas Plains, Edwards Plateau, Rolling Plains, and High Plains, Reid et al (1979) found that bobwhites and blues appeared to select

different breeding habitat in all but the High Plains, and found little or no direct competition between the two species.

Quail managers often contemplate how to manage species in areas that do not possess ideal habitat for their survival. Such is the case with deliberately aiming efforts at bobwhite management in arid west Texas. Scaled quail have a hard enough time thriving even with their specific adaptations to drier climates. This paper assumes the land in question provides habitat for both species, and will deal with the challenges and opportunities related to bobwhites in the desert.

### **WHY MANAGE FOR BOBWHITES IN THE DESERT**

Since significant obstacles exist relative to managing for bobwhites in arid regions, an assessment of the advantages of pursuing such an effort is advisable. Several considerations should be taken into account before proceeding.

First, quail hunting makes a significant economic contribution to local communities, landowners, and operators. Having both species available in huntable populations in their sympatric range increases the attractiveness from a marketing standpoint of a particular ranch. When one species waxes, likely the other will wane, and vice versa. Making the quail hunting opportunity more stable, although the species in greatest number will differ from year to year, largely depending on rainfall.

Second, a direct affect of managing land to benefit bobwhites is usually an increase in range condition which better enables water infiltration, lessens erosion, increases plant species diversity, and improves forage abundance and availability long-term for livestock as well as wildlife. As a general rule, good range management is good wildlife management. The types of management practices involved in quail habitat management will often enhance the habitat for many other bird species as well as other animals.

Additionally, many of the management options for either species, blues or bobs, benefits the other as well. Examples include nest site and loafing cover provision. In essence, sound quail management broadly benefits both species.

### **FEASIBILITY OF MANAGING FOR BOBWHITES IN THE DESERT**

Doggedly managing for bobwhites in arid regions will likely be a disappointing endeavor. Shared range, suitable for both species, is however more likely to produce acceptable outcomes for the efforts expended.

Ironically, some of the highest populations of bobwhites in Texas (TPWD 2007) usually exist in a “desert”, namely the South Texas Plains eco-region, formerly called the Wild Horse Desert. Though not as arid as far west Texas—the Trans-Pecos and the southern end of the High Plains eco-region—the western side of the South Texas Plains experiences average annual rainfall similar to the eastern edge of what is traditionally considered to be the driest part of the state. Blue quail and bobwhites reside here together, much like the region east of the Pecos River. Here both species provide huntable populations in some areas.

Determining which species will receive priority is necessary to develop strategies and objectives for managing the two species together. In most areas which have both species, one is more suited to the most common conditions, the other to the lesser. Simplifying the decision is the contention that good land stewardship, i.e. good range management, holds the greatest promise for enhanced habitat conditions for quail, whichever species holds priority. It follows then that good management for scaled quail is also good management for bobwhite quail.

Bobwhites seem to prefer heavier cover, and blues do well in areas with less dense cover and more bare ground. Certain exceptions have been documented, though. For example, Reid et al (1979) found where sympatric with blues, breeding

bobwhites selected the more open, taller vegetation types, while scaled quail selected the dense, shorter shrub height. He explained that shrubland was negatively correlated with breeding scaled quail numbers in the Trans-Pecos in his study not because it was unimportant but because mixed mesquite shrubland associated with wetter areas was of even greater importance.

Bobwhites need a minimum of ~250 suitable nest sites per acre, ideally in the form of bunchgrass, for optimal nesting cover and often utilize grasses such as bluestems. Blues nest in a variety of habitats, generally more sparse in vegetation (as would be expected in more arid climates), and prefer substrates such as tobosagrass (Buntin 2004).

## **INVENTORY**

Knowing how many of each species is present is the starting point for management efforts. An understanding of the population trend over time of each of the two species can aid planning for habitat manipulation and grazing management. The two species share range, but have different preferences and demands, as outlined briefly above, but one can be preferred over the other in range management schemes if desired because of a perceived trend in one direction or the other. Rollins et al (2005) outlines protocols for acquiring useful, timely, and appropriate inventory of quail populations.

## **MONITORING**

Without a continued, conscientious effort aimed at monitoring the impact on quail populations of management efforts and other variables, an understanding of appropriate future direction will be cloudy. Only by objectively measuring the response of bobwhite populations to management efforts aimed at enhancing them will it be possible to determine which if any should be continued and which are feasible. Additionally, marketing of the coming year's

hunting opportunity is enhanced by knowledge about the existing quail population. Fall covey counts (Rollins et al 2005), for example, can provide crucial information in that regard.

Monitoring habitat features that have a bearing on bobwhite survival is also an important activity for quail managers. In some arid situations it may be revealed that it is a losing proposition to continue to expend efforts aimed at enhancing bobwhite populations. The area may be much more suited to scaled quail. Using the most appropriate tools is crucial in achieving useable results in monitoring rangeland for quail. See Wright et al (2005) for the most appropriate and feasible tools and activities that can be used for practical application by quail managers.

## **HABITAT MANIPULATION**

The types of habitat alteration/enhancements that come to mind to the experienced bobwhite quail manager, such as prescribed burning, brush sculpting, etc., may have less relevance or useful applicability in arid regions. Low rainfall, low humidity, and the resultant relative lack of vegetative cover, of course, combine to make conditions less favorable for some practices. Lessening, through mechanical or chemical means, the density of invasive brush which occupies most of the sympatric range will likely favor blue quail, not bobwhites. A better approach might be to utilize proven techniques (Wright et al 2005) to assess and qualify existing habitat in relation to its provision for the needs of bobwhites. Then concentrate on bobwhites in the more suitable areas.

It is likely that sympatric range could only be feasibly moved in a direction more favorable for blues by fostering more open space and more bare ground. That would involve overgrazing, though, which is not generally advisable. To move sympatric habitat in the direction of being more favorable for bobwhites consider lessening grazing density, which, given adequate rainfall, will result in less bare ground and

more grass cover, a situation which is less favorable for blues and more favorable for bobwhites.

## HARVEST RECORDS

The success of the current year's reproductive effort can be determined by the ratio of juveniles to adults at harvest (Cain and Beasom 1983). A large number of "birds of the year" indicates a good breeding year—a large percentage of young added to the population, and successful nesting, brooding, and rearing. A large number of adults in relation to juveniles would indicate a reproductive "bust"—overall failure of the breeding activity of the year and low accumulation of breeding capital on which to bet the future.

Keeping accurate harvest records can aid in the decision making process relative to setting species priorities, i.e. whether blues or bobs will hold pre-eminence. Results will also contribute to

marketing activities since managers can forecast to some degree the upcoming hunting opportunity given adequate moisture and grazing conditions for the coming breeding season.

## EXPECTATIONS

Generally, bobwhite quail cannot be expected to thrive in arid regions. They may subsist on the eastern edge of such areas in Texas where historic rainfall conditions are marginally adequate to provide their habitat needs. Their presence is a blessing when they prosper in these areas in a given year. Don't expect a relentless movement westward with certain habitat modifications and management practices. In overlapping range the more rain, the more bobwhites you can expect, all other variables being equal—the less rain the fewer bobwhites. In overlapping range heavy grazing pressure generally favors blues, lighter grazing favors bobwhites.

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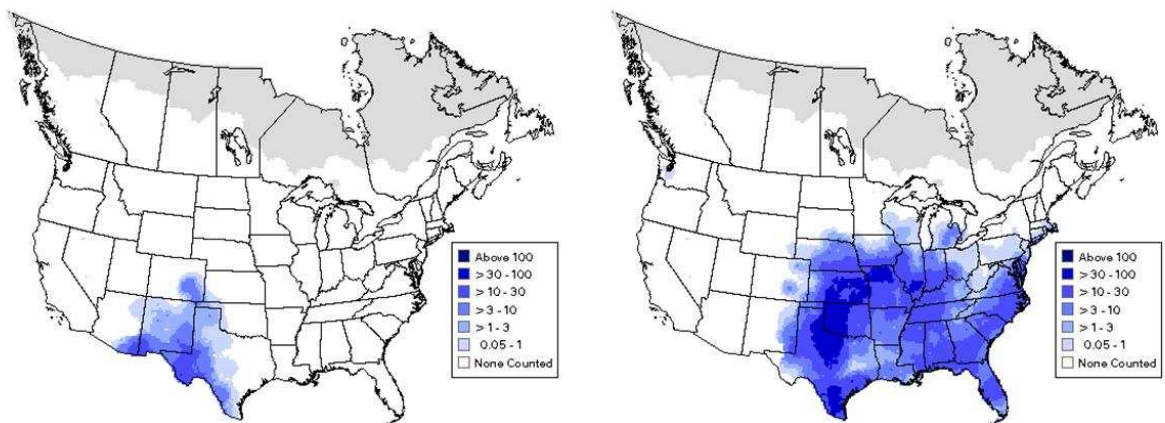


Figure 1. Scaled quail (*Callipepla squamata*) (left) and northern bobwhite (*Colinus virginianus*) (right) summer distributions 1994-2003, North American Breeding Bird Survey.

## HABITAT FOR SCALED QUAIL – “BREAKING DOWN THE PIECES”

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*Abstract.* This presentation is based on my own field observations and personal knowledge about Scaled Quail habitat. I will discuss different habitat characteristics or components that I believe provide benefits to scaled quail. Also, habitat transition and vegetative diversity will be addressed as it relates to quail management. In addition, I will discuss the habitat practices that I believe work best for all quail species in West Texas.

### PIECES OF THE PUZZLE

Let me start by saying that I believe the most important piece of the quail habitat puzzle is **good rangeland condition**. A rotational grazing system that provides light to moderate utilization of the available herbaceous cover is beneficial to quail populations. I believe that this softens the quail decline when we go into a drought period and speeds up the recovery when things turn around. Rainfall is another driving force in this puzzle, but without good range condition most of the rainfall will runoff and produce little cover or food for quail. In the desert you need to make every drop of rain count.

I also believe that there are components or characteristics of habitat that can make one property better than another in the same area. Some of these include:

**1) Draws** – especially in the Trans-Pecos region, they provide thermal cover (protection from heat and cold), protection from predators, abundant food sources, escape, loafing and nesting cover.

**2) Playas** – These shallow depressions are scattered across West Texas and provide temporary surface water but more importantly green vegetation and insects. Playa bottoms

will remain green much longer and continue to provide “greens” and insects even when the surrounding habitat is dry. In my opinion these are underestimated in value and could be critical to quail during droughts. Playas are an excellent type of habitat to have on your property.

**3) Wells with dirt tanks** – Windmills and solar pump wells that have a dirt tank associated with them provide water if needed, green vegetation and insects nearly year-round. But the most important thing may be the green vegetation, which is a major component in the diet of scaled quail.

**4) Livestock pens** – Provide areas of bare soil that get livestock hoof action periodically. This soil disturbance can provide good sites for weeds or “forbs” that are seasonally important foods for quail. Examples would be (Filaree, Croton, Cowpen daisy, Pigweeds, Spurges and Sunflowers). These plants also attract insects which are very important in their diet.

**5) Hills or Mountains** – Hills, ridges and mountains provide vegetative diversity and many times are a means of escape from predators. Different types of vegetation may be found in these different habitat types providing additional food and cover. And while



not fully understood, it does provide something different - a "transitional habitat type" that I believe can be a good thing.

**6) Patches or Mottes of woody cover** – Patches or Mottes of woody cover scattered across a pasture or landscape improves its value to quail. These areas are used for loafing, feeding, protection, shade and allow birds to travel more efficiently over the landscape or pasture to meet their daily and seasonal requirements.

## VEGETATIVE DIVERSITY

The wide range of vegetative diversity that I see from one property to another is very interesting. There is more plant diversity in the Trans-Pecos than any other ecological area of the state. It has been my observation and experience that properties with the greatest plant diversity also have better quail populations. Working with local natural resource specialists to better understand what types of plants you have on your property is highly recommended.

## HABITAT TRANSITION

Whether you are talking about large landscapes or pastures, having different habitat types that transition in and out of one another is more productive than a homogenous area with little change in plants species density or diversity. This aspect of different habitat types transitioning into something different is much easier to understand when you're flying over the West Texas. Each of the components listed above create something different on the ground, a transitional habitat type with different benefits to quail.

## PRACTICES THAT BENEFIT QUAIL IN WEST TEXAS

*Good grazing practices* – allowing for sufficient nesting cover.

*Brush management* – always leave the good woody plants (e.g. Lotebush, Acacias, Wolfberry, Hackberry, Algerita, Allthorn etc.) on any project where possible. Leaving strips, patches or mottes will be beneficial. Management options include (mechanical, chemical and prescribed fire)

*Develop water sources* with associated dirt tanks- to provide most importantly green vegetation and insects and drinking water if needed. Fencing portion of the livestock tanks to ensure green plants and insects are available is also a management consideration.

