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Sustaining the 'Quail Wave' in the Southern Great Plains

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ABSTRACT

The southern Great Plains (i.e., Texas and Oklahoma) historically affords some of the best, and currently most stable, northern bobwhite (*Colinus virginianus*) populations anywhere. However, bobwhite populations have declined in recent years over much of this area, especially east of the 98th meridian. Two subsets of the southern plains, the Rolling Plains (parts of northwestern Texas, western Oklahoma, and western Kansas) and the Rio Grande Plains (south Texas) offer the most expansive, contemporary northern bobwhite habitat throughout its range. Bobwhite habitat in the southern plains is affected primarily by rainfall and rangeland management for livestock. Range management practices (brush control, grazing management) can be prescribed to benefit bobwhite habitat, but a large part of potential bobwhite range in the southern plains suffers from overgrazing and excessive brush control. Farm Bill policies (e.g., Conservation Reserve Program) have had a major impact on dryland agriculture in this region, but their impacts on bobwhites have been only marginally positive (if at all) to date. Income generated from quail hunting in this region currently rivals or exceeds that generated from cattle grazing leases. Accordingly, more landowners are beginning to temper traditional land management goals, and incorporate more quail-friendly practices (i.e., ''brush sculpting'' and reducing stocking rates). Educational efforts aimed at landowners should strive to implement existing knowledge and develop informed decision-makers. The current demand for quail hunting affords an excellent opportunity to promote, and adopt, management practices that will hopefully sustain the heritage of quail hunting in this region of the bobwhite's range for future generations.

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Key words: *Callipepla squamata*, *Colinus virginianus*, education, fragmentation, Great Plains, habitat, management, northern bobwhite, quail decline, scaled quail, Texas

INTRODUCTION

When I read Brennan's (1991) dire predictions about the future of northern bobwhite populations in the southeastern United States, I dismissed the idea as a chicken little strategy (i.e., the sky is falling) to generate dollars for research efforts. After all, quail populations (bobwhite and scaled quail [*Callipepla squamata*]) and quail hunting were very good in my parts of the Rolling Plains in west Texas. A quail ''boom'' had occurred in 1987 and a smaller one in 1992; things were good on the ''western front.''

But Brennan's (1991) fatalistic forecast planted seeds of uncertainty that eroded my complacency. Enough so, that I decided to attend Quail IV at Tallahassee, Florida. The conference served as a wake-up call for me. Quail biologists from one southeastern state after another lamented the decline of quail in their respective states over the last 30 years. The mood was a somber one. One speaker remarked how the ''quail wave'' had run its course in his state; changes in land use (e.g., intensive agricultural systems, intensive timber production) have caused a dramatic decline over most of the bobwhite's historic range in the southeastern United States.

About 1992, I also realized something, possibly a disease epizootic, had caused a dramatic, and as far as I'm concerned inexplicable, decline in scaled quail throughout the Rolling Plains of Texas and southwestern Oklahoma (Rollins 2000*a*). Now my false sense of invincibility relative to both bobwhites and scaled quail had been shaken. Not since have I taken them for granted. I returned to west Texas resolved to rally the troops. Since 1992, I have had the opportunity to be involved with various research and educational efforts aimed at understanding, and hopefully mitigating, the decline of bobwhites and scaled quail in west Texas.

I will examine quail management issues operating in the southern Great Plains, and especially in the Rolling Plains of northwest Texas and the South Texas Plains. Over the last 30 years, these 2 regions of Texas have been the most productive areas for bobwhites in Texas (Texas Parks and Wildlife 2000).

QUAIL TRENDS

Trend lines of bobwhite and scaled quail abundance as estimated by the Breeding Bird Survey (BBS; Sauer et al. 2000) have decreased in both regions (Fig. 1), especially since 1980 (Table 1). Bobwhite declines have been less drastic in the Rolling Plains (identified as Rolling Red Plains by BBS) than in the South Texas Plains (referred to as South Texas Brushlands in BBS). However, bobwhite and scaled quail trends in these areas can be difficult to assess in the short term (<10-year period), as both species exhibit irruptive popula-

