The Northern Bobwhite Restoration Project

13 summaries from 11 technology development projects in 9 States that evaluated conservation practices to help meet population and habitat goals of the Northern Bobwhite Conservation Initiative

NRCS Natural Resources Conservation Service

Agricultural Wildlife Conservation Center
Madison, Mississippi

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Covers: NRCS photos by Lynn Betts

Finding out what bobwhites want

The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Agricultural Wildlife Conservation Center (AWCC) led the Bobwhite Restoration Project, a cooperative effort among multiple agencies designed to develop and evaluate the technology needed to establish or manage the habitat needed to restore northern bobwhite quail populations to 1980 levels.

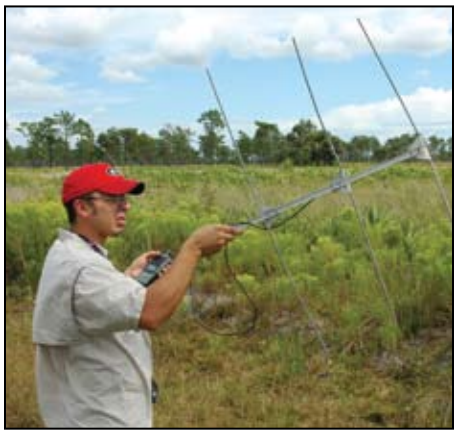
The technology will assist NRCS field staff in future planning by evaluating the effects of NRCS conservation practices on northern bobwhite habitat and populations. The new technology will assist in meeting a goal of the Northern Bobwhite Conservation Initiative (NBCI)—adding 2,770,922 coveys to current populations.

Partners include Mississippi State University (MSU), Forest and Wildlife Research Center, Department of Wildlife and Fisheries (MSU), Quail Unlimited, Inc. (QU), and the Southeastern Association of Fish and Wildlife Agencies (SEAFWA).

The Department of Wildlife and Fisheries at MSU is the umbrella institution that coordinated 11 research projects among 9 universities. States with research projects include Arkansas, Florida, Illinois, Mississippi, Missouri, North Carolina, South Carolina, Tennessee, and Texas.

This booklet summarizes 13 studies from the project. More detailed information on the project is available by contacting the AWCC or visiting the USDA NRCS Bobwhite Restoration Project Web site at http://www.cfr.msstate.edu/nbci, Finding out what bobwhites want.

This booklet was developed by Iowa State University Extension Wildlife Programs for the NRCS Agricultural Wildlife Conservation Center as part of a CESU cooperative agreement.



NRCS photos by Lynn Betts

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Summer fire, rollerdrum chopping could double Florida rangeland quail numbers

The dry prairie in South Florida is some of the best remaining quail and grassland habitat in the Southeastern United States, but years of winter burning have significantly degraded the prairie as habitat, as well as forage for cattle.

Saw palmetto, a native evergreen shrub, dominates in many areas, reducing quality of grasslands for quail, songbirds, and cattle.

"Historical accounts suggest that saw palmetto likely only composed 20 percent of the vegetative community of the dry prairie, and our work suggests that conditions for many grassland and Savannah bird species can be improved if managers strive to attain this natural level," says James Martin, a researcher at the Tall Timbers Research Station. "These habitats are meant to be disturbed— it's a fire-driven ecosystem."

Old habits of land management are changing and show promise for better habitat and cattle production, says Dr. Bill Palmer, Director of Game Bird Research at the Tall Timbers Research Station.

"By using rollerdrum chopping, an U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS)-supported practice, and fire in the summertime rather than winter, we are seeing increases in bobwhite quail populations, an increase in winter bird use and an increase in forage production for cattle," Palmer says.

The Florida study looked at Bachman's sparrow, eastern meadowlark, and grasshopper sparrow. They also radio-collared about 120 bobwhites a year and followed their movements.

The combination of radio telemetry and songbird point counts gave researchers data on bird abundance on numerous properties with varying vegetation throughout southern Florida for 2 years.

They found few songbirds and quail where palmetto dominated. Conversely, birds were more abundant at sites with higher percentages of grasses and forbs in the ground cover, conditions associated with more frequent use of prescribed fire.

"Our research has shown we have an opportunity to double or even triple quail populations with relatively little change in management. It's mostly a matter of a change in season of disturbance, whether it's fire or roller chopping. We'd like to see a 2-year fire frequency," Palmer says.

"We've seen that very quickly—in a matter of a couple of years, you can see an increase in quail populations using these practices."