*Possibly plant woody shrubs and native grasses* where these components are lacking.

*Invasive plants* such as broomweed, mesquite, creosote, tarbush and juniper can be a component of the landscape and provide benefits to quail populations. These plants can provide habitat transition and diversity which may improve the overall habitat picture. The problem occurs when they, overtime, become dominant to the exclusion of other species and reduce vegetative diversity. Invasive plants can be minimized through good management practices such as light to moderate grazing and prescribed fire.

## EXTENSIVE HABITAT MANAGEMENT STRATEGIES FOR DESERT QUAIL

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Management of quail in desert environments and large landscapes lends itself well to extensive kinds of management. The costs and benefits of extensive management are more fitting and feasible for ranchers and quail managers in West Texas. High input, intensive management techniques applied for quail in other regions may not be realistic for some landowners in this region. This paper will address primarily scaled quail. The principles apply well to Gambel's quail, but not as directly to Montezuma quail.

Extensive management is defined as management which is normally done on a large geographic scale, at a low intensity. The idea is to get the most possible benefit over large acreage at a reasonable cost. Extensive management is not about maximizing or even optimizing. Extensive management involves doing those things that are practical for most landowners with a low level of input that have a good likelihood of success.

### THREE GUIDING PRINCIPLES

There are three principles to remember when planning or conducting extensive management for quail in the desert: First, do no harm; Make the most of your rainfall; In all things, moderation.

*First, do no harm* - Large parts of West Texas already provide fairly good habitat for scaled quail. In good years, large populations of quail can be found over large areas. Scaled quail are hardy birds and can be found in some harsh environments. Existing habitat often provides the basic needs of quail

without any additional management. Doing nothing is sometimes the most prudent form of extensive management. However, managers must have realistic expectations for the desert. Seldom will it be possible to maintain high quail populations every year. For desert quail, the two main forms of harm are excessive grazing and excessive or inappropriate brush control. Simply avoiding these two problems will go a long way in providing good quail habitat.

#### *Make the most of your rainfall* -

In an arid environment, the most common sense thing that can be done for wildlife or livestock is to maximize the effectiveness of rainfall. In the desert, rainfall is usually sparse or erratic in amount, and scattered and unpredictable in distribution. There may be periods of three to six months or longer without any appreciable moisture. It is important to store as much rainfall as possible in the soil and to minimize runoff loss. The most effective way to reduce runoff and increase infiltration is to keep a cover of desirable grass. Grass roots add a continuous source of organic matter to the soil and help form a more porous soil. Grass roots and decaying grass litter improve soil structure so that it absorbs water faster and stores water more effectively. Grass plants and dead litter also physically slow down the water giving it more time to soak in. Soil with an appropriate cover of mulch will also stay cooler with less evaporation and provide better conditions for plant germination. A sparse cover of grass leads to a capped and crusted soil surface and an increase in runoff and erosion. The term "desertification" is often applied

when lands become progressively more arid due to a deterioration of the soil, and a reduction in the water holding capacity of the soil. This can occur even with normal or above normal rainfall.

*In all things, moderation* – For desert quail, specifically scaled quail, this rule of moderation applies to grazing, brush control and quail hunting. Moderation in grazing means truly conservative stocking rates during those periods when there is a surplus of grass; and little or no grazing during dry periods when there is no surplus of grass. Moderation in brush control means moderation in the extent of brush control and insuring that plenty of low shrub growth is retained for cover and food. In some cases, moderation may mean no additional brush control at all. Moderation also applies to the selectivity of brush control. Most species of woody plants in the Trans Pecos are good for quail and should be retained. A few species of brush have increased to undesirable densities and need to be thinned to help restore healthy grasslands. Moderation in quail hunting means to harvest conservatively. In those really good years, it may be nearly impossible to harvest too heavily. However, managers must remember that the birds produced in good years are likely to be the primary breeding stock and hunting stock for the following two years.

## HEALTHY GRASSLANDS

Quail thrive best in healthy grasslands. Healthy grasslands will have an abundance of grass as well as a diversity and abundance of forbs, weeds and shrubs. Desert grasslands may not have as much total plant cover or diversity as other regions, but are well suited to scaled quail, and other desert wildlife.

In arid and semi-arid regions, three interrelated factors dictate the health of the grassland: grazing, brush and rainfall. The manager has full control over grazing, some control over brush, and no control over timing or amount of rainfall. By controlling grazing in a very specific and planned manner, rainfall effectiveness can be improved and the damaging effects of drought can be at least partially compensated. With carefully executed brush control, additional grass cover can be retained even during short term drought.

*Grazing Management* - Grazing impacts grasslands in a very obvious way. A typical size cow consumes over 10,000 pounds of grass annually. In some years, there is plenty of grass, if the range is stocked conservatively. In other years, there will be a shortage of grass even if the stocking rate is low. The successful rancher / quail manger must be able to adjust and flex the stocking rate to match changing growing conditions. Running stocker animals rather than cows is one way that successful ranchers are able to maintain grass cover in the desert. Some ranchers run only stocker animals to maximize flexibility. Other ranchers will combine a small base herd of cows, with stockers. The key is being willing and able to sell out or greatly reduce cattle numbers in those years when grass production is low. Selling before the grass is gone is the sign of a skillful and experienced rancher.

What is a conservative stocking rate? There is no such thing as an average proper stocking rate for a region. It varies too much from year to year and from ranch to ranch. Managers should avoid the temptation to stock according to any rules of thumb or average regional stocking rates. Professional help is available from NRCS and other sources to assist in setting and adjusting stocking rates to

meet conservation objectives for livestock or wildlife.

The old range management adage of “take half – leave half” has been used for decades to help managers understand the need to leave a good stubble of un-grazed grass. This concept has been helpful to communicate an important principle, but it has been found to be inaccurate in actual practice. More recent range management work has found that only about 25% of the yearly grass production should be allocated to livestock consumption. A considerable amount of vegetation is eaten by insects or rabbits or is otherwise not available for livestock forage. The key point is that pastures should have a shaggy stubble of old carryover grass throughout the entire winter and spring before new growth starts. In the desert, this is only possible with conservative and flexible grazing management.

Most progressive ranchers utilize some form of intermittent grazing to give pastures periodic rest. Some method of alternating the grazing periods with rest periods will generally help pastures improve in condition if stocking rates are proper. Rest periods are beneficial for quail to help develop improved nest cover and plant diversity. Concentrated grazing can be used to open up dense grass and create some ground disturbance to increase forb production. Val Lehman, the famous quail biologist for the King Ranch from 1945 to 1972, once stated that “little if any southwestern rangeland will support a desirable canopy of tallgrass with satisfying regularity unless it is periodically rested from grazing.”

Desert rangeland does not bounce back as quickly as some other areas. Once the grass cover is damaged or lost, it may be very difficult for the land to recover with desirable native vegetation.

*Brush management* - Much of the degraded rangeland observed in West Texas is the result of severe overgrazing and brush encroachment 50 to 100 years ago. Most of this damage took place before the principles of range management were widely understood and before wildlife management became important. Once the grass is gone and brush becomes the dominant vegetation, recovery of the grassland is greatly inhibited. In some cases, grass can and will grow among the brush. In other cases, grass cannot get a start until some form of brush management is carried out. Mechanical and/or chemical brush management can be an integral part of restoring healthy grasslands and improving quail habitat. Brush management in the desert can seldom be justified economically, but if brush management is going to be done anyway, it can be done in a way to make it much more effective for wildlife.

Mechanical brush management can be very beneficial to quail habitat, especially if it is done in moderation and is done selectively. Reducing the problem species such as mesquite while leaving the desirable species such as wolfberry, sumac, lotebush, saltbush, or catclaw, can greatly improve quail habitat and quail hunting. The ground disturbance from grubbing causes an explosion of forbs for several years and allows the re-establishment of native grasses. Removing one-third to two-thirds of the total brush cover in patterns or strips or irregular blocks will improve habitat for many kinds of wildlife. Leaving the remaining areas in brush, in between the treated areas will insure adequate cover for quail and other wildlife species. Site specific assistance from NRCS or TPWD or other experienced consultants is recommended. One important word of caution to the quail manager: avoid reseeding with exotic grasses, especially Lehman lovegrass. This exotic grass has been extensively

seeded after brush control and now dominates and monopolizes vast areas that once were healthy diverse grasslands. Lehman lovegrass has very limited benefit for quail or other wildlife and is regarded by many as an invasive species.

Chemical brush management is also commonly used in some areas of west Texas. Pelleted herbicides such as tebuthiuron are widely used and are very effective in killing greasewood (creosote bush) and blackbrush (tarbush). Native grasses, such as black grama, bush muhly, plains bristlegass, slim tridens, dropseeds and others often respond very favorably to this treatment. The grass response is often impressive and it is easy to think that a healthy, diverse grassland has been restored. However, this herbicide is a non-selective broadleaf herbicide that stays active in the soil for several years. This means that it will also kill or damage many other broadleaf plants, including many species of forbs, weeds and shrubs. Label warnings as well as actual observations in the field verify this damage. Annual forbs may return within a few years after treatment, but the loss of perennial forbs and desirable shrubs is more long term. Research is needed to document the extent of damage as compared to the benefits. When planning chemical brush management, the manager needs to be aware that many plant species which are desirable to quail, deer, pronghorn and other wildlife will be harmed. This is another reason to conduct brush management in moderation and patterns.

Removal of all livestock after brush management is an essential part of grassland restoration. In the desert, this rest period will usually need to be two to four years, sometimes longer.

## MANAGEMENT BASED ON HABITAT REQUIREMENTS

All quail management, whether extensive or intensive, should be based on addressing the specific habitat requirements of quail. Wildlife managers are sometimes eager to try new techniques because they have heard them used in other areas. Quail management is site specific and should be prescribed on a case by case basis to fix specific habitat weaknesses. The basic habitat requirements of scaled quail are summarized below. Consult the other papers in these proceedings for more detailed information.

*Food* – Insects, seeds and green forbs are all important food sources for quail. Improving plant diversity and plant cover are the best ways to maintain or improve the quail food supply. Grasses, forbs, shrubs and cactus all contribute important parts of the quail diet. Quail food is readily provided within healthy and diverse grasslands and can be greatly increased by any type of soil disturbance. Mechanical brush control, right-of-way construction, or fireguards can all provide this kind of soil disturbance. Note: the diet of Montezuma's quail differs significantly from the diet of other desert quail.

*Cover* – Nest cover is provided by large grass clumps, pricklypear, yucca, and low shrubs. Loafing cover is provided by clumps of low dense shrubs. Grazing management and brush control in moderation are the two primary factors which affect quail cover.

*Water* – Quail get water three different ways. Quail can metabolize some water from the chemical breakdown of carbohydrates during digestion but this provides only a part of their water requirement. Quail also eat insects, greens, or fruits which contain water. This may be the normal way they get adequate water for part of the year.

However, in the desert, there may be long periods of the year when these succulent food items are absent. Quail will readily drink water from troughs, ponds or puddles, and are often found in close proximity to water. The role of surface water for desert quail continues to be much debated among scientists, ranchers, quail managers, and hunters and is a subject ripe for study. Where it is practical, wet areas can greatly improve the diversity of vegetation and stimulate insect production. Windmill overflows, wet areas along pipelines, and ranch road diversions can all be used to concentrate water and grow green vegetation in small areas. Water troughs should be modified with ramps or other structures to allow quail and other wildlife to escape if they fall in.

*Habitability* - Dr. Fred Guthery introduced the concept of habitability to quail managers. This concept emphasizes that quail generally spend their entire life in a rather small area. All habitat components must be provided in close proximity, over and over again across the landscape for the greatest use by quail. If there are large skips in any necessary habitat element, habitability and usable space is reduced. Dr. Dale Rollins provides practical application of the concept by stating that the quail manager should visualize those "honey holes" of ideal habitat, and then cut and paste those attributes across large areas. While this may not be feasible in real practice on large ranches, the theory of making the most of each acre is important to remember whether you are practicing intensive or extensive management.

With extensive management strategies, it is usually not possible to create a high level of habitability across an entire ranch. The manager may

have to be content with 25% to 50% of the area being habitable in normal years. More intensive kinds of management may be needed to create a high level of habitability across larger landscapes.