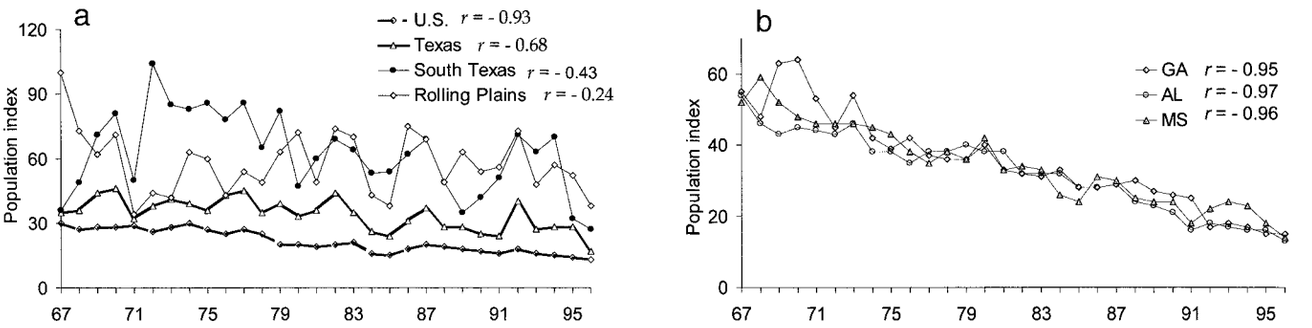

Fig. 1. Northern bobwhite abundance in selected ecological regions in Texas (1a), and in 3 states throughout the southeastern United States (1b), 1966–98. Data obtained from Breeding Bird Survey (Sauer et al. 2000). Ecological regions defined by Gould (1975).

tion growth in the Rolling Plains (Jackson 1962, Rollins 1999*a*, 2000*a*) and the South Texas Plains (Peterson and Perez 2000).

Across the state, bobwhite abundance in Texas declined an average of 4.9% annually from 1980–2000 according to BBS, while scaled quail abundance declined 2.2% annually during the same time period (Sauer et al. 2000). Regional declines have been more pronounced (e.g., scaled quail declined 8.1% annually in the Rolling Plains from 1980–2000 according to BBS). Roadside counts by Texas Parks and Wildlife Department (TPWD) have documented significant declines in some regions (e.g., Pineywoods, Gulf Prairies and Marshes) (Peterson and Perez 2000), but did not document a decline statewide (Peterson and Perez 2000). The most notable declines have been east of the 98th meridian, in the Cross Timbers and Prairies, Blackland Prairies, Pineywoods, Edwards Plateau, Post Oak Savannah, and Gulf Prairies and Marshes ecological regions (Texas Parks and Wildlife Department 2000). Roadside counts for bobwhites in the Cross Timbers, Edwards Plateau, and Gulf Prairies and Marshes ecological regions were below their long-term means 6 of the last 7 years. Counts in 2000 were the

