A close-up photograph of a Northern Bobwhite bird sitting in a nest. The bird has brown and tan mottled feathers and a dark beak. It is surrounded by dry pine needles and twigs. The text is overlaid on the top half of the image.

Northern Bobwhite Habitat Restoration in South Carolina:

Challenges and Opportunities in the 21st Century

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...the unified strategy to restore wild quail

The National Bobwhite Conservation Initiative is a range-wide habitat plan for recovering bobwhites to target densities set by state wildlife agencies (Palmer et. al, 2011), and includes the 25 states comprising the historic range of the Northern Bobwhite. Step-down plans are being developed which encourage increasing habitat in focal areas to achieve those target densities.

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Northern Bobwhite Quail Habitat Restoration in South Carolina: Challenges and Opportunities in the 21st Century

Executive Summary:

Northern bobwhite are declining over much of their range and throughout South Carolina. In addition, many species of grassland birds and early successional or shrub breeding birds are exhibiting substantial declines in South Carolina, with 13 of 17 species showing overall declining trends and six of 17 species exhibiting statistically significant declining trends for the years 1966-2010 (Sauer et al. 2011). These losses are directly related to declines in the quantity and quality of early successional habitat types across the state.

Quail are the ideal focal species for early successional habitat restoration efforts because: (1) quail are declining at a faster rate than any other grassland bird species; (2) quail are an iconic symbol of South Carolina rural culture and traditions and have a devoted and organized grassroots constituency based on their tradition as a hunted species; (3) planning efforts for quail are more advanced at the regional and national scales than those for other grassland bird species; (4) a rangewide recovery plan, the National Bobwhite Conservation Initiative (NBCI), with specific habitat and population objectives has been developed; and (5) all declining grassland bird species are expected to respond to habitat restoration efforts targeting quail.

Past efforts directed to restoration of Northern bobwhite habitat have targeted individual private landowners to a large degree and often resulted in minimal habitat improvement or improvement at scales too small to impact quail populations at significant levels. Limited technical assistance capacity, lack of financial incentives for grassland restoration, and a lack of public appreciation for grassland habitats have all contributed to limited success in quail restoration efforts.

This plan is intended to provide strategic guidance to achieve objectives related to increased technical assistance capacity, improved habitat in agricultural and forested landscapes, increased public awareness and public appreciation of quail and early successional habitats, and improved coordination of research and monitoring efforts for quail. The establishment of a Bobwhite Quail Council is a key step in achieving the objectives listed above.

Accomplishment of objectives listed in this plan support Strategies 1(a), 1(b) and 1(c) of the South Carolina Department of Natural Resources “Vision for the Future” document, which serves as the agency’s Strategic Plan.



Introduction

The bobwhite quail, more properly called the Northern bobwhite (*Colinus virginianus*) has suffered serious declines in South Carolina and throughout much of its range in the past four decades. Data from the North American Breeding Bird Survey (BBS) indicate that in South Carolina the species has declined at a rate of 6.1 percent annually since 1966 (Figure 1). Additionally, many “common” grassland birds have experienced similar declines (Sauer et al., 2011). Common declining species along with their annual rates of decline in South Carolina include: Eastern meadowlark (*Sturnella magna*, -4.5%); Loggerhead shrike (*Lanius ludovicianus*, -4.1%); Grasshopper sparrow (*Ammodramus savannarum*, -4.1%); Wood thrush (*Hylocichla mustelina*, -3.6%); and Gray catbird (*Dumetella carolinensis*, -2.8%).

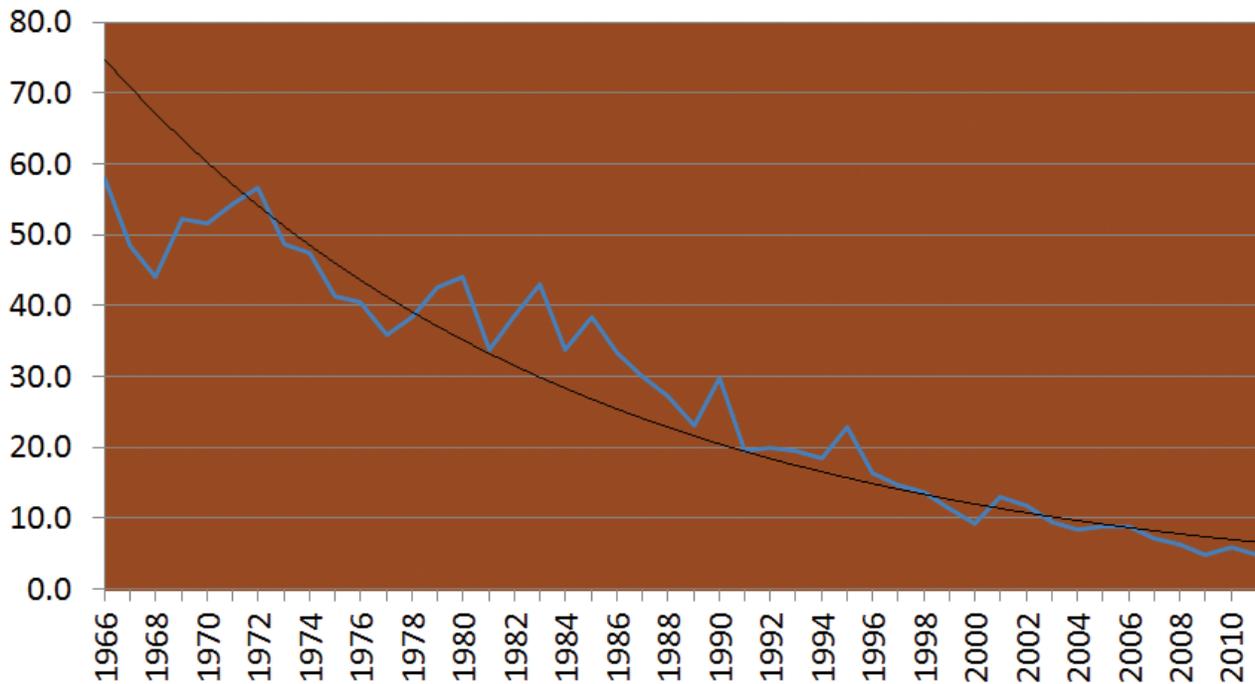


Figure 1. Decline of quail in South Carolina from 1966-2011 from the North American Breeding Bird Survey. Numbers on y-axis indicate average number of bobwhites heard per 24.5-mile route.

Throughout much of its range, and certainly in the Southeastern U.S., bobwhites are considered a species of “early-successional” habitats (Brennan, 2011). Early successional habitats are usually dominated by native warm season grasses, annual forbs and legumes, and shrub thickets which meet the annual life cycle requirement of bobwhites as nesting habitat, brood-rearing habitat and escape cover. In high rainfall zones like the Southeast, early successional habitat must be maintained through periodic management activities such as timber harvest, prescribed fire, and rotational disking.

Early successional habitats can occur in a variety of landscapes and under a variety of land uses. Common examples of early successional habitat include fallow or idle fields, managed crop field borders containing native grasses and forbs, managed woodlands, shrub/scrub thickets and pine savannas. The South Carolina GAP Project data lists eleven habitat types totaling 12,774,876 acres (67% of non-developed lands) in South Carolina on which management to benefit early successional species is a biological possibility (SC GAP, 2006). However, such a listing does not account for constraints such as land ownership, current land use, or difficulty and expense of management. When accounting for current land cover only, it is estimated that less than one percent of South Carolina’s non-developed lands are currently in a productive and useful state for grassland birds.

The Northern Bobwhite in South Carolina

Bobwhite populations in South Carolina likely peaked early in the 20th century, when suitable habitat was a by-product of agricultural practices of the era. Populations remained at high levels through the 1960's. Liberal seasons and bag limits, abundant bobwhite populations, favorable weather, and widespread access to private lands made South Carolina a "bird hunting" destination for hunters across the country. By the 1970's bobwhite populations in South Carolina had begun a precipitous decline due to large-scale habitat changes brought about by urbanization, modern agricultural practices and intensive forestry practices.

