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the Upland GAZETTE

◆ North Carolina Small Game Notes ◆

What's **Inside...**

This issue focuses on research conducted as part of the Farm Wildlife Recovery Team (FWRT). Articles summarize projects studying the ecology of bobwhites and other wildlife on working farms in eastern North Carolina and Central Virginia. The FWRT project is a cooperative effort involving the N.C. Wildlife Resources Commission, N.C. State University, The Virginia Department of Game and Inland Fisheries, Tall Timbers Research Station, and Quail Unlimited.

Making It Work In The Real World

MODERN TECHNOLOGY USED TO grow crops, manage non-crop vegetation, and conserve soil and water, can also be used to increase quail abundance. We have done our research on working farms where profitability and landowner acceptance are priorities. This constitutes our 'real world,' and what follows is plain talk.

Managing From the Heart

Even though I advocate technology to produce crops and wildlife, good ideas and tools do not top my list. First is the heart. Without commitment, neither tested wildlife management techniques nor incentives for conservation will be implemented with care and consistency.

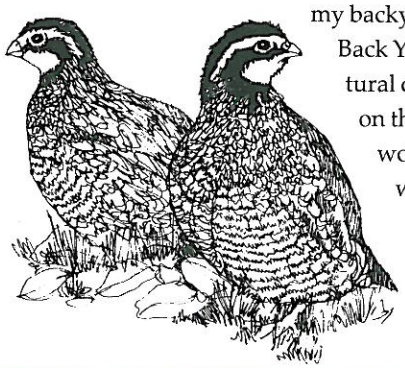
During the last 10 years, we have had field borders mowed down by highway maintenance crews, hired hands and landowners. Some of our borders have been flattened or obliterated by farm machinery and uninvited herbicide treatments. By contrast, where farmers supported this project from the beginning, they not only protected our experimental plots but they also held off hunters who could have taken too many quail.

Patience and Persistence

Hurricanes Dennis and Floyd clobbered us in eastern North Carolina in 1999. In the Wilson County - Edgecombe County research area, 38 inches of rain fell in less than three weeks, essentially drowning the late nests and the new hatchlings. We were depressed, but we counted coveys anyway. The population declined by two-thirds from 1998, but the farms with field borders held twice as many coveys as the ones without them. We are running our large experiment on habitat and predator reduction for a fourth and last year, because it takes repeated measures of our variables and quail populations to provide confidence in our final results.

Working Together

Our FWRT has enjoyed the benefits of a wide spectrum of partners. We recognized that concerns over environmental quality, sustainable agriculture, quail and other farm wildlife, and the future of quail hunting could be brought together to address issues affecting North Carolina, Virginia and the Southeast. Together we influenced the funding of conservation incentives for farm landowners.



Systems Thinking

Agriculture is a highly technical business. Opportunities to improve habitat on farms must be presented to farmers in a business-like manner. Wildlife managers need to know the costs, time of application, maintenance requirements, and implications to crops. Furthermore, we need to predict a level of success. Even farm managers who love quail hunting cannot be expected to invest in wildlife habitat practices that are unlikely to succeed.

Seeing is Believing

Playing on the acronym, NIMBY (not in my backyard), PIMBY (Prove It in My Back Yard) is powerful in the agricultural community. People who live on the land suspect that ideas that work in another area might not work for them. That is why we have worked in three agronomic regions in eastern North Carolina and

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Making It Work In The Real World *continued*

Virginia. That is also one huge advantage in involving working farmers.

Habitat is Critical

Intensive agriculture, without fallow areas, provides essentially no nesting and very limited foraging opportunities for chicks in early summer. The field borders are essentially fallow habitat and they help meet quail needs, while late season soybean crops provide the most important habitat resource for quail broods. On the other hand, conservation tillage, which leaves plant residue in the crop field, provides excellent foraging opportunities for insect-eating quail chicks. Field borders around all the tilled fields results in more coveys on farms.

Trapping, Not the Answer

We are wrapping up our fourth year of intensive trapping and, as I write this, we have yet to count coveys and conduct our final analysis of the data. To date, however, our predator-reduction efforts have not been linked with population increases. Even though professional trappers would do it differently, we worked hard and we trapped well into the spring - way past the traditional trapping season closure. Trapping is not likely cost effective. We have not studied the ecological role of predatory birds, and our research will neither confirm nor deny the notion that Coopers hawks keep our quail populations down.

Quail—A Cash Crop

Our economic analysis of quail hunter willingness to pay for quality wild bird hunting indicated that this has market potential. Opportunities exist for either deer hunting clubs to sublease their property or for landowners to selectively lease out hunting by species. A portion of the money from quail hunters should be reinvested into nesting and brood-rearing cover that will be available in the spring.

