



Outdoor Oklahoma

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Oklahoma Quail Habitat Guide

The Role We Play in Conservation

Is It Hopeless?

Some people are wondering, “is the quail decline a hopeless battle we can’t win?” While we may never see the quail hunting that we had in the 1950s again, we do have hope that it can be good. And it’s our obligation to do everything we can to conserve this bird and the tradition of hunting that it inspires.

JENA DONNELL

Oklahoma has long been home to some of the best bobwhite quail hunting and quail habitat in the nation. The distinct call of the bobwhite has become a symbol of the Oklahoma countryside, and sportsmen and their dogs from Oklahoma as well as out-of-state have enjoyed countless days of exciting bird hunting in this great state.

But the species is currently in a state of long-term decline across its range. Land use changes, such as the introduction of non-native vegetation and increased alteration of native rangeland may all play a role in the decline, as well as other factors haven’t helped quail. Quail thrive in large expanses of native, warm-season grasses and scattered clumps of low-growing woody cover. Oklahoma used to be covered by this type of habitat. And while it still dominates certain areas, there’s less of it. Habitat changes over time.

Sometimes this is plain to see, such as in many counties today that were once dominated by native grasses but that are now marked by draws of oak timber with trees as wide as 10 inches in diameter. In fact, with the exception of the Ozark and Ouachita Mountains, Oklahoma was historically a prairie state. Exclusion of fire along with other human activities have caused much of Oklahoma’s prairie and savannah habitats to be invaded by timber growth, all at the expense of native prairie and the bobwhite quail.

In other cases, habitat changes are more subtle. Some landowners think to themselves, “My land has been in the family for 50 years, and it’s the same today as it was when we arrived.”

Changes to the landscape can be so subtle that landowners may not even realize it’s happening on their own property, and in those cases it may be the wildlife that is affected most.

While Oklahoma remains one of the strongest holdouts of bobwhite quail populations and habitat, wildlife professionals are proactively undertaking extensive efforts to understand and address the downward trend in quail populations.

In the meantime, *there is much that we do understand and that we can do today* to positively benefit quail, particularly on our state’s private lands. It starts with ensuring that each of us does our part.

This guide is going to cover several topics designed to help landowners make a real difference for quail on their property. When executed correctly, the practices described here can even draw quail to a property that otherwise might not support them.

Thank you for your conservation efforts, and good hunting!



Richard Hatcher,
Director

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Contents

Chapter 1

The Role We Play in Conservation. 2

Chapter 2

A Tradition of Quail Hunting. 6

Blues – Oklahoma’s “Other” Quail Species 7

Spotlight on Pen-Reared Birds 8

The Pros and Cons of Supplemental Feeding 9

Chapter 3

Bobwhite Quail Ecology. 10

Weather Impacts on the Northern Bobwhite 14

Chapter 4

Oklahoma: A Changing Landscape 18

Our Culture — A Changing Landscape 19

It was here when I bought the farm — it’s native, right? 20

Changes in Quail Habitat May be Going Unnoticed 24

Chapter 5

Quail Habitat Management Tools 26

The Tool: Prescribed Grazing 28

The Tool: Prescribed Fire 30

The Tool: Brush Management. 34

Chapter 6

Managing for Quail 36

Managing Grasslands for Quail 36

Conservation in Action: Examples from Oklahoma WMAs 37

Managing Timberlands for Quail 38

Conservation in Action: Management Examples from Oklahoma’s WMAs 39

Managing Agricultural Fields for Quail 42

Chapter 7

Monitoring the Change 44

Fall Covey Count Data Sheet 47

Chapter 8

ODWC Invests in Research 48

Cover photo by Gary Kramer

STEVE WEBBER

1

The Role We Play in Conservation

RUSSELL GRAVES

A Look at How Each of Us Can Help Conserve Quail

By Michael Bergin



Partnering for Quail Conservation

Conservation success stories revolve around partnerships. While individual partners each have a role, combining resources and sharing the workload allows for more tasks to be accomplished and ultimately more conservation to be applied on the ground.

As we continue to manage for quail in Oklahoma, it is important we maintain existing partnerships and continue to build others. As you read through this guide, consider your role in habitat management and how you can help achieve the overall goal of quail conservation. ✨

Landowners

Oklahoma is comprised of about 97 percent privately owned land, meaning that landowners are an important — no, crucial — key to helping ensure that quail habitat remains available to these iconic birds. Not only will landowners be a key to bobwhite quail recovery, they are also a key to helping the species thrive once again. With so much land under private ownership, it's up to landowners to partner with the Oklahoma Department of Wildlife Conservation and sportsmen to provide habitat for wildlife, and they do a good job of it. However, with land use changes taking place every day, small-tract landowners face challenges in the quest to provide habitat on a small scale that still makes a big impact. But there is a way.

One thing we know for sure is that quail are dependent on weather and habitat. And while landowners cannot control the weather, they can make great strides in restoring and enhancing the wildlife habitat on their property. In doing so, they can put in place at least one of the puzzle pieces critical for quail to thrive.

Additionally, the impact of what an Oklahoma landowner does for wildlife on his property can spread well beyond his fence line. When an area provides a good arrangement and diversity of nutritious food, shelter and nesting cover, quail have a better chance of foraging and nesting successfully. And when more than one landowner in an area catch on and begin striving to provide better wildlife habitat, their success is multiplied. Not only so, but they set an example that others can follow.

Another thing we know for sure is that, without landowner participation, wildlife conservation — and quail management in particular — just can't happen.

State and Federal Agencies


While private land ownership is “ground zero” as far as on-the-ground habitat efforts that benefit quail, landowners aren't alone in their responsibility. State and federal agencies such as the Oklahoma Department of Wildlife Conservation, U.S. Fish and Wildlife Service, Natural Resource

Conservation Service and others are constantly putting forth efforts in the way of research, land acquisition, on-the-ground habitat work on public land and assistance to landowners. To many wildlife biologists, quail management is both scientific and deeply personal, since many of these individuals are passionate hunters and wildlife enthusiasts who are eager to see the iconic bobwhite quail thrive in its native habitat. Along with private lands programs and routine management efforts on public lands, the Wildlife Department participates in extensive research efforts aimed at learning how to best conserve bobwhite quail. You can learn about a few of these efforts later in this guide.

Oftentimes there are state and federal incentive programs offered through agencies like these that are designed to assist landowners with conservation on their land. You can learn more about these by

calling one of the numbers on the back cover of this guide. There are also a number of non-government agencies like Quail Forever, The Nature Conservancy, the National Wild Turkey Federation and others who play important partnership roles in conservation.

Sportsmen

The other major key to the conservation of quail is the sportsmen that hunt them. You'll learn more about them in the next section, but the take home message is that it takes commitment from multiple parties to make conservation happen. Wildlife Department officials are optimistic that we can make a difference for quail in Oklahoma. Quail populations have a better chance of rebounding when private landowners, sportsmen and the Wildlife Department partner together for the benefit of wildlife. 



WADE FREE

Good Plant Bad Plant

The Good: Sand Plum

Before the luxury of air conditioning, most everyone knew the importance of shade trees. They provided a place to take a break, eat lunch, or take the occasional afternoon nap. Even though we now escape to air conditioned vehicles or houses, wildlife still depend on shade to survive the brutal summer heat.

Because of its growth pattern, sand plum (*Prunus angustifolia*) is one of the many species of native cover that provides wildlife an oasis during the summer. Some studies have shown that woody cover, including sand plum thickets or “motts,” can be at least five degrees cooler than temperatures in direct sun. Temperatures can be further reduced by selecting areas of deeper shade. This means wildlife can avoid lethal temperatures simply by moving to woody cover. Researchers have found bobwhites avoid operative temperatures of over 102°F. Operative temperatures take into account the influence of solar radiation and wind.

Sand plum motts can provide cover for small mammals and big game such as deer while also serving as ideal loafing coverts for upland birds like quail. Because these motts are typically open at ground level, loafing birds are able to rest and digest food while being protected from aerial predators. It also affords them a safe place to “dust” (coating feathers with dust is a common method for birds to cool down and protect themselves from biting insects). Motts are most beneficial when the canopy closure is 60 to 80 percent.

Though typically associated with the more sandy soils of western Oklahoma, sand plum can be found statewide, with the exception of Cimarron County in the panhandle. Sand plum is a low-growing shrub, and is readily recognized by the growth habit alone. The reddish-brown twigs have a shiny appearance, and are equipped with sturdy thorns. Leaves are glossy green, oblong, serrated, and grow on alternate sides of the stems. One of the earliest species to bloom, this shrub produces white flowers in late March and April. The yellow-red fruits ripen in late June and July.

When managing sand plum or other woody cover for wildlife, remember three key aspects:

Location: When woody cover is randomly scattered across native range, wildlife can use the entire habitat, not just the edges of pastures and fields.

Size: Preferred loafing coverts or motts are at least 30 feet in diameter. This provides a covey of quail or a bedded deer optimum protection.

Proximity: Loafing coverts should be relatively close to each other. As quail forage, they prefer to stay within “flushing distance” (approximately 100 feet) of cover.

Even though sand plum has adapted to fire, motts can be top-killed by especially hot fires. If loafing cover is limited, consider disking around small sand plum motts before conducting a prescribed burn. The disked areas will not only serve as a temporary firebreak by reducing the fuel load, but also encourage forbs the following spring. Increasing the amount of forbs near woody cover allows game birds to reduce the amount of time foraging away from protective cover.

While woody cover may be limited on some properties, it may be too dense on others. Maintaining the right combination of low-growing woody cover, nesting cover and brood rearing cover is key.

Just as an old shade tree provides us a cool spot to take a break and avoid the summer sun, sand plum motts offer the same to a variety of wildlife species. As the thermometer continues to rise this summer, remember that wildlife not only rely on woody cover for predator avoidance, but also to escape the heat. 🦋



JENA DONNELL



The sand plum is an iconic symbol of Oklahoma plant life, often recognized for its small fruit that grows along country roadside fences and pastures in the summer. Sand plum and other native shrubs and trees can be purchased from the Oklahoma Forestry Service website at forestry.ok.gov.

Sand plum thickets like the one on the left serve as protective cover for wildlife from both predators and weather.



Good Plant **Bad Plant**

The Bad: Old World Bluestem


By Alva Gregory and Jena Donnell

As discussed later in “Bobwhite Quail Ecology” the key to quail habitat — especially quail nesting cover — is structure and diversity. Quail have adapted to and flourished in a variety of plant communities — from native brushy prairie to open savannahs. The classic description of quail habitat includes native bunchgrasses providing nesting cover with a mixture of forbs (weeds) for food and low-growing brush for loafing and escape cover. Bare ground between native grass clumps allow for both chick and adult quail movement as they forage throughout the landscape. With the shift in agricultural practices and a demand for higher livestock stocking rates, thousands of acres of this “quail friendly” native range have been replaced with introduced forage grasses, including Old World bluestems.

More closely related to silver bluestem than the more desirable big or little bluestem, Old World bluestems were first introduced to the Great Plains in the 1920’s from Africa, Asia, and southern Europe. As with many introduced grasses, there are several cultivars of Old World bluestem; nearly 750 have been tested in the Great Plains. Three of these — Plains Bluestem, WW Ironmaster, and WW Spar — were developed or tested in Woodward, Oklahoma, at the Southern Plains Range Research Station. Because many of these cultivars can

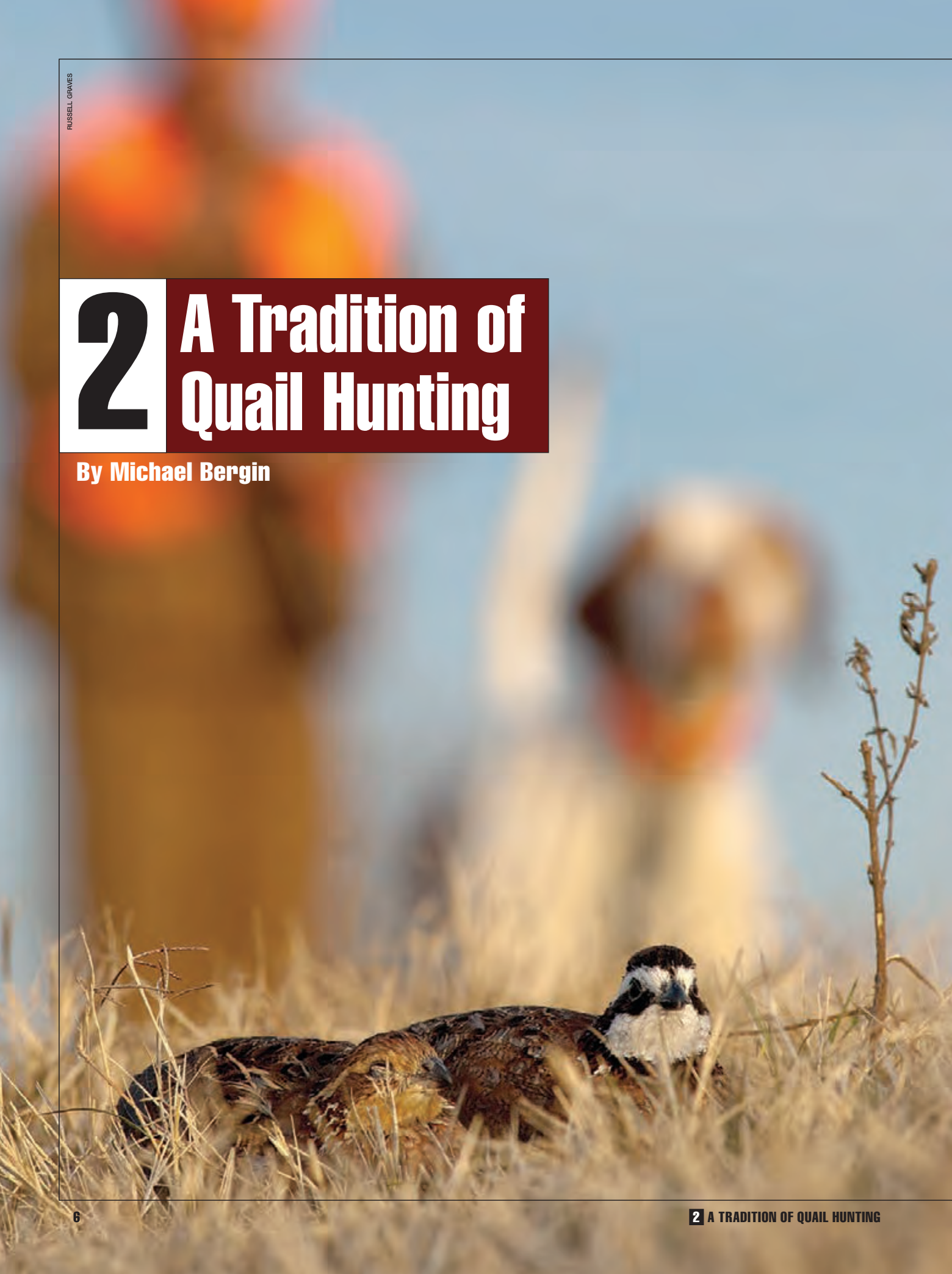
provide quality livestock forage, and are easy to establish and have a wide tolerance level, Old World bluestems and other “exotic” forages have been regularly seeded in Oklahoma pastures. These qualities also made Old World bluestem a popular cover grass in the Conservation Reserve Program (CRP) when the farm bill program began in 1986. Since then, over 50 percent of CRP land in some western Oklahoma counties has been planted to Old World bluestems. Unfortunately, many CRP acres and other fields were planted in thick, solid stands that provide very little vegetative diversity. Without diversity, the value of quail habit is significantly decreased.