As bobwhite populations were declining, big game populations were increasing in South Carolina. As a result, many hunters shifted emphasis from small game hunting to big game hunting. However, interest in bobwhite hunting and bobwhite habitat management remains strong in South Carolina. The South Carolina Department of Natural Resources (DNR) Small Game Project annually conducts site visits and prepares management plans for private landowners, and could do many more if additional manpower were available. In addition, quail management seminars have been conducted annually for the past 25 years with strong interest from private landowners and land managers. Public lands, including DNR-owned lands, are managed for bobwhites usually within the context of multiple-species or habitat maintenance management regimes. These efforts, while they have resulted in modest increases in bobwhite populations on some properties, have generally been insufficient in terms of acreage affected or bobwhite population response to satisfy demands for public quail hunting.

Declining bobwhite populations have undoubtedly contributed to declining quail hunter numbers. In 1991, the total economic impact of quail hunting in South Carolina was \$13,500,000 (Burger et al. 1999). Since that time, quail hunter numbers have declined by approximately 80 percent, likely resulting in a similar decline in economic impact (Table 2). Increased bobwhite populations should increase quail hunter recruitment and economic benefits for states, resource management agencies, and rural communities (Wallace et al. 1991).

Benefits of quail habitat restoration in South Carolina extend far beyond increased quail populations and increased hunting opportunity. Many species of nongame birds, as well as threatened and endangered species, depend on similar habitats and would benefit from management activities directed at Northern bobwhite habitat restoration. The endangered Red-cockaded woodpecker is an example of one endangered species that would benefit from such activities. In addition, many species of songbirds, such as the Eastern towhee, blue grosbeak, yellow-breasted chat, indigo bunting, Northern cardinal, and Carolina wren share habitat requirements similar to the Northern bobwhite and would benefit from habitat restoration efforts.



Table 2. *Quail hunter numbers, hunter effort and harvest from DNR harvest surveys, 1963-2005.*

Year	Hunters	Hunter Days	Harvest per Day	Harvest
1963-64	96,592	918,869	2.27	2,091,571
1966-67	98,354	1,007,898	2.25	2,277,303
1975-76	77,634	602,850	3.13	1,887,508
1978-79	59,777	363,020	2.10	760,598
1981-82	58,736	475,567	2.95	1,402,909
1984-85	48,249	376,472	2.34	882,488
1991-92	32,282	215,284	2.38	511,935
1993-94	28,575	183,793	2.90	533,000
1999-2000	11,075	73,393	1.33	97,582
2002-2003	6,611	32,200	3.01	97,026
2004-2005	6,537	29,614	2.01	59,470

History of Northern Bobwhite Planning Efforts

The Small Game Project was formed in 1978 to address declining populations of farm wildlife including Northern bobwhite, as a result of recommendations from a Program Development Team comprised of wildlife professionals and sportsmen (McConnell et al. 1978). The Program Development Team listed 10 basic concepts necessary in the implementation of a significant farm wildlife program. All of these are still relevant today:

- (1) The basic knowledge presently exists to successfully manage for farm wildlife species. Programs are needed to implement this knowledge.
- (2) Habitat development and maintenance are the cornerstones to increasing farm wildlife populations.
- (3) Management programs will require several years to produce meaningful results and must be continuous, long-term efforts.
- (4) The primary program effort must be to favorably influence other state and federal programs to seriously consider wildlife needs in their programs; and to provide incentives for private landowners to develop and maintain wildlife habitat and to allow sport hunting.
- (5) Any significant habitat program must appeal to and be carried out primarily by private landowners.
- (6) Proper harvest of the resource is necessary in any successful wildlife management program.
- (7) The Department can provide only a small increase in total farm wildlife resources with programs depending solely on state controlled and managed lands.
- (8) The Department must make the public aware of the problems and point out that it has no direct control over many of the activities that affect farm wildlife, such as urban expansion and intensive agricultural operations.
- (9) Production of farm wildlife is at the mercy of economic interest in the land that serves as habitat for these species.
- (10) A broad Department effort will be required for a sound program with the primary role being one of leadership and consultation.

While the mission of the Small Game Project has changed somewhat since its inception, this document continues to provide significant guidance applicable to statewide efforts to improve habitat for Northern bobwhite and associated grassland bird species.

In 2001, a Grassland Birds Working Group was assembled to address declining populations of Northern bobwhite and grassland birds. This group was comprised of DNR biologists, and identified issues, obstacles, priority actions, and management recommendations for a statewide recovery plan of quail and grassland birds in South Carolina. There was consensus among the committee that the plan must be “habitat-based” and that financial incentives are necessary for the successful implementation of a statewide habitat recovery program. Similar to the Program Development Team in 1978, the Committee emphasized the importance of management of private lands and also stressed the importance of partnerships in carrying out a statewide habitat restoration initiative. In a subsequent meeting, the Committee recognized the need for an inter-agency Quail Council to coordinate and facilitate habitat restoration efforts on a statewide scale.

Specifically for Northern bobwhite, the Directors of the member states of the Southeastern Association of Fish and Wildlife Agencies requested the Southeast Quail Study Group (SEQSG – now the National Bobwhite Technical Committee) to prepare a rangewide plan for the recovery of this species in response to its serious decline. As a result of this request, the SEQSG prepared the Northern Bobwhite Conservation Initiative (NBCI), which provided specific habitat restoration goals to restore Northern bobwhite population levels to an average density equivalent to levels that existed on improvable acres in the baseline year of 1980 (Dimmick et al. 2002).

With the establishment of practice CP33, Habitat Buffers for Upland Birds, in the Conservation Reserve Program in 2005, the DNR Small Game Project, in consultation with the U.S. Department of Agriculture (USDA), Farm Services Agency (FSA) and the USDA Natural Resources Conservation Service (NRCS), established a Northern bobwhite focal area comprised of 18 upper coastal plain counties (Figure 2). This focus area was identified based solely upon land use, with percent agricultural land as the primary factor considered for inclusion in the focal area.

Northern bobwhite is included as a priority species in South Carolina’s Comprehensive Wildlife Conservation Strategy (CWCS), elevating the priority of conservation actions to improve populations of the species. In addition, early successional habitat and pine woodlands are included as priority habitat types in the South Carolina CWCS (Kohlsaas et al. 2005).



Figure 2. CP33 Bobwhite habitat restoration focal area for South Carolina, 2005.

Challenges

Southeast quail biologists agree that a lack of nest and brood-rearing cover is the major limiting factor over much of the range of the bobwhite (Dimmick et al. 2002). Experience gained from hundreds of quail management technical assistance site visits has validated this assumption for South Carolina landscapes.

Modern agricultural practices are characterized by large fields of weed-free monocultures that provide few benefits to bobwhites and other species that depend on similar habitats. Idle lands that once provided excellent nesting and brood cover have largely been replaced by crop fields, developed lands or timberlands. Between 1968 and 1991, cropland acres decreased by 32 percent within the state, while idle land acres decreased by 43 percent (Conner et al. 2001).

Pine plantations have increased from approximately 240,000 acres in 1952 to over 3 million acres in South Carolina, comprising approximately 25 percent of all timberland in the state (Conner et al. 2001, Forest Inventory Data Online 2011). Intensive management practices associated with modern pine plantations (high stocking rates, intensive chemical site prep, short rotations) often fail to produce productive habitat for Northern bobwhite and other early successional species.

In addition to intensive forestry management practices, a reduction in the use of prescribed fire has also resulted in degradation or elimination of early successional habitat in older pine stands. Increasing human population, smoke management considerations, lack of training and education, few qualified contractors, and liability concerns limit the ability and willingness of private forest landowners to use prescribed fire for woodland management.

Urbanization as a result of expanding human populations will continue to reduce the land base available for wildlife habitat in South Carolina. In addition to the outright loss of habitat caused by urbanization, habitat fragmentation will result in decreased habitat value of isolated tracts, and will result in difficulty in maintaining viable populations of certain area-sensitive species. For early successional species like the Northern bobwhite, large expanses of intensively-managed timberlands can likewise result in habitat fragmentation.

Wildlife professionals have recognized grasslands and other early successional habitat types as supporting vast assemblages of native flora and fauna and as nesting areas for many species of birds, including Northern bobwhite. However, members of the general public seemingly place lower value on early successional habitats than on wetlands or mature forests. Grasses and weeds, primary vegetative components of early successional habitats, have a negative connotation and are often seen as a product of neglect rather than management. This negative connotation often manifests itself with the individual landowner in the form of “recreational mowing” or the compulsion to “clean up” grassy, weedy areas around the farm. This misplaced effort often compounds habitat losses that occur as a result of modern agricultural or silvicultural practices.