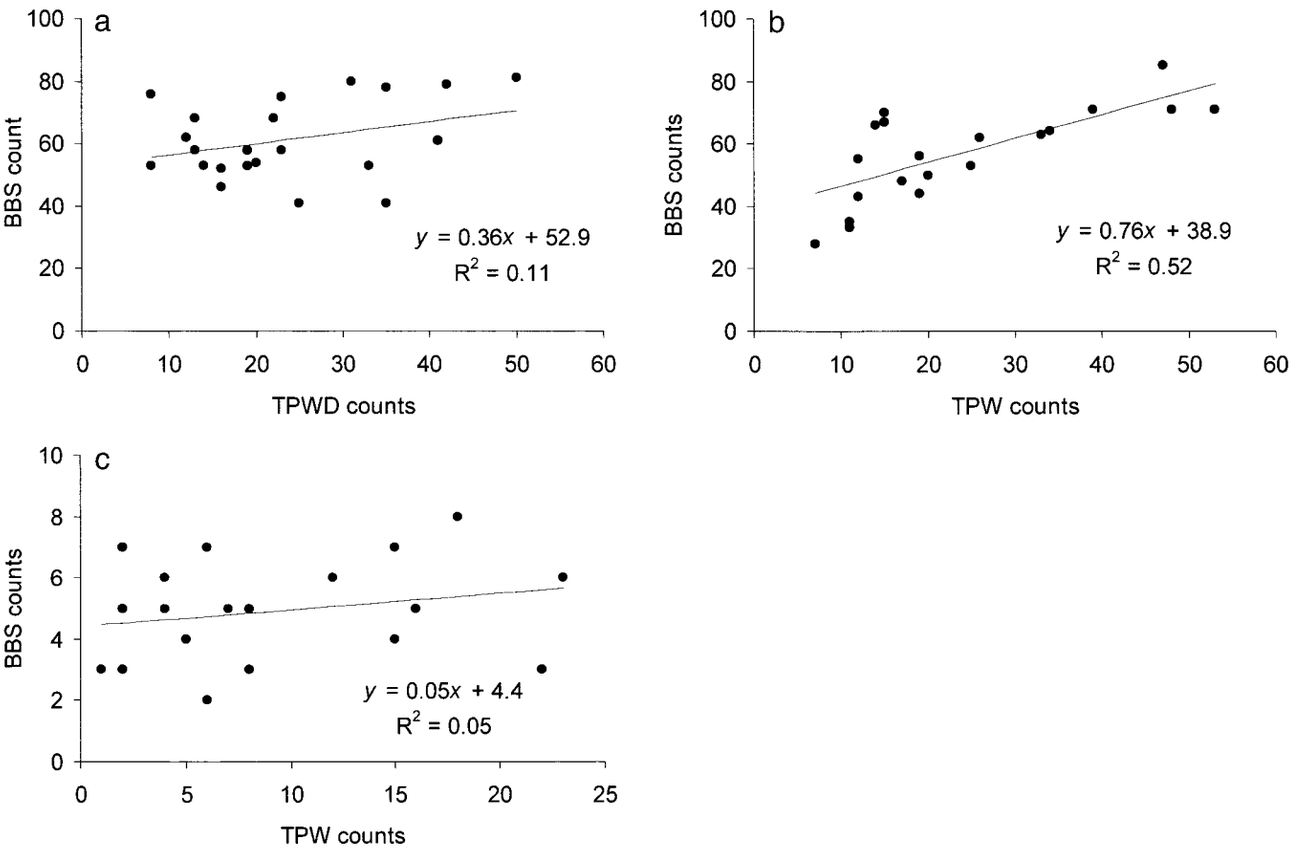

Fig. 2. Correlation of Texas Parks and Wildlife Department roadside quail counts (x-axis) with Breeding Bird Survey counts (y-axis) for 2 ecological regions in Texas. Figures 2a and 2b are for Rolling Plains and South Texas Plains, respectively; 2c is for scaled quail in the South Texas Plains.

Table 1. Northern bobwhite and scaled quail trends in various parts of the Southern Great Plains as estimated by Breeding Bird Survey (Sauer et al. 2000).

Species	1966–2000			1966–79			1980–2000		
State/Region	Trend	*P*	*n*	Trend	*P*	*n*	Trend	*P*	*n*
Northern bobwhite									
Kansas	−1.0	0.17	37	−1.3	0.36	34	−0.4	0.79	37
Oklahoma	−0.9	0.06	61	−0.4	0.56	33	−2.5	0.00	60
Texas	−2.4	0.00	166	3.3	0.00	97	−4.9	0.00	158
Rolling Plains	0.3	0.73	24	2.7	0.28	7	−2.8	0.02	23
South Texas	−1.9	0.00	30	−0.4	0.56	33	−4.1	0.00	29
Scaled quail									
Texas	−3.7	0.00	67	−2.4	0.04	39	−2.2	0.20	59
Rolling Plains	−5.5	0.00	13	2.6	0.90	7	−8.3	0.01	10
South Texas	−3.5	0.02	18	−5.2	0.13	11	0.0	0.99	15

lowest on record for those 3 regions (Texas Parks and Wildlife Department 2000).

Roadside counts (typically conducted in Aug) were significantly correlated with BBS counts (typically conducted in May–Jun) for bobwhites in south Texas ($r = 0.72$, 19 *df*, $P = 0.002$), but not for the Rolling Plains ($r = 0.33$, 19 *df*, $P = 0.14$; Fig. 2). Roadside counts were not correlated with BBS data for scaled quail in the South Texas Plains ($r = 0.22$, 19 *df*, $P = 0.34$).

HUNTER TRENDS

A sample ($n = 250$) of Quail Unlimited (QU) members who resided in Texas were surveyed during the fall of 2000 (D. Rollins, unpublished data) to assess their hunting activities, expenditures, and other information related to quail hunting during the 1999–2000 season. The response rate was 47%. The average QU member in Texas is a white, middle-aged, male. Most (85%) are college graduates with 42% having achieved some post-graduate education. They are affluent (42% reported household incomes >$125,000). Residence was split among rural communities (26%), small cities (<100,000 people) (31%), medium-sized cities (100,000–250,000 people) (28%), and large cities (>500,000 people) (15%). They spent a considerable amount of money ($\bar{x}$ = $10,354 in 1999), with major expenses listed for leases, equipment, and dog-related. The bulk of those expenditures (65%) were made in the destination county. The statistics cited are probably not representative of all quail hunters in Texas.

