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Hunters are a fundamental component of northern bobwhite quail conservation

LEONARD A. BRENNAN*

Richard M. Kleberg, Jr. Center for Quail Research, Caesar Kleberg Wildlife Research Institute, Texas A&M University – Kingsville, 700 University Boulevard, Kingsville, TX 78363, USA

Hunters have been a fundamental component of northern bobwhite quail conservation for most of the past century. Bobwhite quail hunters funded the first modern comprehensive life history study of a wild vertebrate in the 1920s to understand causes responsible for population declines. This investigation identified a causal link between frequent applications of prescribed fire and persistence of bobwhite quail populations in the Southeastern United States, and provided the foundation for contemporary fire ecology science. Since then, hunters in the Southeastern and Midwestern United States have funded numerous other bobwhite quail research and conservation efforts. Research and conservation efforts funded by quail hunters in Texas continue to be especially notable. Non-governmental organizations, and academia, as well as state and federal wildlife agencies have been the conduits for efforts to sustain bobwhite quail populations because predominant land uses no longer support bobwhite quail.

Keywords: *Colinus virginianus*; United States; Hunting; Conservation

The widespread decline of a once-common bird

The northern bobwhite (*Colinus virginianus*) is a New World Quail (Odontophoridae), widely distributed across much of Mexico and the eastern half of the United States. It is a relatively small (170 grams or 6 oz) game bird prized by hunters for its explosive flight, especially when coveys of birds flush after being pointed by a hunting dog [1]. Aldo Leopold referred to bobwhite hunting as ‘Grand-Opera Game’ [1,2].

A rich tradition of bobwhite hunting developed in the Southeastern and Midwestern United States during the early part of the twentieth century, and then even more so after World War II [3]. During the latter decades of the twentieth century, however, it became evident to both hunters and biologists that quail populations had declined significantly. While the reasons for the decline were not known at the time, a review of the species’ range-wide abundance revealed that many bobwhite quail populations had been in decline for a long time, even, for some, as far back as the mid-nineteenth century [4]. Long-term data sets on bird population trends such as the Audubon Society Christmas Bird Count and the U.S. Fish and Wildlife Service Breeding Bird Survey provided clear evidence of the extent to which bobwhite populations had declined since the mid-1960s; and by the early 1990s bobwhites had declined by 60–80% across nearly 70% of their entire range [5]. Twenty years later, the

*Email: leonard.brennan@tamuk.edu

bobwhite quail decline continued unabated and encompassed nearly all states within the geographic range of the species [4].

Hunting did not cause the decline of bobwhite quail nor is hunting thwarting bobwhite quail recovery efforts; rather, a widespread and pernicious loss of habitat has been responsible for the declines of this once very common bird [6]. Furthermore, as will be documented throughout this paper, financial and political support from hunters has been indispensable for bobwhite quail conservation efforts during the past 100 years.

Changing land uses in the nineteenth and twentieth centuries

In 1989, Mississippi State University began developing a research program to identify why bobwhite quail had declined in that state by more than 70% during the prior 20 years. This research was supported by \$100,000 per year from a special bobwhite quail budget allocation of the Mississippi Department of Wildlife, Fisheries and Parks. At the time, nearly 60% of the residents of Mississippi hunted or fished. Political pressure brought by bobwhite quail hunters resulted in the Department of Wildlife, Fisheries and Parks designating bobwhite a conservation priority [7].

The program commenced with an investigation designed to gather information from Mississippi and other southeastern states to examine places that still had bobwhite quail and compare them to places where the birds no longer existed [7]. A rich literature of thousands of peer-reviewed and popular articles, as well as numerous academic books firmly establishes bobwhite quail as having been present historically across a considerable range of agricultural, forest and rangeland habitats. Agricultural lands, however, supported virtually no bobwhite quail anywhere in Mississippi at the time this research began. An exception to this pattern was Holmes County, an area in central Mississippi where small farms with weedy fence rows were still present. The agricultural landscape in Holmes County supported bobwhite quail while the rest of the agricultural landscapes in Mississippi did not. These areas consisted of crop fields that were huge, sterile and lacked weeds. It emerged that no weeds meant no seeds or insects and therefore no bobwhite quail.