## CONCLUSIONS

1. The cost and benefits of extensive quail management are well suited to desert environments, but expectations should be realistic.
2. If current quail populations suffice to meet the manager's goals, doing nothing may be the best form of management.
3. Make the most of limited rainfall by improving the cover of grass and reducing runoff.
4. Conservative (light) stocking rates and de-stocking during drought will benefit quail habitat and grassland health.
5. Carefully planned, selective, brush management can be used to improve quail habitat, but is difficult to justify economically.
6. Do not reseed with exotic grasses such as Lehman's lovesgrass which may be invasive.
7. Be aware that some brush management herbicides will severely damage forb and shrub diversity and abundance.
8. Create low wet areas where feasible to grow green vegetation and insects.
9. Ground disturbance will greatly enhance forb and weed production.
10. Harvest quail conservatively to increase carryover of broodstock.

## RESEARCH NEEDS FOR DESERT QUAILS IN TEXAS

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*Abstract.* Relative to the more popular bobwhite, a paucity of information exists on desert quail biology and management in Texas. Recent treatises (Cantu et al. 2006, Harveson et al. 2007, Silvy et al. 2007) summarize much of the existing knowledge based on desert quails in Texas. But when contemplating the subject of research needs for desert quails, one feels a bit like a reluctant dieter strolling the aisles of the supermarket, i.e., I want one of those, and one of those, and that sure looks good to. Study Sands' conceptual model (Fig. 1) and you'll see how many knowledge gaps there are for scaled, Gambel's and Montezuma quails. Here we offer our "shopping list" of research needs for desert quails in Texas.

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### SCALED QUAIL

Scaled quail are the most studied of the 3 species of desert quails in Texas (across the Southwest, Gambel's quail would likely surpass them. We suggest the following research gaps for scaled quail (in no particular order):

- survival estimates at key times during the annual cycle, e.g.,
  - annual survival;
  - brood survival;
- response to management (e.g., supplemental feed, water, predator control, brush and grazing management);
- census techniques;
- role of hunting (in the context of a 21<sup>st</sup> century landscape);
- changing land use practices (e.g., wind turbines, transmission lines; relaxation of grazing);
- disease (e.g., coccidiosis, avian influenza);
- efficacy of translocating wild-trapped birds for restoration purposes.

We discuss each of these, and suggest how such studies might be funded if sufficient political capital were aligned properly.

#### Survival

With the exception of Pleasant et al. (2006) and Rollins et al. (2008), we have no information on survival of scaled quail in Texas in the "AT" ("after telemetry") era. These authors each studied survival of (mostly) females during the late-winter and into the breeding season (i.e., Mar-Aug). Additional study is needed on seasonal survival in the presence and absence of hunting. Data on brood survival are sorely lacking for all quails, and is difficult to assess. Estimates of cause-specific mortality (e.g., predation, exposure), and an evaluation of attempts to mitigate such, would be an excellent addition to our knowledge base.

#### Response to Management

Topics here relate to scaled quail population responses to "intensive" (e.g., supplemental feed and water) and

“extensive” management. Rollins et al. (2008) found that female scaled quail provided supplementation in south central New Mexico did enjoy greater survival during the breeding season than those not supplemented. Buntyn (2004) compared survival rates of female scaled quail that had access to “moist-soil areas” in Pecos County, TX, but found no differences in survival between areas that did nor did not contain the spreader dams. However, a similar study to compare fall-winter survival is warranted. Predation-related topics could include response to small- and large-scale coyote control, and evaluation of raptor-related mortality rates in different habitat types (i.e., do certain habitats provide superior refuge for quail from Cooper’s hawks and Northern harriers?) Other topical questions here relate to practices like brush management (e.g., mechanical versus chemical strategies), prescribed burning, and grazing management are ripe areas for research.

### Census Techniques

The ability to effectively, and efficiently, enumerate population response is a prerequisite for most studies, yet currently we are limited to spring cock call counts (Brown et al. 1978). “Distance sampling” (Buckland et al. ) is the currently accepted protocol for censusing quails, but has not been evaluated for scaled quail. Ongoing research (M. Schnupp, unpublished data) is evaluating the accuracy of distance sampling from helicopters for bobwhites, and this technique appears promising. C. Snow (Angelo State University) is currently evaluating spring cock call counts, helicopter counts, and roadside counts as ways to monitor scaled quail abundance and predict flush rates at several sites across west Texas. Track counts (Engemann and Allen 2004) along ranch roads may serve as an inexpensive way to monitor

abundance and should be formally evaluated.

### Role of Hunting

Historically, hunting has not been viewed as a major factor in scaled quail (Campbell et al. 1973). However, as hunting scaled quail has become more popular, i.e., more “motorized”, hunting may bear another look. If/as commercial popularity for scaled quail hunting continues to increase, and more of the scaled quail range in Texas is hunted, we need information to assess whether hunting is “additive” or “compensatory” and what factors (e.g., timing of the harvest) influences the sliding scale between additive and compensatory mortality.

### Changing Land Use Practices

Historically, not much changes across most of west Texas’ scaled quail range. Livestock grazing and oil development typically shape the landscape. More recently, wind energy has had a marked effect on the landscape, and promises to increase more in the near future. No data exist on the response of scaled quail to wind farms. We need information on the short- (during construction phase) and long-term (2 years after installation) consequences of wind farms. Do quail continue to inhabit wind farms? Is raptor predation actually decreased in such areas? Do the transmission lines which accompany wind farms increase predation by ravens and raptors? Will the additional income from wind energy permit ranchers to reduce stocking rates of cattle? If so, will they? Another changing practice is “undergrazing”, i.e., stocking at lower stocking rates than those practiced under more traditional beef cattle production paradigms. Does reduced stocking increase scaled quail abundance in the short- and/or long-term? Such questions demand long-



term studies be implemented to monitor quail abundance and habitat change.

#### Disease

Scaled quail abundance nosedived in 1988 across much of their range in Texas. Rollins (1997) hypothesized that disease was a possible candidate for the implosion. We have historically minimized the consideration (i.e., potential impact) of disease on wild quail populations (Rollins 1997). However coffee-shop talk abounds of “coccidiosis” any time a mortality event is sensed by landowners and hunters. The truth is we just don’t know. Surveillance efforts need to be implemented for diseases like avian influenza, coccidiosis, and avian cholera.

#### Translocating Scaled Quail

After the widespread decline of scaled quail in 1988 (Rollins 1997), many areas of the scaled quail’s eastern range in Texas were depopulated. There is interest in translocating wild-trapped birds back into those areas along the 100<sup>th</sup> meridian (essentially U.S. Highway 83). However there are no data to evaluate the efficacy of such restocking efforts.

### **GAMBEL’S QUAIL**

Only recently have researchers started taking notice of Gambel’s quail in Texas (Thornton 2007, Ortega-Sanchez 2006, Sullins 2006, Gray 2005). Although these studies provide valuable insight into Gambel’s quail ecology, we still lack information on their life history, long-term population dynamics, interactions with scaled quail, and how to manage their habitat. Below we highlight some of the more pressing research questions that need to be addressed.

#### Life History

As with all desert quails, there is a disparity between our knowledge of simple life history strategies compared to our knowledge of northern bobwhites. Gambel’s quail are no exception. Only 3-4 studies have attempted to better understand nesting ecology, survival rates, population density, and movements of Gambel’s quail using radiotelemetry. Although radiotelemetry is a relatively expensive tool, in many instances, it is the only tool currently available to evaluate breeding strategies and nesting ecology. Without this baseline information on their habits and habitats, our knowledge of Gambel’s quail will not advance.

#### Long-term Population Dynamics

Because their distribution in west Texas is dependent on linear habitats (e.g., riparian), a thorough evaluation of pioneering strategies is warranted. We propose that Gambel’s quail populations are more prone to drastic changes in distribution compared to other quails because their occurrence in adjacent habitats are unlikely (non-uniform distribution). This lack of continuous distribution would suggest that Gambel’s quail must retreat further during poor years. Using a combination of genetic analysis coupled with long-term population monitoring with radio-telemetry or population surveys should elucidate the causative factors associated with their population dynamics.

#### Interactions with Scaled Quail

Scaled quail occur sympatrically or adjacently to Gambel’s quail, but the level of interaction, competition or hybridization between these 2 species is unknown. Anecdotally, Gambel’s quail are less likely to occur in the upland habitats that typify scaled quail habitats,

but scaled quail will use riparian habitats where Gambel's quail occur. The ecological questions that need to be addressed is how and if these 2 quails partition their resources (food, space, cover) or does competition exist between the 2 species. Further, since the 2 species occur and are known to hybridize (Johnsgard 1970), the question remains what long-term ecological effect does this constant exchange of genetic material have on local populations. Again, monitoring 2 sympatric populations, determining the levels of hybridization through time, and assessing the fate of hybrids should adequately address these questions.

#### Habitat Management

Three questions come to mind with respect to habitat management and Gambel's quail: (1) How can we promote forb production for Gambel's quail? (2) What affect does water supplementation have on Gambel's quail movements and density? (3) How do large-scale salt cedar eradication programs affect Gambel's quail?

Most studies have shown that forbs are an integral portion of the diet of quail in North America. Although Gambel's quail rely less on forbs than other quail (Sullins 2006), they still represent a critical food item in the form of energy-rich seeds or moisture-laden greens. Despite the importance of forbs, no studies have evaluated the effects that mechanical, biological (livestock grazing), or fire has on forb production.

Gambel's quail occur in some of the driest habitats in North America. State agencies and private landowners frequently prescribe supplemental water for Gambel's quail. Rosenstock et al. (1999) and Glading (1943) suggested that Gambel's quail benefited from guzzlers and other man-made water features, but those studies are based on observations before telemetry (BT) and

the term "benefit" was not well-defined. We recommend that a controlled experiment be conducted. Specifically we encourage scientists to evaluate the effects of water supplementation using a completely randomized design using replication of treatments (treatment with water, control without water). We also recommend that researchers measure survival rates and productivity of the populations to better define "benefit" as it relates to quail.

Salt cedar is an invasive exotic that dominates many riparian habitats in the desert southwest. In many areas, salt cedar encroachment is so severe that is the dominant brush species. In these areas, Gambel's quail may be dependent on this invasive species for cover. Because of the ecological damage salt cedar has on riparian habitats, large scale eradication programs have been implemented to restore ecosystem function. However, little is known about the effect these eradication programs have on Gambel's quail. Because of the economic importance of this game bird in the desert southwest, we believe a thorough investigation is warranted.

#### MONTEZUMA QUAIL

Montezuma quail hold the dubious title of being the least understood quail in North America. This is especially true in Texas where their populations once spanned west Texas, the majority of the Hill country, and portions of south Texas and the Rolling Plains. Today their distribution is limited to the Trans-Pecos and an isolated population in the western Hill Country (Harveson et al. 2007). The lack of knowledge on Montezuma quail is exacerbated by 2 factors. First, the complicated nature of their status in Texas does not lend itself to research funding. Montezuma quail are classified as a game bird with a closed season and for decades have been erroneously

labeled as “nongame birds.” Harveson (2008) further describes the sociological and biological barriers associated with managing Montezuma quail in Texas. Montezuma quail are also understudied because of their habits and habitats. Hernandez et al. (2006) suggested that our understanding of Montezuma quail is handicapped because they are difficult to catch because of their cryptic behavior, relatively low densities, and the isolated habitats they occur in. This inability has led to the dearth in the literature on their ecology. Because of this void, many opportunities exist to advance our knowledge of Montezuma quail. Using the framework provided by Harveson (2008), we provide research priorities for Montezuma quail in Texas with respect to (1) life history, (2) population monitoring, (3) conservation genetics, and (4) population modeling.

#### Life History

Bolen and Robinson (2003) identify 4 elusive measures for successfully managing wildlife populations: (1) population size, (2) growth rate, (3) reproductive capability, and (4) seasonal habitat requirements. These 4 questions form the back-bone to our understanding the life history of Montezuma quail in Texas. Only 2 studies have attempted to use radio-telemetry to better understand the ecology of Montezuma quail (Hernandez 2004, Stromberg 1990). Both studies were hampered by small sample sizes and premature mortality of radioed quail. Simple questions regarding the life history of Montezuma quail, including covey dynamics, movements, mating systems, nesting ecology, and survival rates, can best be evaluated by successfully capturing Montezuma quail and monitoring them with radiotelemetry.

#### Population Monitoring

Population trends serve as the basis for management of upland game birds. Montezuma quail are considered an indicator species for the pine-oak woodlands of the Trans-Pecos region and are listed as a “medium priority” and “species of concern” at the Federal and State level in the Texas Wildlife Action Plan. However, no monitoring program is in place for Montezuma quail in Texas. Bristow and Ockenfels (2000) have described a time-constrained dog survey for Montezuma quail in Arizona. Although labor intensive, this monitoring program may provide an adequate metric for measuring population levels of Montezuma quail in west Texas and the Edwards Plateau. Another technique that may hold promise for this elusive bird is the use of occupancy modeling. Currently, researchers with Texas A&M University-Kingsville are evaluating this new technique on Montezuma quail in Texas.