NRCS programs, such as the Environmental Quality Incentive Program (EQIP) targeted to Florida's dry prairie, can directly benefit quail and improve conditions for numerous grassland bird species and likely improve foraging conditions for cattle, Palmer says.

He recommends EQIP practices that include active management scenarios on remnant prairie patches that mimic natural disturbances and shift the plant community more towards herbaceous instead of shrub species.

The results add to the science available on bobwhites, says Dr. Wes Burger of Mississippi State University (MSU), who coordinated 11 studies across the quail range, and Ed Hackett, a biologist with the NRCS Agricultural Wildlife Conservation Center (AWCC), which funded the study.

The AWCC, located in Madison, Mississippi, is a fish and wildlife technology development center.

NRCS photo by Lynn Betts

Northern bobwhite covey rise

Summary of:

One in a series of summaries from the NRCS Bobwhite Restoration Project, Agricultural Wildlife Conservation Center Project # 68–7482–3–121

For more information, see:

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Sculpt brush, graze rangelands in Texas Rolling Plains to benefit bobwhites

Even in the Rolling Plains of northwestern Texas, considered one of the last bastions for viable northern bobwhite populations, quail are declining about 3.5 percent annually.

Brush management, one of the practices offered by U.S. Department of Agriculture (USDA) Farm Bill programs meant to improve grazing lands for both cattle and quail, was evaluated by Texas A&M University from 2005 to 2007.

Researchers evaluated bobwhite response to brush management practices of the USDA Environmental Quality Incentives Program (EQIP) at intervals 2 to 4 years after the practice was implemented. They used paired control-treatment plots in three counties to assess impacts of mesquite and prickly pear cacti control on bobwhite abundance.

Researchers used spring call counts to estimate breeding capital and simulated nests to evaluate impacts on nesting habitat. An array of vegetation measures (nest site availability, forb species richness, etc.) were monitored to assess floristic impacts of brush management as it relates to quail habitat.

"Our results showed that 3 to 5 years after treatment, brush management tended to increase call-counts," says Dr. Dale Rollins with Texas A&M University in San Angelo, Texas. "On sites where we monitored more than 12 paired plots, brush management increased call counts by an average of 29 percent over control sites. Bobwhite abundance tended to become progressively greater on treated areas over the 3 years of our study."

Treatments positively affected breeding capital, but it remains to be seen whether the increase in breeding capital parlays into greater quail densities during the fall hunting season.

Brush control has been a common practice in the Rolling Plains, with mesquite, juniper, and prickly pear being the species most commonly targeted for control.

While large-scale control of mesquite, juniper, and prickly pear is detrimental to quail, strategic brush control, or sculpting, can have significant benefits.

"Ideally, we'd like to know how much brush on a 200-acre basis is optimal for quail. I would say that's anywhere from 10 percent canopy cover on the low end to 25 to 30 percent on the high end," Rollins says.

Quail can spend most of the day in a good loafing cover, a bush or brush of some kind Rollins calls a quail house. "I have two rules of thumb as I talk to a landowner," Rollins says. "One that a quail hunter can appreciate is that you ought to be able to see your bird dogs most of the time. The other is you ought to be able to throw a softball in the air from one quail house to another. So that gives you an idea of what a sculpted landscape should look like for optimal quail habitat."

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NRCS District Conservationist providing technical assistance

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Farm Bill conservation practices improve northern bobwhite habitat

Plant composition and structure resulting from establishing conservation practices with U.S. Department of Agriculture's (USDA Farm Bill funding improves habitat for bobwhite quail in nearly all cases, a study by Clemson University indicates.

The study established, demonstrated, and evaluated practices funded by the Wildlife Habitat Incentives Program, including filter strips, field borders, forest stand improvements, forest openings, prescribed burning, hedgerow planting, riparian forest buffers, and native warm-season grass plantings.

"These practices have a tremendous potential to improve wildlife habitat," says Dr. Greg Yarrow of Clemson University.

Yarrow established the practices using USDA Natural Resources Conservation Service (NRCS) guidelines at the 2300-acre Pee Dee Research and Education Center outside of Florence, South Carolina, then evaluated them against control sites. The evaluation was made based on habitat requirements for the northern bobwhite quail.

A major recommendation of the study was to use a mixture of planted and unplanted (fallow) sites to establish native, early successional habitat. "Planting ensures a desirable mixture of native plants, while fallow areas are less costly to landowners," Yarrow explains.