Few economic incentives exist for creation, restoration, management, and maintenance of early successional habitat. Additionally, there are opportunity costs (e.g. lost farm rent or timber revenue), associated with maintaining early successional habitat. While many federal Farm Bill programs contain practices and specifications that can be used to establish quality early successional habitat (e.g. native warm season grasses for filter strips), these practices are often overlooked in favor of more “tried and true” practices which have traditionally been used to preserve water quality and reduce soil erosion. The Wildlife Habitat Incentives Program (WHIP) receives less funding than most other Farm Bill conservation programs, and provides cost-share, but not incentive payments, for establishment of wildlife habitat.



Opportunities

Nesting and brood-rearing habitat for quail can be provided in agricultural landscapes by incorporating field borders or other fallow patches on farms (Palmer et al. 2005). Practice CP33, Habitat Buffers for Upland Birds, in the Conservation Reserve Program (CRP), demonstrated the effectiveness of field borders at increasing quail and songbird numbers (Evans et al. 2009). CP33 authorized in 2005, is the first practice in CRP directed specifically at the establishment of early successional habitat that has received widespread support and acceptance among federal agency personnel, state wildlife agencies, and private landowners. South Carolina's allotment of 5000 acres under CP33 was quickly allocated to eager and enthusiastic producers in the state. The quick adoption of the practice by producers clearly demonstrates the importance of adequate financial incentives in motivating private landowners to manage for early successional habitat.

In South Carolina, practice CP38E (State Acres for Wildlife Enhancement) was designed to further increase the availability of nesting and brood-rearing habitat by encouraging short-term conversion of agricultural fields to native grasses and forbs. Through 2013, approximately 1000 acres had been enrolled in CP38E in South Carolina.

Other Farm Bill conservation programs, when coupled with practices like CP33 and CP38E, have the potential to further benefit quail by improving fall and winter habitat on adjacent woodlands. In addition, the coupling of bobwhite habitat restoration goals with programs and practices designed to benefit other species with compatible or complimentary habitat requirements has potential to significantly increase acreage of suitable quail habitat.

Restoration of the longleaf pine ecosystem has become a priority of government agencies, non-governmental conservation organizations (NGO), and private landowners throughout the Southeast. This effort has the potential to greatly increase the availability of quail habitat, provided that the re-establishment of the longleaf pine forest includes the re-establishment of suitable native groundcover in the forest understory and the application of frequent prescribed fire.

Even though the use of prescribed fire as a management tool has declined dramatically in South Carolina, resulting in loss of habitat for quail across the state, there is reason for guarded optimism regarding the future of prescribed fire use in the state. The South Carolina Prescribed Fire Council, formed in 2003, promotes prescribed fire by informing citizens about the important role prescribed fire plays in the stewardship of our natural resources. Recently, liability protection for properly trained practitioners of prescribed fire was broadened within the state.

Private landowners, who have long been the cornerstone of wildlife conservation and stewardship in South Carolina and elsewhere across the country, have begun to take a renewed interest in the management of quail in South Carolina. The owners of numerous properties, 3,000 to 7,000 acres in size, have begun intensive management of wild quail with impressive results. It is estimated that at least 40,000 acres of private lands are at some stage of intensive quail habitat restoration in South Carolina, and that number is expected to increase in the foreseeable future (Jerald Sholar, Tall Timbers, personal communication). These properties serve to demonstrate the feasibility of quail restoration through intensive habitat management and can serve as source areas for wild bobwhites to colonize nearby habitat.

Effective quail restoration is predicated on the ability to restore habitat, promote policies that encourage appropriate habitat management, change human perceptions and biases toward quail habitat and management practices, and make efficient use of available manpower, technical assistance and financial resources. Given these multiple, complex objectives, the need for partnerships to promote quail management is critical. Fortunately, multiple organizations are currently involved in bird conservation; performing various roles that range from landscape conservation planning, to public education and outreach, to technical assistance and habitat delivery.



NBCI 2.0: The National Bobwhite Conservation Initiative

The original Northern Bobwhite Conservation Initiative was revised in 2011. It was expanded beyond the Southeastern states to include the majority of states in bobwhite range and renamed the National Bobwhite Conservation Initiative (NBCI 2.0) (National Bobwhite Technical Committee, 2011). The NBCI 2.0 presents nine core principles which provide the justification for bobwhite restoration, as well as, key points and vital elements for a successful bobwhite restoration effort. These NBCI Principles are considered essential to bobwhite restoration in South Carolina as presented in Appendix A.

The NBCI 2.0 is the “unified strategy to restore wild quail” (Palmer et. al, 2011). While the original NBCI did establish habitat and population goals, it provided little guidance on locations of priority landscapes for bobwhite habitat restoration. The revised NBCI 2.0 prioritizes technical and financial resources from state wildlife agencies and conservation partners into landscapes with the highest bobwhite restoration potential through the use of a Biologist Ranking Information (BRI) process. The BRI ranks potential bobwhite habitat into high, medium, and low categories based on current and projected land cover and land use trends from various land cover and land use databases. On December 4, 2008, a workshop was held in Columbia, SC, with 25 natural resource professionals in attendance to develop the BRI information framework for South Carolina. Following this initial habitat ranking workshop, BRI rankings were reviewed by a smaller review team in order to verify initial rankings, review justification for rankings, and resolve ranking discrepancies related to county lines, state lines and other administrative boundaries (Figure 3). The BRI ranking process identified 9,150,594 acres as having medium or high potential as bobwhite habitat in the state.

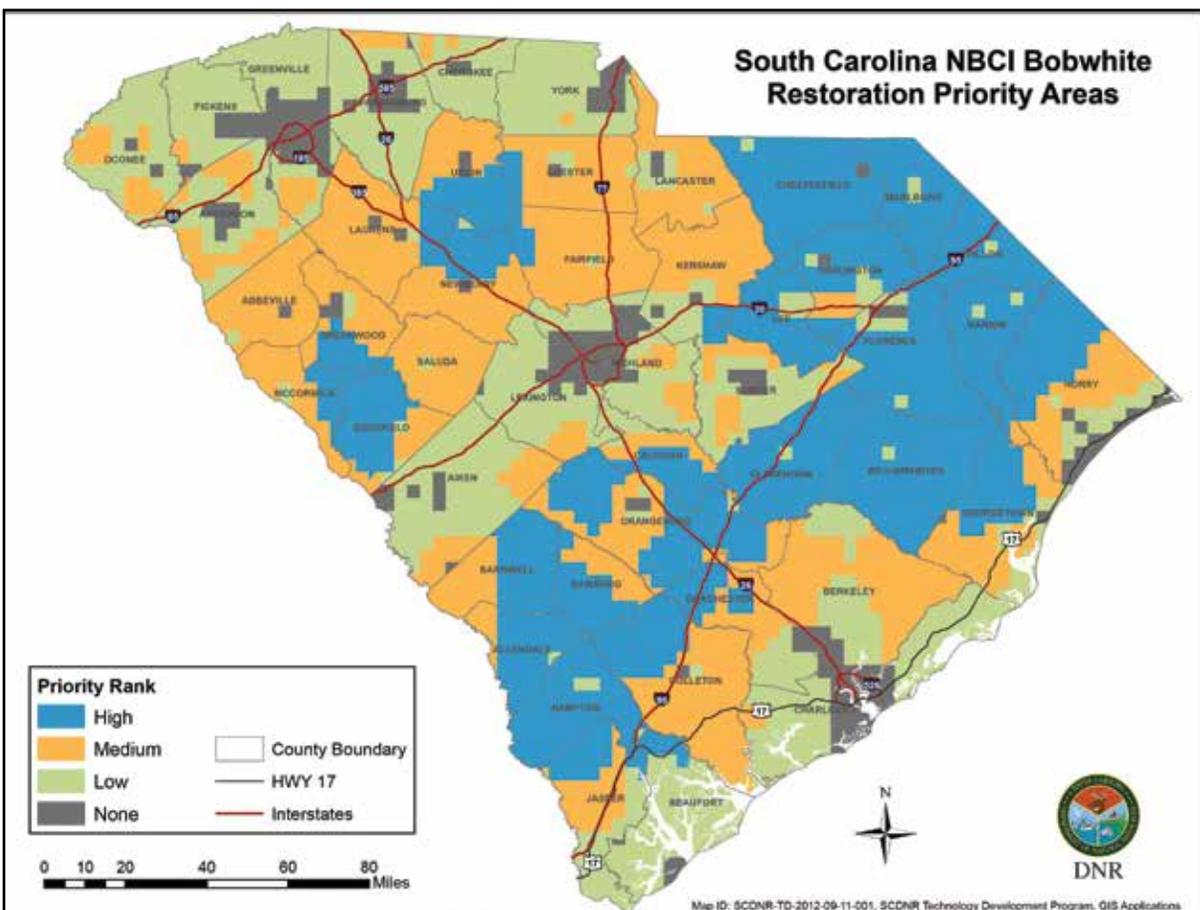


Figure 3. Bobwhite quail habitat restoration potential as delineated through the National Bobwhite Conservation Initiative’s 2.0 Biologist Ranking Information process.