#### Conservation Genetics

Montezuma quail in Texas have experienced a severe range reduction in the last 100-150 years (Harveson et al. 2007). It is thought that many formerly occupied habitats are now void of viable populations, leading to population isolation. By using genetic techniques, we have the opportunity to better understand the circumstances of the range reduction on the genetic composition of quail, which will lead to a more strategic recovery plan for Montezuma quail in Texas. Further, conservation techniques will elucidate dispersal strategies used by quail, allow us to estimate effective population sizes of mountain-specific populations, and evaluate the success of previous reintroduction efforts that occurred in Guadalupe Mountain and Big Bend national parks (Harveson et al. 2007).

## Population Modeling

Once our knowledge of population processes are obtained (survival, mortality, densities, habitat occupancy, nesting ecology, etc...), resource professionals should start evaluating the effects of management strategies on Montezuma quail populations. Population modeling offers researchers the opportunity to ask "what if" questions without testing them on the

populations themselves. In many situations, these scenarios also identify knowledge gaps thus allowing for researchers to focus on much needed data. Management strategies may include assessing variations of an open hunting season on the viability of Montezuma quail, modeling the effects of population reintroduction attempts, and evaluating prescribed fire practices on quail populations.

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## **QUAIL MANAGEMENT AT THE ARMENDARIS RANCH**

TOM WADDELL, Ranch Manager, Armendaris Ranch, Truth or Consequences, NM

The Armendaris Ranch is located in southwestern New Mexico between Truth or Consequences and the Bosque Del Apache National Wildlife Refuge. The 360,000 acres of private property is the largest remaining part of the original Pedro Armendaris Land Grant established in 1815.

The owner has been active in the management of a variety of quail species for 26+ years on properties in the southeast, Midwest, and southwest. The ranch manager was an Arizona Game and Fish wildlife manager for 26 years during which time he conducted scaled quail studies in southeast Arizona. Since retirement from state service he has been involved in the recovery of the quail population on the ranch for 14 years.

The ranch has Gambel's and Scaled quail populations that are managed by constructing water developments, supplemental feed and proper grazing of bison.

The bird dog kennels and training centers are located on the southeastern and southwestern properties with the mid-western upland game bird hunting conducted from the southwestern center. Hunting is limited to the owner and guests except for one hunt donated to Quail Unlimited on an annual basis.

The greatest threat to scaled quail populations in the southwest, within their recent ranges, may be changing average humidity, lack of grass or brush control (depending on which there is too much of) and failure of private land owners, public land management agencies and state wildlife management departments to implement habitat enhancement strategies that are effective.

## QUAIL MANAGEMENT STRATEGIES ON THE K-BAR RANCH

GREGG BLAIN, Owner/Operator, K-Bar Ranch, Ector County, Texas

The K-Bar Ranch is located in Ector and Crane Counties. The ranch has been in the Blain Family since the 1950's, and the fourth generation is now actively participating in the business. We have run a commercial hunting operation for over 20 years, with our guest lodge and Bed & Breakfast open year-round. We are a full service outfitter, with hunts available on the property from September through March. Hunting is our business, and I daresay that our lands are managed more for wildlife than for livestock.

Our quail management rests on three basic ideas; the first is that the hatch is generally not the problem. There may be years of unusual weather that does affect the hatch, but in my experience, by and large, the quail take care of this part by themselves. We should, of course, think twice before destroying their nesting habitat, and we can certainly improve marginal nesting areas, but quail are remarkably prolific creatures. Of all the birds in the world, the bobwhite quail holds the record for the number of eggs produced in a laying season. Many avian species will only lay a few eggs per clutch, or will only make limited nesting attempts. However, if a quail's nest is destroyed, the eggs eaten, or the chicks perish, the quail will continue the attempt to nest until successful, or until time just runs out. The problem, generally, is keeping them alive until fall.

The second idea is based on the fact that quail, like most birds, have a higher body temperature and thus a higher metabolism than most mammals. Also, due to the demands of flight and, in the case of quail, swift escape on foot, birds cannot afford to keep the body fat stores that mammals can. Therefore, quail have a high daily

nutritional requirement relative to their body weight. We get confused when we look at what we consider to be a great year—green pastures, fat and happy cows, slick deer with great antler growth—and fewer quail than expected. Part of the answer, I think, is that a mammal's overall health doesn't suffer in the short run, as it can live off of the nutrition and energy stored in body fat, bone marrow, and muscle tissue. However, even in a banner year, short lapses exist between insect hatches, seed crops and the like. If these lapses begin to stretch out, the quail—who are non-migratory and inherently lean—can be affected. They may not starve to death, but it does render them more susceptible to disease. More importantly, they tend to forage into the marginal areas of habitat, increasing the risk of predation. Whether or not this is an issue in a particular instance is perhaps best evidenced by comparing average covey sizes. If the coveys of quail, either before or after the family groups merge, are significantly larger around the house and barnyard, or near year-round deer feeders, this is likely a problem that needs to be addressed.

Thirdly, predation is, I think, the most significant factor in the number of quail available in the fall. Quail are tasty, but a whole host of other critters that run, fly and slither think so too. For them, there is no closed season and no bag limit. Habitat managed with predation risk in mind is essential.

A great deal of research has been done on predator/prey relationships and cycles, but these mainly focus on resident predator populations. In the Panhandle, West Texas and the Trans-Pecos, a different condition exists because of the flyway, or migration routes, of raptors. Migrant

Red-tail hawks, peregrine falcons, kestrels, harriers and many other birds of prey pass through our corridor going to and from the North. Harris hawks and others from Mexico and South Texas push up from the South. We have plenty of nice, warm, sunny winter days, and these birds will stay around so long as food is available, constantly depleting the quail populations.

There are a few management practices that I would vote most successful for quail, based on the return in quail numbers, while taking into account expenditures of time and money. First and foremost, have supplemental feed available. If not supplied year-round, watch closely. If you suddenly begin to see more quail than before, it may be that they are ranging wider and into more open country in search of food. Quail blocks are good and are not picked on as much by song birds. Another approach that we have tried with good success is to mix scratch grains in with the corn in our deer feeders.

I believe that water availability is important to quail, but as a falconer, I find that when hunting with a hawk instead of a shotgun, the traditional cattle trough with nothing but bare dirt within 100 steps gives a great opportunity for aerial assault—especially in the moment that a flushed quail lands in grass. A better solution to both food and water is what I call the “oasis plan.” Water on the ground, not necessarily a lot of it either, creates quite a green spot out here, and produces an almost year-round supply of quail forage and insects, especially in our hot, dry summers, in addition to supplying water and a quick escape. The normal Texas “pond by the well” is great, but frequently too far apart to be used by more than a few coveys. One alternative, used along pipelines between storage tanks and troughs, is an irrigation emitter dripping into the lid of a metal drum. Emitters can be placed inside metal or PVC pipe covered in

wire mesh to keep those pesky rodents from gnawing on them. Another idea is a small-scale water collector made from a scrap sheet of roofing tin set on pipe T’s. The downhill T has a slot for the water to run into, and an outlet to drip the water into the drum lid. Because metal loses heat at night faster than the air around it, dew will form on the tin sheet even when it doesn’t form on the grass.

Ponds are a great wildlife asset, but are quite expensive when fed by electric pumps. Windmills are more traditional and nostalgic, but with rapidly escalating metal prices, have become costly, and don’t pump when the wind is still—like the month of August. Versus a windmill, solar power generation with an electric pump is more reliable, and generally runs about half the price for an equivalent amount of water, with drastically reduced maintenance. Versus a traditional electric pump, the cost is initially higher (or not- depending on the number of poles to be run), but quickly pays for itself as there is no electric bill.

Most importantly, even though fields of knee-deep grass are the cattleman’s dream, it is far from ideal as habitat for wildlife. Be careful when controlling woody plants and cactus—even stands of greasewood and tarbrush. When flying my hawk, I generally shy away from greasewood hillsides and mesquite thickets, as it ends up being a frustrating experience with lots of stoops and lots of misses. Brush strips are generally prescribed, but we have also tried leaving small islands of brush instead. These produce a lot of brush-to-open-pasture contact for the acreage of brush left without any significant increase in brush encroachment.

No-graze areas are ideal low cost ventures. On a small scale, though, scrubby mesquites and cactus create their own protected and shaded spot where the cows and deer don’t



nibble, providing food, cover and nesting areas. Our no-graze program was born entirely by accident, as one summer, we decided to fence off a small corner of each pasture, about a quarter acre or so, to pen cattle when moving them pasture to pasture on horseback. This allowed us to regroup and return to catch any strays or escapees, or just to take a break. These areas are excellent for monitoring your pasture's grazing capacity over time, and become incredible wildlife habitat.

Finally, predation control should be a part of any wildlife program. I say predation control instead of predator management for a reason. Some predators can, and defensibly should, be controlled in number; for instance, disease vectors like coyotes and skunks. Feral animals, such as wild hogs and housecats, are destructive to native species. Many of the predators, though, are beyond our ability to control—specifically in the case of quail, hawks, owls, and to some extent, roadrunners.

One strategy that we have found to be successful is to build small net-wire pens, around 8 to 12 feet square, around a bramble bush or thicket of some kind. Quail can easily negotiate net wire on foot at full speed, escaping

ground predators. The brush provides overhead cover from birds of prey. We find that quail often covey there for the night, and in periods of inclement weather. Even better, place a quail block or feeder in a corner or near the pen, so the birds are not forced to forage very far when weather conditions render them most vulnerable. A dripper in one of these pens with existing brush produces an almost impenetrable thicket, and a quail paradise is produced.

Because quail are highly adaptive creatures, our methods to help them along must also be adaptive. It is much like a diet—what works for some, fails for another. For every wildlife tool that works for us, many were tried that just didn't. Whatever you do try, implement it on a small scale first: it simply ends in frustration, discouragement and unnecessary expense when a large scale program is ineffective. Plus, small scale effort leaves room for subsequent projects to adapt to your specific needs. Otherwise, we hear echoes of that all-too-familiar phrase: "If I had it to do all over again..." I wish you the best of fortune with your endeavor to nurture a sustainable population of wild quail.

## AN INTRODUCTION TO OUTDOOR WEST TEXAS: A QUAIL OUTFITTER

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Outdoor West Texas is a privately owned Service Company dedicated to managing Hunting and Recreational Properties. "O.W.T.", as the company is frequently referred to, was created approximately 20 years ago, and grew out of a need to capitalize on an emerging revenue resource which today has become known as, "The Hunting Industry."

Currently, O.W.T. manages in excess of 20 individual ranches that comprise approximately 450,000 acres. The mainstay of O.W.T.'s responsibilities center around deer hunting and quail hunting. All leases with hunters are quality, "long term" programs, with absolutely no "day hunting" activities involved.

Outdoor West Texas provides a full service, turn key, package to ranchers and property managers. All contract services are customized to fit the exact needs of each individual property and its own management objectives. O.W.T.'s full service management package provides for, but is not limited to, the following:

1). Securing and maintaining quality and qualified hunters;

2). Providing, securing, and maintaining solid contract agreements between the hunter and the client with the advantage weighted on the side of the land owner / manager;

3). Working with the land owner / manager to establish property rules, and enforcing same;

4). Working with the land owner on an annual basis to survey game populations, and to establish recommended harvest objectives accordingly;

5). Working with the land owner / manager to establish and maintain habitat criterion;

6). Billing hunters for, and collecting all monies related to, hunting activities; **NOTE:** All checks are made payable to the land owner, sent directly to the land owner / manager or his designee, and deposited directly to their own proprietary depository account. At no time are checks made payable to Outdoor West Texas.

7). Handling all phone calls and communiqués with hunters;

8). Requiring and collect annual game logs to ensure that management objectives are met, and to ensure that all pertinent game laws and regulations are in compliance;

9). Scheduling and attending semi annual management meetings with land owners and/or managers;

10). Attending appropriate Seminars, Workshops, and Conferences related to land and game management in order to stay apprised of latest studies and findings, and communicating same back to O.W.T. clientele.

Outdoor West Texas provides these and other "customized" services as required by landowner / agent, and

charges for these comprehensive services on an all inclusive, pre established percentage of Gross Receipts. Historically, landowners make not less than they have when managing the properties themselves, but without the headaches associated with finding, maintaining, and managing hunters. More typically, our clients have found that they not only eliminate the associated headaches, but more

importantly they find that they receive more net – even SUBSTANTIALLY more net income by partnering with Outdoor West Texas. References are of course available upon request.

We at Outdoor West Texas stand ready to customize a program to fit your own particular needs, and to enter into a long and mutually beneficially relationship for all concerned.