"It will also be important to use herbicides, disking, or fire to maintain habitats, and for the NRCS to be flexible in establishment and maintenance guidelines to allow for local conditions."

Highlights of the study include:

- Planted and fallow filter strips and field borders provided habitat for bobwhite quail.
- Forest stand improvements and forest openings in combination with prescribed burning provided the greatest benefit to bobwhites.
- Riparian forest buffers were slow to establish but eventually developed over time.
- Hedgerow plantings were also slow to develop and control of invasive weeds was a problem.
- Controlling invasive weeds was key to establishing and maintaining native warm-season grasses.

A landowner survey was also conducted in 2007. Results included:

- Most were familiar with Farm Bill wildlife conservation practices.
- A majority had signed up for programs and were satisfied.
- Those who signed up heard about programs through newspapers or mailings.
- Those who signed up were motivated by other landowners who participated, demonstrated, or passed along knowledge of programs and practices.
- Those who had not signed up indicated they would be more inclined to participate if smaller parcels of land could be signed up under the same contract, more technical assistance was available, and there were fewer restrictions.

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Field border (*top*); Prescribed burning (*bottom*)

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Field border size and shape make a difference for northern bobwhite

A North Carolina State University (NCSU) study found that quail populations may be increased in agricultural landscapes with relatively little amounts of land dedicated to early successional habitat.

The study of linear and block field borders on 24 farms found that quail populations almost doubled on farms where 2 to 3 percent of the cropland edge was allowed to go fallow. It also found that blocks of fallow habitat (1/4 acre to 6 acres in size) produced twice the number of quail as narrow (10-foot wide) linear field borders.

"We were trying to come up with ways to fine tune the practice of field borders so that we can be more efficient in the way we put field borders on the landscape," says Dr. Christopher Moorman, associate professor at NCSU.

In North Carolina and in the Southeast, many of the plants that naturally volunteer on fallowed ground provide exceptional cover and food for quail, so researchers felt there was no need to do any special planting in the field borders to get a quail response.

"We create field borders by allowing croplands to go fallow, and once you abandon them, they come back in native grasses, a diversity of herbaceous plants like goldenrod and sometimes a mixture of shrubs," Moorman explains.

The study lasted for 3 years, beginning in 2004, which was a pretreatment year. Moorman and graduate student Jason Riddle sampled summer quail populations through point counts from mid-May through the end of June and then returned to all the farms in October and November and listened for coveys.

"I was surprised that we were able to see the dramatic quail increase that we did on farms in agriculture-dominated landscapes and farms with nonlinear borders, with as little as 2 to 3 percent of the total row crop area converted to field borders," Riddle says.

Ideally, the researchers say field borders would comprise 5 to 10 percent of the landscape. However, block habitats increased quail numbers by 30 percent even in areas that were not connected to other habitats.

"If you wanted to design your field borders in a way that best benefits quail, you'd want block habitats of fallow vegetation in landscapes dominated by cropland," Moorman says.

"This is a simple thing farmers can do at very low expense, and they can have maybe double the number of quail they had before they implemented this practice," he adds, "and that's a big contribution to quail populations if applied over a very large area."

Although their 24 research sites were conducted in southeastern North Carolina, Moorman and Riddle feel confident that the results will apply to much of the quail range, especially the Southeast where agricultural crop production dominates.

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NRCS photos by Lynn Betts

Block field border (*top*); Linear field border (*bottom*)

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Quadruple northern bobwhite numbers with buffers that connect block habitats

Research in Mississippi by Iowa State University (ISU) and Mississippi State University (MSU) shows a cumulative positive effect for quail from applying buffers that connect larger blocks of grassland habitat.

Researchers compared quail and songbird populations in strips of switchgrass to filter strips planted to a more diverse mixture of Indiangrass, big bluestem, little bluestem, and other grasses and forbs. They also studied responses to various filter strip widths.

"Farms with buffers alone supported twice as many quail as nearby conventional farms," says Dr. Wes Burger, professor and principal investigator for the project at MSU. "We found a farm with buffers and blocks supported four times as many. The study also found that narrow buffers were better than no buffers at all, and wide buffers were better than narrow buffers."

They also confirmed that more diverse plantings produced a greater diversity of birds.

"We use nesting survival as an indication of the habitat quality for the wildlife species that are inhabiting these particular habitat treatments," says Ross Conover of ISU.