Also included in these habitat rankings are the expert opinion of wildlife biologists, foresters, and land managers who incorporated various logistical, sociological and biological factors into the rankings through the identification of major land use opportunities and land use constraints. Forested land represented approximately 65 percent of the land area identified as having medium or high potential for quail habitat enhancement within the state, followed by agricultural land at 19 percent. Therefore, it is not surprising that the primary opportunities for bobwhite restoration in South Carolina were identified as forest/ woodland savanna management and field borders/farm field management. Conversion of pastures to native warm season grasses was also identified as a prominent opportunity for quail habitat enhancement. The primary barriers or constraints to bobwhite habitat restoration and management in South Carolina are urbanization threats, small farm/parcel sizes, inappropriate vegetative cover types (forest or sod grasses) and intensive farming pressures.

A primary goal of the NBCI 2.0 is to be scalable, such that state plans can be stepped down to the appropriate level for implementation and monitoring. For South Carolina, a tiered structure starting with the NBCI 2.0 BRI is proposed. The state is subdivided into NBCI Focal Regions based on the BRI. The new NBCI Focal Regions encompass the 18 counties included in the original Northern bobwhite habitat restoration focal area from 2005, plus an additional 12 counties comprised of predominately high and medium ranked habitat potential for bobwhites. Focal regions identified using the BRI ranking as the primary criteria include the Pee Dee, Central, South and Piedmont (Figure 4).

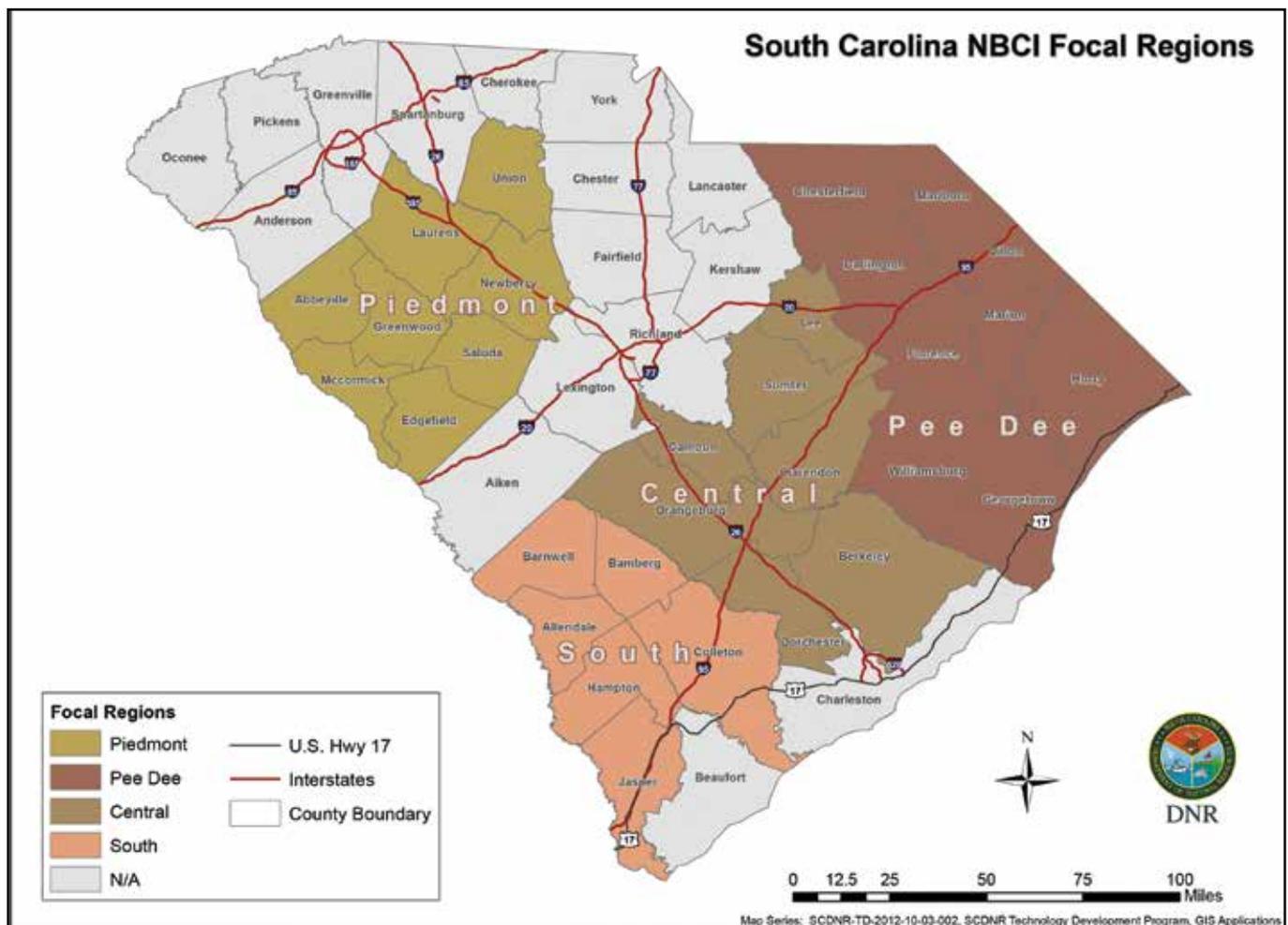


Figure 4. NBCI Focal Regions identified using bobwhite habitat restoration potential as identified through the National Bobwhite Conservation Initiative’s 2.0 Biologist Ranking Information process.

The operational unit of this plan will be NBCI focal areas, which will be developed based on the BRI in conjunction with additional factors, such as the availability of state, federal, and NGO personnel, presence of private and/or public conservation lands, existing quail populations, and other factors. Focal areas should consist of the minimum area needed to sustain a quail population through time, regardless of landscape context. To meet the criteria of a focal area under the NBCI 2.0, a focal area should contain at least 1,500 acres of year-round habitat that comprises more than 25 percent of the total area. Concentrating efforts to well designed focal areas optimizes the ability to produce and document habitat accomplishments and the resultant quail population response.

Population Objectives

During the last two decades of the 20th century, a surge of interest in conserving birds and their habitats spurred the development of several unprecedented, partnership-based bird conservation initiatives (e.g., North American Waterfowl Management Plan, Partners in Flight). These initiatives have produced international, national and regional conservation plans for birds that lay out species status assessments, population objectives, habitat conservation issues and objectives, and monitoring needs. Each initiative has taken a slightly different approach based on the needs of the partnership, number of species and extent of data available.

The 2002 NBCI established bobwhite population goals for each state based on estimated densities in 1980 and 1999 and the amount of improvable habitat available in each state. Using this method, the South Carolina population goal for the 2002 NBCI was to add 87,632 coveys to the estimated 1999 quail population through the manipulation and enhancement of 5,094,889 acres.

As part of the NBCI 2.0, state quail biologists created a spatial layer of current estimated (“existing”) bobwhite population densities and future potential (“managed”) densities, assuming proper implementation of management practices. Current densities are the best estimates based on available data and expert biological opinion, and managed densities are considered the potential response of bobwhites to habitat management. Current quail densities, extrapolated to all upland habitat types, yields a statewide population estimate of 306,148 birds (25,512 coveys) or one covey per 499 acres. For all lands ranked as high or medium for quail habitat restoration potential, the current population estimate is 278,971 (23,234 coveys) or one covey per 394 acres. Managed density estimates from the NBCI 2.0 predict we could add 34,801 coveys (12 birds per covey) to landscapes rated with high BRI potential and 26,574 coveys in areas rated with medium BRI potential, for a total of 61,375 coveys if all the prescribed management occurred in all of these areas statewide. The resulting density would be one covey per 108 acres. Achieving habitat restoration objectives on all medium and high priority acres within the four focal regions would result in the addition of approximately 52,425 coveys, 85 percent of total restoration goals for the state.