Most (80%) respondents hunted quail during the 1999–2000 hunting season. Of those who hunted, the mean number of days hunted was 15.3 days in 1999, down 29% from an average of 19.7 days in 1990. Hunters bagged a mean of 3.6 bobwhites/hunting day. Based on the expenses cited here, the average quail bagged cost the hunter $207. That equates to a quail value of $1.15/g ($34.50/oz), or $1,215/kg ($552/lb)! A sizeable number (19%) of those surveyed indicated they had purchased property within the last 10 years for quail hunting.

Most (87%) Texas QU members believed that quail numbers had declined on the properties they had hunted over the last 10 years. A few reported an increase (7%) or no change (6%) in quail populations. When asked ''what are the most important factors affecting quail populations in the counties where you hunt,'' the most frequently cited factors were weather (78%), land use changes (48%), predators (42%), overgrazing (39%), and fire ants (33%). At least 10 other factors were reported less frequently.

Relevant TPWD statistics indicated a 49% decline in quail hunters from 1981 to 1999 (Texas Parks and Wildlife Department 1999). Quail hunting participation (i.e., quail hunter days) dropped 39% during the same time period. No economic expenditure data are available for nonresident quail hunters, but the expenditures likely approach or exceed those incurred by resident quail hunters. Nonresident quail hunters increased 462% from 1981–98.

FACTORS AFFECTING QUAIL

Abiotic

Weather.—The influence of precipitation on quail in semiarid ranges is well documented (Campbell et al. 1973, Giuliano and Lutz 1993, Bridges et al. 2000), but how it influences quail populations is not (Rollins 1999*a*). Hanselka and Guthery (1991) estimated that annual precipitation accounted for 40% of the annual variability observed in bobwhite populations in south Texas. Irruptions appear to be related indirectly to rainfall, possibly through some plant-related stimulus (e.g., nutrition). Various theories have examined Vitamin A (Lehmann 1953), phytoestrogens (Cain et al. 1987, Delehanty 2000), phosphorus in the diet (Cain et al. 1982), effects of drought stress on breeding physiology (Koerth and Guthery 1991), and more indirect effects through habitat change (Rollins 1999*b*), or some related aspect (insect availability; Roseberry and Klimstra 1984:112).

An alternate hypothesis is that precipitation increases nesting cover across the landscape (i.e., ''usable space'') (Guthery 1997), and subsequently may increase nesting success by complicating the predators' search efficiency (Rollins 1999*b*). Quail irrup-

tions in the Rolling Plains ecoregion of Texas are characterized by landscapes dominated by common broomweed (*Xanthocephalum dracunculoides*) (Jackson 1962, Rollins 1999*a*). Dense canopies of common broomweed tend to ''insulate'' quail from predators (avian and mammalian) and hence increase ''usable space.''

Jackson (1962) characterized bobwhite irruptions in the Rolling Plains of Texas as an interaction among drought, livestock grazing practices, plant succession, and periodic episodes of heavy rains. Jackson's (1962) explanation of the situation may be described as a 5-step process.

1. A drought of several years, coupled with livestock overgrazing, depletes much of the habitat, hence most of the bobwhite population.
2. A year of average rainfall promotes secondary succession on the bared soils, resulting in expanses of annual forbs (e.g., doveweed [*Croton* spp.], buffalobur [*Solanum rostratum*]) useful as food to quail. The habitat is ''functional [but] unstable.'' The nutritional situation is good and the predator population has lagged during the dry years. Bobwhites undergo a ''lateral'' increase and occupy sites across the landscape.
3. A year of excessive rainfall breaks the drought. The landscape is now covered with a dense canopy of common broomweed which provides excellent winter ground cover, yet is open at ground level for easy travel by quail. ''Now the range is all bobwhite habitat as regards cover'' (Jackson 1962). The quail population increase is rapid (i.e., a ''vertical'' increase).
4. A year of normal rainfall follows with good moisture carryover from the previous year. The bobwhite population explodes and occupies all marginal habitats (even roadsides). Meanwhile plant succession has advanced to a stage less desirable to bobwhites (mostly grasses) and the quail population is left ''out on a limb,'' and probably competing for food with an irruptive rodent population.
5. The bobwhite population crashes if food or cover fails before spring. Dry years set in and continue. Conditions revert again to phase 1.

''Water harvesting'' (i.e., contour ripping and installing ''spreader'' dams) has been promoted recently for increasing herbaceous biomass, species diversity, and arthropod biomass (R. J. Buntyn, Texas Agricultural Experiment Station, unpublished data). Study areas near Ft. Stockton, Texas where such practices had been applied, along with conservative stocking rates, exhibited high (>70%) hatch rates for scaled quail during a 2-year study.