"The conservation buffers had lower nesting survival than early successional block habitat, but it's important to note here that we witnessed approximately 30 percent nesting survival in our conservation buffer habitats."

As shown in other studies, buffer widths make a difference for quail and songbirds. "When we compared 90-foot-wide buffers to 120- and 180-foot-wide buffers, we found the wider buffers increased nesting density," Conover says.

"The bottom line here is increased width and diversity of conservation buffers is going to drastically increase the overall wildlife benefit received from those buffers."

And, when filter strips are combined on a farm with larger blocks of habitat, even more wildlife gains can be made, especially for quail.

"We've seen that in wide open agricultural landscapes in the Delta, we expect about one covey per 125 acres in the fall. In landscapes where buffers are implemented, we can double that population to about one covey per 70 acres. And on a landscape where comprehensive conservation is implemented across the property, we can produce about one covey per 29 acres. So buffers double the population, comprehensive conservation across the property doubles it again," Burger says.

Burger was somewhat surprised at how quickly the buffers were colonized by grassland species like dickcissel and bobwhite. "It's amazing when you go into an agricultural landscape and you create a little bit of habitat by installing upland habitat buffers, how quickly they respond," Burger says.

The results add to the science available on bobwhites, says Burger, who coordinated 11 studies across the quail range, and Ed Hackett, a biologist with the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCD) Agricultural Wildlife Conservation Center (AWCC), which funded the study. The AWCC, located in Madison, Mississippi, is a fish and wildlife technology development center.

NRCS photos by Lynn Betts

Block habitats (*top*); Buffer connecting block habitat (*bottom*)

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Woody cover and deferred grazing make habitat for quail in Texas High Plains

In the High Plains of Texas, percent woody cover and visual obstruction to a height of about two and a half feet are critical predictors of bobwhite quail abundance, a study by Texas Tech University shows.

Researchers examined practices used in the U.S. Department of Agriculture's (USDA) Environmental Quality Incentives Program (EQIP) for their usefulness to quail on eight study sites in Bailey, Cochran, Hockley, and Yoakum Counties in Texas. Five sites were treated with brush management, three with prescribed grazing.

"We estimated quail abundance on each study site and an adjacent control site using call counts from 2005 to 2007," says Dr. Brad Dabbert, Associate Professor in the Department of Natural Resources Management at Texas Tech. "We also went out on those areas and looked at habitat features including percent woody cover, percent forbs, percent grasses, and percent bare ground. And we examined visual obstruction, which is how well the habitat obstructs the view of quail predators."

What they found surprised Dabbert. "Generally, if you look at the scientific quail and brush management literature, most of it indicates quail need from 5 to 20 percent woody cover in the environment. So we thought on a lot of these sites we might have too much woody cover. What we ended up finding was that woody cover was the number one important variable for the presence and abundance of quail," Dabbert said. "If you got below about 10 percent woody cover, populations pretty much didn't exist. But the site with about 40 percent woody cover had the highest quail populations of any of the sites we examined."

The second most important factor was visual obstruction, whether it was grassy and weedy cover or woody cover. "You needed visual obstruction, approaching 3 feet off the ground. The better a habitat area was able to obscure the vision of predators, the more quail we had on those sites," Dabbert adds.

"EQIP's incentives for prescribed grazing, brush management, and prescribed burning can be a powerful tool for encouraging proper grazing management. And it can help increase the acreage of suitable habitat for northern bobwhite in the High Plains, where rangeland provides the most potential for adding usable habitat," Dabbert says.

"We recommend, when implementing the prescribed grazing practice here, that stocking rates and deferment periods be tailored so that visual obstruction is established and maintained at a height of 16 inches or more to help northern bobwhites."

Brush needs to be controlled, the study indicates, but at least 10 percent brush cover is needed. In contrast to brush management (removal), range planting and prescribed grazing may be more useful tools for providing quail with the necessary mix of woody and grass components, the study concludes.

The results add to the science available on bobwhites, says Dr. Wes Burger of Mississippi State University (MSU), who coordinated 11 studies across the quail range, and Ed Hackett, a biologist with the USDA Natural Resources Conservation Service (NRCS) Agricultural Wildlife Conservation Center (AWCC), which funded the study. The AWCC, located in Madison, Mississippi, is a fish and wildlife technology development center.

NRCS photos by Lynn Betts

Measuring visual obstruction; Dog on point (*inset*)

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Northern bobwhite chicks survive better in restored habitat, Arkansas study shows

Research in Arkansas comparing unrestored fescue fields with areas restored for bobwhite quail brood use discovered mixed results.