A similar situation existed in the majority of the pine and mixed-pine forest habitats in Mississippi where forest management practices favoring increasing tree density gradually eliminated bobwhite quail habitat [8], while creating good conditions for wild turkeys (*Meleagris gallopavo*). Notable exceptions proved to be those areas of public lands, such as the Noxubee National Wildlife Refuge, where open, park-like piney woods were maintained by frequent prescribed fires implemented to assist the endangered red-cockaded woodpecker (*Picoides borealis*). Overall, however, forest management practices in Mississippi were detrimental to bobwhite quail populations.

Thus, changing land use practices in agriculture and forestry, along with long-term forest succession, combined to eliminate hundreds of millions of acres of habitat that once supported bobwhite quail in various parts of their range. Abundant bobwhite populations were no longer an effortless product of agriculture and forestry throughout much of the Southeastern and Midwestern United States. Undoubtedly massive suburban sprawl also contributed to this general loss of suitable habitat and subsequent population decline [6].

Rangeland habitats, if grazed properly, can be a promising exception to the problems clean farming and industrial forestry practices pose to bobwhite quail populations. This is

because most rangelands evolved in places that are too dry to farm and/or grow trees. The largest remaining tracts of bobwhite habitat in the United States today are found on rangelands, and the largest of these tracts are found in South Texas [4].

The way rangelands are managed for grazing domestic livestock is the key to ensuring quail habitat can be developed and maintained. Grazing that is too intense eliminates vegetation and critical nesting cover while too infrequent grazing will result in thick grassy monocultures that similarly prove disadvantageous to bobwhite quail nesting and rearing success [4].

It is in places like South Texas that bobwhite quail hunters are playing an influential role in managing habitats for bobwhite quail on lands leased for hunting purposes and where hunters subsequently sub-lease for cattle-grazing purposes and thereby influence how grazing by livestock is controlled [9] This is an incredibly important development for bobwhite conservation, and it is directly related to bobwhite hunters' willingness to use their money to support self-directed bobwhite conservation priorities.

The first efforts at bobwhite conservation

The first modern bobwhite quail conservation efforts in the United States were supported by hunters in the Red Hills region of Northern Florida and Southern Georgia in the 1920s and 1930s [10]. Prior to the American Civil War, the region supported extensive cotton plantations which afterwards were replaced by a patchwork sharecropping agricultural system that – while culturally troubling – created fabulous bobwhite quail habitat. Coupled with a rural culture that frequently burned the piney woods to keep them open for foot travel and help reduce the numbers of ticks and snakes, this socio-economic mélange created a near-perfect agricultural and forest matrix of habitat for quail. As a result, populations flourished.

As the twentieth century dawned, wealthy business men from industrial centers such as Cleveland and New York, who spent their winters at hotels in the region, started buying large, (2000–20,000 acre) tracts of land for recreational hunting, with bobwhite quail the preferred quarry [10]. Nearly all of these plantation lands were connected, creating a near-contiguous quality landscape for quail of about 200,000 acres. The owners of these plantations managed the land appropriately and enjoyed incredibly abundant quail and quail hunting opportunities for about two decades.

This changed dramatically when forest management policies were altered to address concerns arising from the catastrophic wildfires that occurred in the Western United States in the 1920s and 1930s [11]. Faced with the economic devastation these fires cost, the U.S. Forest Service worked hard to implement a policy that viewed all forest fires as destructive, and concluded that fire had no place in forest ecosystems, whether on public or private lands [11]. Forest Service personnel, often in the form of the 'Dixie Crusaders', lobbied the Georgia-Florida bobwhite hunting plantation owners to cease their 'woods burning' in the name of good forest management and conservation. Being good citizens, the bobwhite hunting plantation landowners did exactly this. The consequences for bobwhite quail were disastrous. Within a few years of commencing fire suppression, bobwhite quail populations on the hunting plantations and elsewhere in the United States plummeted [10].