Bigger is Better

Our work is being conducted on a 300- to 500-acre scale, and we have documented positive results from habitat enhancement. We believe that larger is better. We do not know how small a farm unit would have to be before the risk of failure due to insufficient habitat would exceed costs. If located near areas of young, intensive forestry operations (clearcuts or young plantations), smaller farms managed for quail are more likely to have good quail abundance, but we have not tested this idea.

Just Getting Started

In writing this article, the absence of data to test relevant ideas surfaced time and again. Yet I believe we have learned a lot through our adaptive research efforts, in which we conducted experiments on the scale of whole farms within agriculturally similar regions. Certainly, one of the biggest hurdles to quail abundance is acceptance by the rural community that fields with weedy field borders do not equate to poor farming, but rather with good land stewardship. But it all must start with caring about quail. ◆

—Dr. Pete Bromley, N.C. State University

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How Many Coveys?

OBTAINING RELIABLE POPULATION estimates of wild quail is challenging. Even the best bird dogs typically locate just 50 percent of coveys or less. And counting coveys by bird dogs or by people conducting drive-counts takes large amounts of time and effort, yielding rough estimates, at best. We needed a quick and statistically valid method to count coveys. An option that had been previously discussed but never thoroughly tested quantitatively was to count calling coveys before sunrise.

The "covey call" is a loud, clear whistle given during the predawn hours. This call is given on a regular basis while coveys are still forming and establishing their winter ranges. For two years, biologists with the Farm Wildlife Recovery Team and Tall Timbers Research Station followed radio-marked quail coveys on five sites in North Carolina, Florida and Tennessee to document when coveys called, how much they called and how weather affected calling patterns. More than 600 observations were collected from 130 radio-marked coveys. From this data, we were able to determine what proportion of coveys would be likely to call, and at what times.

We found that calling was concentrated around 25 minutes before sunrise and that highest calling rates were during the last two weeks of October, with an average of 76 percent of radio-marked coveys detected. Weather was important. Quail were more likely to call on clear, calm mornings when the barometric pressure was high. Conversely, on mornings with low barometric pressures or with cloudy, windy, stormy weather, coveys called infrequently or not at all.

You can determine the quail population on your land by following these nine simple steps.

1. Conduct your surveys during mid-October mornings when the calling rate is highest.

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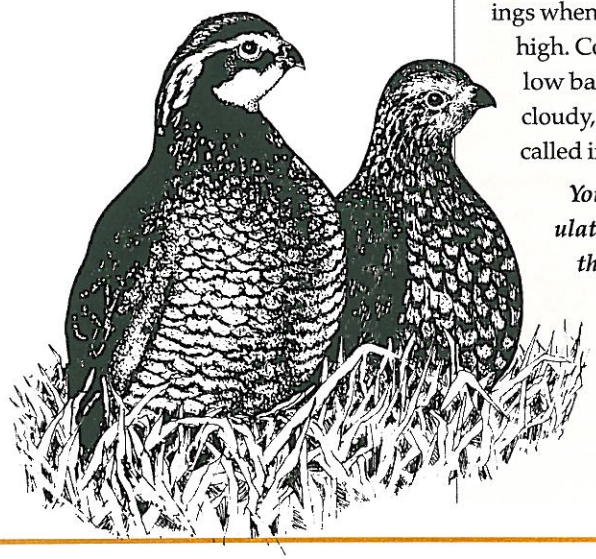


Bobwhite Response To Predator Reduction And Field Borders

THE MAJOR OBJECTIVE OF OUR RESEARCH project is to evaluate the potential of habitat enhancement (i.e., the establishment of field borders composed of volunteer vegetation) and/or predator reduction and whether it increases recruitment of quail into fall populations. Earlier research by Dr. Bill Palmer and Marc Puckett identified shortage of early-season nest and brood habitat on North Carolina farmland as the major factor limiting quail populations. In 1997, we established four sets of study farms on typical farmland in eastern North Carolina and the Piedmont of Virginia. Each set of farms consists of four study sites: a predator-reduction site, a habitat-enhancement site, a combined predator-reduction/habitat-enhancement site, and a control site. (A control site is a farm where no experiments are conducted in order to better gauge the impact of treatments on other farms.) The study sites are approximately 300 to 500 acres. Unfortunately, due to drought and other factors, the habitat enhancement treatments failed in Virginia. However, we have conducted predator reduction on two farms in Virginia, and we have two control farms there. Although the results of the study cannot be fully evaluated until after the 2000 field season, we have analyzed data for the first three years.