Habitat Fragmentation.—Habitat fragmentation is commonly cited as a chronic agent in the decline of bobwhites (Klimstra 1982, Brennan 1991). Urbanization and land fragmentation are especially acute in the eastern half of Texas (Wilkins et al. 2000), and these trends are coincidental with declining quail abundance in those areas. However, Peterson et al. (*this volume*) could not identify consistent trends or identify land use relationships that described bobwhite abundance across its geographic range.

Global Warming.—Quail populations have declined coincidentally with global warming (Guthery et al. 2000). These authors outlined mechanisms (e.g., reduced length of the laying season) that may depress quail reproduction. Global warming could also exacerbate the negative impacts of habitat fragmentation, habitat loss, and overgrazing.

Biotic

Predation.—Rollins and Carroll (2001) provided an overview of the impacts of predation on bobwhite and scaled quail. Although quail have adaptations for coping with high predation rates (e.g., renesting, large clutches), populations in some areas may be suppressed by predation. Changes in land use, management practices, and predator communities interact to depress quail populations over much of the bobwhite range. Recent changes in land use may have made quail more vulnerable to predation (Hurst et al. 1996, Rollins 1999*b*). Additional studies are needed to assess the role of predation and predation management in light of these landscape-level changes.

Comparing earlier studies (Stoddard 1931:188, Jackson 1952) to more contemporary studies (Frost 1999) suggests that changes have also occurred within populations and communities of various predators that are often implicated in the decline of quail populations. The increasing popularity of feeding deer (*Odocoileus virginianus*) over much of Texas may be 1 factor predisposing greater raccoon (*Procyon lotor*) abundance (Cooper and Ginnett 2000). Such temporal changes in predator populations may be important, especially in light of landscape changes that may make quail more vulnerable to predation (Rollins 1999*b*).

Fire Ants.—In the southeastern half of Texas, fire ants (*Solenopsis* spp.) have probably received more attention than any other invasive agent for their role (real or perceived) in the demise of quail in that region. A divergence of opinions exists about the absolute importance of fire ants as a mortality factor for bobwhites (Brennan 1993*a*, Allen et al. 1995, Mueller et al. 1999). Some of these differences may stem from different species of fire ants involved. Earlier studies (Travis 1938) were conducted before the importation of the red imported fire ant *(S. invicta*) which typically occurs at greater mound densities, and is more aggressive than native fire ants (Vinson and Sorenson 1986). Several studies in the Coastal Prairie region of Texas (Allen et al. 1995, Giuliano et al. 1996, Mueller et al. 1999) have identified causal mechanisms resulting in greater chick mortality in areas with high densities of red imported fire ant.

Hunting.—Quail hunting is typically considered to be self regulatory. Hunters spend fewer days afield and have lower success in ''poor'' years and conversely in ''good'' years (Peterson and Perez 2000). Peterson and Perez (2000) analyzed bobwhite and scaled quail harvest data in Texas and generally found support for the self-regulating hypothesis. The average Texas quail

hunter in their data set hunted between 2.5–3.0 days regardless of quail abundance. However, a subset of the quail hunter population in Texas (QU members) hunted an average of 15 days in 1999 (D. Rollins, unpublished data).

Quail biologists have argued for at least a decade about the degree to which hunting at various times in the season is additive or compensatory (Roseberry 1979, Brennan and Jacobson 1992). Experiments designed to determine the effect of harvest timing and intensity on the subsequent breeding capital of bobwhites are needed (Brennan 1991, Peterson and Perez 2000).

Two situations in Texas underscore the need for a better understanding of harvest management at finer spatial scales than that practiced by state wildlife agencies. First, the low number of public hunting areas which are heavily hunted, and are likely to field even more hunting pressure (unless changes are made to reduce hunter access) as quail numbers decline in areas farther east. Second, the escalation of land values for quail hunting (i.e., the price of private quail hunting leases) may increase hunting pressure, even during ''poor'' years (Peterson and Perez 2000).

Landowners in Texas often argue the current season length (about 115 days; usually early Nov through late Feb) is too long, and they believe the TPWD Commission should decrease the season length and/or bag limit. However, Peterson (1999) suggested that minor regulatory changes in season length or bag limit would be inconsequential in terms of reversing declining quail populations. The TPWD's philosophy is to maximize hunter opportunity (i.e., set a long season) and let individual landowners establish more conservative guidelines as they deem appropriate for their individual properties.

If bobwhite abundance continues to decline in Texas, I predict that the latter third of the season will be curtailed. And I question how long quail seasons will remain open in the eastern third of the state where bobwhite abundance is acutely low. Can hunting mortality be anything less than additive in such locally declining populations?