"We looked at two restored areas and two adjacent unrestored areas in Searcy and Fulton Counties in Arkansas between spring of 2005 and summer of 2007," says Dr. Chris Kellner of Arkansas Tech University. "We found that the habitats used by broods did not differ between restored areas and nonrestored areas."

"We also found that chicks grew substantially faster in nonrestored areas, where arthropod biomass was significantly greater than in the restored areas," says Dr. James Bednarz of Arkansas State University. "We also found that chicks moved more slowly in unrestored areas, which may indicate better habitat for foraging."

On the other hand, researchers also found bobwhite chicks that used restored habitat in Fulton County survived better than chicks that used unrestored areas in both Searcy and Fulton Counties.

Management activities for restoration included burning, disking, eradication of fescue with herbicides, planting native warm-season grasses, fencing borders of pastures, and land clearing.

Quail followed with radiotelemetry

Researchers captured 90 bobwhites and fitted them with transmitters to locate nests and follow broods. All chicks were individually marked; missing chicks were assumed to have died. Broods were monitored intensively to assess habitat use and movement patterns.

Habitats that bobwhite broods used were characterized, and comparisons were made among habitat used by broods, nesting habitat, and random locations that researchers assumed were not used by bobwhite broods. Nesting habitat in fescue fields consisted of dense stands of tall fescue with little bare ground and few forbs. Habitat that broods used supported more forbs, shorter and not particularly dense grass with more open ground.

Researchers also developed a discriminant function model to determine how effective the management activity was in producing nesting and brood rearing habitat. "We found the best management included activities that created some bare ground, promoted development of forbs, and also supported a variety of grass species," Kellner says. "For example, a combination of disking, burning, fescue eradication, and planting of native grasses produced a habitat structure that was similar to habitats used by bobwhite broods."

However, broods in Searcy County seldom used restored habitat, even when such habitat was adjacent to the brood's home range. Quail tended to leave managed areas at the beginning of the breeding season and seldom returned.

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Northern bobwhite

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Spray tall fescue in the fall to stimulate native warm-season grasses for quail

High-quality quail habitats are dominated by plants that provide protective cover, nutritious food sources and allow travel, feeding, and loafing within and under the cover.

"Tall fescue fails that test on at least two counts," says Dr. Craig Harper, associate professor and Extension wildlife specialist at the University of Tennessee (UT). "Its dense structure near the ground and deep thatch layer limits mobility of quail chicks and ground-feeding songbirds. The dense growth and thatch also suppress germination of desirable forbs that provide food resources."

Harper was the principal investigator on a UT study that compared herbicide and disking treatments to eradicate tall fescue.

Research treatments

The study evaluated two herbicides —glyphosate and imazapic—that were applied in the spring and fall, with and without disking in the season after application. The treatments were applied in three fields across Tennessee. Prior to herbicide application, fields were prepared for spraying by haying or grazing to remove all debris from the field. The tall fescue was allowed to regrow 6 to12 inches before applying herbicides.

"Fall applications of glyphosate and imazapic, with and without disking, provided greater reduction in tall fescue coverage than spring applications, with and without disking," says John Gruchy, a biologist with the Mississippi Department of Wildlife, Fisheries and Parks, who helped carry out the study. "Disking following fall herbicide applications did not further reduce tall fescue coverage."

By the second growing season after treatment, coverage of native warm-season grasses increased after fall herbicide applications, with or without disking, and after spring herbicide treatments. Forb coverage increased dramatically following all treatments.

Food resources for northern bobwhite were increased following all treatments. Forb coverage, both desirable and undesirable, tended to decrease in the second year after treatment. The structural characteristics of the field improved dramatically following eradication of tall fescue. The openness at ground level was increased following all treatments, especially the disking treatments. Vertical structure was increased following all treatments except for spring sprayings, which did not kill tall fescue as well as the fall spraying treatments.

Recommendations

"We recommend spraying tall fescue in the fall with two quarts per acre of a glyphosate herbicide," says Harper. "If undesirable grasses are expected to become a problem, apply imazapic at a rate of 6 to 8 ounces per acre in April before undesirable plants emerge."

Harper says if desirable plants do not emerge from the seedbank by the second growing season following spraying, it may be necessary to plant a mixture of native grasses and forbs.