Existing and managed densities should be considered hypotheses to be tested through monitoring in an Adaptive Resource Management (ARM) framework. Use of current and managed densities in an ARM framework can provide feedback on the effectiveness of quail management efforts at various spatial scales (Palmer et al. 2011).

NBCI 2.0 focal areas should have the goal of meeting 50 percent of the managed density target in 5 years and 100 percent of the managed density target in 10 years.

South Carolina - NBCI Pee Dee Focal Region

The NBCI Pee Dee Focal Region consists of nine counties in the eastern portion of the state (Figure 5). Approximately 2.1 million acres were ranked as high or medium potential for bobwhite habitat restoration in this region, with upland pine (37 percent) and cropland (28 percent) as the predominant cover types. Major opportunities for restoring bobwhite habitat in the Pee Dee Focal Region include forest management/woodland savanna restoration and fallow field management in agricultural landscapes. Primary constraints to quail management in the Pee Dee include small farm/parcel sizes, vegetation types incompatible with bobwhite management, intensive farming, and a lack of funding and staff on public lands.

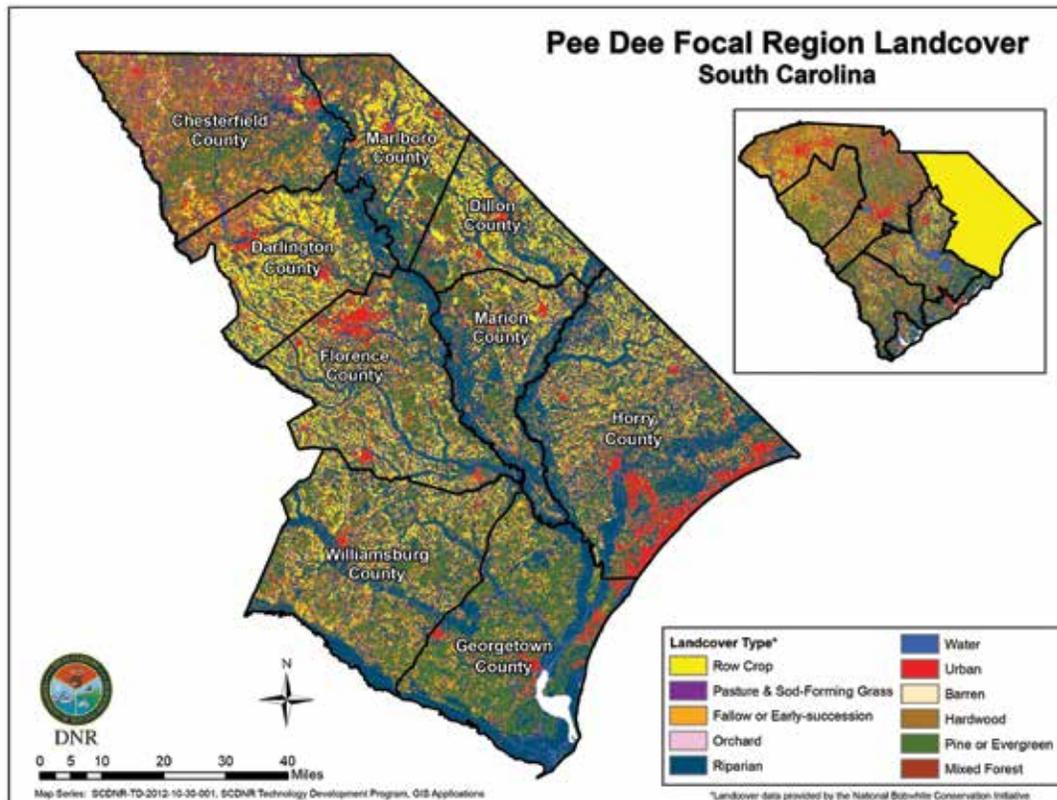


Figure 5. South Carolina NBCI Pee Dee Focal Region.

Significant public land holdings within the Pee Dee Focal Region include the Sand Hills State Forest, Carolina Sandhills National Wildlife Refuge, McBee Wildlife Management Area (WMA), Marsh WMA, Woodbury WMA, and Lewis Ocean Bay Heritage Preserve.

Full implementation of the habitat opportunities in the Pee Dee Region would result in adding 18,859 coveys or about one bobwhite per 9.5 acres. This equates to approximately 31 percent of the statewide covey goal.

South Carolina - NBCI Central Focal Region

The NBCI Central Focal Region consists of seven counties located in the coastal plain of South Carolina (Figure 6). Approximately 1.5 million acres were ranked as high or medium potential for bobwhite habitat restoration in this region, with upland pine (37 percent) and cropland (27 percent) as the predominant cover types. Major opportunities for restoring bobwhite habitat in the Central Focal Region include field border and farm field management and forest management/woodland savannah restoration. Primary constraints to quail management noted in the Central Region include intensive farming, urbanization threats, and vegetation types incompatible with bobwhite management.

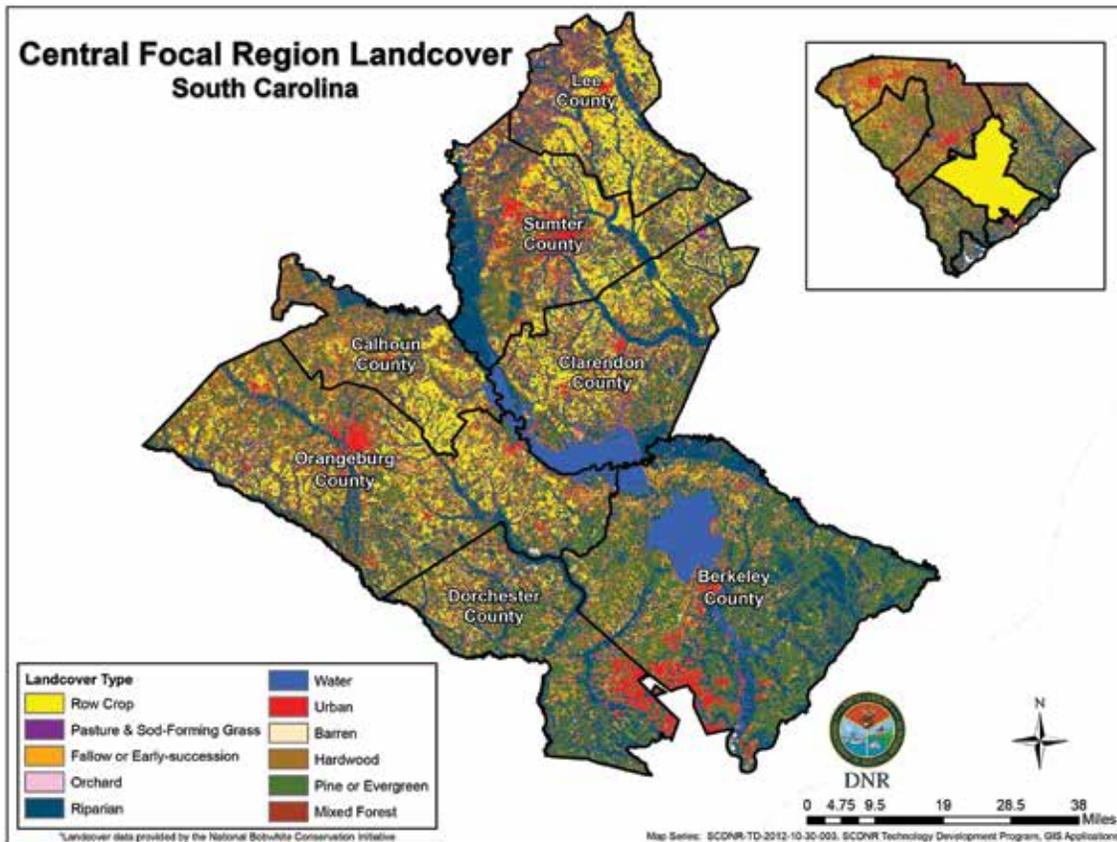


Figure 6. *South Carolina NBCI Central Focal Region.*

Significant public land holdings within the Central Focal Region include Bonneau Ferry WMA, Canal WMA, Manchester State Forest including Oak Lea WMA, Santee Cooper WMA, and portions of the Francis Marion National Forest.

Full implementation of the habitat opportunities in the Central Region would result in adding 12,767 coveys or about one bobwhite per 10 acres. This equates to approximately 21 percent of the statewide covey goal.