Because of the extensive nature of Old World bluestem plantings, many biologists and researchers have tried to find ways to improve existing Old World bluestem fields. Unfortunately, they have found limited options. To best benefit wildlife, biologists recommend the Old World bluestem field be treated with herbicide and replanted to native grasses and forbs.

The Old World bluestem field should be burned, grazed, or mowed in late winter or early spring and then treated with a non-selective herbicide (glyphosate or Arsenal) applied during the first part of June. A second application will be needed eight weeks later. Spot spraying may be needed the following year. Other options include planting a cover crop for seedbed preparation. Consideration should be given to utilizing the introduced grass during the growing season, saving the native rangeland for winter grazing. 

2 A Tradition of Quail Hunting

By Michael Bergin



To an Oklahoma quail hunter, every moment spent in the field with family, friends and dogs is a moment well spent.

Brandon Cary of Yukon knows this all too well. A father of two, Cary hopes to instill an interest in conservation and hunting in his young boys. His own interest in hunting comes from his family roots. Having grown up in Hollis, Oklahoma, hunting quail was part of his way of life, passed down to him by his own late father.

“Quail hunting for me can be summed up in one word — ‘relationship,’” Cary said. “My Dad and I rarely missed an opening day. He’d wake me up early, and we’d start the day with breakfast together at the Hollis Inn. After breakfast we’d spend the rest of the morning following a pair of good bird dogs around the old home place. I can’t remember many instances where my Dad didn’t get his limit, but for me it was always about the time we got to spend together. It’s a tradition that I’m hoping to pass down to my own boys.”

While Cary misses the times he spent with his father the most, he does hope to see quail thrive in the habitats they have left today.

Memories of dogs on point, coffee from a thermos, snowy winter days, big open country, coveralls, over-and-unders, game vests, hearty lunches, Grandpa, Dad and Mom are conjured up in the minds of hunters when they look back upon years of great quail hunting. And while all of these things are central to the making of a great memory in the field, none of them are as symbolic of the great sport of quail hunting as the iconic bobwhite quail itself.

Unfortunately, data tells us that the popularity of quail hunting is declining, as evidenced by the number of Oklahoma quail hunters — declining from 110,000 in 1980 to less than 30,000 hunters today. This is not because quail hunting isn’t fun anymore. It’s a more complex issue than that. Many youngsters are not even getting the chance to be exposed to hunting, and so they may never be enticed by the joys of pursuing quail. As a result,

Blues — Oklahoma’s “Other” Quail Species




By Jena Donnell

Bobwhite quail are the most common and popular quail species in Oklahoma. Even so, there’s another special quail that sportsmen can hunt in our state — that is, if they are willing to travel to extreme northwest Oklahoma. Often considered a desert quail, the scaled quail, or “blue quail,” has similar habitat needs as the bobwhite but prefers more arid, short-grass rangelands.

Though many birds are named for their call or song, all the common names for this species are based on feather color or characteristics. Regardless of the name, sportsmen wanting to add this species to their list should be prepared for a long chase. Unlike bobwhites, scaled quail are known for their tendency to run when disturbed instead of flushing.

Like bobwhites, scaled quail are ground nesting birds. Because “blues” are found in more arid shortgrass prairies where nesting material may be limited, nests are typically made in shallow depressions lined with grass and leaves. Birds frequently use shrubs, cactus, and other woody cover for additional protection. Reproduction is tightly tied to weather, and scaled quail are less likely to have multiple clutches than bobwhites.

Scaled quail begin forming coveys in late summer and fall, sometimes as early as August. Covey size is variable, with an average of 19 to 38 birds. Coveys of over 150 birds have been reported in sand sagebrush grasslands.

Though rare, hybridization between scaled quail and bobwhites may occur where the two species ranges overlap. Characteristics of both species are most obvious in male hybrids. These hybrid males tend to have a white throat patch but lack a distinct black border. Instead, a patch of hazel-colored feathers is present below the lower mandible. Breast and belly feathers are similar to scaled quail, while side and flank feathers are representative of bobwhites. These hybrids are often referred to as “blobs.” 

they may not have a chance to develop an appreciation for habitat and conservation of the species.

So preserving the tradition of quail conservation through hunting is more important now than ever.

Put simply, *hunting is conservation.*

The Oklahoma Department of Wildlife

Conservation receives no general state tax appropriations and is supported primarily by sportsmen through their purchase of hunting and fishing licenses. Through their purchase of hunting licenses as well as the purchase of certain hunting equipment, funds have continued to flow into

(continued on page 9)

Spotlight on Pen-Reared Birds

By Doug Schoeling



Many quail enthusiasts — landowners and sportsmen alike — are attempting to increase the quail population on their properties by releasing pen-reared birds. While these birds are commonly used to train young or inexperienced bird dogs, interest in this practice has significantly increased as wild quail populations continue to decline statewide. Unfortunately, releasing pen-reared birds has been proven to have a minimal and short-term impact on the overall quail population.

A Few Downsides to Pen-Reared Birds

- **Birds are not acclimated to life outside the pen:** When pen-reared birds are released into the wild, they no longer have access to the food, water and shelter once provided in the pen. This can lead to a very low survival rate after release.
- **Increased predation:** Because released birds are not acclimated to life outside the pen, they may not have the innate fear of predators, or may not have as effective escape maneuvers.
- **Disease:** Pen-reared birds are usually kept in confined areas which may lead to a number of different diseases. Because many of these diseases are primarily associated with confinement, wild quail populations may never have been exposed to them. Releasing “carrier” pen-reared birds could increase the chance of the disease spreading into the wild population and

may have genetic consequences to wild quail.

- **Behavior:** Without parents to imprint on young, pen-raised quail may not realize they are quail.

To address some of the pen-reared issues, some landowners release birds from a “surrogator.” In this type of release, young chicks are placed in a special container with food, water, and a heater. Because these surrogator-raised birds have little to no human imprinting, it is believed these birds will act more like wild birds.


Researchers with Oklahoma State University recently looked at the effectiveness of this release system on a ranch in western Kansas. Chicks were raised to five weeks of age in the surrogator and then released. A small number of the survivors were fitted with a radio transmitter to determine survival. Though an average of 78 percent of the chicks survived to five weeks of age in the surrogator, 65 percent of the birds were dead within three weeks of release. For the complete study, log on to <http://139.78.48.197/utlils/getfile/collection/theses/id/4041/filename/4042.pdf>.

With today’s low wild quail populations, many landowners and sportsmen may feel like releasing pen-reared birds is the only option. However, biologists caution this practice may be effective for bird dog training or allow for “put and take” hunting, but will not improve the wild quail population. 🦋

wildlife conservation in Oklahoma as part of the Wildlife Restoration Program. Hunting equipment carries a federal tax that is collected from the manufacturer, and the U.S. Fish and Wildlife Service then distributes such taxes to state wildlife agencies like the Oklahoma Department of Wildlife Conservation. The funds must be used by the states for wildlife conservation efforts. The program functions as a “user pay, user benefit” program in that the number of hunting licenses issued in Oklahoma annually helps determine the final amount of the program’s funding. Because of the Wildlife Restoration Program, Oklahoma’s funds today represent millions of additional conservation dollars invested in our state by licensed hunters.

Because of efforts to enhance and restore habitat, quail benefit, as do so many other species in Oklahoma ranging from big game like deer and pronghorn to wild turkeys, rabbits and others. Sportsmen’s dollars have gone a long way in making that happen through research projects, habitat restoration, law enforcement, education and long-term cooperative relationships between the Wildlife Department, landowners and sportsmen.

In short, one of the best ways to support wildlife conservation, and therefore quail conservation, is to purchase a hunting license and go hunting. Additionally, hunters can introduce others to the outdoors by taking them hunting. Becoming a volunteer instructor for the Wildlife Department’s hunter education program makes a big difference through educating the next generation of hunters in local communities. Or get involved in local chapters of effective conservation groups such as Quail Forever. Projects and fundraisers held by conservation organizations are effective ways to raise money for conservation projects.

The tradition of quail hunting is synonymous with the preservation of habitat. Not only so, but the intrinsic riches gained from the quail hunting experience range from simply seeing beautiful countryside and knowing you are a part of conservation to forming deep and lasting memories and relationships with family and friends. 

The Pros and Cons of Supplemental Feeding

By Doug Schoeling


Quail enthusiasts across the state are looking for options. Those most concerned with bird health and body condition may be considering supplemental feeding; hoping to improve survival, increase body size, or simply to attract birds to their hunting area. Other sportsmen may be deterred by the high cost, the potential for concentrating predators or feeding non-target animals (especially small mammals like raccoons). Another fear is that concentrating birds around artificial food sources could spread disease.

Regardless of the pros or cons, biologists caution that a supplemental feeding program is only effective when *native food* is the *limiting resource*. Many times, lack of suitable woody cover or nesting cover limits the quail population more than food availability. Even so, food could be limited in quantity or quality, or high concentrations of quality feed could be inaccessible to quail because of distribution or other obstacles. Before you begin an expensive supplemental feeding program with no guarantees of a population response, first consider your native food source. Are there an adequate number of plants that attract insects in the spring and summer and provide seed in the fall? Is there a way to connect areas with high concentrations of weeds? If food is the limiting resource on your property, three of the basic quail management tools — prescribed fire, prescribed grazing, and strip disking — are oftentimes more beneficial than implementation of a feeding program.

Does supplemental feeding really benefit the quail population?

Increased interest in supplemental feeding programs has led to several scientific studies examining the year-long value to birds. One Texas study looked at the effects of supplemental feeding on body condition and overall benefits to the population. They found that feeding did increase over winter survival, but only in areas of deep sand. Feeding on study sites with sandy loam or clay soils had no added benefit to the population. These results indicate that deep sand soil types do not produce as many native forbs as sandy loam or clay soils. At the time of the study, supplemental feeding costs were estimated at \$5.70 - \$6.58 per bird. Because hunting leases in deep sand areas were only \$4 per acre, researchers concluded it would be more cost effective to lease additional land than to add supplemental feed. For supplemental feeding to be effective, there would need to be an increase in the spring quail population. Unfortunately, other research studies haven’t been able to show this improvement. For the complete study, log on to <http://texnat-tamu-edu.wpengine.netdna-cdn.com/files/2010/09/page15.pdf>.

When the same researchers looked at the impact of supplemental feeding on reproductive success, they found no improvement on any sites because quail — especially nesting hens — are primarily feeding on high protein insects instead of seeds. Additionally, many agricultural seeds used in feeding programs such as milo may not meet the minimum nutritional requirements for quail.

As quail numbers continue to decline, sportsmen are looking for a solution. Unfortunately, adding a supplemental feeding program may not help the quail population as much as many quail enthusiasts would like. Even so, during severe winter weather events, snow and ice can limit food availability for short periods of times. During these types of weather events, supplemental feeding can be used to increase food availability. Because food is seldom the limiting factor for the population and the spring diet for quail is insect based, biologists recommend other habitat management practices that will not only improve the forb element, but also the nesting cover and bare ground habitat components. 

3

Bobwhite Quail Ecology

Physical Description

Bobwhite quail are a study in camouflage. Reddish brown and tan above, this softball-sized bird easily hides in a variety of habitats. Though quail are easily concealed by their neutral coloration, individual feathers have surprisingly intricate patterns. Breast and flank feathers are perhaps the most striking; white with dark, narrow v-shaped bars. Males have a white chin and throat, with a black eye stripe. Females have tan facial markings.

Chicks are covered in buff-colored natal down when hatched. Juvenile feathers first become visible at two weeks of age and down is completely replaced by the time birds are four weeks old. By 15 weeks of age, the molt is complete, and all birds have adult plumage.