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NRCS photo by Lynn Betts

Dr. Craig Harper of UT stands in a disk strip

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Farmers will use some, not all, practices to help quail, Missouri survey shows

A large majority of landowners want bobwhite quail on their property, and they recognize that habitat management is the solution to quail restoration, a landowner survey by the Missouri Department of Conservation (MDC) indicates.

A smaller percentage of landowners, however, were willing to use prescribed quail-friendly practices.

"Much of the potential success of large-scale northern bobwhite restoration depends on private landowners working together to restore habitat on multiple, contiguous farms," says Dr. Tom Dailey of the MDC. "So we wanted to get a better idea of what it will take to engage landowners to manage habitat for quail."

The MDC analyzed responses from 735 northern Missouri landowners—20 percent were full-time farmers, 24 percent farmed part-time, 36 percent were landlords, and 20 percent were recreational owners who did not use the land for farming.

Reasons landowners gave for hesitating to manage land for bobwhite quail were that they did not:

- like the (weedy, unmowed) habitats or practices (use of prescribed fire)
- have the expertise or equipment to implement the practice
- have the labor or money
- want strangers knocking on their door asking to hunt
- like contracts or the requirements involved

On the other hand, of the more than 80 percent of landowners who wanted to see quail on their land, nearly half showed interest in quail habitat restoration. The top priority for these landowners was knowing that management is, in fact, increasing quail numbers.

These landowners fit a profile: row crop income was not important; positive experience with government conservation programs; willing to use quail-friendly management (fire, disking, native plants, etc.); money and time less of a constraint; attended habitat workshops; allowed quail hunting; male; some college education; and owned land for just a few years.

Many of the landowners had participated in conservation programs. The two most used programs were the U.S. Department of Agriculture's (USDA) Conservation Reserve Program and programs of Missouri Soil and Water Conservation Districts. Across all programs, 76 percent rated their experiences as "good."

"Overall responses from this study confirm the need for aggressive restoration programs with conservation agencies and organizations collaborating. Landowner needs are complex, so multiple strategies must be used to craft programs that are effective, socially acceptable and economically attractive," Dailey says.

The study gave the USDA Natural Resources Conservation Service (NRCS) a better understanding of landowner needs and desires, and why they might adopt certain practices, according to Pat Graham, retired NRCS state biologist in Missouri.

The survey was one of 11 projects coordinated across the quail range by Mississippi State University and funded by the NRCS Agricultural Wildlife Conservation Center (AWCC) as part of the Bobwhite Restoration Project. The University of Missouri and Quail Unlimited also participated.

The AWCC, located in Madison, Mississippi, is a fish and wildlife technology development center.

NRCS photo by Lynn Betts

NRCS employee discussing northern bobwhite with landowner

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Managing CRP fields increases bobwhite numbers, Illinois study shows

Managed U.S. Department of Agriculture (USDA) Conservation Reserve Program (CRP) fields had more use by bobwhites and other grassland songbirds during the breeding season than non-managed fields, according to a Southern Illinois University (SIU) study.

The study found that more than 93 percent of the original CRP plantings in Illinois were seeded to exotic cool-season grasses, primarily tall fescue. Low bobwhite abundance and poor brood rearing conditions in Illinois have been linked to a high percentage of fields planted to fescue.

The study did not establish a link between northern bobwhite abundance and the amount of CRP acreage.

"It appears that the decline in bobwhite numbers is not correlated with the amount of CRP, but it may be related to the quality of these grass stands," says Dr. Donald Sparling, Associate Director of the Cooperative Wildlife Research Laboratory at SIU.

The SIU study evaluated the effectiveness of three commonly used farm management practices to increase bird use, improve habitat conditions for bobwhites, increase arthropod availability, and increase foraging efficiency of imprinted bobwhite chicks.

Thirty fields were treated—10 with strip disking and 20 with a strip herbicide application of glyphosate and ammonium sulfate—in October 2005 to 2006. Ten select herbicide sprayed strips were then drill planted with 87 percent Korean lespedeza and 13 percent partridge pea in April 2006 to 2007.

"We expected to see an increase in the use of managed fields by bobwhite broods and select grassland songbirds during the breeding season due to a predicted increase in arthropod abundance and more desirable early successional vegetation conditions," says graduate student Douglas Osborne.

The herbicide treatments were relatively effective at decreasing exotic grass cover, but disking was ineffective at decreasing grass cover and increasing bare ground for more than one growing season.