## HUNTING AND QUAIL MANAGEMENT ON THE ROCKER b RANCH

JIM HURST, Wildlife Coordinator, Rocker b Ranch, Reagan and Irion Counties, Texas

*Abstract.* The Rocker b Ranch is located in Irion and Reagan counties 12 miles north of Barnhart, Texas. The ranch consists of 268 sections (173,000 acres). It is owned and operated by the Texas Scottish Rite Hospital for Children located in Dallas, Texas. The ranch is host to many wildlife species that include white-tailed deer, pronghorn antelope, mule deer, Rio Grande turkey, javelina, bobwhite and scaled quail.

### HISTORY

The Rocker b Ranch was originally founded in the 1870's as the Bar S Ranch. In 1954 the ranch was purchased by Senator William Blakely changing the name to the Rocker b Ranch. Senator Blakely donated the ranch to the Texas Scottish Rite Hospital for Children in 1964. The ranch continues to play a pivotal role in the day to day operations of the hospital.

### MANAGEMENT OF THE RESOURCES

The Rocker b has been managing for its wildlife populations and habitat for over the past 50 years. In the early years it was thought that chaining the mesquite was the proper method to be used. These methods while effective for the short term removal of mesquite proved to be ineffective and damaging to other plant species that supported the long range goals of the ranch. In more recent years the management of brush on the ranch has progressed to a more modern approach. Methods being used include mechanical, chemical and prescribed fires.

#### *Sample Brush Plan A:*

Year One = Grubbing and Raking  
Year Two = IPT Follow Up  
Year Three = Prescribed fires  
Year Four = IPT Follow up

#### *Sample Brush Plan B:*

Year One = Aerial Herbicide Application  
Year Two = IPT Follow-up  
Year Three = Removal and Raking  
Year Four = Prescribed fire

The ranch is currently trying to reach a brush canopy of 25 to 30 percent while converting the remainder to grassland with light brush cover.

The ranch is in year two of these programs and will be monitoring the results for the most economically feasible and effective method.

Managing our water resources is also a very important tool we use for our wildlife and livestock on the ranch. In our efforts we have constructed dirt tanks to collect run off from rainfall, we constructed dirt tanks to collect overflow water from windmills and electric pumps. We have also began building dirt tanks around abandoned oilfield water wells and put them back into production.

The ranch is currently using a cow calf operation as well as a stocker cattle operation to maximize the economic potential of the land while minimizing negative long term effects on the land.

The ranch currently is not involved in any supplemental programs for feeding of wildlife.

The Rocker b Ranch is host to an extensive hunting operation hosting on average 500 hunters per year with the majority being quail hunters. The quail hunts offered are as follows:

*Non Assisted Quail Hunt.* These hunts are charged on hunter/day basis and do not include any amenities or guides.

*Day Buggy Quail Hunt.* These hunts are charged on buggy/ day basis and include a guide, quail buggy and bird processing.

*All Inclusive Quail Hunt.* These hunts are charged on a hunter/ hunt basis and includes 2 nights lodging, 2 days hunting with guide and buggy, meals, airport transportation and bird processing.

The ranch does not provide dogs, alcohol, firearms, ammunition or license to its guests. All guests are required to read and sign a copy of the ranch rules and a release of liability and indemnity form.

We currently use the Dallas Safari Club Show and word of mouth for our marketing. We feel that a happy and satisfied hunter will return with several of his friends and an unsatisfied hunter could prevent countless numbers of hunters from visiting. Our goal is to treat every hunter with respect and to send them home with the feeling he has just met new friends and become part of the ranch family. Using this theory we have carried a 95 percent return hunter rate. We have hunters coming from 17 different states with 70 percent being resident Texas hunters.

I believe the future of quail hunting in west Texas is promising. More landowners are beginning to recognize the economic impact that quail hunting has in west Texas. More and more hunters are also realizing a true sportsman's paradise can be found out here.

West Texas is facing several issues that effect quail such as water, brush encroachment, land fragmentation and loss of habitat due to oil production. These issues are important to the success of quail in west Texas. All land

owners and land managers should educate ourselves to help combat these issues to preserve the little bird we have come to respect.

## **CONFESSIONS OF A BLUE QUAIL HUNTER**

DAN LAW, Life-long Quail Hunter, Lubbock, Texas

I was raised on a dairy farm in Alabama where all of my hunting involved squirrels and rabbits. Most of our hunting was “still hunting.” I can remember occasionally seeing a covey of bobwhites, but I always assumed hunting quail was only for rich people. During those years growing up I also had only one to three shells. Those were the days when the store owner would “break the box” for a customer.

I came to West Texas in 1955 and a Red Raider football teammate introduced me to blue quail. I had never heard of them! On my first hunt he let me sneak up on a covey we had seen, thinking I would get an excellent shot. To my surprise, those quail were disappearing into the next county! I have never been the same!

My life has been enriched by the fantastic experiences I’ve had hunting “blues” for many years in west Texas!

## **CIRCLE HUNTING FOR BLUE QUAIL IN WEST TEXAS**

CHARLES GAINES, Life-long Quail Hunter, Midland, Texas

Blue quail are a challenging bird to hunt. We began to use jeeps to hunt blues in the early 1950s. We would drive across the ranch until a covey was spotted or flushed. We would then pull up and stop short of the birds. We would get out and throw a Frisbee over the birds and blow a hawk call to cause the quail to hold. We would then converge on the birds on foot with dogs. The circle method was first realized in the early 1960's when a covey was discovered between the jeeps. We got out and surrounded the covey. After that, we began to surround the birds by design.

When circle hunting SAFETY IS PARAMOUNT. We usually use 6-8 people in 2-4 jeeps. Blaze orange is worn by all hunters to increase visibility. We drive until a covey is flushed, then pursue it in a U shape fan. We drive and stop just short of where the birds lit. We drop a person off and continue around until the circle is complete. All guns are kept unloaded until you leave the jeep. No loaded guns are allowed in the vehicles. When you leave the jeep, muzzles are pointed up. All birds must be 45 degrees or higher before a shot is taken. You never shoot across the circle or at birds on the ground within the circle. Once the birds are surrounded we work back and forth closing the circle with dogs working. The best shots are rarely taken because of safety. If a bird leaves the circle, is shot, and falls outside the circle it is flagged. A cap, a washer with flagging tape, or an arrow drawn in the sand have all been used to mark downed birds. No one leaves the circle to retrieve birds until the center is cleared. Leaving the circle could be dangerous if the other hunters are unaware that you are out there. Always keep the circle as uniform as possible.

Circle hunting is advantageous way to keep up with the running blues. We are careful to keep count of all birds taken and all wounded birds count against an individual hunters limit. Because this method is so productive, managers considering the circle hunt should be careful to keep hunters from over-hunting or over-harvesting quail. Hunters also have to be experienced and always err on the side of safety.

## MARCHING TO THE BEAT OF A DIFFERENT QUAIL

CAL HENDRICK, Quail Hunter, Odessa, TX

### WHY CHASE BLUE QUAIL ON FOOT?

West Texas quail hunters employ a variety of different methods to hunt desert quail including scaled quail (more commonly referred to in west Texas as blue quail). Although this paper could apply to bobwhites as well, it is geared toward desert quail. At any rate, various methods are utilized in hunting desert quail including the following: (1) circling the wagons (in this case, jeeps); (2) buggy chasing; (3) spotting and stalking; and (4) the old fashion walking method. Each hunting technique enjoys a certain following, and each one has its advantages.

I have tried each of the methods, and almost every permutation and combination of each, and I like them all. However, my favorite method of hunting quail is to locate a covey and then walk them down with my dogs and friends. For reasons that I cannot completely articulate, when it is man versus quail, it seems just and right.

If you have ever employed the walking method, or more accurately the "chasing method", you know very well that the quail often prevails. They can flush wild, or not flush at all. I have literally been out run by quail on too many occasions to count. The covey can take off sideways, straight out, behind you and right into another hunter. If a strong wind is involved, the covey can quickly gain altitude and reach extreme velocities. However, after a hard walk, I find pleasure in having spent time pitting my skills against a covey of blue quail.

I find many advantages to chasing quail on the ground. First, I prefer a shot presentation where my feet

are planted firmly on terra firma (solid ground). No matter which way a bird flushes, I am generally able to quickly enter into a shooting position to give myself a good shot at the departing bird. That is not true on some of the buggy hunts I have participated in.

When you are "on the ground", you have the ability to find everything from deer sheds, arrowheads, to gold coins (well, it happened once). If you are lucky enough to own flushing dogs, such as a pair of Labrador Retrievers, it is great fun watching the dogs pick out the scent and work the individual quail.

However, to be honest, I think I enjoy hunting quail on foot because of the sense of satisfaction you get when you return to the jeep. Your legs hurt; you are out of breath, and you're your shirt is wet with sweat. Perhaps it reminds me of football practice as a kid. For whatever reason, I find a sense of satisfaction and pleasure from competing against the quail one on one.

### GEAR

In my opinion, when chasing after quail, proper gear is essential. I will start from the bottom up, with a good pair of boots. My personal favorites are Russell PH ThornArmor, but there are many choices for footwear. If you have access to a Cabela's or Sportsman Warehouse, you can try on any number of boots. Both have excellent catalogs and websites. I prefer a solid leather boot with a good walking sole. Cowboy boots are out, because they are simply not comfortable enough for a full day of walking over rough terrain. Tennis shoes, although a good choice, are



susceptible to thorns, snakes and other problems. As a result, a full leather ankle boot presents the best choice to protect your foot from the various cacti you will encounter during a full day of walking.

The next important piece of gear is thorn resistant pants. I prefer a thick canvas pants with thorn protector I purchased from Tiemann's, a company no longer in business. Tiemann's still makes pants for prior customers, but unfortunately, they will not take new orders. However, I know various companies manufacture brush pants, and you can locate the brush pants in catalogs (or on the web) such as Cabela's, Kevin's, Stafford's, Dunns, Filson, etc. Most of the pants are a Levi type pants with cordura on the front and back, but sometimes the thorn resistance material is not strong enough for thorns I encounter.

One of the most important pieces of gear is an orange shirt and an orange vest. I cannot tell you how frustrating it is to hunt quail with someone wearing camouflage. You don't have to be invisible to hunt quail, and in fact, the exact opposite is true. You must be **visible!** With the number of catalogs currently available, as well as the internet, there is no reason not to locate a featherweight vented back, shooting pad shirt, in Hunter's Orange. Also, various manufacturers produce excellent orange hunting vests. My favorite is the vest manufactured by Texas Hunt Company ([www.texashuntco.com](http://www.texashuntco.com)) in Monahans, Texas. It offers everything a bird hunter needs to be successful in the field, as well as to increase visibility to other hunters. You can find similar orange vests and shirts in Berretta's, Kevin's Outdoor and Apparel, Cabela's, or Stafford's catalog, as well as other companies marketing bird hunting gear. An orange baseball cap is also highly recommended.

Two other critical items that should be part of every quail hunters gear are hearing protection and sunscreen. It seems like every year I encounter more and more days with sunshine and extreme heat while quail hunting. After spending too many days in the office, the sun is intense, and you should carry a good sunscreen in your hunting truck. More important, however, is hearing protection. I spent too many years shooting dove and quail without hearing protection, and I am now paying the price. I have severe hearing loss due to exposure to loud noise. There are many modern devices that offer both hearing enhancement and hearing protection. I strongly urge everyone to invest in top quality hearing enhancement and protection to avoid problems with your hearing later in life.

When it comes to guns, everyone is an expert. However, since I had to prepare this paper, I thought I would give you my advice. For most hunters, I would recommend a 12 gauge, semi-automatic shotgun, preferably with gas pistons to reduce felt recoil. My favorite is a Remington 1100 or 11-87. I recommend a high quality shell loaded to 1¼ ounce of 6 shot, maximum drams of powder, what is commonly referred to as a high velocity load. These shells are now approximately \$15.00 a box, but they are the most effective shell for hunting blue quail.

If you are lucky enough to own dogs, particularly Retrievers, I would switch to 7 ½ shot 1¼ ounce load, high velocity shell. I find the additional pellets are more effective in hitting the birds, and the dogs are more effective at finding the birds. Without a dog, 6 shot is the only shell you should use because of the toughness of blue quail. I have watched quail knocked out of the air, fall 90 feet to the ground, and get up and run a 9.1 100 yard dash into a rat's nest or some other cover. I have witnessed too many crippled birds disappear and

be lost. Thus, I refuse to recommend any load but a high velocity shell loaded with 6 shot.