HABITAT CHANGE

Obvious Trends

Habitat loss in Texas occurs as a result of introduced pastures (e.g., bermudagrass [*Cynodon dactylon*], old world bluestems [*Bothriochloa* spp.]), large-scale brush control, overgrazing, urbanization, and in eastern portions of the state, timber production. Population growth along the Interstate 35 corridor (especially) is having dramatic impacts on former quail habitat (Wilkins et al. 2000). The fragmented habitats that are now the rule east of the 98th meridian bode poorly for bobwhites in Texas, just as they have for much of the southeastern United States.

Historically, the 2 most pervasive practices that have affected quail habitat in the Rolling Plains and South Texas Plains are brush control and overgrazing. The title of Guthery's (1986) book, ''Beef, Brush, and Bobwhites,'' underscored the importance of grazing and brush management for bobwhites in south Texas. Brush and grazing management can be an asset or liability for quail managers.

In my opinion, the ultimate habitat problem in the classical quail country along the eastern Rolling Plains (i.e., east of a line from Abilene to Vernon) is overgrazing. Overgrazing changes the composition (i.e., species diversity) and the structure (fewer tall bunchgrasses) of the vegetation. The novice quail manager sees such sites as awash with good food-producing plants (e.g., western ragweed [*Ambrosia psilostachya*] and doveweed), but food is rarely the limiting factor for bobwhites in this region (Guthery 2000:68).

Quail managers often promote grazing to manipulate plant succession (Guthery 1986:36). But optimal bobwhite habitat in more arid regions calls for higher seral stages than more mesic environs (Spears et al. 1993). The need for heavier stocking to provide adequate bare ground is rarely a problem west of the 98th meridian. Good grazing management that promotes higher successional species is recommended for quail range in most of west and south Texas.

Although the value of a quail hunting lease can equal or surpass the value of a grazing lease in the Rolling Plains and South Texas Plains (D. Rollins, unpublished data), cattle are still king on most quail range in Texas. Much of the quail range suffers from ''subsistence ranching,'' where high stocking rates and continuous grazing are common. Increasingly, such heavy grazing is exacerbated by federal farm programs (e.g., drought disaster feed programs) that allow high stocking rates to be maintained during drought.

However, attitudes are changing, especially as more ranches are purchased with the goal of increasing quail populations. The importance of quail hunting as a factor driving real estate values in Texas is noncontroversial. Within the last decade, 19% of Texas QU members had purchased property for the primary purpose of hunting quail. If such trends continue, and I believe they will only escalate over the next 10 years, there will be growing interest in the idea of ''prescribed grazing,'' (i.e., grazing for the purpose of attaining specific habitat management goals) and ''undergrazing'' (i.e., conservative stocking rates).

Large-scale brush clearing is detrimental to quail habitat. However, the judicious use of brush control can be an excellent tool for managing quail habitats (Guthery 1986:23, Guthery and Rollins 1997). Adoption of a ''Brush Sculptor'' philosophy (Rollins et al. 1997) (i.e., the planned, selective control of brush to enhance wildlife habitat) is becoming popular throughout west and south Texas. I predict that attention to wildlife habitat needs will indeed shape the present generation of brush contractors and landowners.

Another concern is the increasing attention given to brush control as a means for enhancing watershed yield. During the last 2 legislative sessions, some $23 million was appropriated for landowners in certain west Texas watersheds to clear brush for the purpose of increasing water yield to rivers and reservoirs. Con-

flicts arise when trying to maximize water goals while sustaining adequate wildlife habitat (Rollins 2000*b*). Thurow et al. (1997) estimated that >95% of the brush from a given area would need to be removed before substantial increases in water yield could be expected. These thresholds typically exceed the minimum woody cover requirements for bobwhites in this region.

While too much brush control can limit quail habitat, it should be noted that increased density of mesquite *(Prosopis glandulosa*) and junipers (*Juniperus* spp.) can reduce habitat potential for quail. Some sites have simply become too dense with brush to provide usable space for bobwhite and scaled quail. In such areas, the judicious use of appropriate brush control (i.e., brush sculpting) can be an effective tool for habitat managers.

Cryptic Trends

Habitat fragmentation harms quail populations by forcing quail to live in ever smaller parcels of suitable habitat. Accordingly, fragmentation facilitates the quail's enemies (e.g., mesomammals) involved in nest depredation (Rollins and Carroll 2001). Guthery's (1997) ''usable space'' hypothesis predicts that quail populations are better served by an abundance of habitat (''quantity'') than by improving the ''quality'' of smaller patches. Jackson's (1962) depiction of broomweed in quail irruptions is an example of a periodic pulse in usable space.