"Bobwhite abundance in sprayed and spray/seed fields was nearly six-fold greater compared to disked and untreated fields in 2006 and 2007," Sparling says.

"In general, imprinted bobwhites consumed more arthropods in spray and seeded fields than any other treatment type."

Avian relative abundance and species richness responded positively with all three treatments during the first 2 years of the study, but species diversity decreased across all treatment types from 2006 to 2007.

"We believe CRP management has the potential to create more desirable habitat conditions for quail and other grassland birds," Sparling says, "but the effectiveness of CRP management depends on the acceptance and cooperation of landowners."

The results add to the science available on bobwhites, says Dr. Wes Burger of Mississippi State University (MSU), who coordinated 11 studies across the quail range, and Ed Hackett, a biologist with the USDA Natural Resources Conservation Service (NRCS) Agricultural Wildlife Conservation Center (AWCC), which funded the study.

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NRCS photo by Lynn Betts

Northern bobwhite hen on the nest

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Fire, heavy disking, other management maintain bobwhite habitat in Tennessee

Early successional habitat, the plant communities often found in fields and forest openings, require disking, burning, or some other form of management to keep the grass and forb plant community from becoming a forest plant community.

"The quality of early successional habitat is determined by the types of plants that are present and the structure of the vegetation at the ground level," says Dr. Craig Harper, associate professor and Extension wildlife specialist at the University of Tennessee (UT).

"Many species, including quail, thrive in early successional habitats made up of a diverse mixture of native grasses for nesting substrate, forbs to provide food, and shrubs for escape cover. Such plant communities are open at ground level with a dense canopy of vegetation at about waist high that allows small wildlife to move about easily without being exposed to predators or extreme weather conditions," he adds.

Harper's research on management options has led him to a number of conclusions on managing for quail.

- Prescribed burning removes litter, improves ground level vegetation structure, and stimulates desirable plants in the seedbank.
- Disking improves habitat structure and composition by incorporating litter, reducing ground level vegetation density, and stimulating desirable forbs.
- The effects of disking and burning vary greatly based on the timing and frequency of disturbance and the local seedbank.
- Mowing (or bush hogging) is the least desirable practice for managing early successional habitats because it creates dense thatch at the ground level, reduces cover, and is not effective in controlling tree saplings.
- Herbicides are particularly useful for controlling undesirable plants in early successional habitats.

Harper has a number of recommendations for landowners wanting to see more quail on their land.

- Burning during spring (March) on a shorter rotation (2–3 years) in larger blocks (50–100 acres) will promote a greater density of warm-season grasses ideal for grassland song birds.
- Burning in September or spraying herbicides may be necessary in some years to control woody succession. Disking areas during the fall/winter (October–February) on a 3-year rotation will create better brood-rearing and feeding cover for bobwhites.
- Breaking fields into smaller management units (5–10 acres) will create a more diverse array of cover types for a greater variety of species. Desirable shrubs provide important cover and should be protected.

It is critical that landowners think beyond their property boundaries and partner with neighbors to conserve, sustain, and increase populations of early successional wildlife, Harper concludes.

The results add to the science available on bobwhites, say Dr. Wes Burger of Mississippi State University, who coordinated 11 studies across the quail range, and Ed Hackett, a biologist with the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Agricultural Wildlife Conservation Center (AWCC), which funded the study.

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Photo by Craig Harper, UT

Early successional habitat

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Burning, disking evaluated as bobwhite management in South Carolina

Management techniques can and do affect the plant composition and structure in early successional quail and songbird habitat, a study in South Carolina confirms.

The study of early successional habitats, field borders, perennial hedgerows, and native warm-season grasses on 14 fields across 250 acres on the Nemours Plantation in the coastal plains found that forb cover was increased on all areas treated.

"Forb cover was greater than grass cover in all treatment plots whether burned or disked and regardless of frequency," says Ernie Wiggers of the Nemours Wildlife Foundation.

The mean percent cover for forbs ranged from 49 percent to 71 percent and was highest in winter disking treatments conducted every 2 or 3 years. The mean percent cover for grass species ranged much lower, (16–40%), and was highest in treatment plots that were burned annually. Mean percent cover for bare ground was lowest, at or below 11 percent across all treatments, but was highest in treatment plots that were disked annually in winter or summer.

Researchers found the best timing for disking to prevent woody stem growth was in the spring, every 1 or 2 years. Frequency of disking had more to do with its value than timing.