Scientific efforts to enhance quail abundance

On 25 April 1923, a group of concerned hunters, many of whom owned bobwhite quail plantation lands in Georgia and Florida, and who were concerned about the declines in quail numbers, held a luncheon meeting at the Links Club in New York City. The primary topic of discussion was ‘launching an investigation of the life history and habits of the bobwhite quail on the approximately 200,000 acres of private preserves in the Thomasville (Georgia)-Tallahassee (Florida) region’ [12]. A memorandum of agreement between a ‘Committee to represent the sportsmen’ and the Bureau of Biological Survey (the precursor agency to the U.S. Fish and Wildlife Service) was signed on 5 February 1924. Seventy-three hunter-donors contributed a total of \$46,260.52 to fund the Investigation, as it was called [12]. Herbert L. Stoddard, a self-educated naturalist from Illinois was hired to direct the project that called for ‘an intensive study of all phases of the life history of the bobwhite’ [12]. Stoddard’s bobwhite quail study ran for five years and was completed on 1 July 1929. It took Stoddard two additional years to analyze his findings and compile the manuscript that would become the first modern comprehensive study of a wild animal in relation to its environment conducted in the United States [12].

Stoddard hypothesized that lack of prescribed fire was the factor responsible for the collapse of the bobwhite populations. Both he and the hunting plantation owners who funded the work, as well as the administrators in the Bureau of Biological Survey, knew that an exhaustive study of bobwhite quail life history would have to be undertaken to test this idea and to ensure the results of the work would withstand scrutiny [11].

As Stoddard moved towards publication, he faced concern from his editors regarding his chapter ‘The Use and Abuse of Fire on Southern Bobwhite Reserves’; yet, he held his ground against both editors and Department of Agriculture administrators who were inclined to dilute his message. The acrimony reached a point where Stoddard threatened not to publish the book, which many in the wildlife community were eagerly awaiting [11]. Fortunately for bobwhite quail conservation, Stoddard’s 559 page *magnum opus*, funded entirely by bobwhite quail hunters, was eventually published in 1931 [11]. Although a few of Stoddard’s conclusions have been corrected over time [13], it is remarkable that this book on bobwhite quail life history remains essential reading for anyone who seeks to undertake research on this species.

Furthermore, Stoddard’s plea to organize a ‘well equipped experiment station’ to understand the long-term effects of prescribed fire on bobwhite quail and other wildlife came to fruition in 1958 when Tall Timbers Research Station was founded [10]. With a track record of 57 years of research, Tall Timbers Research Station now includes a Land Conservancy program that holds conservation easements on well over 100,000 acres of bobwhite quail hunting plantations in the Red Hills Region of Georgia and Florida [10]. The environmental legacy of these hunting plantations, and the scores of rare, threatened and endangered plants and animals that they now support, testifies to the generations of bobwhite quail hunters who have supported the conservation efforts for this six-ounce bird.

Considerable early scientific work with bobwhite quail was also undertaken in Texas. After first conducting bobwhite quail research for the Texas Cooperative Wildlife Research Unit at Texas A&M University from 1936 to 1939, and then for the Texas Game, Fish and Oyster Commission from 1939 to 1944, Val W. Lehmann was hired as a wildlife biologist for a large private land holding, the King Ranch, in 1945. In the preface of his classic book *Bobwhites in the Rio Grande Plain of Texas*, Lehmann noted that ‘... Herbert Stoddard ... was the first of several naturalists who inspired me to search for the truth

despite its elusiveness.' [14]. Lehmann was the first professional wildlife biologist to work on quail on private lands in South Texas. Four influential members of the Kleberg family who ran King Ranch in the 1940s hired Lehmann because of '... their desire to do everything possible to increase wildlife so long as practices did not interfere with normal livestock operations' [14]. One of their priority species for recovery was the bobwhite quail.

Lehmann conducted ground-breaking work on bobwhite quail movements [15] and documented virtually all aspects of their life history in the semi-arid subtropical region of South Texas. Lehmann's (1984) work contains a breath-taking array of banding data that show how individual bird membership in bobwhite quail coveys changes over time. These band-return data show how covey sizes ebb and flow to keep the average size of a quail covey somewhere around a dozen birds. Large coveys (18–20 birds) tend to shed individuals to become smaller and small coveys (6–8 birds) tend to take in individuals to become larger. More than four decades passed before Lehmann's findings were corroborated using radiotelemetry.

Unlike Stoddard, who published his results in a book relatively early in his career, Lehmann's book appeared in 1984, very near the end of his life. Like Stoddard's own work, Lehmann's too was funded by hunters [14]. This is remarkable considering that the South Texas bobwhite hunting industry, as it is now often referred to, hardly existed during the main arc of Lehmann's career. Indeed in the 1940s and 1950s, the members of the Kleberg family, and their associates, were among the few people in South Texas who hunted bobwhite quail yet they were insightful enough to hire Lehmann and privately supported his research for decades. Lehmann would later note how their example influenced others in Texas [14]; '... other ranches, many of whom now consider a wildlife manager as essential as a livestock foreman.' Today, it remains a hard and fast policy that all hunting lease operations on the King Ranch have a professional wildlife biologist on staff [9].