Aging Quail

The most accurate way to age quail is to examine the coloration and molt pattern of the wing feathers. The first step is to fully extend the wing. The longest wing feathers are at the bottom, and the outermost feathers are called the primary feathers. Primaries are numbered one to

KELLY ADAMS



Primary Feather Replacement Sequence

"Growing" Feather	1	2	3	4	5	6	7	8	9	10
Quail Age (in weeks)	4	5	6	7	8	9	10	14	Not Replaced this Year	

Typical Adult Wing with Molt Completed

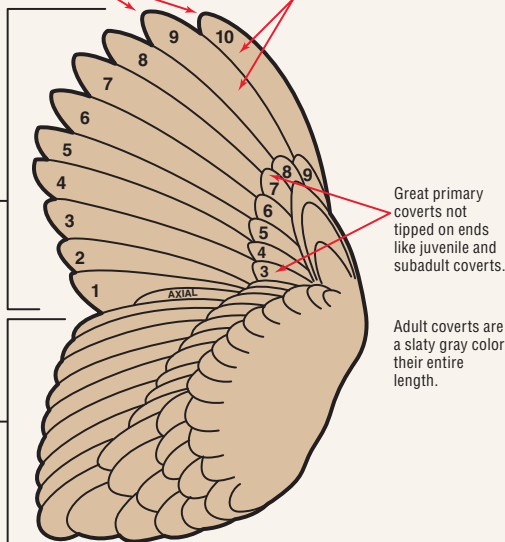
The tips of outermost primaries 9 and 10 of adult are more rounded on ends than juvenile primaries 9 and 10.

Primaries 9 and 10 the same shade as 1 through 8. (Primaries 9 and 10 on juvenile with completed molt are very slightly faded when compared to primaries 1 through 8)

An adult with a completed molt, ends of primary feathers make a uniformly rounded profile.

Primaries 1 through 10

Secondaries



Great primary coverts not tipped on ends like juvenile and subadult coverts.

Adult coverts are a slaty gray color their entire length.

Reverse examination with under-wing coverts open to expose base of primaries will show all primaries fully regrown, scales not present on lower shaft of primaries at point of attachment and all lower shafts are hard.

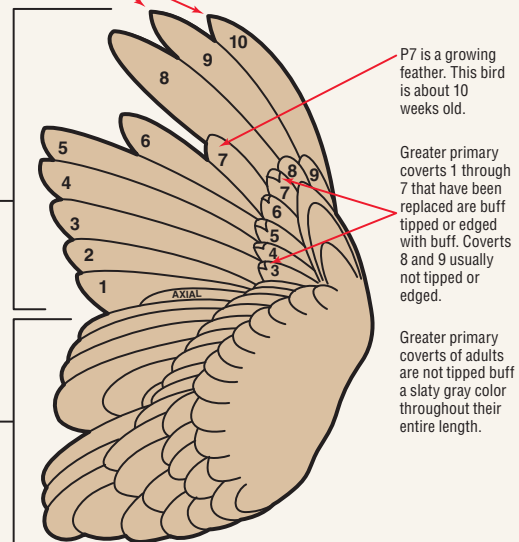
Typical Juvenile Wing with Molt in Progress

The tips of outermost primaries 9 and 10 of juveniles are more pointed on ends than adult primaries 9 and 10.

On juvenile with an incomplete molt, ends of primary feathers make a broken profile due to regrowing primaries.

Primaries 1 through 10

Secondaries



P7 is a growing feather. This bird is about 10 weeks old.

Greater primary coverts 1 through 7 that have been replaced are buff tipped or edged with buff. Coverts 8 and 9 usually not tipped or edged.

Greater primary coverts of adults are not tipped buff a slaty gray color throughout their entire length.

Reverse examination with under-wing coverts open to expose base of primaries will show a regrowing primary, indicated by a soft bluish-colored shaft at the point of attachment to the wing, and/or a loose scale on the shaft at the base or point of attachment.

10, with the 10th primary on the outer edge. Primary feathers are partially covered by the much shorter covert feathers. Buff colored tips on the coverts separate juveniles from adults. Juveniles will keep buffy tips for one year.

To estimate the age of juvenile birds, simply examine the primary feathers for the “growing” or replacement feather. Because these feathers are grown and replaced in a certain time sequence, the age of the bird can be determined to the nearest week.

Life of a Quail

For most of the year, quail are social animals, forming small groups or “coveys” of 12 to 15 birds. These birds spend most of the day together, foraging in the early morning and late afternoon and loafing in low-growing brush the rest of the day. While coveys are tight-knit associations, the membership often changes throughout the year.

Spring/Summer

In early spring, coveys scatter and males begin whistling “bob-white” to establish mating territories and to attract mates. Both males and females begin nest building in early spring. Nests are built on the ground and vary from a simple depression

in grass litter to a complex, dome-covered bowl with one or multiple entrances. Nest building can take five to 10 days. After the nest is completed, females lay one egg a day (sometimes skipping a day) until the clutch is complete. The number of eggs laid varies throughout the breeding season, with an average of 12 to 14 eggs in mid-season. Incubation begins only after the clutch is complete, allowing chicks to hatch within hours of each other. Both males and females incubate clutches, with a majority of nests being attended by females. Even so, females will sometimes lay a clutch of eggs, leave the male to care for it, and go find another mate. Incubation averages 23 days. All told, the nesting process requires 44 to 53 days. After hatching, chicks are led away from the nest when down feathers dry and begin foraging alongside the adult.

During spring and summer, quail diets consist of insects and other high protein items. Hens require extra protein for egg-laying, and chicks rely on insects for the first six weeks of life. After six weeks, the diet partially shifts to seeds and berries.

Nesting continues throughout the summer, with the majority of the hatch completed by mid-July.

Autumn

Nesting season winds down in autumn.

Even so, if initial nests are destroyed by predators or weather events, hens may attempt second or third nests. Though nest initiation plummets in drought, hens take advantage of fall rains; young chicks have been seen as late as November.

Birds begin moving in autumn, and coveys begin reforming. During this time, birds mingle with different coveys and can move several miles. These movements are collectively known as the “fall shuffle.” Early fall coveys often consist of one to three adult pairs, their

surviving young, and one to several cocks or pairs that failed to produce broods. Bobwhites lost from one covey may join another so that birds of several different ages may be found together.

Winter

At the end of the fall shuffle, newly formed coveys prepare for winter. Movements are minimized and covey sizes tend to remain fairly stable. Coveys often coalesce as winter progresses; while covey size may remain the same, the number of coveys on a given area tends to decrease.

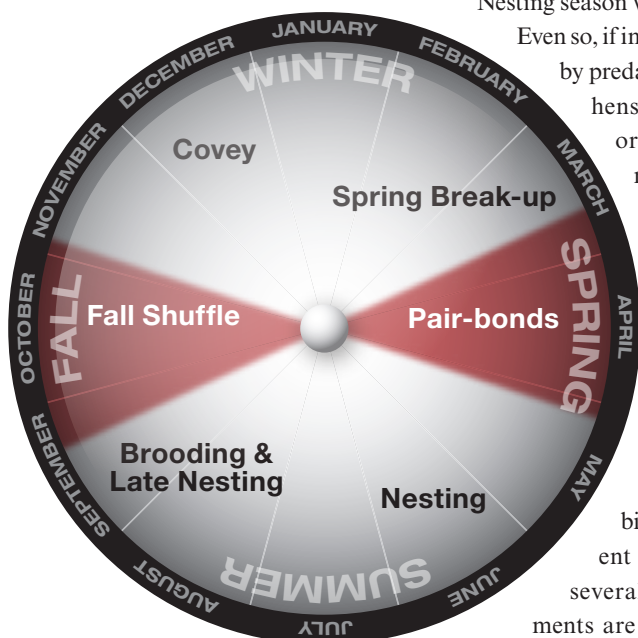
The diet shifts dramatically in the winter from seasonally abundant insects to fallen forb seeds. Many studies have tried to rank the preference of “bobwhite friendly” plants, but this task has proved difficult. Bobwhites consume the seeds and plant parts of over 1,000 plants.

Surviving the Year

Bobwhites face many challenges during the course of the year, and only a small number survive. Spring floods, late season freezes or exceptional droughts impact nesting success. Additionally, freezing temperatures, heavy snows and ice storms take their toll on the winter populations. When these weather events are combined with natural predation and unfavorable habitat changes, chances of survival are low. The average life span of a bird is eight to 11 months, and a mere 20 to 30 percent of the population survives to the next year.

Even with a relatively short life span and survival rate, some years have a noticeable “boom” of quail numbers. Other years are obvious “busts.” Because of this cyclic pattern, quail managers have long thought of quail as an annual crop, much like corn or soybeans. While several factors can impact quail populations each year, generations of biologists have seen an obvious link between average rainfall patterns and quail populations.

Though it feels like quail populations are in the trenches, it is important to maintain quality habitat across the landscape. As weather patterns shift to more favorable conditions, quail populations should respond.



This figure shows the annual cycle of social and reproductive behavior of the bobwhite quail.

Habitat Needs

Bobwhite quail have a multi-state distribution; ranging from the pine woodlands of the southeast to the open rangeland of the Great Plains. Because of the vast landscape changes across the range of bobwhites, it is impossible to describe “optimum” quail habitat. What is considered quail habitat in Florida may not be classified as quail habitat in western Oklahoma. Instead, managers should focus on the specific habitat needs of bobwhites, and modify existing habitat (be it forest, cross timbers, or range) to better suit those needs.

Brood Rearing/Foraging Habitat

Bobwhites are largely seed-eaters. Though they take advantage of seasonally abundant foods — green vegetation and insects in spring and summer — seeds comprise more than 60 percent of their diet throughout the year. Forbs like western ragweed, Texas croton, and beebalm are often praised by quail managers. But grass seeds like panicums and paspalums and legumes such as Illinois bundleflower and native peas are commonly found in quail crops. Regardless of the menu, quail need to be able to reach the food; everything a quail eats must either be directly on the ground or within six inches of the ground. For the nutritional needs of quail to be met year round, it is best to have a wide variety of forbs and legumes available. These plants also attract insects, which are especially important for laying hens and newly hatched chicks.

Many forbs and other quail-friendly plants have a growth pattern that is advantageous to the birds. Plants with a single stem at ground level and a wide canopy at the top provide foraging quail with screening cover. When abundant, these branching overhead canopies can conceal quail from aerial predators like Cooper’s and Sharpshinned Hawks.

Foraging habitat doesn’t end at the right mixture and height of forbs or other insect attracting plants. Bare ground is an essential component in foraging habitat. Quail must be able to freely move through the habitat and visually find insects or dropped seeds. Unlike larger game birds, quail are weak



Prime brood rearing habitat for quail such as this leads to birds using the area more.



scratchers, and won't be able to easily access seeds that have fallen into deep ground litter.

Nesting Habitat

For many ground nesting birds, a clump of native grass is "home sweet nest." Bobwhites are capable of nesting almost anywhere, but prefer grass clumps that matured the prior season. Bunchgrasses like little bluestem, big bluestem and Indiangrass are often used during the nesting season. Nests are made by scratching a small depression next to the base of these bunchgrasses and then lining the newly fashioned bowl with vegetation. Though mature clumps at least one foot in diameter (about the size of a basketball) are prime locations, birds will also choose smaller clumps if they are protected by woody shrubs.

Another component of nesting habitat is bare ground. Newly hatched chicks must be able to travel from the nest to brooding areas. Some managers consider native grasses too thick when an area has more than 1,200 basketball-sized clumps per acre. After this point, some sort of management may be needed to make the habitat more functional.

Before next year's nesting season, evaluate the available nesting habitat:

- **Are there enough mature bunchgrasses? Many ground nesting birds select areas with 250 to 300 basketball-sized clumps of mature bunchgrass per acre.**

- **Is the grass tall enough to conceal an incubating bird? Make sure at least six to eight inches of stubble height will be available during the nesting season (April 1 to Sept. 30).**

- **Has the thatch layer become too thick? Throw a softball and watch its landing. If the ball rolls after landing, bare ground and travel corridors are probably sufficient. If the ball "sticks" its landing, consider setting back succession by grazing, conducting a prescribed fire, or disking 15 to 30 foot strips in the densest habitat.**

Loafing/Escape Habitat

In its simplest form, cover provides protection from both predation and weather. Between the morning and afternoon feeding sessions, quail retire to woody cover to digest food and avoid unfavorable weather conditions.

Though cover requirements can vary, bobwhite quail prefer low-growing woody thickets or loafing coverts. Sand plum thickets, shinnery motts or stands of sumac are prime locations; the dense canopy affords protection from aerial predators while the open understory allows quail to rest and dust. Like many other birds, quail take dust baths to protect themselves from external parasites.

Management of wildlife cover requires balance. With no management, low-growing brush can slowly give way to a closed canopy forest, or dense thickets that may attract

nest predators. Conversely, excessive brush management can increase predator detection and restrict wildlife movements. Like with vehicle care, maintenance of wildlife cover is typically the best and easiest route.

Evaluate the woody cover available for loafing bobwhites:

- **Consider the structure: Will the existing cover conceal a loafing covey of quail? For most wildlife species, low-growing cover is most beneficial; individual thickets should be three to six feet in height and at least 30 feet in diameter. To avoid detection from aerial predators, thicket canopy should be 60 to 80 percent closed.**

- **Consider the placement: To allow quail to use the entire habitat, cover should be scattered across the landscape, not confined to the edges. When managing for bobwhites, individual thickets or coverts should be within flushing distance. Some biologists equate flushing distance with an adult softball throw; if a softball is thrown from any point of the property, will it land in woody cover?**

Putting it All Together

Quail have three major needs—to build a well concealed nest, to find adequate foods, and to escape predation. While these needs represent equally important habitat components, a property will only be able to support a population of quail year round if all habitat components are relatively close together. While quail might be able to build a nest in a thick stand of grass, they may have to move their chicks to another property with abundant forbs and bare ground. Likewise, birds may be able to easily find fallen forb seeds in a recently deferred overgrazed pasture, but without adequate escape cover they may be subject to predation. As you assess your quail habitat, try to identify which habitat component—nesting cover, brood rearing habitat, bare ground or loafing cover—is missing. Then focus management efforts on the limiting factor. Remember, quail habitat doesn't have to stop at your fence line. Talk with neighboring landowners about your quail management plans and join forces. A number of agencies provide on-site evaluations and technical advice free of charge. 🐾



JENA DOWNIE

Weather Impacts on the Northern Bobwhite

By Dwayne Elmore

The southern Great Plains, including Oklahoma, is characterized by weather extremes. With summer temperatures exceeding 115°F and winter temperatures below -10 °F, temperatures range wildly. Precipitation likewise can be exceedingly heavy or light. These factors have strong direct and indirect influences on all wildlife populations, including bobwhite quail.