Having said that, I recognize some folks are particularly skilled at shooting, and they are willing to give up extreme shots, and can effectively use a 20, 16 or 28 gauge shotgun. I often hunt with a buddy, Jeff Wemmer, and he uses a 20 gauge s/s Purdey. He is a very effective quail hunter. However, he limits his shots to those quail within range. So, I recognize other choices exist, but you have my recommendation.

### TECHNIQUES TO EMPLOY

This section is perhaps the most important part of this paper. In order to hunt blue quail on the ground, you must first locate blue quail. This is much easier said than done. In fact, I have heard many stories of hunters going out and spending all day in the field, and finding three or four coveys. I have hunted the same pasture the day before or the day after, and located twenty coveys. Perhaps I am just lucky, but I think my luck involves hunting habitat that generally holds birds.

If you are lucky enough to hunt on the same property each year, you know that you can find birds in the same general location each year. Certain habitats have food, cover, and shelter, and these areas hold a covey of quail year in and year out. The secret to life is finding these locations, that is, habitat that holds coveys every year. I recommend when trying to locate blue quail to compare the land to what a Bass fisherman looks for when trying to locate bass - - **structure**. I generally look for a certain type of structure. What do I mean by structure?

You need to look for topography that sticks out from the country around it because of unique features. For example, after a new pipeline is cut through a pasture an area in west Texas, you will generally find quail on

the fringe areas of the pipeline cut. The same is true with both new and old roads. Quail often congregate and use roads as travel corridors to reach feeding or loafing cover.

Likewise, any type of water structure generally holds quail nearby. I do not know if it is cause or effect, but I guarantee if you can find a water tank or pond, you generally can find a covey of quail in the vicinity. To locate old tanks, look for a heavy brush line around the tank. Tanks/ponds are generally located where water runs to a low spot, and creates an artificial or perhaps natural holding pond. Because of the water flow and accumulation, brush tends to be thicker in this area. You can generally find quail on the fringe area of this heavy cover which quail often use as loafing and roosting cover.

Also, never ignore tank batteries, old well locations, and oilfield structures. It is amazing the number of quail I have found by simply driving around a tank battery, and locating quail under the shade of a mesquite tree during the heat of the day. I have lost count of the number of coveys I have found at or near well locations and old tank batteries.

Likewise, old houses and cattle pens tend to centralize coveys of quail. If you are driving in an area, and locate a set of cattle pens, or an old homestead, check out the area closely for quail activity. Many times there is also a water source nearby. Trees and brush lines are often created by these structures. Quail use the structures as loafing areas.

Another effective technique is to check areas where there has been brush clearing. I have found that in pastures with recent excavation or dozing work, for the purpose of brush clearing, simply look around the remaining heavy brush that maintains in the area, or on the fringe areas, and hunt those brush lines. You will generally find quail traveling from the

open area to feed back to the brush line and/or loafing at or near the brush line. In the middle of the day, quail can generally be found at or in the brush line.

I generally use a jeep in order to locate and travel to the specific areas listed above. You can use a pickup truck, a 4-wheeler, or any other 2 or 4-wheel vehicle for that matter. The key is to locate areas containing habitat quail utilize.

Once a covey is located, the next issue to address is the best method to hunt the covey. In a perfect world, you should approach the covey with the wind in your face. I make this recommendation based on a multitude of factors. First, when the birds flush, I want them to flush into the wind, and not with the wind. If you have never watched a covey sail a half mile away, you have missed a real treat. Trust me, walk into the wind when you begin to hunt the covey.

Another important reason is to allow your dogs to catch scent of the birds, so you have some warning where the birds are currently located. You often see the birds running ahead, but not always. Failure to follow Rule No. 1 will lead you to great frustration.

Second, I believe a critical factor in effectively hunting a covey is to "bust" the covey as soon as possible. Although I rely on no scientific evidence, I have chased a covey of quail for over a long distance, and I end up chasing one or two birds. Where did all the other birds go? I sometimes never find any of the birds. However, if I am able to "bust" a covey fairly quickly, I have found that the birds stick better, travel a shorter distance, and they are easier to hunt.

My third rule for hunting blue quail is that when you reach the final group of birds, and/or they finally flush or you lose the covey, you then need to zigzag back to the spot where the birds were originally located. It is amazing

how many birds you walk past while chasing a covey. I would not have believed it to be true, until I purchased bird dogs, and began to flush a number of birds that either had veered off or "stuck" behind me. I have found birds sitting in prickly pear, Tobosa Grass, and other types of cover. Once, however, in flat, open ground, a quail hid from me. I still cannot figure out how I did not see the bird, but as touched the head of my Pointer, to release him from the point, a bird flushed from under my feet. Looking back on that incident, I have yet to figure out how I failed to see a bird sitting in the open dirt. It seems impossible, but it happened.

Fourth, if at all possible, always hunt with the sun at your back. This becomes an issue in the early morning and late evening hours. There is nothing more frustrating than flushing birds into a direct sun, and being unable to take a shot. Thus, as you look for birds, never forget the direction of the wind or the position of the sun.

Fifth, if you are near a property line, do not push birds over your neighbor's fence. I cannot tell you how many times I have located birds at or near a perimeter fence. Always cut in front of the birds, and force them back onto your hunting area. This perhaps may violate Rule 1 and 4, but unless you want to push a covey over the fence, be very careful about hunting birds next to perimeter fencing. This is also sometimes true with cross fencing. Birds tend to love barbed wire fences, and they are often on one side, and I am on the other. Thus, try to keep this in mind as you search for coveys.

My last rule is never to give up on a covey. I have also walked a long distance, and apparently lost the covey, and on my way back to the truck, I relocate the group. Further, I have often walked into second and even third coveys on the same walk. I don't know why I tend to walk into multiple coveys, although it probably has something to

do with the quality of the habitat. Regardless, always carry plenty of shells and water, as your walk may often find a different covey on the same walk.

## **SAFETY FIRST**

Before beginning each day, I strongly recommend you have a tailgate meeting and briefly review each hunter's responsibility with regard to safety in the field. I should not have to remind anyone of the Dick Cheney incident, and how poorly it was received by the national media. Although hunting is far safer than playing football, for example, the results of a shotgun blast to any part of the body is not healthy, and can be deadly. As a result, if you are with a new group, or your old buddies, it is always recommended to have a short safety meeting to talk before the day begins.

Obviously, if you have kids younger than 17, I strongly urge every parent to enroll their child in a hunter safety course. Take the course with the kids and have fun together. Basic firearm safety rules should be observed by all hunters. As John Wayne once said, "There is no excuse for negligence".

Firearm safety is the primary responsibility of every hunter in the field. When hunting quail, hunters can sometimes get separated. Although it is urged that each hunter stay in a direct line with the other hunters, which allows safe shooting to the front, it is not always possible. Therefore, you must be careful when you are in the field. Some lessons should be reviewed before each hunting session including the following:

**1. Always treat all guns as they are loaded.** When hunting blue quail, my gun has shells in the magazine (with the plug out), but no shell in the chamber. The safety is on, and your finger should

be kept away from the trigger. However, you should assume you and all your buddies' guns are loaded. Do not take any person's word about the status of a weapon. Assume it is loaded, and always point the muzzle in a safe direction. Never ever point a gun at a person or any object you do not want to shoot. Safety first.

**2. Use your gun safety.** I know of some hunters who are so safe they do not load their shotgun at all until a covey is ready to be flushed. With blue quail, you never know when you might locate a covey, and that rule seems to be difficult to enforce in the field. As a result, because most gun safeties are extremely reliable, always keep your guns on safe. When you are ready to shoot, eject a shell from the magazine to the chamber, but keep the gun of safety until you are ready to fire. Keep your finger away from the trigger until you are prepared to shoot. Failure to do so will result in an immediate trip to the hospital, and at the minimum, a loss of flesh, and at the most, a tragic accident. Safety cannot be ignored.

**3. Alcohol and loaded weapons do not mix.** Always save your drinking until after the day's hunt is over. If any hunter in your party ever becomes intoxicated, that individual should be disarmed immediately, and his day should be over.

**4. Know where you are shooting and what you are shooting at.** Generally in west Texas, you have miles and miles of open range. However, there can sometimes be mobile homes, trailers, pumpers and others out in a field. Always be sure you have acquired a visible shooting lane and identified target before shooting.

As mentioned earlier, you will often find quail at or around a barbed wire fence. I strongly urge you to unload the chamber, put the gun down,

and climb over the fence. This, of course, is true with any obstacle.

There are several other rules that should be mentioned. First, be sure you are using the correct ammunition. Although you generally cannot shoot a 12 gauge in a 20 gauge, the same is not true for a 16 gauge shell. A word of warning should be appropriate.

The NRA has 10 Rules of Firearm Safety, which should always be followed. There is no way to warn you of every possible danger in the field, but you cannot ignore snakes, spiders, and potentially rabid animals, and a host of other animal problems. When walking, you will also notice there are holes in the ground, sticks laying every which direction, and numerous other obstacles that could cause a fall. As long as the gun is unloaded, pointed in a safe direction and the safety is on, even if you fall, you should be fine. However,

you must employ all safety rules in order to have a safe and happy hunt.

## **CONCLUSION**

It does not matter which way you prefer hunting quail, as long as you are out in the field hunting. I recommend trying each and every method, and determining which method provides the most enjoyment for you. Obviously, if you have a young group of guys, who are athletic, you may very well enjoy the walking method I have described above.

However, if you are hunting with a grandfather, perhaps a jeep or different method might be more appropriate. Whichever way you choose to hunt, go out and enjoy opening weekend this year. As a reminder, quail season opens statewide, in all counties, on October 25, 2008. The season ends February 22, 2009. Best of luck and good hunting.

## CONTINUING EDUCATION AND ASSISTANCE FOR QUAIL MANAGERS

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*Abstract.* Most wildlife managers and ranchers are sensitive to the fact that quail habitats have changed over the last 20 years, but relatively few have pondered the fact that the “habits” and educational needs of ranchers and wildlife managers have changed just as dramatically. The purpose of this paper is to expose ranchers and wildlife managers to the best of the new and the best of the old sources of information in a framework that fits the times and helps them to continue to build their educational library, and easily locate sources of assistance.

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### INTRODUCTION

*I not only use all the brains that I have, but all that I can borrow.*” — Woodrow Wilson

In a profession fueled heavily by experiential knowledge, ranchers and wildlife managers are intimately familiar with the adage, “Experience is a strict teacher – she gives the test first and the lesson afterwards”. While there are many sources of information available for various tasks and management strategies, there is no textbook for ranching, and many times the difficulty of tracking down appropriate information outweighs its usefulness. Many of the strategies employed by today’s producers are the result of an evolution of ideas and experience stemming from ancestors, and passed down through the generations through Grandpa’s stories and musings in small-town coffee shops.

### TECHNICAL, FINANCIAL AND EDUCATIONAL RESOURCES FOR LANDOWNERS

Fortunately, as land managers have become more sophisticated and knowledgeable in their stewardship ventures, conservation organizations

and agencies have adapted and matured as well. There is a wealth of information, technical, and financial assistance available to land managers from a wide variety of agencies and organizations with a mission to educate and assist landowners and conserve our most precious natural resources. As stated earlier, however, the challenge to landowners is finding the programs and forms of assistance that meet their specific needs most appropriately. In most cases, the Internet provides the most up-to-date and easily accessible information on natural resource education and assistance programs. See Table 1 for a listing of programs and sources of information specifically related to Texas quail management.

The more common sources of information for quail managers in Texas, as outlined by Rollins (2007), fall into five categories: agencies, universities, foundations, non-governmental conservation organizations, and private industry (including consultants). Additionally, local landowners who are successful quail managers must not be overlooked as sources of information.

State and Federal agencies with programs that provide technical and financial assistance to landowners in managing quail and other wildlife habitats include the Texas Parks & Wildlife Department, Oklahoma Department of Wildlife Conservation,

Oklahoma Conservation Commission, The Natural Resources Conservation Service, Farm Service Agency, and US Fish and Wildlife Service (Table 1).

Extension programs initiated through the Texas A&M University System are great sources of education and technology transfer to landowners. Some Texas Extension events focused on quail conservation include a series of 1-day workshops called "Quail Appreciation Days", demonstration efforts like the Texas Quail Index, regional symposia in north and south Texas, and the Bobwhite Brigade Wildlife Leadership Camps (Rollins et al. 2000). For more information about these events, see <http://teamquail.tamu.edu>.

Additionally, the Texas Wildlife Association (TWA) and other not-for-profit organizations offer a wide range of programs for landowners, many times in partnership with state agencies. Most notably, TWA partners with Texas AgriLife Extension Service every other year to deploy the intensive, year-long QuailMasters program.