Walter Rosene also made outstanding contributions to bobwhite quail science. A native of Iowa, Rosene received the first master's degree granted by the Wildlife Research Unit at Auburn University, Alabama. Except for a brief stint in the U. S. Navy during World War II, Rosene worked as a biologist first for the federal Soil Conservation Service Division and then for the federal Bureau of Sport Fisheries and Wildlife until 1964. He lived in Alabama and worked throughout the Southeastern United States where he became familiar with many bobwhite quail plantation owners in the Low Country of South Carolina as well as those in Alabama, Georgia and Florida [16]. After he left his federal biologist job in 1964, Rosene went to work as a consultant for numerous quail hunting plantations. From 1964 until his retirement nearly four decades later, Rosene's annual income and work-related travel and operating expenses were supported by bobwhite quail hunters who owned private hunting plantations. Rosene made several annual visits to each property and worked with plantation personnel to implement what he called a 'Prescription for Plenty' strategy for bobwhite quail habitat management [16]. Rosene knew that habitat was the key to bobwhite management success, but he also knew that hunting pressure needed to be managed as well. His landmark book, '*The Bobwhite Quail: Its Life and Management*', received the Outstanding Wildlife Publication Award from The Wildlife Society. Along with his numerous peer-reviewed publications, Rosene achieved fame for many aspects of his work, including his findings that the pesticide heptachlor, a chlorinated hydrocarbon used in futile attempts to control the invasive red fire ant (*Solonopsis invicta*) actually did more harm to nesting birds, including bobwhite quail, than to the fire ants themselves [17].

As the science and management of bobwhite quail matured, it attracted a wider array of participants and led to publication of the Proceedings of the First National Bobwhite Symposium in 1972. These proceedings contained landmark papers from research conducted mostly in the Southeastern and Midwestern United States, and virtually all the scientific work was supported in one way or another by the private landowners and/or the hunting community [18]. A second National Bobwhite Symposium was held ten years later in 1982. These national meetings were a clear indication of how quail research had grown from its earliest start some fifty years before.

Research efforts expanded further in the early 1990s when several state wildlife agencies launched various research and management initiatives focusing on bobwhite quail conservation. States such as Mississippi, Georgia, and Virginia all used either special state budget allocations or Pittman–Robertson Act funds from hunters to conduct bobwhite research and/or improve bobwhite habitat management prescriptions on state wildlife areas [19]. Several of these statewide initiatives are still in existence and are now in their second or third iteration. These initiatives ensure that bobwhite quail management extends to public lands, and that it is not exclusively exercised on private plantations.

The National Bobwhite Symposium was revived in 1992 with a big-tent philosophy to include all six species of quails native to the United States, not just bobwhites. A key feature of the third National Bobwhite Symposium was the establishment of a National Strategic Planning Workshop for Bobwhite Research and Management [20,21]. The purpose was to ‘Develop cooperative working groups of biologists and managers from state and federal agencies ... for each region of North America that supports quail’ [21]. In 1995, led by South Carolina and a dozen or so other Southeastern States, the Southeast Quail Study Group was formed [19]. In 2002, the Southeast Quail Study Group became the National Bobwhite Conservation Initiative, which is now in its second iteration [22]. During the past year or so, twenty-five state wildlife agencies have worked together to put the National Bobwhite Conservation Initiative on firm financial footing by providing Pittman–Robertson funds to support this program [19].

The role of non-governmental organizations

It is highly significant that the leading scientists who established the baselines for understanding bobwhite quail biology and management, Stoddard, Rosene, and Lehmann, all conducted the bulk of their work on bobwhite quail while affiliated with non-governmental organizations and/or with programs funded by hunters. Stoddard needed the cooperation of the U.S. Bureau of Biological Survey to overcome the political influence of the Forest Service in the U.S. Department of Agriculture, but his research was funded entirely by bobwhite quail hunters. Rosene and Lehmann both had prior relationships with state or federal agencies, but the most influential aspects of their work were affiliated with non-governmental organizations and private landowners and funded by bobwhite hunters.