The predator-reduction phase of the study involves the trapping and euthanasia of five species of mid-sized mammals—opossum, raccoon, gray fox, red fox and skunk. (Skunks occur on Virginia study sites only.) A total of 52,484 "trapnights" was accumulated for the first three field seasons of the study. (A trapnight is equivalent to one operable trap set for one night.) The number of trapnights for the '97, '98 and '99 field seasons were 14,029, 18,880, and 19,575, respectively. A total of 1,146 target animals was removed from all study areas during the first three field seasons. Table 1 shows the number of each species removed per year. Preliminary results indicate that our reduction efforts reduced target-predator activity on the landscape during the early-nesting season. However, our efforts are not holding over from year to year, as indicated by a similar number of predators being removed each field season. (See PREDATOR MONITORING) We tallied early-morning covey calls (see HOW MANY COVEYS?) each fall to estimate the number of quail coveys. Preliminary comparisons have been made among all four treatment sites (Figure 1) and among each treatment type (habitat enhancement and predator reduction, Figures 2 & 3). The data indicate that quail responded positively to early season cover provided by habitat-enhancement efforts, resulting in almost a two-fold increase in the number of coveys. However, to date, mammalian predator reduction at this scale and intensity has had marginal, if any, effect on numbers of coveys.

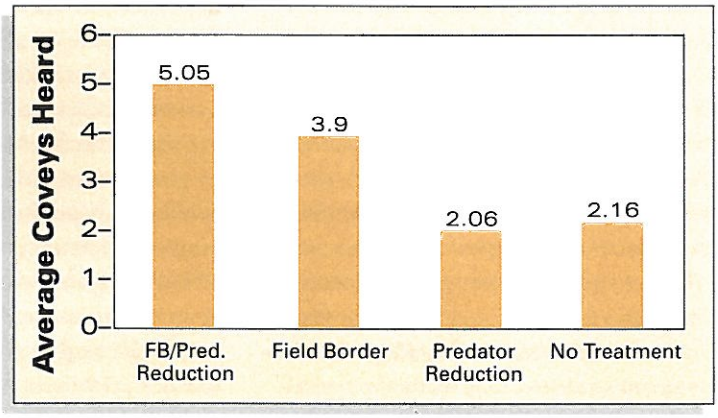
Field border management appears to have the potential to significantly increase quail populations on Eastern North Carolina farmland. However, integrating effective field border management on modern farms has proven to be a challenge. We have had a particularly difficult time controlling loblolly pine and wax myrtle. Since we have learned that quail populations respond favorably to field borders composed of volunteer vegetation, we believe the effective establishment and maintenance of field borders on a variety of landscapes warrants additional research. ◆

—Evin Stanford,
N.C. Wildlife Resources Commission

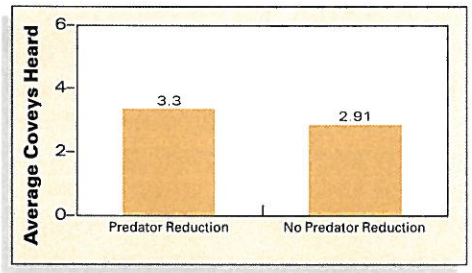
Table 1. Predators removed from all study areas, 1997 - 1999 Field Seasons

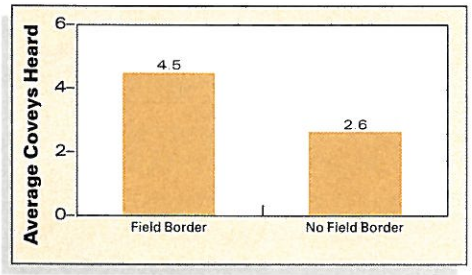
Species	'97	'98	'99	Total
Opossum	203	229	263	695
Raccoon	93	91	79	263
Gray Fox	39	29	32	100
Red Fox	31	3	10	44
Skunk	11	17	16	44
Total	377	369	400	1,146

Figure 1. 1998 and 1999 morning-covey-call survey results for all four treatment sites.



Figures 2 and 3. 1998 and 1999 morning-covey-call survey comparisons for each treatment type.





Crop Insect Implications of Weedy Field Borders

Members of the FWRT have investigated numerous aspects of field border ecology. These include the habitat value of field borders for quail and ground-nesting songbirds, the potential for intercepting nitrogen in surface and subsurface runoff and the economic benefits of maintaining field borders. Our phase of the research focused on the relationships between these weedy borders and insects in cotton and soybean crops.