South Carolina - NBCI South Focal Region

The NBCI South Focal Region consists of six counties located in the coastal plain (Figure 7). Approximately 1.4 million acres were ranked as high or medium potential for bobwhite habitat restoration in this region, with upland pine (49 percent) and cropland (14 percent) as the predominant cover types. Major opportunities for restoring bobwhite habitat in the South Focal Region include forest management/ woodland savanna restoration and field border/farm field management. Existing quail conservation areas (public and private) in the South Region were also considered as an asset or opportunity for bobwhite enhancement in the region. Significant constraints to quail habitat enhancement in the South Focal Region include vegetation types incompatible with bobwhite management, prevalence of sod-forming grasses, low adoption of new technologies by producers, and difficulty of prescribed fire use.

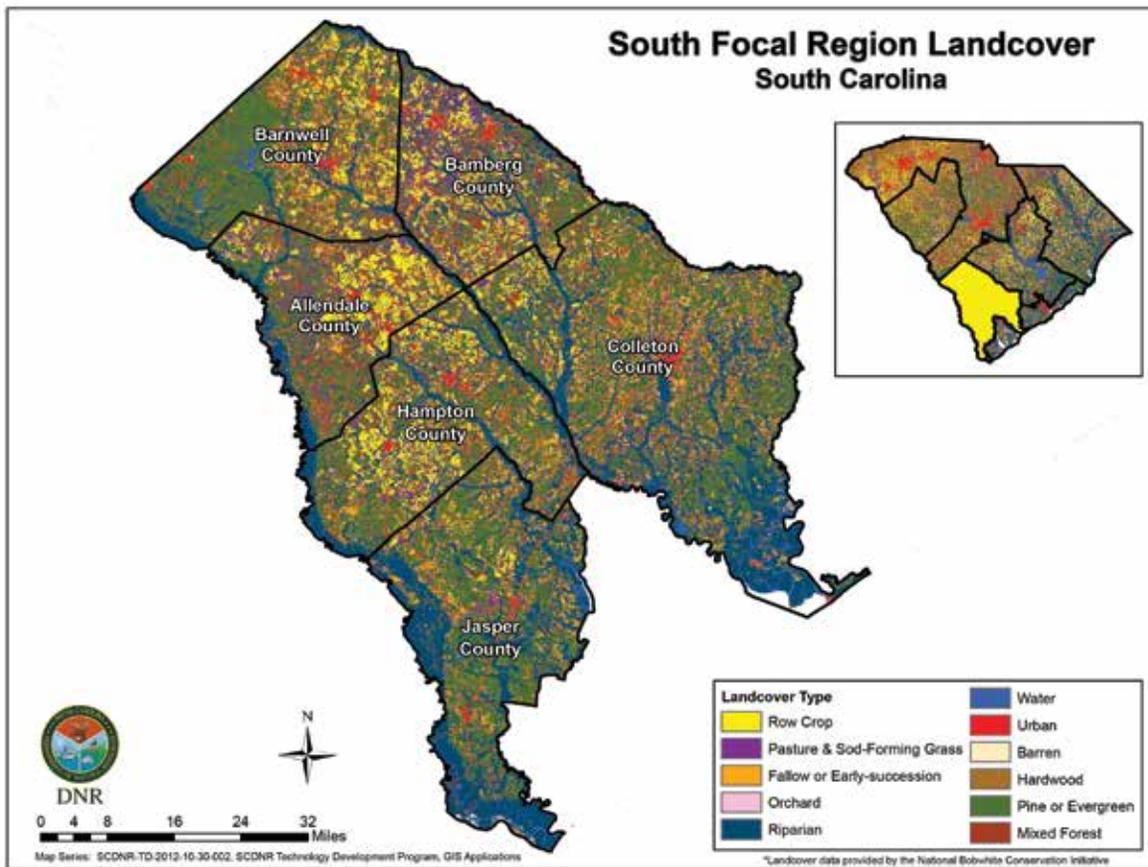


Figure 7. South Carolina NBCI South Focal Region.

Significant public land holdings within the South Focal Region include Webb Center WMA, Palachucola WMA, Hamilton Ridge WMA, and Donnelley WMA.

Full implementation of the habitat opportunities in the South Region would result in adding 10,708 coveys or about one bobwhite per 11 acres. This equates to approximately 17 percent of the statewide covey goal.

South Carolina - NBCI Piedmont Focal Region

The NBCI Piedmont Focal Region consists of eight counties located in the Piedmont (Figure 7). Approximately 2.2 million acres were ranked as high or medium potential for bobwhite habitat restoration in this region, with upland pine (43 percent) and upland hardwood (33 percent) as the predominant cover types.

Major opportunities for restoring bobwhite habitat in the Piedmont Focal Region include forest management/woodland savanna restoration and conversion of pastures to native warm season grasses. Primary constraints to quail management in the Piedmont Focal Region include low bobwhite numbers, extensive forested landscapes, small farm/parcel size, extensive acreage of sod-forming grasses and urbanization threats.

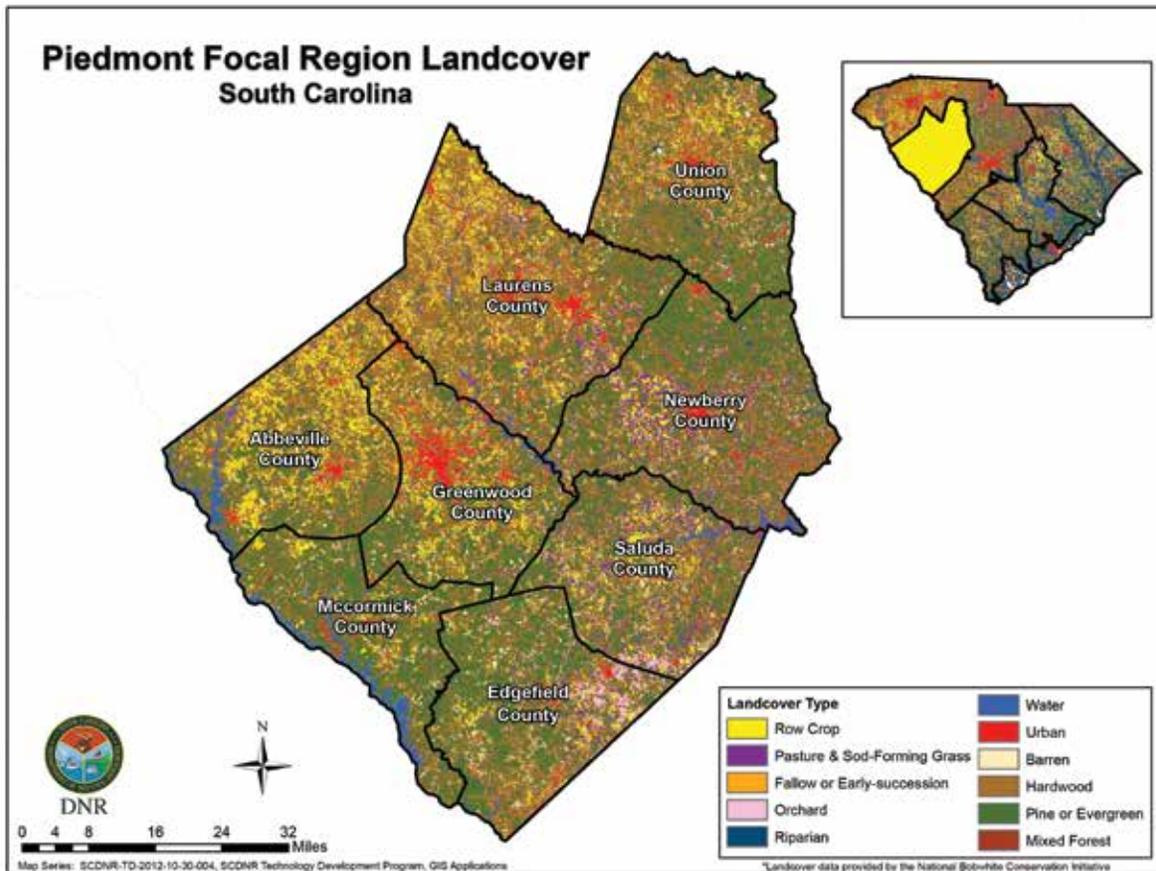


Figure 8. *South Carolina NBCI Piedmont Focal Region.*

Significant public land holdings within the Piedmont Focal Region include Belfast WMA, James L. Mason WMA, U.S. Army Corps of Engineers lands and portions of the Sumter National Forest.