Furthermore, the non-governmental organization, Quail Unlimited, was established in 1981 entirely for the purpose of increasing and sustaining quail populations [23]. This organization was founded and funded for many years by quail hunters, and it made some excellent contributions to bobwhite quail conservation, especially through its national magazine. It was eventually replaced by Quail Forever, which was an outgrowth of the highly successful hunter-based and funded organization Pheasants Forever [24]. Quail Forever, along with a similar organization named the Quail Coalition, based largely in Texas,

have put more than 95% of the dollars they have raised directly into projects that support bobwhite research and conservation [24,25] In Texas alone, various chapters of the Quail Coalition have directed at least 3 million dollars to bobwhite quail conservation in the past five years [25]. Bobwhite hunters make up the vast majority (more than 90%) of the members of these non-governmental organizations [23–25].

The role of private landowners

It is difficult to exaggerate the role private landowners have played in bobwhite quail conservation over the years. Since the first initiatives in the Thomasville-Tallahassee Region of Florida/Georgia a century ago and until today, private landowners have been exceptionally generous when it comes to supporting bobwhite quail conservation and research. Most of these individuals are hunters and they provide their support indirectly by paying excise taxes on sporting arms and ammunition that is funneled through the Pittman–Robertson Program to wildlife conservation. They also provide support directly through personal donations to non-governmental organizations and academia. In addition, one of the key contributions private landowners have made to bobwhite quail conservation has been making their land accessible to quail researchers. Natural laboratories such as the 800,000+ acre King Ranch in Texas and the 200,000+ acres of quail hunting plantations in the Thomasville-Tallahassee region, have been essential for conducting experimental research on the habitat selection preferences and population ecology of wild bobwhite quail [26].

Academia

Dr Fred S. Guthery was arguably the first professor at a university to develop a full-time research program dedicated to bobwhite ecology and management. After a brief stint at Texas Tech University, Guthery started at the Caesar Kleberg Wildlife Research Institute in the early 1980s. In 1997 he moved to Oklahoma State University to fill the Bollenbach Endowed Chair, the first endowed chair at a university dedicated to bobwhite quail research. Other notable universities that created full-time faculty positions for bobwhite research professors include Mississippi State University and the University of Georgia. The Cooperative Wildlife Research Laboratory at the University of Southern Illinois supported the landmark 15-year study of bobwhite quail population dynamics by Roseberry and Klimstra [27].

The Caesar Kleberg Wildlife Research Institute is unique in that it has an endowed center for bobwhite quail research and two endowed faculty positions dedicated full-time to bobwhite quail investigations. There are also three endowed graduate student fellowship positions in this program. With twenty fully-funded graduate students working on specific quail research projects and eight professors (three dedicated full-time and five part-time to bobwhite quail research) this is the largest quail research program active today [26]. Incredibly, virtually all funding for this bobwhite research comes from hunters. In academia, even when bobwhite quail research funds do not come directly from hunters, the funds nearly always come from agencies that have been lobbied by bobwhite hunters to support the research that forms the scientific basis for bobwhite quail conservation.

Conclusions

Making the case that hunters support quail conservation efforts is akin to cutting butter with a chainsaw. It does not take much effort. Today, with nearly all prevailing land uses in the United States being hostile to bobwhite quail, directed, purposeful habitat management must be conducted just to sustain their populations. Opportunities to observe, hunt, and otherwise enjoy wild bobwhite quail are no longer a happy accident of how we grow our crops, tend our forests or graze our rangelands. In almost all cases our industrial efforts do not provide the habitat required for bobwhite quail; instead they tend to reduce, impair or destroy it. Currently in North America only the hunter constituency is working to confront and change this pattern of wildlife loss; other voices of concern are virtually absent.

Nevertheless, the fact that hunting and hunters are a fundamental component of bobwhite conservation efforts seems to be overlooked, or perhaps underappreciated, by most professional wildlife conservationists, and certainly by the general public. Perhaps, because hunters have given such support so generously and for so long it is simply taken for granted; but it should not be. We need to do a better job of telling this story to the wildlife professionals and to the public of North America. Without hunters expressing their concern, advocating for change, and financially supporting critical research, the future for bobwhite quail would be a drastic decline. For a century now hunters have been the driving force behind bobwhite quail conservation.

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