Pest-insect management is a very important consideration in crop production, particularly in warm, humid areas such as North Carolina. Crop production and crop protection in modern farming relies on integrated pest management (IPM). A strong IPM system calls for multiple ways to control losses due to pests, as well as an efficient scouting program. Management strategies may include physical and mechanical controls that include tillage practices, crop spacing, crop rotation, variety selection, chemical control and biological control. We wanted to understand the impact of field borders on pest-insect management in fields surrounded by them.

We took advantage of field borders established for bobwhites to determine the effects of borders on insects in crop fields. Studies in other regions of the country have suggested that weedy vegetation can serve as a refuge for some crop pests. Bug populations that develop in field edges can move into adjacent crops. For example, the tarnished plant bug, a secondary pest of cotton, uses a number of plant species found in field edges as host plants. Our results, however, indicate that North Carolina field borders provide more pest-management benefits than problems.

Field borders appeared to enhance the populations of some beneficial insects (those that feed on pest species) in cotton. The results varied by year, with more beneficial spiders, big-eyed bugs and minute pirate bugs in cotton fields with field borders in 1998. Only green lacewings were more abundant adjacent to field borders in 1999. During all years of our study, 1997 to 1999, spiders, big-eyed bugs, minute pirate bugs and green lacewings—all beneficial—rebounded much faster in fields with borders after insecticide applications following the peak of the bollworm flight in August.

The most exciting finding was the effect of field borders in cotton and soybeans on one of the most important pests, the bollworm (or corn earworm). In two of the three years, fewer bollworms were found in soybean fields with borders, while during the third year there was no difference in bollworm numbers with or without field borders. In two of the three years, we found fewer bollworm eggs in cotton terminals, and the damage to squares and small bolls in fields without borders was nearly double that of fields with borders. In 1998, the only cotton fields that exceeded the treatment threshold for bollworm eggs were those without borders. Some pests were present in greater numbers in fields with field borders. In 1997 and 1998, plant bugs were more common in cotton fields with borders. Thrips, a seedling pest of cotton, were also more plentiful near field borders.

So what do our results tell us? Except for a couple of secondary pests, the weedy field borders did not appear to contribute to major pest problems. We also found that field borders may enhance beneficial insect populations and therefore help reduce populations of some other pests. This information could prove to be valuable to farmers and may help them decide that field borders are not such an economic risk after all. ◆

—Randy Outward and Dr. Clyde Sorenson, N.C. State University

Predator Monitoring

One goal of the FWRT was to determine how nest predators of bobwhites would respond to both habitat improvement and reduction of key nest predators. Because of their documented predation on quail nests, we were especially interested in five mammalian predators—red and gray foxes, raccoons, opossums, and skunks— but we also hoped to gain information about other potential nest predators of quail including snakes, crows, rodents, as well as domestic cats and dogs.

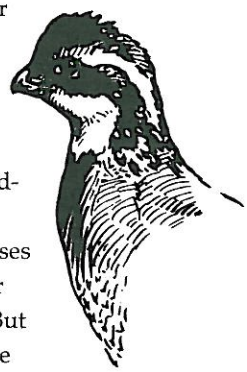
To understand how all these predators responded to our habitat improvements and predator-reduction efforts, we needed a way to monitor as many nest predators as possible. By monitoring both where and how frequently predators hunted on our study farms, we could determine which treatment affected predator activity the most.

We designed a survey method that let us monitor the activity of most bobwhite predators. Our survey method combined a camouflaged artificial nest, quail eggs, and a tinted sand ring to record and identify predators. The camouflaged nest hid the eggs from view, much like a true quail nest, and the sand ring recorded the footprints of predators that stole eggs from the nest. This survey method allowed us to survey the activities of 10 different nest predators.

We used this information to answer three questions. First, did more nesting habitat (via our field borders) affect the foraging behavior of predators? Second, did the reduction of mid-sized mammals cause a decrease in predator activity? And third, did the reduction of mid-sized mammals allow other predators to increase their activity?