Full implementation of the habitat opportunities in the Piedmont Region would result in adding 10,091 coveys or about one bobwhite per 18 acres. This equates to approximately 16 percent of the statewide covey goal.

Bobwhite Population Monitoring

Historical Monitoring

In 1979, the DNR Small Game Project initiated a summer call-count survey (CCS) to monitor bobwhite populations at the state level. This survey contains more survey routes than the BBS, and should be more precise and more sensitive to smaller changes in population abundance. Population trends detected by the CCS are nearly identical to those detected by the BBS for South Carolina.

In addition to the spring CCS, the Small Game Project also conducts an annual survey of avid bobwhite hunters in South Carolina. This survey reveals hunting success as measured by coveys per hour and has proven useful in tracking population trends and regional population differences.

Beginning in 2000, DNR Wildlife Section staff began conducting fall covey count surveys on select WMA lands across the state. This survey is extremely valuable in detecting annual population fluctuations for individual properties, and provides a means to monitor population response to management activities targeted at increasing bobwhite populations on those properties. However, due to the manpower requirements of conducting fall covey counts, the technique is not suited to large scale (i.e. statewide) population monitoring.

From 2006 to 2008, DNR Wildlife Section staff participated in spring call counts for bobwhites and five species of priority songbirds, as well as fall covey counts for bobwhites as part of a multi-state monitoring protocol to estimate bobwhite and priority songbird response to implementation of the CP33 (Habitat Buffers for Upland Birds) practice in the CRP. Results from South Carolina indicated that calling male bobwhites and fall coveys were two to three times greater on fields with CP33 buffers than on paired control fields (fields with no buffers). Field sparrows and Indigo buntings also exhibited positive population responses to creation of buffers on crop fields. The observed population responses validate an underlying assumption of the NBCI that a relatively small change in primary land use in agricultural landscapes can result in measurable and substantive population response (Evans et al. 2009).

Bobwhite Monitoring in the era of NBCI 2.0

Monitoring is an essential part of the effective implementation of the NBCI 2.0, and should be a fundamental component of any management plan (Evans et al. 2011). An effective monitoring program, integrated across multiple spatial scales, will allow the NBCI 2.0 and participating states to assess plan progress, evaluate specific management actions, and augment future conservation plans and guide management decisions

Relative abundance data (e.g. indices), such as those obtained from the BBS, summer call counts, and quail hunter surveys are easier to collect, cost less, and can provide data for broad-scale trend information. However, the utility of indices to provide inference beyond simple comparisons and long term trends is severely limited (Evans et al. 2011).

The development and improvement of monitoring methods (e.g. distance sampling, double sampling, removal methods, etc.) which incorporate measures of detection probability now allow for estimation of population density. Evans et al. state multiple times in their NBCI 2.0 chapter that population density should be the parameter of interest for a comprehensive NBCI monitoring program, as population density allows direct evaluation of population response to management actions across at multiple spatial scales and over time.

Considering existing densities and managed densities as hypotheses to be tested in an ARM framework, measurement of population density is the only means of evaluating initial population estimates and assessing the effects of management actions on bobwhite populations.

The *ad hoc* Monitoring Subcommittee of the NBTC recommends standardized or coordinated monitoring across states and focal areas as a means to demonstrate the relationship between habitat and bobwhite population response and to validate the habitat-based strategy of the NBCI 2.0.

In order to achieve this coordinated monitoring approach, the *ad hoc* Monitoring Subcommittee recommends three options for monitoring spring and fall quail densities in order to determine the relationship between habitat management and density. Protocols for monitoring quail populations on South Carolina focal areas should be adopted from recommendations of the NBTC *ad hoc* Monitoring Subcommittee.

Strategic Plan for Northern Bobwhite Restoration

Precipitous declines in populations of Northern bobwhite and other grassland bird species associated with similar habitat types clearly warrants action on the part of natural resources agencies charged with habitat and species conservation. Past actions, while they may have helped to slow the decline of these species, have been insufficient to elicit landscape-level population increases. The following objectives and strategies are presented in order to initiate actions that will lead to the achievement of habitat restoration goals for South Carolina presented in the NBCI 2.0.

Vision: To increase the quality and quantity of Northern bobwhite and grassland bird habitat in the South Carolina landscape.

Objective I: Develop an organizational structure that will facilitate cooperation among state and federal agencies and increase capacity for technical assistance to private landowners.

Strategies:

1. Rebuild the capacity of the DNR, specifically the Small Game Program, to deliver quail and grassland bird habitat technical assistance and provide input to conservation program policy decisions at the state and federal levels.
2. Increase capacity for delivery of technical assistance and Farm Bill program information through placement of biologists in NRCS offices.
3. Establish a State Quail Council to develop a shared vision of bobwhite management among state agencies, federal agencies and private landowners and to facilitate and monitor habitat restoration progress on a statewide scale.
4. Establish a Bobwhite Quail Technical Committee to advise the Council and develop implementation plans for habitat restoration, research and public education.

Objective II: Establish NBCI 2.0 quail focal areas and demonstration areas based upon the NBCI 2.0 BRI.

Strategies:

1. Identify core bobwhite populations and bobwhite habitat enhancement projects on public and private lands.
2. Encourage and facilitate establishment of public/private land management cooperatives and private landowner quail management cooperatives.
3. Increase landowner participation in USDA Farm Bill programs that provide maximum benefits for quail and grassland birds.
4. Coordinate and provide cross-training between DNR and partner agencies staff on programs and best management practices for grassland birds within individual programs.
5. Seek additional funding sources that will provide financial incentives to landowners for implementation of beneficial practices.

Objective III: Increase quality quail hunting opportunities on public lands.

Strategies:

1. Identify DNR lands with high potential for quail habitat restoration and revise management plans on these properties, where appropriate, to include intensive management for quail and grassland birds.
2. Develop a Memorandum of Agreement between state and Federal agencies and private conservation organizations in South Carolina to facilitate quail habitat improvement on public lands (see Appendix B: South Carolina Bobwhite Quail Council Memorandum of Agreement).
3. Assist other public land management agencies with development of quail habitat enhancement plans and quail hunting programs.
4. Pursue opportunities to purchase lands suitable for long-term quail and grassland bird habitat development and maintenance.

Objective IV: Monitor quail populations through various means at multiple spatial scales to detect long-term population trends and annual population fluctuations.

Strategies:

1. Participate in coordinated monitoring of NBCI 2.0 focal areas in order to assess affects of management and provide feedback in an adaptive management framework.
2. Monitor statewide quail hunter participation and harvest through a licensee survey conducted no less than biennially.
3. Continue the annual quail hunter survey, and seek to increase participation of avid quail hunters.
4. Establish a consistent framework for monitoring hunter effort and quail harvest on WMAs intensively managed for quail.



Implementation of the Plan

The science and technology of bobwhite habitat restoration is well-established. The purpose of this strategic plan is to provide recommendations for additional administrative, sociological, and tactical approaches that may be used to achieve the habitat restoration goals as set forth in the NBCI 2.0, and to direct habitat enhancement efforts in such a way that maximizes likelihood of success and provides maximum return on investment of limited resources.

The goals of this plan are ambitious. Over 9 million acres of land have been identified as having medium or high potential for quail habitat restoration. The target population represents an almost four-fold increase in the existing quail population. Success of this plan and any subsequent efforts at quail recovery and restoration of grassland/shrub habitats will require cooperative projects amongst all agencies and private entities involved in land management and/or providing technical assistance to landowners.

In order to achieve meaningful and measurable gains in the quail population, we must move beyond farm-by-farm management and begin to manage quail on a geographic scale that assures the long-term viability of the species. The focal region approach presented in this plan is one way to achieve that goal.

Monitoring programs must be sufficient to document annual changes in populations, document impacts of habitat management practices, and allow comparisons among focal areas and focal regions.

Establishment of NBCI 2.0 focal areas and development of monitoring protocols for focal areas should begin immediately. Public lands, specifically DNR-owned lands, represent the greatest opportunity for establishment of focal areas in the near term. While these lands constitute only a small portion of total statewide acreage available for quail habitat restoration, many of these areas are already in various stages of habitat restoration, have staff and equipment resources to implement additional management, and have trained personnel available to implement monitoring programs.