Temperatures can stress quail, reduce areas of the landscape they use, and may cause nest abandonment. High temperature increases evaporation and is therefore related to plant production, which can influence habitat for nesting and brood rearing, particularly in areas dominated by herbaceous plants rather than shrubs.

At the other extreme, cold temperatures associated with extended periods of snow and ice can increase mortality and lower breeding populations. Quail lacking protective cover and adequate seed-producing plants will be at a higher risk from such events.

Yet precipitation appears to be the most powerful driver of quail pop-

ulations in Oklahoma from year to year. Comparisons of long-term precipitation trends and quail populations in portions of Oklahoma and Texas reveal a tight correlation. That is, quail increase during wet periods and decline during dry periods as their breeding effort decreases. Rainfall greatly influences plant production,

PRECIPITATION APPEARS TO BE THE MOST POWERFUL DRIVER OF QUAIL POPULATIONS IN OKLAHOMA FROM YEAR TO YEAR

which in turn impacts quail. Further, as rainfall and temperature are often related, dry summers are usually hot summers. At high temperatures, quail must make decisions on whether to continue to incubate nests, or escape to cooler areas of the landscape to survive. However, wet years following dry years are often characterized by high amounts of annual forbs (related to the bare ground required for germination of these forbs), which are important plants for quail.

As we have no control over the weather, it seems futile to manage for droughts, floods, freezes, and heat waves. However, certain practices may lessen the impacts of extreme weather and assist quail populations in recovering. First, concentrate on providing ample habitat: try to make every square foot of a quail area usable each and every day of the year. Dur-

ing very hot periods of the summer, much of a landscape becomes too hot for quail to occupy. Areas of shrub cover can be several degrees cooler, and telemetry data reveals that quail move to these areas during the heat of the day. Thus, not only does shrub cover provide protection from predation, but it also mediates temperature for quail. Additionally, larger areas of habitat (or usable space) will provide for larger populations of quail, assuming other factors are equal. Maintaining large blocks of habitat can prevent local population loss during weather extremes and promote faster recovery once conditions improve. Another management strategy is to lower the stocking rate of cattle during droughts. If too much grass forage is removed by livestock, you will reduce cover for quail, particularly in areas with limited shrub cover. Another concern

that landowners often have is whether or not to provide surface water. While quail require water to survive, they receive sufficient amounts from foods they consume and water produced during digestion of these foods. Research has shown no relationship between quail numbers and available surface water.

The most important thing that a landowner can do to mitigate weather effects is to maintain large areas of habitat for bobwhite. Landowners should also plan for weather extremes and not expect “average” weather conditions in a region characterized by high variability in annual weather. Finally, it should be noted that most climate models predict Oklahoma weather will become more variable in the future; thus the boom and bust of quail populations may only become more pronounced. 🐦



Researchers are using the above device to record operative temperatures across quail habitat. Research similar to this has shown lemon sumac and other shrubs found in mixed shrub communities provide thermal refuge.

JENA DONNELL

RUSSELL GRAMES

Good Plant Bad Plant

The Good: Shinnery Oak

When you think of oak trees, images of massive branches, tree houses, and tire swings may come to mind. A three-foot oak tree is nothing to write home about, until you realize its presence in the western part of the state is a real plus for some of Oklahoma's wildlife species. On the surface, the towering oaks of the east may appear more impressive than shinnery oak (*Quercus harvardii*), but a different story lies just below the ground. Shinnery is a clonal species, with an immense underground stem and root system that sends hundreds of shoots above the surface. In fact, up to 90 percent of an individual plants' mass is underground. The bulk of the remarkable root system runs parallel to the ground — just two to three feet below the surface — making this plant especially vulnerable to plowing and root grubbing.

The low-growing habit makes shinnery an important wildlife plant, providing both food and cover. White-tailed deer, lesser prairie-chickens, and bobwhite quail forage seasonally abundant buds, catkins, and acorns. (Crude protein averages 15 to 20 percent in the buds.) Eleven species of rodents and at least six species of snakes are commonly found in shinnery and over 142 species of birds have been recorded in Oklahoma's shinnery communities. Many of these bird species forage on the insects hidden in the leaf litter. These insects are especially important during the breeding season when hens increase protein intake for egg development.

Shinnery also provides a critical wildlife habitat component — cover. Deer often bed in motts and game birds use shinnery to escape from aerial predators. For many game species, including bobwhite quail, woody cover is most beneficial when the dense canopy is three to four feet tall, the surface layer is relatively open, and individual thickets or "coverts" are in close proximity to each other. This arrangement protects birds from overhead predators, allows them to watch for ground predators while resting and digesting food, and increases the amount of space they can travel while searching for food.

Shinnery oak — the shortest of Oklahoma's oaks — is a member of the white oak group and rarely exceeds four feet in height. Biologists believe uncharacteristically tall shinnery is the result of hybridization with post oak (*Quercus stellata*), and call hybrid thickets "motts". In purist form, this shrub is only one to two feet tall, or "shin" high (though the name aptly describes this shrub, "shin" is actually derived from the Louisiana French word chene, meaning "oak"). Shinnery is most commonly identified by its short-statured growth form. It can be distinguished from other western shrubs by its rough gray bark and deciduous leaves that have shallow lobes or indentations on the margin. When still on the shrub, half of the fruit, or acorn, is covered with a husk or "cap." Buds begin to swell in late March, and shinnery flowers in April and May.

This beneficial shrub once covered over 750,000 acres in Oklahoma. Through the years, that number has dropped more than 10 percent due to mechanical and chemical brush clearing for row cropping and grazing purposes. Because this shrub requires deep sand, shinnery has always been restricted to the looser soils of western Oklahoma. Though most shinnery is found on private lands, it is managed on a few public lands, including Packsaddle Wildlife Management Area.

Prescribed fire is the most common management tool for reducing shinnery height. Under proper conditions, a fire can result in a one- to two-year decrease in oak canopy, leading to a positive response of grasses and forbs. Even so, fire can stimulate oak resprout in the growing season after the burn. Dividing rangeland in three to four burn units allows for a variety of shrub heights and densities. This method ensures habitat requirements are met for both game and non-game species. Though effective, mechanical and chemical means of control are much more expensive and permanent — making predator avoidance more challenging and potentially reducing foraging opportunities.

Wildlife populations may not be limited by shinnery occurrence, but they are certainly attracted to the low-growing shrub with nutritious forage. With seasonally abundant foods — buds and catkins in spring and acorns in the fall — and protection from predators and weather, shinnery is a wildlife plant for all seasons. 🐿️



STEVE WEBBER



DR. RANDY ROSIERE



Good Plant **Bad Plant**

The Bad: *Sericea lespedeza*

By Jeff Pennington

Sericea lespedeza was brought to this country from eastern Asia in 1896. It was intended to provide forage in areas of the southern states known for poor, eroding soils with livestock forage. It was planted extensively in farm fields beginning in the 1940s. In the 1950s through the 1970s it was used in US Department of Agriculture programs and in state and federal construction projects for erosion control.

Sericea is palatable to cattle and wildlife in early spring when it is short. By summer, tannin levels increase, which makes the plant unusable by cattle. This allows *sericea* to flourish in a rangeland grazing system. The cattle consume the native grasses which reduces the competition for the *sericea*.

Sericea is drought tolerant, is resistant to insects, grows well in poor and acidic soils, and produces large amounts of small seeds. Its seeds are spread by livestock, wildlife, machinery and even unclean hay crops. It is resistant to 2, 4-D, which is the most common and inexpensive type of broadleaf weed killer.

There are two factors that make *sericea* such a bad plant for quail habitat across the state. First, *sericea* spreads with the use of fire. Fire creates bare ground and scarifies the abundant seeds, which facilitates germination. The fact that *sericea* benefits from burning limits prescribed fire usage by landowners who have *sericea* on their property. This reduces the effectiveness of the best tool to maintain healthy rangelands and quail habitat. In the absence of fire, most rangelands will convert to areas dominated by trees, which is unsuitable habitat for bobwhites.

Second, *sericea* is so despised, that sometimes landowners will spray their whole property with herbicide for its control. This also kills the essential brushy plants and forbs that quail need in order to survive. Most of the time the brush is a secondary target for the landowner, and would not have been sprayed if not for the *sericea*. It often takes many years for the brush component to come back on these properties.

The best method for control of *sericea* is to do a late winter or early spring burn to germinate as many seeds as possible. Then apply triclopyr (Remedy) herbicide in the spring, or Cimarron herbicide in the fall. Spot treatments will be necessary for several future years to gain full control.

Sericea lespedeza may be our best example of how introduced plant species can negatively affect wildlife habitats. It was brought here with the best of intentions, but *sericea* has certainly been a disaster for Oklahoma rangelands and bobwhites. 🐔

4 Oklahoma: A Changing Landscape

By Allan Janus



The range-wide decline of bobwhite quail is obvious to many Oklahomans, especially to those with a strong tradition of quail hunting. But Oklahoma's quail population isn't the only thing that has changed across our landscape; Oklahoma has a history of change, so much so that change has become a constant. In addition to changing quail numbers, we have seen great changes in climatic conditions, land management goals, agriculture systems, and the rural lifestyle. Each of these changes has indirect impacts on our wildlife populations.

Residents of Oklahoma are quite familiar with the drastic changes of our state's weather on a day to day basis. We also recognize that long-term averages of annual weather conditions represent our regional climate. Changes in Oklahoma's climate are especially noticeable in a recently produced chart of our annual precipitation for the last 100 years (to view this graph and other climate data, log on to climate.ok.gov). With the exception of the last 30 years, climatologists found strong five year tendencies of wet and dry periods. These wet and dry cycles

impact the regional vegetation, which in turn impacts our quail populations.

While these wet and dry cycles have likely been ongoing for thousands of years, Oklahoma has experienced more recent changes. In 1870, surveyors used the Public Land Survey System to begin dividing the Indian Territory into "townships" containing six square miles or "sections." Later, during the Land Run these divisions were used to record the location of newly claimed 160-acre homesteads or "quarter sections." With the development of these homesteads and nearby towns, Oklahoma's landscape was forever changed.

Since the Land Run, Oklahoma has seen extensive changes in agricultural systems and land management strategies. As homesteaders were improving their claims in accordance to the Homestead Act, or "proving up," they planted crops and further divided the land into multiple fields. This lifestyle progressed until the formidable Dust Bowl of the 1930's. But as the land recovered from the extreme drought with increased rainfall and soil conservation

practices, the farming lifestyle rebounded. While the agricultural market drove the types of crops planted, technology limited the extent of cropland across the state. In general, landowners farmed smaller areas and rotated cropped fields so that individual fields were rested or left "fallow." Though very different from the native habitat of pre-homestead Oklahoma, this combination provided quail with adequate nesting and brood-rearing habitat in fallow fields, and loafing and escape cover in the brushy field edges.

While remnants of this lifestyle remain in today's agricultural systems, there have been impressive improvements in farming technology that allow for more productive fields and more efficient harvest. Tractors and other farming equipment can now be armed with sensors that allow for precise fertilizer application which could significantly reduce cost and increase yields. More efficient equipment allows for a larger percentage of the crop to be harvested, and time required to harvest crops is significantly reduced. This allows for a

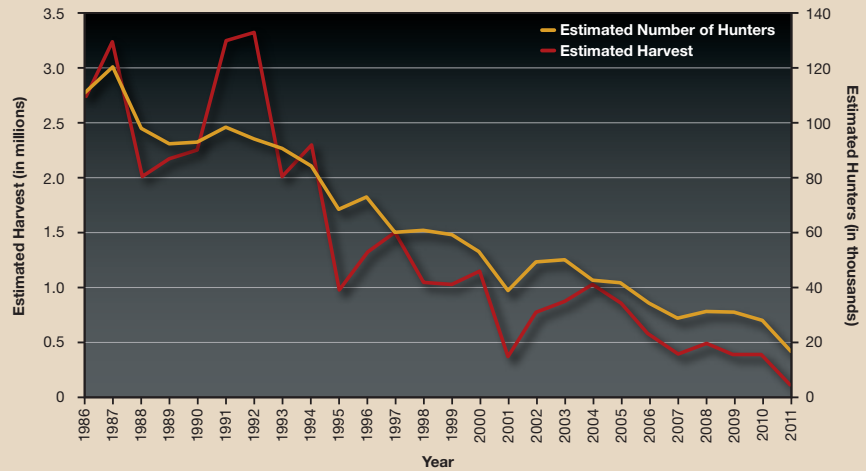
larger number of acres to be harvested in a shorter amount of time when compared to harvest equipment of the past. Improvements have also been made in forage grasses and livestock production. Forage varieties are often tested regionally to see which variety is most productive, which is preferred by livestock, and which produces the highest livestock gains. While these improvements have benefited the farming and ranching industries, these changes will not be as beneficial to bobwhite quail populations.

As agriculture systems have changed, so too has land ownership and land use. With changes in the economy and management objectives, land is constantly bought and sold. Even when land passes through generations, it is often divided between family members with different ambitions and plans. Surveys conducted by the National Agricultural Statistics Service show the impact of these differences on our farming and ranching lands. A 2012 report shows that Oklahoma has 17,500 fewer farms than reported in 1960. This represents a loss of 2.6 million acres previously dedicated to farming and ranching. While the loss of these farming and ranching lands may not directly represent a loss of quality quail habitat, the agricultural systems of the 1960's were much more compatible with quail than today's systems.

As we consider declining bobwhite populations, it is important to consider the sheer number of factors that impact quail and other wildlife populations. Changes in regional climate, land management goals, agricultural systems, and even our rural lifestyle could be indirectly impacting quail numbers. When individual factors are combined, like drought with introduction of sod forming grasses and increased clean farming techniques, quail and other wildlife populations have a hard time recovering. Though we can't change the weather, or what happens on the other side of the fence, we can adjust our management practices to ensure all habitat components are available to quail or other wildlife species of interest. 🐦

Our Culture — A Changing Landscape

By Andrea Crews



While Oklahoma's landscape changes all around us, it's equally important to note the changes taking place in our own culture as well. We are a people on the go, and quite frankly, it is becoming more and more difficult for some individuals to escape the city environment long enough to become captivated by the wonders of the outdoors.