#### **CONTINUING EDUCATION FOR QUAIL MANAGERS: A TEXAS EXAMPLE**

*QuailMasters: Understanding the Quail Equation - Quail-passionate land stewards participated in this intensive treatise of the art and science behind quail management in Texas in 2005 and 2007. The format of the program, a series of 4 workshops spanning 7 months, allows facilitators to challenge students with in-depth homework assignments, quizzes, and special projects. Participants, mostly landowners and managers from across the state, toured some of the top bobwhite properties in Texas (or by extension anywhere!). Rick Snipes showed off his "Augusta National of Quail Hunting". Snipes' ranch in the sandhills of Stonewall County epitomizes the concept of "usable*

*space" for quail. Other ranches toured include the Hailey Ranch in Fisher County, the S Ranch near San Angelo, the historic King Ranch, the Wagner Ranch in Duval County, the Mesa Vista and Bar-P Ranches near Pampa, and many other notable quail properties across the state. Students use various indexes (call counts, dummy nests) to learn techniques for monitoring quail abundance and habitat conditions on their own properties. QuailMasters students learn to identify 50 plants important for quail in their region of Texas. Each student builds a personal plant collection containing scanned specimens, photographs, and seeds as appropriate. Business management skills that addressed liability, tax implications, lease management, and cattle-quail interactions were also covered. Students were challenged to refine their critical thinking skills and abilities to "improvise, adapt, and overcome" as they wound their way through various quail conundrums. Some comments from participants include the following:*

*"Quail Masters allowed me to expand and review my quail and habitat knowledge. QuailMasters created an opportunity to grow and strengthen my networks with other quail passionate land stewards and private and agency professionals. I would highly recommend QuailMasters to anyone who considers quail an important part of their way of life or way of making a living."*

- Dr. Bill Eikenhorst, DVM,  
Brenham (QM 2005)

*"The Quail Masters program was an excellent educational experience. It was more hands-on than traditional field days. The smaller "class" size, along with the class schedule provided students the opportunity to tour ranches where various management techniques are implemented; then take that*

*knowledge home and apply it to their ranch."*

- Rory Burroughs,  
Comprehensive Land Management,  
Rotan (QM 2005)

*"My many years of experience piled onto an education from Texas A&M University holds no candle to the experience I have enjoyed and endured in QM 2005."*

- Mike Petter, Resource and  
Land Management, Pleasanton (QM  
2005)

*"You are never too old or too educated to learn more about your area of study. QuailMasters refreshed and renewed my knowledge of quail management principles and practices that hopefully I will be able to apply on the South Texas property I manage".*

- Marc Bartoskewitz, Biologist –  
King Ranch, Inc., Kingsville (QM  
2005)

*"The student will become a "covey" member, thus developing new contacts and friendships that can last for a lifetime—whether it is sharing information or sharing hunting trips. I know I would welcome my new friends to hunt with me [any day]."*

- John Fambrough, Landowner,  
New Braunfels (QM 2007)

*"You will be glad you took the course. I am, and I don't even own a ranch in quail country. I just love to hunt quail and watch my dogs work. The QuailMasters course is worth the money."*

- Joe Colbert, Landowner,  
Bertram (QM 2007)

If you are interested in participating in QuailMasters 2009, please contact Jenny Sanders (jsanders@twa-mail.org 361-279-7287)

or Dale Rollins (d-rollins@tamu.edu 325-653-4576).

## CONCLUSION

Land and wildlife management is an intricate and complicated task. While experiential knowledge is a necessity, reliance solely on our own mistakes to guide our actions will inevitably lead us down unnecessary roads of frustration and regret. In the age of information transfer that we live in, we would be remiss if we did not take advantage of the wealth of knowledge available from other landowners, agency personnel, non-government organizations, and university researchers. Hopefully the attached table will give you a starting point for finding your personal 'honey-holes' of Internet information. However, if you do not have access to the information super-highway, use Table 1 to look up phone numbers in your local phone book. Most of the agencies and organizations listed have 1-800 numbers that can direct you to information help-desks where you can request printed information, and directions and contact information for local offices and personnel.

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Table 1. Landowner resources for education, technical, and financial assistance for quail management in Texas and Oklahoma.

		Programs/Services of Interest	Entity	Link
Agencies	State	<b>Landowner Incentive Program:</b> Provides financial and technical assistance to landowners to help conserve rare species in support of the newly drafted <a href="#">Texas State Wildlife Plan</a> . <b>Private Lands &amp; Public Hunting:</b> Technical & financial assistance to landowners through contact with local biologists.	Texas Parks & Wildlife Department	<b>Biologists, Resources &amp; Assistance:</b> <a href="http://www.tpwd.state.tx.us/landwater/">http://www.tpwd.state.tx.us/landwater/</a> <b>Landowner Workshops &amp; Field Days</b> <a href="http://www.tpwd.state.tx.us/newsmedia/calendar/?calpage=landowner">http://www.tpwd.state.tx.us/newsmedia/calendar/?calpage=landowner</a>
		<b>County Extension Agents</b> (Technical Asst. & Education): <a href="http://county-tx.tamu.edu/">http://county-tx.tamu.edu/</a> <b>Bookstore</b> (Extension Publications & Natural Resource Books)	Texas Cooperative Extension	<a href="http://texnat.tamu.edu/">http://texnat.tamu.edu/</a> <a href="http://teamquail.tamu.edu/">http://teamquail.tamu.edu/</a> <a href="http://tcebookstore.org/">http://tcebookstore.org/</a>
		<b>Large-scale, long-term demonstration to evaluate quail abundance.</b> Goal is to develop practical management strategies to optimize quail populations. Opportunities for private landowners to participate in program to benefit their own properties as well as landscape-level populations.	Texas Quail Index	<a href="http://teamquail.tamu.edu">http://teamquail.tamu.edu</a>
		<b>Best Management Practices</b> Technical and financial assistance for improving water quality, etc.	Soil & Water Conservation Districts	<a href="http://www.tsswcb.state.tx.us/swcds.html">http://www.tsswcb.state.tx.us/swcds.html</a>

Table 1. Continued.

Agencies	Federal	<b>Partners for Fish &amp; Wildlife Program:</b> Provides technical & financial assistance for the restoration & enhancement of fish & wildlife habitat on private lands. <b>Cooperative Conservation Initiative:</b> Financial assistance to restore natural resources & establish or expand wildlife habitat. <b>Private Stewardship Program Grants:</b> Technical & financial assistance to provide benefits to species listed, proposed, or candidates for Endangered Species List	US Fish & Wildlife Service	<a href="http://www.fws.gov/">http://www.fws.gov/</a>  <b>Texas Partners Information:</b> <a href="http://ecos.fws.gov/docs/partners/web/pdf/481.pdf">http://ecos.fws.gov/docs/partners/web/pdf/481.pdf</a>
		<b>Environmental Quality Incentive Program (EQIP):</b> Technical & financial assistance for farmers & ranchers for conservation of soil, water, & related natural resources including wildlife.	Natural Resources Conservation Service	<b>Local Service Centers</b> <a href="http://offices.sc.egov.usda.gov/locator/app">http://offices.sc.egov.usda.gov/locator/app</a>  <b>NRCS Landowner Assistance Programs</b> <a href="http://www.nrcs.usda.gov/programs/">http://www.nrcs.usda.gov/programs/</a>
		<b>Conservation Reserve Program:</b> Technical & financial assistance to reduce soil erosion, improve water quality & wildlife habitat. <b>Grassland Reserve Program</b> (Administered by FSA & NRCS): Purchase of development rights to prevent conversion of productive grazing or haying operation to other purposes.	Farm Service Agency	<a href="http://www.fsa.usda.gov/">http://www.fsa.usda.gov/</a>

Table 1. Continued.

<b>Non-government Organizations</b>	Focus on Education, Advocacy & Technical Assistance Internet Resources & Technical Assistance Focus on Education, Advocacy & Technical Assistance	Excellent plant image database for reference in inventorying plants on your property	Noble Foundation	<a href="http://www.noble.org">http://www.noble.org</a>
		Numerous educational program focused on quail and other wildlife listed here	Texas Wildlife Association	<a href="http://www.texas-wildlife.org">http://www.texas-wildlife.org</a>
		<b>Audubon Texas Quail Initiative:</b> Focus on restoring mixed grassland habitat.	Audubon Texas	<a href="http://www.tx.audubon.org">http://www.tx.audubon.org</a>
		Focus on Education, Advocacy & Technical Assistance	Quail Forever	<a href="http://www.quailforever.org/">http://www.quailforever.org/</a>
		Focus on Education, Advocacy & Technical Assistance	Quail Unlimited	<a href="http://www.qu.org/">http://www.qu.org/</a>
		Focus on Education, Advocacy & Technical Assistance	The Nature Conservancy	<a href="http://www.nature.org/">http://www.nature.org/</a>

## ON THE HORIZON – EMERGING ISSUES IN QUAIL MANAGEMENT

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*Abstract.* Tremendous effort on the part of researchers and educators has resulted in significant gain in raising awareness among landowners, land managers, and wildlife enthusiasts regarding factors that impact quail populations. These same landowners, land managers, and wildlife enthusiasts have applied this awareness often with the aid of federal and state incentives in a hands-on manner that has restored and nurtured habitat favorable to quail. Yet, quail populations continue to disappoint even in “good years” and on properties benefiting from intensive, exemplary management.

What's missing? What are we missing? What are the emerging issues in quail management looming on the horizon? Below is a broad outline of informal responses compiled from quail experts and quail managers. What may appear at first like a laundry list of factors is in deed a sincere inquiry in leaving no stone unturned when it comes to understanding the plethora of factors that either favorably or negatively impact quail populations and quail densities.

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- I. Energy Development
  - a. Wind Farms
    - i. Impact of fragmentation resulting from road and turbine construction
    - ii. Impact of vertical structures
  - b. Oil & Gas Production
- II. Reliable Survey Methods
  - a. Relative Abundance – i.e. TQI
  - b. Absolute Abundance – i.e. Density Surveys/Helicopter Use
- III. Management Practices
  - a. Grazing Practices
    - i. Overstocking
    - ii. Understocking
  - b. Impact of Intensive Management Practices
    - i. Feeding
    - ii. Watering systems
  - c. Restocking effects – i.e. SQ in eastern counties (Stonewall)
  - d. Role of supplemental protein feed
- IV. Climate Change
  - a. Impact on Breeding Seasons & Production
  - b. Impact on Viability
  - c. Impact on Habitat
  - d. Role of Spring Precipitation vs Fall/Winter Precipitation

- V. Disease
  - a. Climate Change Impact
  - b. West Nile/avian cholera
  - c. Parasites
- VI. Nutrition
  - a. Possible impact of nutrition decline due to loss or change in food sources on population
  - b. Role of supplemental protein feed & other high quality feed
- VII. Habitat Loss
  - a. Biofuels
    - i. Impact of increasing use of ag lands for monoculture plantings
  - b. Impacts of invasive exotic grasses
  - c. Fragmentation
- VIII. Hunting Pressure
  - a. Interface between hunting pressure and viable spring population density; how to manage
  - b. Impacts of steel shot on wounding loss
- IX. Predator Impact
- X. Human Factor – Is the message really reaching a critical mass?
  - a. The “RA” factor – to be defined
    - i. Ambivalence
    - ii. Rural vs Urban competition for resources
    - iii. Stewardship & Sustainability Science

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## POSTER ABSTRACTS

### BOBWHITE RESPONSE TO LARGE-SCALE WILDFIRES IN THE TEXAS PANHANDLE: A GIS-BASED ANALYSIS

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*Abstract.* The use of geospatial information systems (GIS) has enabled precise analysis of natural phenomena in relation to landform and temporal data. GIS software (ArcView 9.2, ESRI, Redlands, CA) was used to evaluate habitat occupancy by northern bobwhites (*Colinus virginianus*) for wildfire-burned areas in the panhandle of Texas. Specifically, we examined how far into the burned area quail penetrated and their relative abundance for 2 years post-fire. Year one (2006) showed that quail had a clear preference for the unburned areas when compared to burned areas. When quail did penetrate into the burned area, there appeared to be no discernable pattern. Year 2 (2007) was more complex with some sites having greater use of the burned area while other burned plots still had no quail present. This variation is believed to be a function of different fire intensities and soil texture.

## **A CASE STUDY FOR SCALED QUAIL DIETS IN THE PERMIAN BASIN OF TEXAS**

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*Abstract:* During the 2007-2008 hunting season, crop contents were collected from blue quail harvested on a ranch in northern Upton County. The habitat was primarily upland mesquite and tarbush flats. Birds were collected in a non-scientific manner during recreational hunting. Hunts were conducted in the morning hours during November and December and during the afternoon in January and February. Post-harvest crops were collected and the contents saved and catalogued for each individual bird. The seeds were sorted by species. All vegetative matter and insects were lumped together. Twenty-five unique plant species' seeds were identified. Some of the most important seeds are included below. Not all seeds were identified to the species level. Field guides and manuals could not be located that included all seeds.