Implementation of the plan will require increased commitment of resources dedicated to habitat improvement, delivery of technical and financial assistance, and monitoring. Establishment of a statewide Bobwhite Quail Council and Bobwhite Quail Technical Committee are possible means to achieve this increased commitment by partners. Regardless of the structure or composition of current and future partnerships, success of the plan and the future of quail and quail hunting in South Carolina will be heavily dependent on those partnerships.



References:

- Brennan, L.A. 2011. A Biological Basis for the National Bobwhite Conservation Initiative: Northern Bobwhite habitat and population ecology. Pages 7-26 in Palmer, W.E., T.M. Terhune, and D.F. McKenzie, eds. The National Bobwhite Conservation Initiative: A range-wide plan for recovering bobwhites. National Bobwhite Technical Committee Technical Publication, ver. 2.0, Knoxville, TN.
- Burger, L.W., D.A. Miller, and R.I. Southwick. 1999. Economic Impact of Northern Bobwhite Hunting in the Southeastern United States. *Wildlife Society Bulletin* 27(4):1010-1018.
- Conner, R.C., T. Adams, B.J. Butler, W.A. Bechtold, T.G. Johnson, S.N. Oswalt, G. Smith, S. Will-Wolf, and C.W. Woodall, 2004. The State of South Carolina's Forests, 2001. *Resour. Bull. SRS-96*. Asheville, N.C.: U.S. Department of Agriculture, Forest Service, Southern Research Station. 67 pp.
- Dimmick, R.W., M.J. Gudlin, and D.F. McKenzie, 2002. The Northern Bobwhite Conservation Initiative. Miscellaneous publication of the Southeastern Association of Fish and Wildlife Agencies, South Carolina. 96 pp.
- Evans, K.O., L.W. Burger Jr., M.D. Smith, S. Riffell. 2009. Conservation Reserve Program CP33 - Habitat Buffers for Upland Bird: Bird monitoring and evaluation plan, 2006-2008 Annual Report. 55 pp.
- Forest Inventory Data Online. 2012. Accessed August 27, 2012.
- Kohlsaatt, T., L. Quattro, J. Rhinehart. 2005. South Carolina Comprehensive Wildlife Conservation Strategy: 2005-2010.
- McConnell, C, S. Kirby, C. Woodhouse, G. Linscombe, D. Pursley, J. Jacobs, and W. Josey. 1978. Farm Wildlife Program Recommendations for South Carolina Wildlife and Marine Resources Department. SCDNR. Unpublished report.
- Palmer, W. E., S. D. Wellendorf, J. R. Gillis, and P. T. Bromley. 2005. Effects of field borders and mesomammal reduction on bobwhite abundance on North Carolina farms. *Wildlife Society Bulletin* 33(4):1398-1405.
- Palmer, W.E., T.M. Terhune, T.V. Dailey, D.F. McKenzie, and J.G. Doty. 2011. Executive Report National Bobwhite Conservation Initiative (NBCI 2.0): The unified strategy to restore wild quail. National Bobwhite Technical Committee Technical Publication. Knoxville, TN. 18 pp.
- SC GAP Analysis Project Website. 2006. <http://www.dnr.sc.gov/GIS/gap/scgaphome.html>.
- The National Bobwhite Technical Committee. 2011. Palmer, W.E., T.M. Terhune, and D.F. McKenzie (eds). The National Bobwhite Conservation Initiative: The range-wide plan for recovering bobwhites. National Bobwhite Technical Committee Publication, ver. 2.0, Knoxville, TN.
- Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D.J. Ziolkowski, Jr., and W.A. Link. 2011. The North American Breeding Bird Survey, Results and Analysis 1966-2010. Version 12.07.2011. USGS Patuxent Wildlife Research Center, Laurel, MD.
- Wallace, M.S., H.L. Stibling, and H.A. Clonts. 1991. Effect of hunter expenditure distribution on community economics. *Wildlife Society Bulletin* 19: 7-14.

NBCI PRINCIPLES

HERITAGE:

Northern bobwhites (*Colinus virginianus*) are traditionally a valued part of our nation's cultural, rural and hunting heritage. Widespread restoration of wild quail populations to huntable levels will have myriad positive societal benefits for individuals, families, landowners, communities, cultures and rural economies.

STEWARDSHIP RESPONSIBILITY:

Reversing long-term and widespread population declines of wild bobwhites, associated grassland birds, and the native grassland ecosystems in which they thrive is an important wildlife conservation objective and an overdue stewardship responsibility.

HABITAT PROBLEM:

Long-term, widespread population declines for bobwhites and grassland birds arise predominantly from subtle but significant landscape-scale changes occurring over several decades in how humans use and manage rural land.

SOLUTION IS HABITATS ON WORKING LANDS:

Bobwhites and other grassland species can be increased and sustained on working public and private lands across their range by improving and managing native grassland and early-succession habitats, accomplished through modest, voluntary adjustments in how humans use rural land.

INTER-JURISDICTIONAL RESPONSIBILITIES:

State fish and wildlife agencies bear legal authority and leadership responsibility for bobwhite conservation, and migratory grassland birds are a federal trust resource; however, the vast majority of actual and potential native grassland habitat is privately owned.

PARTNERSHIPS AND COLLABORATION:

Restoration success depends on a network of deliberate, vigorous and sustained collaborations with land owners and managers by state, federal and local governments as well as by corporate, non-profit, and individual private conservationists.

STRATEGY:

Success is reliant on long-term, range-wide strategic planning combined with coordinated, effective action at all levels of society and government, to address conservation policy barriers and opportunities that could have the needed landscape-scale influences.

ADAPTIVE MANAGEMENT:

Principles of adaptive resource management must be embraced to both inform and increase the efficiency of management and to satisfy multi-resource and multi-species needs.

LONG TERM:

Following a half-century of decline, restoration of bobwhite and grassland bird habitats and populations across their range will require determined conservation leadership, priority, funding and focus for decades to come.

SOUTH CAROLINA BOBWHITE QUAIL COUNCIL MEMORANDUM OF AGREEMENT

WHEREAS, the Northern Bobwhite (*Colinus virginianus*) occupies a prominent place in South Carolina's wildlife heritage; and

WHEREAS, South Carolina's bobwhite population declined by 6.1 percent per year from 1966 - 2011; and

WHEREAS, this decline has resulted in a reduction of quail hunters and wildlife associated recreation opportunities for South Carolina's citizens; and

WHEREAS, this decline has resulted in the loss of millions of dollars of economic revenue in rural South Carolina communities; and

WHEREAS, primarily land use changes resulting in a loss or degradation of early succession habitat, not only for bobwhites, but also for certain songbirds and many other wildlife species, have caused this decline; and

WHEREAS, the National Bobwhite Technical Committee developed the National Bobwhite Conservation Initiative that sets goals and objectives for early succession habitat development in South Carolina that are needed to restore quail populations to their 1980 level; and

WHEREAS, the South Carolina Department of Natural Resources is charged with conserving and maintaining South Carolina's wildlife resources for present and future generations; and

WHEREAS, the restoration goal of the National Bobwhite Conservation Initiative only can be achieved through the collaborative efforts of state, federal and private conservation organizations; and

WHEREAS, the South Carolina Bobwhite Quail Council, a multi-organizational task force, has been formed by the South Carolina Department of Natural Resources Board to facilitate the Initiative's implementation in South Carolina.

NOW THEREFORE, be it resolved that the undersigned organizations do agree, to the extent feasible, to actively support Bobwhite Quail restoration efforts and assist with the implementation of the National Bobwhite Conservation Initiative through internal and external outreach, applicable research, and the promotion and application of land management practices and programs, subject to the availability of funds, to establish and maintain habitat for bobwhite quail and other early succession wildlife species in South Carolina.

COMMON ACRONYMS

ARM	Adaptive Resource Management
BBS	North American Breeding Bird Survey
BRI	Biologist Ranking Information
CCS	Summer Call Count Survey
CRP	Conservation Reserve Program
CWCS	South Carolina Comprehensive Wildlife Conservation Strategy
DNR	South Carolina Department of Natural Resources
FSA	Farm Service Agency
NBCI	Northern Bobwhite Conservation Initiative
NBCI 2.0	National Bobwhite Conservation Strategy
NGO	Non-governmental Conservation Organization
NRCS	Natural Resources Conservation Service
SEQSG	Southeast Quail Study Group
USDA	United States Department of Agriculture
WHIP	Wildlife Habitat Incentives Program
WMA	Wildlife Management Area







DNR