Of course, those families in which the outdoor heritage is a strong tradition do make for an exception.

Sheltered in mid-America, Oklahoma's rural lifestyle is relatively protected from the winds of societal change blowing from the east and west coasts. Ranching, farming and a connection to the landscape are an integral part of what it means to be an Oklahoman. Hunting and fishing are still valued family traditions.

But a drive along I-35 or I-40 quickly reveals that our state isn't immune to urban sprawl. Stretches of unbroken landscape become less common each year. The metropolitan population increases with each Census while small town main streets struggle. Those coastal winds of change are blowing even here, bringing slow and gradual change.

Urbanization is typically accompanied by a weakened connection to the land. Children are growing up with electronic playmates and organized sports rather than the chance to run free outdoors and

explore nature. While the prior generation learned to hunt by chasing rabbits, today's kids learn to hunt by shooting at simulated games on a flat screen TV in the living room...or not at all.

So as the physical landscape around us has an effect on quail populations, our culture may increasingly influence wildlife populations as well — either negatively or positively depending on how earnestly we accept the challenge to be conservationists. As for today, participation in small game hunting is in decline and has been over the last few decades. The graph on this page reflects hunter survey data collected by the Oklahoma Department of Wildlife Conservation, and it shows that the number of quail harvested has been going down since 1986. The number of quail hunters has been going down as well. In 1986, there were approximately 111,000 hunters who harvested 2.7 million quail. By 2011, there was an estimated 17,341 quail hunters who harvested less than 110,000 birds.

While it is understandable that fewer hunters are pursuing quail during times when quail are less abundant, it's also crucial that hunters recognize their important role in conservation through their purchase of hunting licenses as well as through passing on to the next generation their tradition of conservation through hunting. 🐦

It was here when I bought the farm — it's native, right?

When biologists talk about native grasses, they are referring to grasses historically present on a site. How did the non-native plants get here?

Non-native plants arrived here in several ways.

When settling the “New World,” many immigrants relied on the “Old World” plants and crops from their homelands; crops they were familiar with and knew how to grow. In more recent years — especially with the changes in production agriculture and the demand for higher stocking rates — forage grasses like bermudagrass and tall fescue have been “introduced.” While these grasses may be “landowner approved,” they cause many challenges for wildlife that have relied on and adapted through time to the availability of native bunchgrasses, forbs, and low-growing shrubs.

The Problem with Many Introduced Grasses

All grasses aren't “created equal.” Some tolerate drought better than others. Some

grow quickly, and some take time to establish. Some grow low to the ground, and others reach impressive heights of six feet or more. Each species or variety has advantages and disadvantages; while many introduced grasses are undoubtedly suited as livestock forage, they may not provide quality wildlife habitat.

But why?

The major wildlife-related problem with introduced grasses is structure. Though quail can nest in a wide variety of places, successful nests must be sheltered from predators and unfavorable weather events. Oftentimes grazed fields of introduced grasses offer little nesting structure. A second problem with introduced grasses is that they are typically planted to provide the maximum amount of forage for livestock. While livestock producers associate more pounds of forage production with more pounds of livestock gain, quail biologists associate thick stands of grass with restricted foraging and movement. Management of these grass stands generates another problem for quail and other ground nesting birds — fertilization and application of herbicides make introduced grass stands

even more challenging for quail. Both of these practices reduce diversity — a key term for quail management. Fertilization often allows one introduced grass to out-compete other plants, and herbicide use removes the major food component for quail — forb seeds.

As an example, bermudagrass is the tried-and-true introduced forage in eastern Oklahoma. With fertilization, it grows quickly, can tolerate periods of drought, and handles heavy grazing pressure without long-term consequences. From a cattleman's standpoint, bermuda offers several opportunities. From a wildlife standpoint — especially a ground nesting bird's point of view — bermudagrass creates numerous challenges.

In mature stands, bermudagrass forms a thick carpet of grass. In these situations, travel by foot is taxing enough for an adult bobwhite, but to newly hatched chicks, moving through a sea of bermudagrass is a hopeless endeavor. Just as travel is virtually impossible, so are foraging efforts. Even when bermudagrass fields are left unsprayed and the quail's staple diet of forbs, legumes, and insects can be found, the fallen seeds are inaccessible to the birds. Just imagine trying

to find and retrieve a dropped BB pellet in the middle of a bermudagrass pasture with a pair of tweezers.

On top of travel and foraging challenges, quail also have to deal with overhead predators. When in native range, bobwhites avoid detection by staying underneath the canopy of taller grasses and forbs. If threatened, birds can escape to nearby brush. Now, consider the options in a field of bermudagrass. Even if birds were able to avoid detection by getting underneath the sod-forming bermudagrass, escape cover has often been reduced to the edge, and is rarely nearby.

Managing for both livestock and wildlife takes compromise. While the positive forage characteristics of bermudagrass and other introduced forages may be acceptable for livestock operations, meeting wildlife objectives on the same property requires an alternate, “native” approach. This alternative native plan isn’t without challenges. When managing native range, producers are encouraged to “take half and leave half” of the current year’s growth, ensuring enough forage and nesting cover are available the

following year. Those same reasons may make it necessary to pull cattle off earlier than planned in droughty years. To sustain production, native range managers need to closely monitor forage removal and plan grazing activities at least a year in advance. For managers with bermudagrass pastures, maximum production often requires multiple applications of

costly fertilizers and herbicides. In short, management practices and goals vary for introduced and native pastures. While managing for native grasses certainly requires a different approach, it is the best option when considering both livestock and wildlife.

In the next section, we’ll look a little more closely at some of these challenges. ✂



JENA DONNELL

In this introduced pasture, grass is grazed uniformly, forbs are limited and low-growing brush has been eliminated.

Good Plant **Bad Plant**

The Bad: Tall Fescue

To increase the amount of forage available to livestock, many producers often over-seed an introduced pasture with a complementary introduced grass species. This combination often includes a warm season grass and a cool season grass so that livestock have continuous access to more palatable, actively growing forage. A common pasture mixture in the eastern third of the state is bermudagrass and tall fescue.

Tall fescue was first introduced from Europe and North Africa in the late 1800’s. Major planting efforts began in the 1940s for pasture improvement and erosion control. By 1960, fescue was well accepted in the Ozark region, and its popularity as a livestock forage has continued to increase. Since 1980, fescue has been commonly planted in Conservation Reserve Program (CRP) fields, especially in the central and southeastern regions of the United States.

Fescue grows in dense clumps, and is readily recognized by the coarse dark green foliage. Some cultivars, including Kentucky 31, harbor a fungal endophyte that allows tall fescue to outcompete native grasses for nutrients. Because of this, fescue aggressively dominates fields, reducing plant diversity and bare

ground. Unfortunately, this endophyte produces alkaloids that can cause “fescue foot” in grazing cattle and may cause reproductive problems in other livestock. This endophyte is also suspected to reduce reproduction in bobwhite quail and small mammals.

Because tall fescue has been extensively planted throughout much of the bobwhites range, biologists have been studying the impacts of this introduced forage on quail populations and have tried to find the best habitat management strategies.

Though studies have shown that fescue can provide suitable nesting structure, chicks are often stranded in the dense thatch. Travel is even more difficult for birds nesting in bermudagrass fields overseeded with tall fescue. When these two sod-forming grasses are combined, the litter layer is virtually impassable to quail, and foraging opportunities are significantly decreased.

Bobwhite managers have found conversion of tall fescue fields to native warm season grass stands is the best habitat improvement option. Researchers have found the best conversion method involves creating a uniform grass height of four to six inches tall and then applying glyphosate (Roundup®) and seeding of native warm season grasses. Spot spraying residual tall fescue with a post-emergence herbicide during the initial growing season may be necessary for a complete conversion. Some other options are burning, plowing, and seeding to agricultural crop before reseeding with native vegetation. ✂

Good Plant Bad Plant

The Good: Bluestems

All Photos Courtesy of The Samuel Roberts Noble Foundation, Ardmore, Oklahoma

Wildlife managers are always talking about the importance of helping native wildlife to thrive. But for that to happen, it's crucial that certain native plant life thrives as well — and at the right times of the year. For ground nesting birds like quail, that means adequate nesting cover must be available in the spring, ideally from native grasses that grow in bunches. Certain species of bluestem that grow in Oklahoma fit this bill, but the landowner hoping to benefit wildlife needs to be able to accurately identify them in order to successfully manage for them.

For starters, there are six species of bluestem found in Oklahoma, but only three of them are considered “important” wildlife plants — big bluestem, little bluestem and broomsedge bluestem. All of them are warm season grasses, actively growing during the warmer months when temperatures range between 85 and 95 degrees Fahrenheit. They are dormant during fall and winter. Individual clumps or “bunches” are formed by new shoots growing from underground stems, or “rhizomes.” While many bluestems can be identified by the blue-green appearance of new growth, they can also be distinguished by the flattened bases of

individual stems year-round and by several other factors. The following is a description of each.

Big Bluestem (*Andropogon gerardii*)

One of the tallest of Oklahoma's tall grasses, big bluestem often reaches heights of six feet or more! When mature, this plant is often recognized by the “turkey foot” seed head formed by three “racemes,” or flowering parts. If plants are immature or have been grazed, big bluestem can be distinguished by flat leaves with small hairs on the upper surface of the leaf. This plant can provide both nesting and screening cover for wildlife, and is preferred cattle forage. Big bluestem flowers between August and November.

Little Bluestem (*Schizachyrium scoparium*)

Much shorter than big bluestem, little bluestem only grows two to four feet tall. Though it typically has a single inflorescence or seed head, it can have paired or grouped seed heads. By mid-summer, plants begin to mature and can be identified by their reddish tint. Often promoted as the principal grass used for bob-white quail nesting cover, actively growing little bluestem also provides good forage for cattle. Little bluestem flowers between August and November.

Broomsedge Bluestem (*Andropogon virginicus*)

Broomsedge bluestem grows two to four foot tall, and is a robust plant that typically stands upright throughout the winter.



Big bluestem can reach six feet tall, sometimes taller.



Big bluestem close-up. Notice flat leaves with small “hairs.”


Often confused with little bluestem, mature broomsedge can be distinguished by the straw colored appearance and the split seed head that is partly enclosed in a reduced leaf. (The inflorescence of little bluestem is not enclosed). Broomsedge bluestem can provide nesting and screening cover for wildlife, but has limited value as cattle forage. This bluestem flowers between September and November and is more common in eastern Oklahoma.

Managing Beneficial Bluestems

Management of native grasses for wildlife requires a delicate balance. While tools like prescribed fire and grazing can be extremely beneficial, they can also create unnecessary challenges. For example, a well-planned prescribed fire can stimulate native grass growth, remove debris, and increase forb abundance. On the other hand, burning during nesting season can remove essential nesting cover, and even destroy nests.

Liabilities associated with prescribed fire often tempt landowners to manage native grasses with a mower instead of a drip torch. While mowing may seem like a less risky management tool, consider this difference: a prescribed fire will reduce the litter layer, while mowing increases the amount of thatch on the surface. In terms of habitat management, lightly disking random strips is a better alternative than mowing. Vegetation response to disking depends on timing and location; disking in fall and winter encourages beneficial forbs while spring disking can stimulate less desirable vegetation like johnsongrass, and

crabgrass. Even so, spring disking on sandy soils in western Oklahoma can promote sunflowers and croton.

Regardless of your bunchgrass management technique, make sure that all habitat components (nesting cover, brood rearing habitat, and woody cover) are within close proximity to each other. If your plans include fire or grazing, consider a rotational system. Dividing the property into thirds, and rotating which unit is burned or grazed is the best way to ensure enough cover is available for game birds. 

The Aging Process

Native warm season grass plantings have predictable growth patterns. Once the stand is planted, establishment is followed by early successional habitat — an even mixture of forbs, grasses and bare ground. If left undisturbed, this habitat type gradually gives way to a more mature plant community; bunchgrasses fill out and the amount of forbs tend to decrease. While mature bunchgrasses are a preferred component of nesting habitat, stands unmanaged for three or more years typically have an accumulation of dead grasses or thatch and little bare ground. Because a buildup of thatch can limit movement and foraging opportunities, many wildlife species — especially ground nesting birds — prefer the open mixture of early successional habitat.



Little bluestem provides great cover for wildlife and ground-nesting birds. Though it typically has a single inflorescence or seed head, it can have paired or grouped seed heads, as shown.



Broomsedge bluestem grows two to four feet in height. The split seed head of broomsedge bluestem.

Changes in Quail Habitat May be Going Unnoticed

By Doug Schoeling

Without realizing it, landowners across the state are influencing quail populations with seemingly subtle habitat changes. From a landowner's perspective, these modifications may not be considered harmful. From a quail's outlook, they may make nesting or predator avoidance an even bigger challenge.

When managing for quail it is essential to look at habitat from a quail's perspective, or a "quail's-eye view." Before making major — or seemingly minor — changes, consider its effect on the local quail population. Will the proposed practice improve loafing cover or reduce it to the edge of the field? Will the practice significantly increase the thatch layer

on the ground or will quail be able to move and feed easily? Some common practices that could degrade quail habitat without landowners noticing are described in this section. Before implementing these practices on your property, consider how they will change the habitat from a quail's view.

Beneficial Grasses vs. Detrimental Grasses

One misconception is that quail habitat is just grass. As has already been touched on in this guide, grass needs to have the right growth pattern, structure, and composition to be the most beneficial to quail. When native bunchgrasses are converted to non-native, sod-forming grasses, nesting and screening cover is reduced and foraging

and movement is restricted. Additionally, introduced grasses often outcompete native forbs, an important food source. Because of the aggressive nature of many forage grasses, they can be difficult and expensive to remove. Before converting your native stand to introduced forages, consider the long-term effects on the quail population — limited nesting cover, limited travel corridors, and limited food.