Agricultural pest plants or otherwise undesirable species including crotalaria and dewberry were more dominant than desirable species in many treatment plots. Desirable plant species included grasses such as broomsedge and bluestems and seed producing forbs including ragweed and partridge pea. Broomsedge and other native grasses responded best to plots burned in winter and spring every 2 or 3 years. Ragweed and partridge pea were not widespread. Where they occurred in the seed bank, these forages responded best in plots disked in the winter.

Existing seed bank critical

The research confirmed that successful establishment of early successional habitat relies heavily on the existing seed bank. "Managers may want to evaluate their seed bank by first disking a test strip at different times of the fall and winter to observe resulting plant species," says Greg Yarrow of Clemson University. "To get quality habitat, you may have to eradicate undesirable species and plant desirable species if they don't exist in the seed bank."

Songbird nest searches resulted in 75 nests, primarily from shrub nesters. Field borders and hedgerows accounted for 61 percent of the nests but made up only 15 percent of the available field habitat. Only 11 bobwhite nests were found, but 951 telemetry locations showed ditch lines, food plots, and hedgerows were used by bobwhites more than field borders and native grasses.

Partners in the study include the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) in South Carolina, the South Carolina Department of Natural Resources, and Clemson University.

The results add to the science available on bobwhites, says Dr. Wes Burger of Mississippi State University (MSU), who coordinated 11 studies across the quail range, and Ed Hackett, a biologist with the NRCS Agricultural Wildlife Conservation Center (AWCC), which funded the study. The AWCC, located in Madison, Mississippi, is a fish and wildlife technology development center.

NRCS photo by Lynn Betts

Prescribed fire in grass

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More songbirds and quail with prescribed fire and strip disking in Arkansas

A comparison of managed and nonmanaged landscapes in Arkansas shows landscapes with managed habitats support more quail and songbirds.

The comparisons by Arkansas State University (ASU) and Arkansas Tech University also show a greater diversity of songbirds in managed landscapes.

"We conducted point counts in 2005 to 2007 at 68 points in Fulton County and 60 points in Searcy County on land set aside by the Arkansas Fish and Game Commission for use as demonstration areas," says Dr. James Bednarz of the Department of Biological Sciences at ASU. "Half of the points in each area were in managed areas and half were in reference areas. We also established two Breeding Bird Survey (BBS) routes in both counties. The BBS data allowed us to examine landscape-level responses by birds to management. We also radio-tagged quail to determine habitat use in the managed area of Fulton County."

Dr. Bednarz, Dr. Chris Kellner, Richard Baxter, and Kevin Labrum found significantly higher densities (more than 50% higher) of all songbirds in managed areas (.4 birds/acre) than reference areas (.25 birds/acre) in Fulton County during 2005. Birds classified as early successional species also had significantly higher densities in managed areas in 2005 (.07 birds/acre) than reference areas (.02 birds/acre). In 2006, managed areas again supported significantly higher total birds, 1.7 birds per acre, than reference areas at 1.3 birds per acre. Early-successional species were also more abundant in managed areas (.44 birds/acre) than in reference areas (.07 birds/acre) in Fulton County in 2006, although this last trend was not significant.

In Searcy County, densities of all birds and early successional birds were not statistically different in managed areas compared to reference areas in both years.

Quail were detected more frequently on the managed area routes compared to the reference area routes each year. Species diversity was also slightly greater on the Fulton and Searcy county managed BBS routes.

"We documented 1,992 radio-tagged quail locations in 2005 and 2006. Our telemetry data suggested that areas with prescribed burns were higher quality habitat than unburned areas," Baxter says.

The response by quail and other birds was more pronounced in Fulton County than Searcy County, and this may be due to the fact that a greater proportion of the Fulton County focal area has been managed (>20%) compared to the Searcy County focal area (<10%). Prescribed burning and strip disking were the most beneficial practices for quail and songbirds. There was also a noticeable positive response by some songbirds, especially prairie warblers and yellow-breasted chats, to thinning and burning of woodlands.

The results add to the science available on bobwhites, says Dr. Wes Burger of Mississippi State University (MSU), who coordinated 11 studies across the quail range, and Ed Hackett, a biologist with the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Agricultural Wildlife Conservation Center (AWCC), which funded the study.

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NRCS photo by Lynn Betts

Conducting prescribed burn

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Excellent bobwhite habitat was found and new guidelines were suggested for habitat in study areas, including (clockwise) Florida, Mississippi, Texas, and North Carolina.