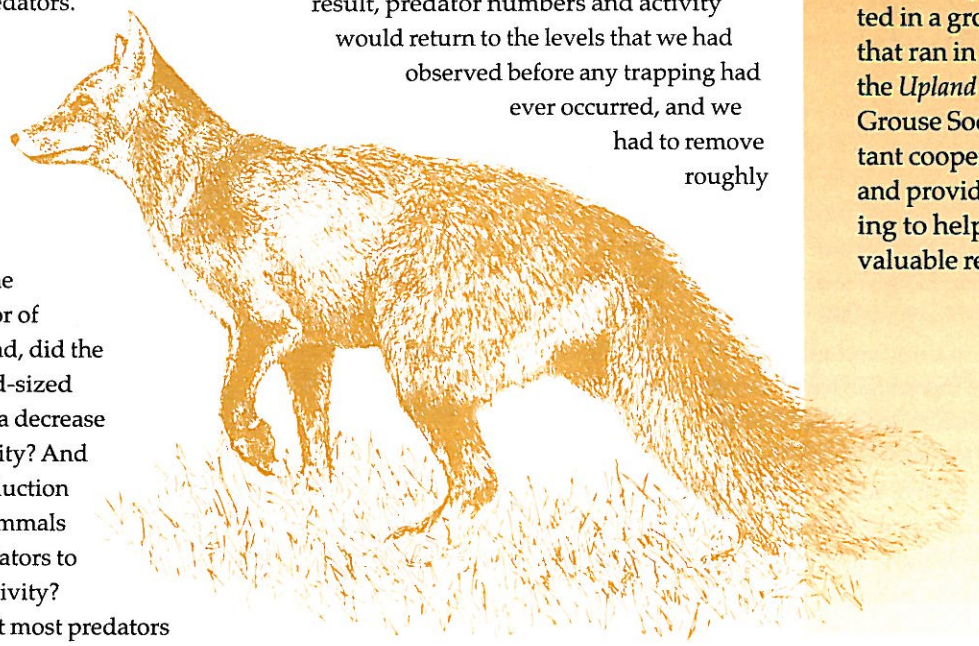
We found that most predators were unaffected by the presence of field borders. However, we did observe increased rodent activity in Hyde and Tyrrell Counties. Their activities were greatly increased on areas with field borders, probably because field borders provided habitat for rodents when nearby fields were bare. The FWRT had hoped that the dense vegetation of the field borders might limit the amount of predator foraging that occurred in the field borders, creating a "safety zone" where limited predator activity might allow quail to produce more young. However, we found that predators foraged throughout the field borders, meaning that our field borders probably wouldn't provide a "safety zone" for nesting quail. Maybe our borders were not wide enough or the drainage ditches within our borders provided a travel lane for predators. Larger blocks of habitat, preferably without drainage ditches-might solve this problem.

Our research showed that predator activity was greatly affected by the reduction of mid-sized mammals. Predator reduction decreased predator activity on all of our study farms, especially for "target" predators (foxes, raccoons, opossums, and skunks). However, the decreased level of activity among predators was temporary. During the eight months of the year when the FWRT was not trapping, predators immigrated into our study areas. As a result, predator numbers and activity would return to the levels that we had observed before any trapping had ever occurred, and we had to remove roughly the same numbers of predators every year. To maintain low levels of predator activity on our study farms, it would be necessary to intensively remove predators year-round.



The reduction of mid-sized mammals didn't cause noticeable increases in the activities of other predators, like crows. But that may result from the mid-sized mammals re-establishing themselves so quickly. If mid-sized mammals were continually removed, other predators may become more common or more active, and offset any benefits of trapping. ◆

—Jim Gillis, N.C. State University



Major Cooperator Omitted

We regret that a major cooperator was omitted in a grouse-study article that ran in the spring issue of the *Upland Gazette*. The Ruffed Grouse Society is an important cooperator on the study and provides significant funding to help complete this valuable research.

What About Songbirds?

SONGBIRDS ARE AN IMPORTANT PART of the natural heritage of our farmlands. From the seemingly countless melodies of the morning chorus, to the brilliant flashes of color from buntings, warblers, and cardinals, to the thousands of insects and weed seeds consumed daily, songbirds play an important role in both the ecology and human experience of the farm landscape. Unfortunately, the recent trends toward larger and "cleaner" crop fields have not been kind to many songbirds. Since many species utilize the brushy and weedy edges created around farm fields for foraging, nesting, and avoiding predators, field borders can increase some of that habitat to the farm, and can be an important part of farm management that benefits wildlife.