A Few Good Weeds

Quail rely on a variety of forbs, or "weeds" for food. These forbs produce large amounts of nutritious seeds in the fall and attract a variety of insects in the spring. When herbicides are used, the forb composition and density is significantly reduced. Without this important winter food source, quail will



need to move to other areas that provide food. Once again, quail that are forced to travel through poor habitat to get to a new food source may be more susceptible to predation.

Similarly, landowners may be reducing the spring and summer quail diet by applying pesticides to help control insects that eat crops or plants. If pesticides drift to the edge of the field, or into adjoining habitat, the habitat may become unsuitable as the protein-rich insect diet is removed.

Application of herbicides and pesticides are often needed to protect crop fields, but can also impact the quail population. Before spraying, consider where quail forage, and limit whole-field spraying. Instead, try to spot-spray when possible.

Habitat is Rough Around the Edges

Landowners take pride in having a well-maintained property. To many, this means removing fallen limbs from open woodlands or savannahs and keeping grass a uniform height across the property. “Overgrown” areas are quickly identified and mowed or brush-hogged at the first opportunity. Unsightly briars and thickets are removed from fence rows to simplify fence repair. Though these “improvements” may make the property more appealing

to landowners, they may spell disaster for quail habitat.

Though it may be tempting to jump on the tractor and brush hog the pasture, mowing can remove three important quail habitat components — cover, food, and bare ground. When native grasses are mowed to a uniform height, they may be too short, or unsuccessfully hide quail nests. Screening or overhead cover is removed when tall forbs that could conceal foraging quail chicks are cut down. Low-growing brush is removed, limiting escape and loafing cover. If cut before seed set, forbs no longer provide important winter food. Mowing also increases the thatch layer, making daily foraging and movement impossible.


Walk a Mile in Their Shoes

In many ways, degradation of quail habitat is a “Death by a Thousand Cuts.” Native grasses are converted to unwelcoming forages. Nesting habitat may be overgrazed, leaving nests vulnerable to



STEVE WEBBER

predation. Forbs are sprayed or mown at a critical time in the quail’s life cycle. Thatch build up in unmanaged habitat makes travel for chicks intolerable. Protective brushy cover is pushed to the edge of the field, and escape from aerial predators may be impossible. Though these changes may seem subtle at the time, they have drastic impacts on quail.

Before you give in to the urge to “clean up” the property, take a minute to look at the fallen branches or thick briars from a quail’s perspective. Will removing these eye-sores benefit the quail population? Or make daily life more difficult? 

BEFORE YOU GIVE IN TO THE URGE TO “CLEAN UP” THE PROPERTY, TAKE A MINUTE TO LOOK AT THE FALLEN BRANCHES OR THICK BRIARS FROM A QUAIL’S PERSPECTIVE. WILL REMOVING THESE EYE-SORES BENEFIT THE QUAIL POPULATION?

RUSSELL GRAVES



5

Quail Habitat Management Tools

Much like auto mechanics, bobwhite quail managers go to work with specific tools in their toolbox. While new techniques have been developed, these tools remain much the same today as in Aldo Leopold's day. The well-known Father of Wildlife Management marketed four primary pieces of equipment — the cow, the plow, the axe, and the match. Even so, many Oklahoma managers have had to learn how to get the most benefit from these time-honored tools within their region.

A Closer Look at Regional Variation

Historic Oklahoma wildlife biologists Lester Duck and Jack Fletcher identified 15 ecological regions across the state in 1943. Today, Oklahoma is recognized as one of the most diverse states in the US. But what really drives this diversity? Without the considerable variations in climate and soil, Oklahoma's diverse habitat — described by dominant vegetation — wouldn't be possible.

Climate

Undoubtedly, regional vegetation is influenced by temperatures, rainfall patterns and growing season lengths. In fact, some botanists consider climate the most important environmental factor on a regional scale for vegetation. For example, in Oklahoma's humid-subtropical southeast, average annual rainfall is significantly greater than in the semi-arid southwest. Because this increased precipitation leads to increased soil moisture (which is essential for plant growth) plant production is typically much higher in this region. Increased plant production in the southeast can also be attributed to a longer average growing season.

Slope also plays a role in vegetative communities. In the northern hemisphere, southern facing slopes receive more solar radiation than northern facing slopes. This pattern can be seen in the Ouachita Mountains of southeast

Oklahoma. The warmer, drier climate of southern slopes produces more pine dominated stands while the wetter, cooler northern slopes tend to have more hardwoods.

The Climate of Oklahoma

From the Oklahoma Climatological Survey

Average Growing Season Length:

- 175 days in the western panhandle.
- 195 days in the eastern panhandle.
- 225-230 days in the southeast.

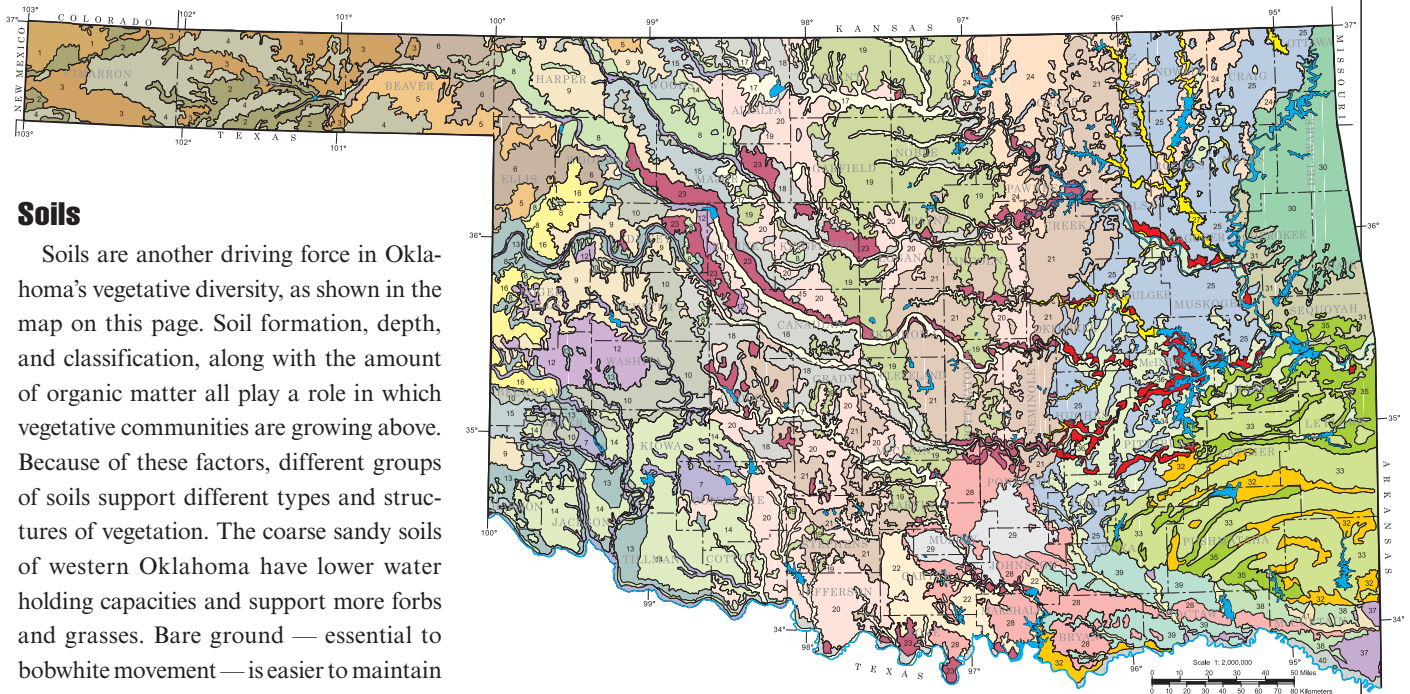
Average Annual Rainfall:

- ~17 inches in far western panhandle.
- ~56 inches in the southeast.

Annual Rainfall Extremes:

- 84.47 inches recorded at the Kiamichi Tower in LeFlore County in 1957.
- 6.53 inches recorded at the Regnier Station in Cimarron County in 1956.

Soil Map of Oklahoma



Soils

Soils are another driving force in Oklahoma's vegetative diversity, as shown in the map on this page. Soil formation, depth, and classification, along with the amount of organic matter all play a role in which vegetative communities are growing above. Because of these factors, different groups of soils support different types and structures of vegetation. The coarse sandy soils of western Oklahoma have lower water holding capacities and support more forbs and grasses. Bare ground — essential to bobwhite movement — is easier to maintain in these looser soils. Conversely, the tighter loamy soils in the southeast have a greater water holding capacity and support more woody vegetation. Bare ground is typically more difficult to maintain in these soil types.

Adapting Quail Habitat Management Strategies

As quail managers, we need to recognize what we can't change and instead focus on what we can change. We have little power over annual or seasonal rainfall or the soil type or texture, but we can alter our management techniques to ensure the right habitat structure is available for quail.

Though quail are able to live in a variety of habitat types — from pine savannahs to shortgrass prairies — they still have specific structure-based habitat needs. With adequate moisture, the sandy soils of western Oklahoma can support a variety of native bunchgrasses, forbs, low-growing shrubs and adequate bare ground. In these situations, quail management can enter maintenance mode. As annual rainfall increases and soils become tighter, the brushy grasslands are constantly shifting to more forested habitats. While these timbered areas can support healthy populations, quail management requires more rigorous and intense treatments.

When developing your quail habitat management plan, two of the first considerations should be location and weather patterns. If located in a more arid region, be sure to add flexibility in burning and grazing schedules to maintain nesting cover in case of drought. Managers in the east may need to follow their management plan timeline more closely to

effectively manage regrowth. Three of the most common quail (and wildlife in general) practices are discussed in this section to help you build your management plan and gear up for next year's management activities. To see how these practices are used or combined in your region, check out the "Managing for Quail" section. 🐔



KELLY ADAMS



The Tool: Prescribed Grazing

By Weston Storer

Prescribed grazing is perhaps the most utilized management tool on both private and public landholdings. It is commonly used to improve or maintain the quantity and quality of forage for livestock. But prescribed grazing can also benefit several species of wildlife—including bobwhite quail. Grazing removes the old growth (thatch) which creates more palatable forage for livestock the following year and increases bare ground for foraging birds. If this old growth isn't removed, it can shade out or limit new vegetative growth during the growing year which in turn reduces overall livestock gains.

Setting correct stocking rates is essential when developing a prescribed grazing plan. Simply put “stocking rates balance the needs of the plants with the needs of the animals.” Because stocking rates are based on the amount of forage available

each year — which is directly affected by climate and soils — stocking rates should be re-evaluated each year.

Determining the amount of available forage is the first step in setting stocking rates. There are several methods producers can use to obtain the amount of forage available on their property. Some producers use guesswork from previous years or previous grazing plans. Others obtain soil surveys from the NRCS Ecological Site Description (ESD). Each ecological site reflects the soil depth, topography, slope, plant production and species composition of an area. The easiest way to calculate the available forage is by installing 8'x8' fenced grazing exclosures. These exclosures allow the grass to grow without grazing pressure. At the end of the season, clip and weigh the vegetation within the exclosure. Exclosures should be moved

each year during the winter. Standing crop information obtained from past years — the more the better — will aid in better decision making on stocking rates.

The next step for setting a stocking rate is to calculate the amount of livestock utilization by estimating the amount of forage left standing at the end of the growing season (September through October). While the “take half, leave half” concept is commonly accepted in range management, it may be misleading. Fifty percent should indeed be utilized, but livestock consumption should only represent about 25 percent of utilization. It should be expected that the other 25 percent will be laid on, trampled, or consumed by other species such as insects or wildlife.

Stocking rates will vary depending on the type of grazing system used. The best grazing system for one property may not

work for other properties in different vegetation types. Livestock type (cow/calf pairs, stockers, etc.) and the time and duration of the grazing event (seasonal, year-round, etc.) affect stocking rates.

Stocking rates can also vary depending on the type of livestock and its size. This factor is expressed by Animal Units (AU) per unit of land area. The most common animal unit is a 1,000 pound dry cow, and represents 1 AU. The estimated dry forage requirement for this 1,000 pound cow (1 AU) is 26 pounds per day. Different livestock and their sizes have different animal unit equivalents (AUE). See Table 2 for the forage demands of each animal unit equivalent.


With proper stocking rates, a landowner can see a positive livestock response and benefit wildlife and their habitat. Grazing is a useful tool that can be used in a wildlife management plan to reduce old growth and increase new vegetation growth. For more information about prescribed grazing, contact your local wildlife biologist or NRCS office or read OSU Fact Sheet NREM-2886 on Stocking Rate Determination on Native Rangeland. 

Table 1. Ranking and comparison of grazing systems to benefit livestock and wildlife habitat

Rank	Grazing System	Livestock Response (\$)	Quail Habitat Response
1	Patch Burn, Patch Graze	Good	Excellent
2	Continuous	Good	Good
	4 Pasture, 3 Herd	Good	Good
3	High Intensity, Low Frequency	Fair	Poor
	Multi-Paddock Mob	Fair	Poor

As an example, landowner “Bob White” has 1,000 acres of native tall grass prairie and wants to know how many 1,000 pound dry cows he can graze on the property. At the end of the growing season, he clipped and weighed the vegetation within his grazing enclosures. He found the end of season standing crop was 6,360 pounds per acre. Bob White wants to graze from May 1 to September 30 (150 days).

From the information in table 2, we know that a 1,000 pound dry cow is considered 1 animal unit (AU). We also know that in order to “take half, leave half” only 25 percent of the available forage can be consumed by livestock. Using the following formula, we find that Bob White can graze 407 cows on his 1,000 acre property for 150 days.

$$\frac{(\text{Total Land Area}) \times (\text{Average End of Season Standing Crop}) \times (\text{Forage Utilization})}{(\text{AU Forage Demand per AU per day}) \times (\text{Animal Unit Equivalent}) \times (\text{Number of Days Grazed})}$$

$$\frac{(1,000 \text{ acres}) \times (6,360 \text{ pounds per acre}) \times (0.25 \text{ or } 25\%)}{(26 \text{ pounds per day}) \times (1 \text{ AU}) \times (150 \text{ days})} = \frac{1,590,000}{3,900} = 407 \text{ cows}$$

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Table 2. Animal weight, rounded animal unit equivalent (AUE) and estimated daily forage of dry matter (DM).