I believe that suitable nesting cover is perhaps the single most limiting factor across Texas. My students have used simulated nests to study hatch rates relative to various management practices. Hatch rates tend to be >50% when the number of suitable bunchgrass clumps (e.g., *Schizachyrium scoparium, Hilaria mutica*) exceeds about 650/ha (Slater et al. 2001). The manager's goal should be to enhance nesting cover across the landscape, and not just in small ''islands'' (e.g., 2 ha) of nesting habitat. Lower stocking rates and timely deferments from grazing can be used to improve the availability of good nesting cover.

When discussing cryptic habitat loss, I often cite the Hippocratic oath (i.e., first do no harm) as an axiom for quail managers. Hippocratic management includes those practices that would at first glance appear benign to quail, but may ultimately be liabilities. Examples include (1) the proliferation of deer feeders in Texas, which concentrate egg-eating mesomammals (Cooper and Ginnett 2000, Rollins and Carroll 2001); (2) the proliferation of farm ponds which may fragment prairie landscapes and enhance their habitability by raccoons (Rollins 1999*b*); and (3) government-subsidized livestock feeding programs during droughts which postpone (or preclude) de-stocking procedures, and ultimately range recovery.

Disease.—Disease is usually dismissed as an issue in wild bobwhite management. However, Rollins (2000*a*) provided anecdotal evidence that disease may have been involved in the drastic decline of scaled quail across the Rolling Plains in 1988. Scaled quail populations have remained at low levels since that time. The playa lakes region (High Plains of Texas) harbors ≥3 million waterfowl during the winter months, and is occasionally subjected to epizootics of avian cholera.

Another potential disease problem is aflatoxicosis from contaminated ''deer'' corn. A 1998 study (N. Wilkins, Texas A&M University, unpublished data) found that 44% of the deer corn purchased at various locations (n = 52) across Texas contained >20 ppb of aflatoxin, the recommended maximum for consumption by poultry. An estimated 300 million pounds of deer corn were fed in Texas during 1998.

Sociological/Political

''Deermania''.—While bobwhites have historically been ''charismatic avifauna,'' the decline of bobwhites over the eastern half of Texas ensures that the ''Baby Boomer'' generation of Texans (i.e., those born between 1945–55) may be the last to become familiar with the ''poor-bob-white'' song. A generation of Texas quail hunters and pointing dogs has been replaced with one fascinated by deer feeders and compound bows (especially in east and central Texas). Quail hunter numbers in Texas decreased by 49% from 1981 to 1999 (Texas Parks and Wildlife Department 1999, Adams and Causey 2000). Similarly, quail hunter numbers in Oklahoma decreased 73% from 1967 to 1996 (Crews and DeMaso 2000). Political attention and budget priorities within state wildlife agencies ultimately track user participation rates. Conceivably the demand for deer hunting and management may become pervasive in state wildlife agencies, perhaps ultimately to the atrophy of quail management (Brennan 1993*b*). Has such a cervid-weighted priority evolved in both Oklahoma and Texas over the last 20 years? One former TPWD Commissioner relayed to me that during his 6-year term on the Commission in the early 1990s, discussion of quail totaled less than a couple of hours. Recent attention to the plight of quail has renewed interest in the species, and may increase research and management efforts directed at quail (Brennan 1999).

Lack of Focus/Coordination.—In many respects, we in the southern plains have been slow to recognize (or admit) that quail populations are in trouble. Some argue whether the ''decline'' is real, and if so, in which ecological regions populations have declined, and whether such declines are ''ecological destiny.'' Brennan (1999) lamented that quail biologists in the southeastern United States may be ''bucking the sun'' (i.e., fighting an uphill battle) in attempting to restore bobwhite abundance in that region. Strategic plans like that developed by the Southeast Quail Study Group, and various state quail initiatives (e.g., Georgia and Virginia), are evidence that the battle will continue to be waged.

Quail research in Oklahoma and Texas has been largely disjointed over the last 20 years (or longer). Universities involved with quail research during this period have included major players (Texas A&M [including Texas A&M—Kingsville], Texas Tech Uni-

versity, and Oklahoma State University), smaller universities (e.g., Stephen F. Austin University, Southwest Texas State University), state wildlife agencies (TPWD and Oklahoma Department of Wildlife Conservation), and privately-funded entities (e.g., Caesar Kleberg Wildlife Research Institute, Welder Wildlife Foundation, Samuel Roberts Noble Foundation). Funding mechanisms (i.e., competitive proposals) have tended to isolate, rather than consolidate, research efforts.