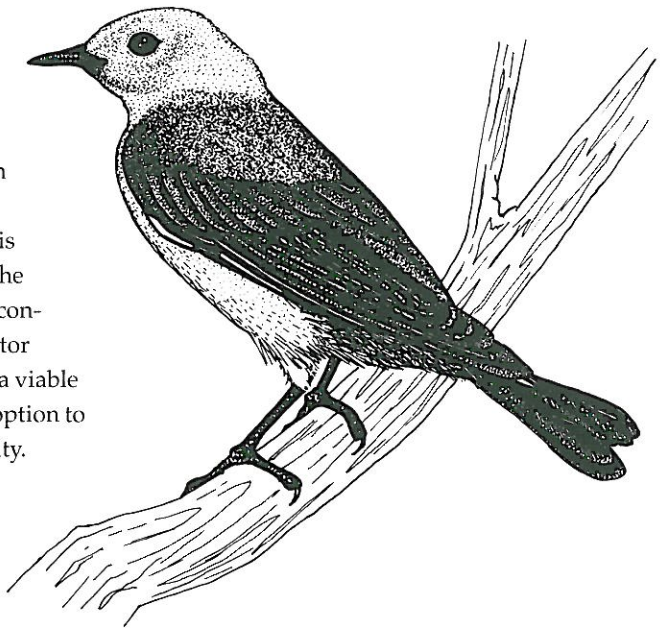
Between 1996 and 1998, we evaluated the effects of field borders and predator reduction on songbirds during two critical times of the year—late winter and summer. In late winter, brushy field edges are inhabited by several species of sparrows and related birds. In fallow cover you may find cardinals, dark-eyed juncos, as well as song, savannah, swamp, field, chipping, and white-throated sparrows. Our surveys revealed that farms with field borders had three times as many sparrows as farms with mowed field edges. Sparrows concentrated in field borders and frequently used the borders as escape cover when flushed from fields. This suggests that field borders may play an important role in helping sparrows survive the winter.

In the breeding season, a wider variety of birds use field border habitat. We focused our surveys on those birds we thought most likely to benefit from our field borders and predator reduction, including indigo bunting, common yellowthroat, blue grosbeak, eastern bluebird, chipping sparrow, eastern meadowlark, field sparrow, brown-headed cowbird and, of course, bobwhite quail. The trend was for more of these indicator species to be found on farms with field borders, particularly field sparrows and quail. The indigo bunting tended to be found in lower abundance on farms with field borders, while the other birds either showed no preference or would be more abundant on field border farms in some years and in some counties, but not others. In Wilson County, a greater abundance and diversity of birds nested in field borders compared to mowed field edges. More than 150 nests were found in Wilson County, where fields were located adjacent to timber stands, fallow fields and other suitable bird habitats. Only five nests were found in Hyde County, where fields were arranged in huge farmed openings separated only by drainage ditches and dirt roads. On all farms, fallow areas provided critical nesting habitat, as very few elevated cup nests were found in row crops (corn, soybeans, tobacco, cotton, and wheat). Field borders were particularly important early in the breeding season when little cover was available elsewhere. The primary nesting species were field sparrow, common yellowthroat, indigo bunting, blue grosbeak, northern mockingbird and yellow-breasted chat. Field sparrows and common yellowthroats showed the greatest nesting preference for field borders.

Although field borders increased nesting attempts, reproductive success was low. More than 83 percent of the active nests failed, mostly due to predation. Apparently, predators were selectively hunting field borders, the primary nesting habitat available. Though we did not determine the predator responsible for nest loss, the removal of 100 mid-sized mammal predators in Wilson County did not increase nesting success. More study is needed to fully understand the effectiveness and ecological consequences of mammal predator reduction before this will be a viable and desirable management option to increase songbird productivity. Brown-headed cowbird parasitism (they lay their eggs in the nests of other species) was not a significant source of nest mortality, as only three of 53 active nests were parasitized and no nest failed due to parasitism.

Nesting success was particularly low for field sparrows (overall nest success was 6 percent). The combination of increased breeding density with low success of cup nests suggests that field borders may be acting as ecological traps (a place that attracts breeding birds only to have them suffer high mortality or low reproduction). This, in combination with the poor results seen in the Hyde County "industrial farming" landscape, underscores the need to manage the whole farm for the benefit of wildlife. While field borders provide benefits to wintering and nesting songbirds, it is clear that they are not sufficient by themselves to support breeding populations. Managing not only field edges, but timber stands, fallow areas, and the fields themselves for wildlife will provide for more of the habitat features songbirds need and provide more nesting areas, resulting in a greater diversity and abundance of our feathered friends on the farm. ◆