Animal Type	Class (pounds)	AUE	DM Demand (pounds per day)
Goat			
Nanny	120	0.2	5.2
Billy	175	0.27	7.0
Cattle			
Calf	300	0.4	10.4
	600	0.7	18.2
	800	0.8	20.8
Cow	1,000	1.0	26.0
	1,200	1.1	28.6
Bull	1,500	1.3	33.8
	2,000	1.7	44.2
	2,500	2.0	52.0
Horse	1,000	1.0	26.0
	1,200	1.1	28.6
	1,500	1.3	33.8

The Tool: Prescribed Fire

By Scott Parry



Fire in Oklahoma has historically been a regular occurring event. The plant communities we have in the state are not “recoverable” from fire but are in need of fairly frequent fire to maintain their quality to many wildlife species and to persist into the future. Without fire, we see plant communities change from having high diversity of plants, insects and abundant open ground to a much lower diversity of these things and too much plant litter accumulating on what is best left as open ground. Additionally, certain plants like eastern redcedar have an advantage to establish without fire interactions on the landscape, while other, “bobwhite-beneficial” plants, are disadvantaged. The need to introduce fire as a regular functioning part of a land management program cannot be overlooked if we are going to truly manage for bobwhites.

There are numerous effects that fire has on any given place. The magnitude

and impacts of these effects are dependent on several factors including the timing or season; weather conditions such as temperature, wind and humidity; climatic conditions like drought or wet periods; timing since the last fire; fuel loads; and so on. With that said, there are some common effects that we can anticipate following a fire. Immediately following the fire, the dead fine fuels will be burned along with smaller woody material and leaf litter. Depending on the intensity of the fire and the amount and types of fuels, some brush and larger trees may also be top-killed. This exposes the mineral soil and allows for germination of herbaceous and woody plant seeds that have been dormant. A good number of these plants will be grasses and forbs that are very beneficial to bobwhites. The burning of plant materials also increases open areas at ground level, making mobility

for bobwhites easier. This can increase the amount of areas that bobwhites can use for feeding, raising broods and nesting over time. As time elapses, the new vegetative growth becomes mature and the cycle continues. With fire returning at regular intervals, the larger woody vegetation will decrease in abundance. This is when we start to see the formation of openings in wooded areas. More frequent and higher numbers of fires on a property will create more openings, control more brush and favor grasslands and shrublands with a variety of plants that are typically favorable for bobwhites.

We have established that fire is an irreplaceable tool to manage bobwhites. However, it is obvious that we are limited by property boundaries and certain structures that we don’t want fire to interact with, such as homes, barns, fences, etc. So we need to turn our attention to how to accomplish a

contained fire where we want it to occur and minimize the chances of escapes in that area or how to write and implement a prescribed burn plan.

Prescribed Fire Basics

Burn bosses often say they learn something new with each prescribed burn. Varying topography, weather, crew experience and available equipment create unique opportunities and challenges. To take advantage of the opportunities and limit the challenges, pre-planning is a must.

Pre-Planning Activities

Prescribed Burn Plan

Prescribed burning is a complex management practice that requires significant forethought. The best way to ensure all factors have been considered is a prescribed burn plan. This plan should contain burn objectives, directions to the burn site, minimum equipment needs, ignition proce-

dures, preferred weather conditions and crew responsibilities.

When creating a burn plan, it is recommended a degree of flexibility be built into preferred weather conditions. If weather conditions are too restrictive, acceptable burn opportunities may be missed. Waiting on the perfect day to burn may be futile.

A good plan also includes a map of the burn unit, smoke management considerations and alternate ignition plans should weather conditions vary from the forecast.

Firebreak Installation/Maintenance

Perhaps the largest expense associated with prescribed fire is the installation of firebreaks. Though sometimes costly, firebreaks are essential. Firebreaks not only reduce the fuel load along the edge of the burn unit, but can also allow water trucks and other equipment access to the entire unit. Creating straight, navigable fireguards are preferred to facilitate ignition and more

importantly allow for timely patrolling. Any standing snags or brush piles located next to the firebreak should be pushed outside, or well within the burn unit to reduce the fuel load and to prevent “spot fires” (spot fires are any fire located outside the burn unit).

There are several types of firebreaks, and multiple types can be used in combination to reduce the flame length and intensity next to the break.

- Bare Ground Lines — Typically created by disking or dozing, bare ground lines are the preferred firebreak type. All vegetation is removed from the firebreak, leaving only mineral soil.
- Natural Firebreaks — Natural breaks like bluffs, rivers, or streams can be used as long as they are at least 10 times the height of flammable fuel to effectively stop the fire. If necessary, mow or disk next to the natural break to further reduce the fuel load.
- Vegetated Firebreaks — To limit erosion,

Standard Burning Equipment

Personal Protective Equipment

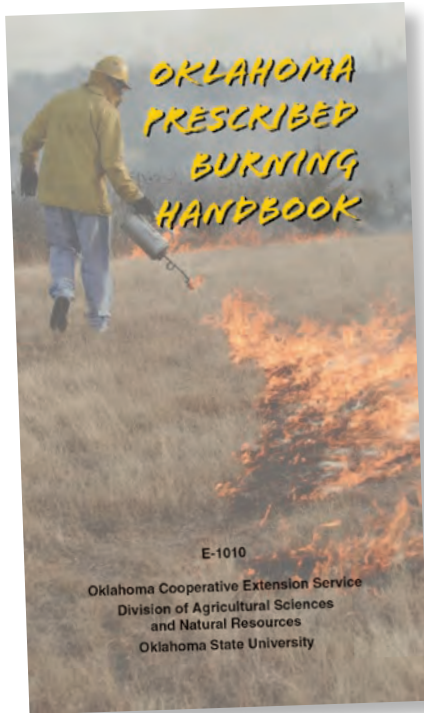
- 100 percent cotton clothing
- Leather gloves
- Boots
- Goggles
- Drinking Water
- Hand Held Radios

Ignition/Suppression Equipment

- Matches
- Fuel (2:1 Diesel:Unleaded Gasoline)
- Drip Torch
- Water Sprayer



JEREMIAH ZUPRENDIA



For more information on prescribed burning in Oklahoma, check out the Prescribed Burning Handbook available from the Oklahoma Cooperative Extension Service and on the web at <http://pods.dasnr.okstate.edu/docu/SHARE/dsweb/Get/Document-6613/E->.

some managers prefer to plant firebreaks to a cool season crop. Annual plants like rye grass or small grains are commonly used. When burning with vegetated firebreaks, be sure the crop is actively growing, or that dead thatch has been removed.

Weather Considerations

Weather conditions play a large role in fire behavior — especially temperature, wind speed, and relative humidity. These factors can impact fuel ignition, fire intensity, and direction of the fire. Even though all the pre-planning requirements have been met and crews are ready, many burns are often called off the day of the burn because weather conditions do not meet the prescription.

Recommended Weather Conditions for Beginning Burners


Temperature	33 – 85 °F
Wind Speed	5 – 15 miles per hour
Relative Humidity	> 40 percent

Though experienced burn bosses can take advantage of a wide range of weather con-

ditions, it is recommended that beginning burners use the above weather conditions to reduce the risk of spot fires or escapes.

Burning Techniques

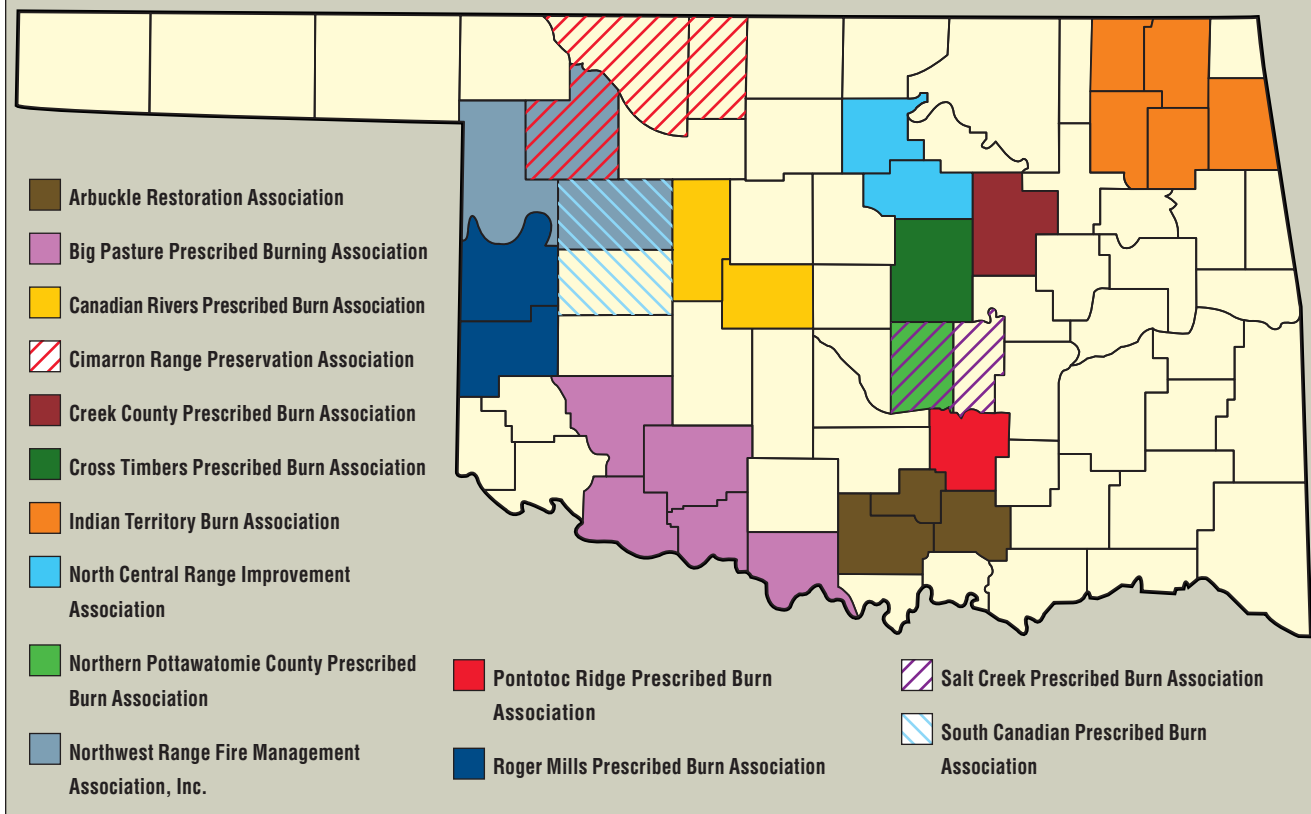
Two types of fire are commonly used during a prescribed burn — headfires and backfires.

- A headfire is a fire that moves with the prevailing wind or upslope regardless of wind direction. Because headfires are the fastest moving and most intense fires, they are also considered the highest risk. Headfires are often used to maintain or control woody brush and to remove debris.
- A backfire is a fire that moves against or into the prevailing wind or downslope regardless of wind direction. Because backfires are slower moving and typically burn at lower flame height, they are easier to contain and control. Backfires are most effective with heavy fuel loads. Backfires are associated with “patchy” burns and are often used to maintain wildlife habitat. 



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Prescribed Burn Associations in Oklahoma



New Association to Help Simplify Prescribed Burning for Landowners

A new association has been formed to provide landowners and state prescribed burn associations with an organization that can assist them with liability insurance, finding funding for equipment and training and a voice for prescribed burning throughout the state.


The Oklahoma Prescribed Burn Association (OPBA) was formed through a three-year Conoco-Phillips challenge grant from the Playa Lakes Joint Venture through the High Plains Resource and Conservation District. Ron Voth is the executive director of this first of its kind organization to assist landowners with all aspects of prescribed burning.

Prescribed burning is a useful and important habitat management tool employed to remove accumulated litter, encourage new vegetative growth and to control excessive invasion of brush and woody cover. Native rangelands that are burned periodically have a wider diversity of plants that are beneficial to wildlife than unburned prairies. Wildlife such as quail benefit from burns because they increase mobility by removing litter, attract greater density and diversity of insects used by quail chicks as food and increase the ability of birds to feed on those insects.

The primary goal of the OPBA is to become the umbrella organization for landowners and local prescribed burn

associations to receive reasonably priced liability insurance for conducting prescribed burns. Through the OPBA, the insurance will be available to burn association members at an affordable rate. The insurance covers escaped fires, suppression costs, injury to people assisting with the burn and problems caused by smoke. A five-member board of directors has been formed to assist with the development of this organization. Members include Alva Gregory, Oklahoma Department of Wildlife Conservation; Darrel Dominick, Oklahoma Conservation Commission; Paul Clark, Natural Resource Conservation Service; Karsen Davis, Roger Mills Prescribed Burn Association; and John Weir, NREM, Oklahoma State University.

There will be a minimal annual fee, and a charge for each burn the landowner would like to have insured. There will be some requirements for each burn, which are currently being developed by the association and the insurance company.

The Noble Foundation will provide essential support in the form of resources and personnel to enable the conduct of the OPBA operations and programs. For more information, log on to the Oklahoma Prescribed Fire Council website at www.oklahomaprescribedfirecouncil.okstate.edu. 

The Tool: Brush Management

By Jeff Pennington

Growing up in Creek County in the mid-1970s, it was common to go bird hunting and find good numbers of quail. Eventually I moved away from the area, and when I returned 15 years later, there was a notable difference. Deer and turkey, which had been almost nonexistent when I left, were now abundant. Quail, on the other hand, were still present, but in much lower numbers than when I lived in the area 15 years prior. Many of the spots where we used to bird hunt were now grown up in post oak and blackjack forest.