While these results are not the product of a rigorous scientific design, some key observations can be made. Diets changed as the season progressed. We would conjecture that these changes are based primarily on availability and not the product of selective foraging. There was an obvious absence of grass seeds. While it is known that most grass seeds are less palatable to quail, those that produce a hard, slick, seed coat are readily consumed. Panic grasses, bristlegrass and Johnson grass were all present on the ranch but not found in crops. Again this is likely a timing issue, as these plants seed in the summer and do not seem to be a part of the fall/winter diet.

## **THE EFFECTS OF HIGH TEMPERATURES ON NORTHERN BOBWHITE AND SCALED QUAIL DEVELOPMENT DURING THE PRE-INCUBATION PERIOD**

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*Abstract.* Northern bobwhite (*Colinus virginianus*) populations are declining at approximately 3% per year. The cause of the decline has been studied extensively on adult bobwhite, yet no research has been conducted on the developmental stage. I hypothesize that exposure of bobwhite eggs to high nest temperatures ( $>39^{\circ}\text{C}$ ) during the pre-incubation period may alter or hinder embryonic development and affect the timing of hatch. I propose to expose bobwhite and scaled quail (*Callipepla squamata*; a desert species) eggs to simulated-nest conditions and to projected global warming conditions to determine the contribution of the developmental stage to the bobwhite decline.



## A MULTI-SCALE ANALYSIS OF MONTEZUMA QUAIL HABITAT IN THE DAVIS MOUNTAINS OF TEXAS

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**Abstract.** Montezuma quail (*Cyrtonyx montezumae*) are one of the least researched game species in North America, and are the only game bird in Texas with a closed hunting season. Little information is available on habitat requirements of Montezuma quail; therefore we initiated a study to identify macro and micro-habitat characteristics for Montezuma quail in Trans-Pecos, Texas. Specifically, our goals were to: 1) quantify the habitat use of Montezuma quail at a localized and landscape scale, 2) produce a model that describes and predicts Montezuma quail occurrence in the Davis Mountains, and 3) gain an understanding of the management needs for Montezuma quail. We recorded all encounters (flushes, sightings, radiolocations, and incidental) with Montezuma quail from December of 2004 through August of 2006 ( $n = 75$ ) for analysis at a landscape level. From December 2005 through August 2006, locations were found for localized analysis ( $n = 20$ ). Localized analysis was conducted by use of a paired plot design modeled after that of Bristow and Ockenfels (2002). Montezuma quail exhibited the highest preference for woodland-forested areas with herbaceous screening cover >10-25 cm in height, an elevation of 1,738 to 1,838 m, a slope of 0 to 9%, and a Normalized Differential Vegetation Index (NDVI) value of 0.4677 to 0.5474. Based on our analysis, it appears that the Davis Mountain Preserve has large areas of contiguous habitat suitable for Montezuma quail. Our results differ from other published studies because of the homogeneity of suitable habitats for Montezuma quail.

## **OCCUPANCY MODELING AS A METHOD FOR MONITORING MONTEZUMA QUAIL POPULATIONS IN WESTERN TEXAS**

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*Abstract:* Little information currently exists regarding the life history and ecology of Montezuma quail in Texas. The secretive nature and cryptic plumage of this species makes obtaining basic ecological information difficult. Developing an effective population monitoring program for Montezuma quail is a challenge because the technique must be practical for surveying vast landscapes and provide reliable population trends while taking into account the quail's low detectability. We propose to use a presence-absence approach to estimate occupancy rate, detection probability, and abundance of Montezuma quail. We also will quantify vegetation type, elevation, aspect, slope, and food-plant density at each monitoring site to develop resource-selection functions for the species. Research will be conducted on Elephant Mountain Wildlife Management Area (Brewster County) and Davis Mountains Preserve (Fort Davis County) during July–August 2007 and 2008. Thirty monitoring sites will be surveyed 5 times per season with the following data collected: time of day, temperature, humidity, number of calling individuals, and total number of calls. A playback recording of a male buzz call will be played for a duration of 10 minutes to detect presence. Our first year results indicate high occupancy rates at both Elephant Mountain Wildlife Management Area (98–100%) and the Davis Mountains Preserve (94–100%). As expected, probability of detecting Montezuma quail during surveys was low on both sites (30–53%). These results imply that surveys for Montezuma quail have to be repeated at least 3 times in order to ensure detection of the species given it is present. This study will provide the necessary data to assess the current status of Montezuma quail, monitor population trends, and guide conservation efforts.

## **SURVIVAL, PRODUCTIVITY, AND STRUCTURE OF GAMBEL'S QUAIL POPULATIONS IN THE CHIHUAHUAN DESERT, TEXAS**

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*Abstract:* Although well-known and investigated in Arizona, where their populations are highest, Gambel's quail have received less attention along their eastern distribution. This is especially true of Gambel's quail in the state of Texas. In efforts to establish baseline information to facilitate management of Gambel's quail in Texas, we initiated a study to (1) examine the composition of the population, (2) compare sampling techniques for determining the composition of the population, (3) estimate survival rates, and provide original descriptive data on demographic characteristics (i.e., sex and age ratios, survival rates, causes of mortality) of Gambel's quail in the Chihuahuan Desert of Texas. Our study was conducted on 3 private ranches in Hudspeth County, which represented 3 independent populations. Gambel's quail were captured, banded, radiotagged, and released. Additionally we harvested 222 Gambel's quail from areas surrounding our study site. We captured 359 Gambel's quail; 235 individuals came from the upland area and 124 from the river study area. Sex ratios were approximately equal, whereas age ratios (an index to productivity) varied from 1-2 juveniles/adult. Annual survival rates did not differ between years and did not differ among study sites and ranged from 23 to 42%. Avian and mammalian predators were attributed to 23 and 52% of known mortalities respectively. This data will provide resource managers necessary information on Gambel's quail populations to successfully manage their populations.

## **HABITAT USE AND SPATIAL MOVEMENTS OF GAMBEL'S QUAIL IN THE CHIHUAHUAN DESERT, TEXAS**

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*Abstract:* Gambel's quail have the potential to be an important economic gamebird in Texas. However, no scientific information exists about the Gambel's quail in Texas. We initiated a study using radiotelemetry to describe the ranges and habitat use of Gambel's quail in the Chihuahuan Desert region of west Texas. This information will assist in concentrating management efforts to target specific habitats of Gambel's quail. Gambel's quail were captured, banded, radiotagged, and released on 2 study sites in far west Texas. Using a GIS (geographic information system) we estimated their range size and evaluated their affinity toward specific habitats. Ranges of Gambel's quail on the upland study area ranged from 25 to 393 acres. Ranges of Gambel's quail on the river study area ranged from 10 to 137 acres. From 385 telemetry locations among 24 individuals, Gambel's quail used riparian zones 84% of the time on the upland study area. From 426 locations among 24 individuals, Gambel's quail selected native riparian zones 66% of the time and salt cedar riparian zones 31% of the time on the river study area. Average ranges and core areas were greater from the upland study area, nearly twice that of the river area. The diversity of vegetation provided a wider variety of food. Riparian zones are essential components of Gambel's quail habitat in Texas. Managers should ensure that riparian habitats are conserved for Gambel's quail as they provide thermal and predatory protection, roosting cover, and numerous woody seeds for food.

## STATUS, DISTRIBUTION, AND PRINCIPAL FOODS OF GAMBEL'S QUAIL IN TRANS-PECOS, TEXAS

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**Abstract.** Aside from a few unpublished documents, virtually no data exists regarding Gambel's quail (*Callipepla gambelii*) in Texas. Published information on the distribution of Gambel's quail in Texas is ambiguous and food habits are unknown. We initiated this study in order to assess distribution and status, and to determine the principal foods of Gambel's quail in Texas. Distribution occurs from El Paso County southeast to Brewster County below 1,350 m within the Rio Grande valley and intermountain basins along low elevation drainages supporting alluvial plant associations. Small sporadic populations also occur along major drainages on the east and west sides of the Beach and Sierra Diablo Mountains in Hudspeth and Culberson counties, north to Dell City, Texas. Food habits of 392 Gambel's quail were determined for a 24-month period in 2002 to 2004. Twenty foods constituted 91.1% of the volume of all items consumed. These were: seeds of *Salsola kali*, *Chilopsis linearis*, *Descurania pinnata*, *Verbesina enceloides*, *Mentzelia multiflora*, *Setaria leucopila*, *Lepidium virginicum*, *Prosopis glandulosa*, *Acacia constricta*, *Acacia greggii*, *Lupinus* spp., *Ambrosia* spp., *Oligomeris lineofolia*, and *Lesquerella* spp.; fruits of *Lycium berlandieri*, *Rhus microphylla*, *Condalia warnockii*, and *Celtis reticulata*; green vegetation; and arthropods. Forb seeds were the most consumed food type followed by fruits of woody perennials, seeds of woody perennials, green vegetation, animal material, and grass seeds. Plant species that provided food for Gambel's quail also provided critical escape, loafing, and roosting cover. Promoting or protecting existing woody cover is critical to maintaining Gambel's quail habitat. Native brush removal should be weighed against loss of habitat and possible reduction in quail numbers.

## **A PREDICTIVE MODEL TO DETERMINE OCCURRENCE OF GAMBEL'S QUAIL IN TRANS-PECOS, TEXAS**

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*Abstract:* Gambel's quail are a common quail species in southwestern states of the United States and the northwestern states of Mexico. In Texas, this species occurs exclusively in the Trans-Pecos region. Gambel's quail are a game bird with a season that extends from mid-fall to mid-winter. Gambel's quail are underutilized and could become an important game bird and source of income for ranchers in the Chihuahuan Desert region of Texas. Salt cedar (*Tamarisk* spp.), introduced from Asia for ornamental and erosion purposes, is invasive in the western part of the Rio Grande corridor and occurs throughout the distribution of Gambel's quail in Texas. Knowing this, the objectives of this study were to: (1) delineate salt cedar and native riparian habitats along the Rio Grande corridor in the Trans-Pecos; (2) evaluate those habitats based on the known distribution of Gambel's quail in the Trans-Pecos; and (3) estimate the amount of suitable habitat for Gambel's quail in Trans-Pecos, Texas. Although dominant along the Rio Grande, native riparian vegetation was more prevalent than salt cedar communities when combining primary creeks in all counties. Brewster County was the area with a higher percentage of salt cedar (21.2%) vs. native riparian vegetation (78.8%). The largest extension of salt cedar occurred in Presidio County with an extension of 25 mile<sup>2</sup> but this only represented 12.7% of our analyzed area. Hudspeth County had an occurrence of salt cedar of 11.2 mile<sup>2</sup> representing 6.8% of the estimated riparian area of the Rio Grande corridor in this county. The amount of area associated with urban area and agricultural fields in El Paso County was 350 mile<sup>2</sup>. Although the ecological effects of salt cedar within the distribution of Gambel's quail habitat are unknown, the diversity of salt cedar stands (e.g., monoculture) is much less to the food diversity provided by native riparian vegetation. Resource managers should prioritize efforts to eliminate salt cedar and restore native riparian habitats.

## **A COMPARISON BETWEEN DISTANCE SAMPLING AND STRIP TRANSECTS FOR ESTIMATING GAMBEL'S QUAIL IN TEXAS**

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*Abstract:* Gambel's quail are a common quail species in southwestern United States and northwestern Mexico. In Texas, Gambel's quail occur in the Trans-Pecos region. Few studies have investigated Gambel's quail ecology and no studies have monitored Gambel's quail trends in Texas. No survey protocols exist for estimating density or trends of Gambel's quail. The objectives of our study were to: (1) estimate Gambel's quail density using line transect distance method and the strip transect method; (2) determine population density by vegetation classes. Gambel's quail densities estimated with the line transect distance method for Lasca road ( $D = 217 \text{ bird/mile}^2$ ) and the River site ( $D = 329 \text{ bird/mile}^2$ ) were similar to densities estimated with the strip transect method ( $D = 293 \text{ bird/mile}^2$  and  $D = 194 \text{ bird/mile}^2$ ). Gambel's quail densities estimated for introduced riparian habitat ( $D = 339 \text{ bird/mile}^2$ ) were also similar to densities estimated for native riparian habitat ( $D = 720 \text{ bird/mile}^2$ ). Gambel's quail showed preference for introduced riparian habitat and native riparian habitat, rather than desert scrubland habitat in the River site; this was similar to Lasca road where Gambel's quail showed preference for native riparian habitat rather than desert scrubland. Strip transects effectively estimate Gambel's quail density and are more time efficient.