—Jeff Marcus,
N.C. State University



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2. Limit your survey mornings to clear, calm "bluebird" mornings.
3. If more than one person is counting coveys, persons should be spaced a half mile apart to minimize the chance of counting the same coveys.
4. Each observer should be in place at least 45 minutes before sunrise.
5. Record and map each covey detected until sunrise.
6. Verify your observations by returning to the same point over a couple of mornings and average all counts.
7. Assuming that surveys are conducted on good-weather mornings in October, to calculate the coveys divide your covey count by .70 (the calling rate or proportion of coveys calling) to obtain the estimated number of coveys within your hearing range. Each census point surveys a circular area with the radius of 500 yards or an area of 165 acres. (The hearing area may need to be adjusted to fit your landscape and hearing ability.)
8. The calling rate may have to be adjusted slightly to account for the fact that coveys are stimulated to call when they hear a neighboring covey call. If you typically hear only one to two coveys from a point, you will want to reduce the calling rate to .65. If you are hearing more that seven coveys, increase the calling rate to .80.
9. To calculate the total number of quail in the census area, multiply the number of coveys by 11.2 (the average October covey size). ◆

See the article on "Bobwhite Response to Predator Reduction and Field Borders" to see how we used this technique to survey fall populations on our study areas.

—Shane Wellendorf, N.C. State University

Bobwhite Brood Ecology

DURING MY GRADUATE RESEARCH, many dedicated wildlife technicians, including myself, played Mom or Dad to several hundred bobwhite chicks. Bobwhite chicks will imprint on the first thing they see move after they hatch. To learn more about bobwhite brood ecology, we used this facet of the bobwhite's life history to our advantage. We incubated quail eggs in a mechanical incubator, and after the chicks hatched we spent the better part of two days with the chicks so they would imprint on us. When the chicks were about 10 days old, we led them through various habitats and monitored their daily growth. In order to get the chicks to follow us, we imitated hen noises. (Mostly we clucked like chickens, but hey it worked!)

Ten-day-old bobwhite chicks need 6 grams of insects per day to survive and grow. (Six grams of the insect types eaten by chicks would be about the size of a golf ball.) The abundance of preferred insects in a given habitat should be a good indicator of bobwhite brood habitat quality.

Illustration by Wallace Hughes

In an attempt to learn how insect abundance relates to bobwhite chick growth, we collected insects in the same areas in which our imprinted chicks foraged. We collected these insects with pit fall traps buried in the ground, sweep nets (similar to the butterfly nets pictured in Far Side cartoons), and with a D-Vac—a lawnmower-motor-suction device mounted on a backpack.

We tested the prediction that insect abundance would be greatest in the habitats in which the chicks gained the greatest amount of weight and vice versus. However, we learned that the abundance of the insects we collected often did not correspond to the daily growth of the chicks. Our estimates of insect abundance obtained with sweep nets, pit fall traps, and the D-vac cannot take into account the differences in such factors as insect quality as chick food and availability of insects to the chicks as influenced by the structure of the plant community. For example, when we ranked the habitats studied from best to worst using insect abundance as the criterion for the ranking, that ranking did not match up with the daily growth of the bobwhite chicks. We knew that quail chicks need to eat insects to survive and we knew how much they need to eat. What we still cannot measure is how many bugs need to be in a given field within the feeding range of quail chicks for a bobwhite brood to grow and survive.

By studying feeding rates and growth rates, we have shown that fallow habitats and no-till soybeans provide excellent areas for brood nutrition. After watching several hundred imprinted bobwhite chicks forage, I believe that other components of bobwhite brood habitat are probably just as important to the chick's growth and survival as the number of insects in a given area. The type of plants in the area, the amount of open ground and overhead cover and the amount of shady and sunny spots are significant but, as of yet, unproven aspects of complete brood habitat. I believe the structure of habitat is probably as important as the amount of food (bugs) within that habitat.

The good news is that wildlife biologists understand good bobwhite brood habitat and how it can be created. Light soil disturbance in winter every two to three years will produce habitat suitable to bobwhite broods. Properly managed, fallow fields, field edges, and forest opens can all provide good quality brood habitat. ◆