STEPS IN THE RIGHT DIRECTION

Research Efforts

Texas would be well served to study the structure and function of the Southeast Quail Study Group, and clone a state version. The size and ecological diversity of the state, plus its strategic importance in the future of wild bobwhites, and economic impact from quail-related recreation suggest that such coordination is overdue. The recent appropriation of a ''Quail Decline Initiative'' (QDI) in May 2001 provided some seed money to initiate such a planning effort. The recent establishment of endowed quail chairs at Oklahoma State University and the Caesar Kleberg Wildlife Research Institute reflects a growing research interest in quail, and will hopefully provide leadership in developing a more focused, regional, long-range strategic plan. Such efforts need to be replicated at various locations across the state, and conducted for longer time periods than are presently done. A secure funding base for such long-term research interests is needed, and one that could be promoted with full funding of the proposed QDI.

Outreach

Brennan (1991, 1999) identified extension outreach programs as a key component in the effort to reverse the decline of quail. Over the last 10 years, my primary contributions to quail management have been outreach efforts. These include efforts aimed at landowners, game managers, youth, and the general public.

Adult Education.—The increasing importance of quail and quail hunting to the Texas economy has permitted me to spend considerable efforts aimed at landowner education (e.g., field days and workshops). In 1998, I initiated daylong workshops called ''Quail Appreciation Days'' (QUADs) that focus on appreciating (i.e., judging with heightened awareness) the importance of quail (economic and ecological) and their habitat needs. To date 30 QUADs have been conducted across the western half of Texas. Pre- and post-tests are used to measure information transfer, and post-test scores typically double. Subsequent follow-up analyses are needed to determine how much of the technology learned is applied, and results in sustaining or increasing bobwhite abundance. Efforts are in place in various counties to implement a series of quail estimation indices (e.g., whistle counts, simulated nest surveys) to monitor management effects over time.

Another adult education program was ''W.I.L.D. about Quail'' (Wildlife Intensive Leadership Development). This program involves a series of 3 ongoing, 2-day workshops to train and equip participants as ''master volunteers'' who will then help promote quail conservation in their local communities.

Over the years I've had the opportunity to develop productive relationships with various media. Currently, I write weekly or monthly columns for outlets that target ranchers (Livestock Weekly), farmers (Texas Farmer-Stockman), and hunters (Quail Unlimited Magazine). This network is beneficial in (1) delivering timely information targeted for various stakeholders, and (2) cultivating support for quail-related conservation efforts (e.g., QDI). The Internet affords special opportunities, and several excellent web sites provide technical and lay information about quail management.

Youth Education.—Perhaps my most notable contribution to quail management, and certainly my most personally rewarding accomplishment, has been the inception, and success, of the Bobwhite Brigade (Rollins et al. 2000). Initiated in 1993, this week-long ''boot camp'' on quail management and leadership development has trained ≥500 youth (ages 14–17). Students are encouraged to return to their home communities and conduct awareness-level educational programs on quail conservation. To date, ≥3,000 such programs have been conducted. The Bobwhite Brigade has since been replicated in 2 other regions of Texas, and in ≥5 other states.

EPILOGUE

The next 10 years promise to be especially exciting, and anxious, times for quail managers in the southern Great Plains. If (as) bobwhite abundance continues to decline in more eastern ranges, the demand for wild bobwhite hunting will undoubtedly sustain, and likely increase, the appetite for those interested in improving quail habitat in Oklahoma and Texas.

I believe that very soon we will see acknowledgment that the quail ''tail'' is wagging the livestock ''dog'' as the primary motivation for rangeland ownership in northwest and south Texas, and perhaps western Oklahoma. I am excited about the current hunger for information and technical assistance among both ''traditional'' ranchers and absentee landowners who purchase properties for recreational use.

I am cautiously optimistic that an ''early diagnosis'' of the quail decline in the southern plains will permit and promote appropriate therapeutic management. Certainly we can glean much from successes and failures on the research, outreach, and political fronts from our colleagues in the southeastern United States. Efforts will require the coordination and support of state game agencies, universities, landowners, conservation organizations, and an increasingly apathetic public. My optimism is tempered, however, by the rapidly growing population in Texas. As such, the challenge in Texas will be the same as points farther east: how to keep bobwhites on an increasingly fragmented landscape.

If we fail, I for one will lament the plenary session for the next national quail symposium to be held in Texas. I fear the theme will be ''what used to be,'' and the opening presentation will be ''all's quiet on the western front.'' Let us not become complacent lest the quail wave may play itself out on the plains of west Texas.

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