—Walter Lane, N.C. State University

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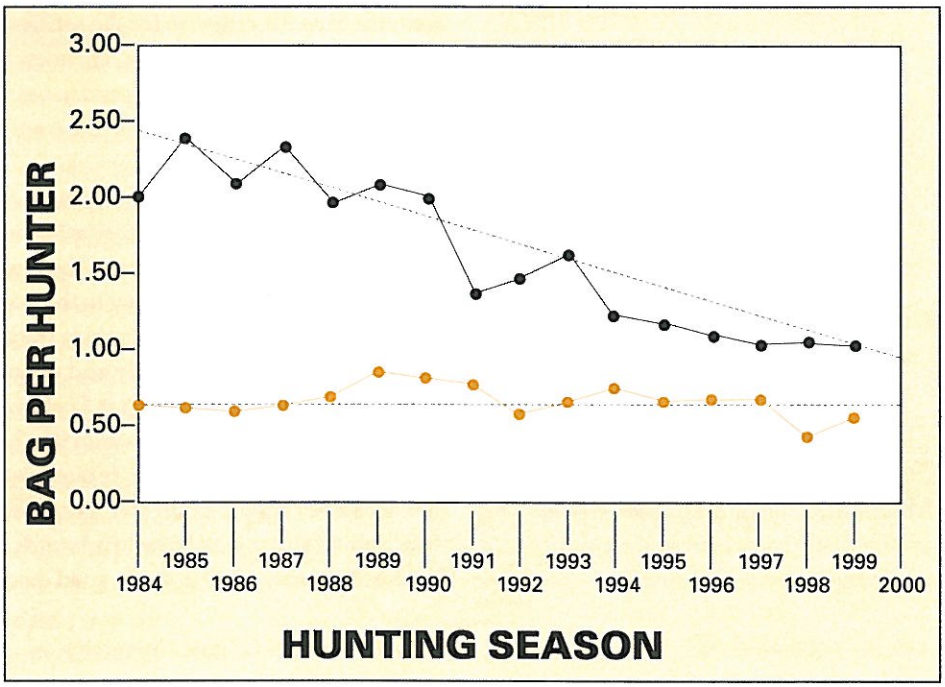
Grouse and Quail Harvest Rates By Avid N. C. Hunters

Data provided by North Carolina avid quail hunters indicates that hunting success for bobwhites has declined over 50 percent since the 1980s while grouse hunter success has been variable but lacks the steep downward trend exhibited by quail data. Quail population trends, driven by land use changes, continues to be a major concern of Division of Wildlife Management staff. The Division is currently undergoing a review of staffing to address habitat management on private lands, Game Lands Management directed toward bobwhites, tax issues impacting wildlife habitat, and hunting regulations in a renewed effort to address this particularly vexing problem. ◆



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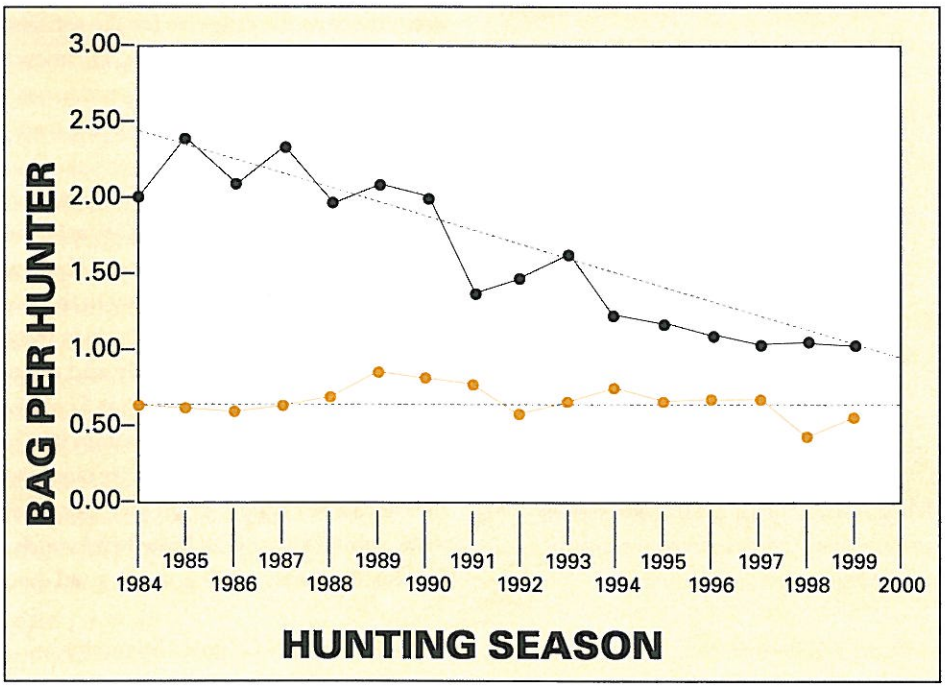
Grouse and Quail Harvest Rates By Avid N. C. Hunters

Data provided by North Carolina avid quail hunters indicates that hunting success for bobwhites has declined over 50 percent since the 1980s while grouse hunter success has been variable but lacks the steep downward trend exhibited by quail data. Quail population trends, driven by land use changes, continues to be a major concern of Division of Wildlife Management staff. The Division is currently undergoing a review of staffing to address habitat management on private lands, Game Lands Management directed toward bobwhites, tax issues impacting wildlife habitat, and hunting regulations in a renewed effort to address this particularly vexing problem. ◆



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