Fifteen years seems like a short amount of time for a landscape to drastically change, but it happens fast. Fire suppression, large scale farming, conversion to pasture grasses, and urban sprawl all take their toll on bobwhite habitat. Since statehood, these changes have caused quail habitat quantity to take a nosedive. In many portions of the state, like my old home in Creek Co., the lack of brush control has taken the largest toll of them all.

Since my return to the area in the early 1990s, the march of the oaks eating up native grasslands has continued. Combined with the other factors, we now have a small fraction of the quail habitat in the area compared to when I was a kid. Today quail numbers are so low in the county that many local kids do not know what they look like.

—Jeff Pennington, central region wildlife supervisor

In the days before settlement, periodic fires — most of which were set by Native Americans — kept Oklahoma's grasslands open by top-killing woody vegetation. Areas like my old home in Creek Co. would have had stands of oak, but they would have been kept short by the periodic fires. Brushy native grasslands were the result — perfect habitat for quail. In the absence of fire, these areas quickly convert to closed canopy forest and lose their value to bobwhites.

To restore the grassland habitat in these timbered areas, intensive brush management is needed. Brush management can be

broken in to two distinct classifications — cedar and hardwood trees.

Eastern Redcedar

The presence of eastern redcedar is an indicator that fire has been absent from the landscape. Eastern redcedars are best controlled with the use of prescribed fire. However, it takes a very intense fire to control eastern redcedars over five feet in height. Landowners that are just getting started with the use of prescribed fire are often unable to contain the type of fire needed to control these large trees. In many cases, mechanical treatment of the eastern redcedar is necessary to restore quail habitat.

While you can cut them with chainsaws and bulldoze them, in most instances, clipping eastern redcedar is the most effective method. Many contractors have hydraulic shears that are able to cut the eastern redcedar off just above ground level. Eastern redcedar will not resprout if they are cut below the lowest living

limb. The advantage to clipping over dozing is that it does very little disturbance to the ground. If the eastern redcedar encroachment is not too far advanced, native grasslands can return in just a couple of years after clipping. Following up with periodic prescribed fire is essential in areas that have been clipped to prevent eastern redcedar reinfestation. The good news is that low intensity fires can effectively control eastern redcedars that are less than four years old.

Southwest Oklahoma is home to another juniper species, redberry juniper. Much like the more common eastern redcedar, this juniper can reach excessive densities and can limit quality quail habitat. However, unlike the eastern redcedar, this juniper does re-sprout if top-killed and is not suppressed by prescribed fire. Mechanical treatment when followed by herbicide application of Tordon 22K is the best means of control for this species.

Hardwood Trees

The first thing in hardwood tree management for quail habitat is to know the species you are controlling. The “best” treatment type will be based on the woody species present on your property. If you are unsure of the type of woody vegetation present, or the best treatment option on your property, consult the Wildlife Department or another conservation agency for free technical assistance.

Native grasslands with a large amount of hardwood trees can be treated with mechanical or chemical applications.

Mechanical

Advantages to mechanical clearing are that you can be selective in the trees that you remove, and you have instant results.

As with eastern redcedar, you can chainsaw or clip hardwood trees. It is very labor intensive and expensive, but provides good results on smaller acreages. As opposed to eastern redcedar, hardwood tree species that are cut or sheared should have their stumps “treated” as many will resprout. Within a few hours of cutting, apply a mix of 1/4 triclopyr (Remedy) herbicide to 3/4 diesel to the

stump. This will effectively kill the tree and keep it from resprouting.

The most common type of mechanical treatment is performed with a bulldozer. It is important to note the blade should be kept off the ground. It is effective, but very expensive to treat large areas. In addition to instantaneous results on tree removal, disturbed sites will usually have a strong forb plant community with a high percentage of bare ground, both important traits for quail habitat.

Chemical

Most traditional chemical applications are done with a water mix through a sprayer. While this is easy to do in a crop field or on your lawn, it is almost impossible to do with 20’ tall trees.

Aerial spraying is an option, and is usually very effective, but it is nonselective and sometimes presents problems with drift.

More Chemical Options

Tebuthiuron pellets (Spike)

Provides excellent control of oak species and most other hardwood tree types; apply late winter to early spring.

Advantages: Easy to apply.

Disadvantages: Nonselective, any tree that absorbs chemical in its roots will die.

Basal bark treatments

Apply mix of 1/4 triclopyr (Remedy) and 3/4 diesel to the entire bottom 12” of the tree; wet bark down to the point of saturation, but not to the point of where the mix runs off.

Advantages: Effective, selective, excellent control on medium sized trees with thin bark.

Disadvantages: Labor intensive and expensive on a per-acre basis. Diesel will also eat up the seals in pump up sprayers, so buy inexpensive sprayers and only use them when you can spray a high amount in one day.

Triclopyr (Remedy) foliar application

Usually done in spring or early summer before plants are drought stressed.

Advantages: A good method for “brush sculpting” areas that have a high percentage of brush coverage. The remaining living brush would be left in “clumps” scattered throughout the property, not in one large block. Brush sculpting one or two years after prescribed fire places the vegetation at a good level to get coverage with the chemical solution.

Disadvantages: This method will only kill the portions of the plant sprayed, so it is only effective on low growing young trees or brush species. ✂



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6 Managing for Quail

As mentioned previously, quail management techniques vary by region. While Oklahoma is a very diverse state, we have broken this section into three regions — grasslands, timberlands and agricultural fields.

Managing Grasslands for Quail

By Eddie Wilson

Oklahoma has three primary types of prairie — tallgrass, mixed-grass and shortgrass. As expected, these names are derived for the height of the dominant grass species.

But, while the dominant species leads to the name, short grass species can be readily found in tallgrass prairies and tall grass species can be found in the shortgrass prairie. Grasslands also have a diverse forb component. When low-growing brush is added to this combination, quail habitat is formed.

In managing grasslands for bobwhite quail, the top three tools are prescribed grazing, prescribed fire, and mechanical

manipulation. All three tools can be used to manipulate native vegetation and create habitat for quail. The most cost effective management tool per acre is grazing, followed by prescribed burning, then mechanical manipulation (which is also the most expensive). Each tool can be used individually or in any combination. As has been discussed throughout this publication, the type of management tool used depends on a number of variables, including the size of the property, the soil type, the current plant community and the annual weather conditions. Management goals may be achieved

using only mechanical manipulation on small acreages, whereas all three tools may be needed to reach desired goals on large acreages. Managers need to remain flexible so adjustments can be made as needed to achieve desired goals. For example, drought conditions may prompt a burn ban and exclude prescribed fire as an option during any given year.

There are almost as many ways to manipulate plant communities as there are reasons for the manipulation. The following are some examples of mechanical manipulation used on western Oklahoma wildlife

management areas and the results that have been observed.

Strip Disking

Strip disking is the most commonly used mechanical manipulation practice on WMAs. Strip disking is used to produce a weedy plant successional stage in native grasslands. To achieve quail management goals, strip disking can be done February through March (very effective in late February and early March in northwest Oklahoma). The results will produce a variety of native forbs (weeds), including crotons, western ragweed, bee plant and common sunflowers — all of which are important food sources for bobwhite quail. Native forbs will produce seed during dry seasons much better than domestic grains. Whenever possible, disked strips should be located in close proximity to woody cover, such as sand plum thickets. Strips should be disked on a three-year rotation to maximize diversity. Disking should not be done after spring growth begins.

Producing weeds not only provides a winter food source in the form of seeds, but a summer food source as well. Weeds attract insects, and insects are a high protein food source essential to adult and chick survival. Disking also can be used to increase the size of sand plum thickets. Disking around the edge of the thicket will promote root sprouts, which will increase the size and vigor of the thicket. Disking will remove rank vegetation and open bare ground, which in turn provides travel lanes for chicks.

Pasture Aeration

A Lawson Pasture Aerator (also known as a “Roller Chopper”) is a piece of machinery that has been used on northwestern WMAs to reduce woody cover and increase forb production. The pasture aerator was purchased primarily as a tool to decrease sagebrush density. It is a very heavy piece of machinery and will reduce mature sagebrush plants to ground level. A pasture aerator is similar to an offset disk in configuration. However, instead of disks, it has two large steel drums lined with spiral rows of six-inch square teeth. Since the teeth are all that penetrate the soil, the ground surface

is left smooth and not turned over as it would be if disked. Using a pasture aerator leads to a less severe soil disturbance and better grass survival while still creating enough disturbance to increase forb production. When using a pasture aerator to increase forb production, strips need to be worked more frequently than when disking to maintain desired soil disturbance.

Strip Mowing


Strip mowing is another form of mechanical manipulation used on WMAs to improve quail habitat. Mowing strips will remove dense vegetation and create travel lanes in areas that were previously inaccessible to quail. Mowing also encourages cattle to utilize an area, when used in conjunction with prescribed grazing. Cattle will graze mowed strips more intensely, thus exposing bare ground and increasing forb production.

On more productive grasslands associated with clay soils, mowing produces an undesirable thick litter layer.

Eastern Redcedar Removal

The removal of Eastern redcedar is an important part of quail management on western WMAs. Quail will use eastern redcedar trees for cover and an emergency food source, especially during heavy snow periods. However, due to the highly invasive nature of cedars, they are not a desired plant species for quail habitat. Eastern redcedars also provide an avenue for ground predators to ambush quail and a perch for avian predators. The most cost effective way to remove cedars is prescribed fire. The mechanical removal of cedars is often required to establish a safe fireguard. Cedars are mechanically removed with the use of skid steers, tractors, and dozers on WMAs. Both hydraulic saws and clipper attachments for skid steers and tractors are used on small to medium size cedars. Dozers (and dozers used with a ball and chain) have been used to lay down large thick stands of cedar on two western WMAs. The trees were later burned. The mechanical removal of eastern redcedar is expensive and slow. It is best used as a supplement to prescribed fire.


Each site needs to be considered individually and managed accordingly to provide

maximum benefit to quail. There are a great number of informational resources available to assist with quail management. Oklahoma State University offers a number of fact sheets to assist in quail management. Additionally, the Natural Resource Conservation Service and the Wildlife Department can assist and provide on site visits to develop a specific management plan for your property. For Wildlife Department contacts, see the inside back cover of this booklet. 

Conservation in Action: Examples from Oklahoma WMAs

Grazing on Cooper WMA

Grazing systems will produce a variety of results depending on the type of system you choose. The first system you choose may not produce the results you desire, as was the case on the Cooper WMA. During the first grazing lease period, four of the seven Cooper leases were set up to be a simple rotation, while the other three leases were grazed continuously.

All of the leases were grazed during the growing season — April through mid September. In the four rotational leases, one pasture in each lease would be rested from July 1 to June 30 the following year. After several years it was determined that using an annual rotation was not the best choice when it comes to quail management. The rested pastures produced large amounts of cheat from April to June, annually. Since the average first quail hatch on Cooper is during the second week in June, the cheat was too thick to allow for good brood rearing habitat. Cattle gains also decreased using a switch-back rotation due to the fact that when the cattle entered the rested pasture on July 1, they had to eat through the dead cheat to access the perennial grasses. A non-rotational grazing system from April to September annually is now used to better benefit quail and grazing lessees. 



Managing Timberlands for Quail

By Dwayne Elmore

Oklahoma contains about 12 million acres of forest land. The southeastern corner of the state is characterized by a mix of bottomland hardwood forests and upland loblolly pine forests. The forests in the remaining eastern third of the state contain mostly shortleaf pine and various hardwood species (dominated by oak and hickory). The central portion of the state contains the cross timbers forest, which is primarily post oak and blackjack oak. The cross timbers extends into western Oklahoma, where many riparian corridors also are present containing species such as cottonwood, sugarberry and elm. While many landowners do not consider their forest stands as potential bobwhite habitat, with proper management, forests can provide all necessary habitat components for bobwhite. In fact, bobwhite density can be as high as one bird per acre in managed forests. However, landowners must understand the basics of forest management in order to consistently produce high bobwhite densities in forest land.

A Few Basic Terms

There are two basic management techniques needed to manage forests for bobwhite: forest regeneration and timber stand improvement.

Forest Regeneration: The primary way to regenerate a forest is following a com-



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Another example of timber stand improvement. In this oak forest stand in eastern Oklahoma, a chainsaw was used to create a feathered edge where a forest stand met a native grass pasture. In time, this edge will resprout in hardwood saplings which will provide a shrub layer around the perimeter of the pasture. Periodic fire can be used to maintain the shrub cover.



DWAYNE ELMORE

This is an example of a timber stand improvement project in a cross timbers forest. Herbicide has been applied to approximately 1/3 of this post oak dominated forest to create forest gaps. The increased sunlight has stimulated a variety of herbaceous plants, shrubs, and vines.

mercial harvest. The stand may either be naturally regenerated (from seed and root sprouts) or by planting. Furthermore, forest regeneration may be either even-aged or uneven aged. Even aged harvests consist of removing all trees from a stand and thus the resultant regeneration will all be of the same age. The most common method of even aged harvest in Oklahoma is the clear cut. This is used extensively in loblolly pine stands. Clear cuts are also conducted in hardwood stands when tree species that require substantial sunlight to regenerate (e.g. oak) are desired. Uneven aged harvest,

or selective cut, involves removing a portion of the forest stand such that there will be two or more age classes of trees. This is often used in hardwood stands and also in some pine stands such as shortleaf pine. Both of these regeneration types can be used for bobwhite management.

Timber Stand Improvement: Sometimes, a landowner wishes to manipulate the composition of an existing timber stand either to improve future timber value or to meet other objectives such as wildlife management. This is called timber stand improvement (TSI)

and it is used to improve the quality of an existing stand but is not a harvest. Furthermore, in forests that have no timber market value (i.e. most of the cross timbers forest), a landowner would consider using TSI since commercial harvest is not a viable option. TSI can consist of practices such as prescribed fire, herbicide application, girdling (cutting through the cambium of a tree to kill it), or cutting select trees.

Basal Area Calculation: There is one final term that is useful for landowners to understand in regards to forest management.

Conservation in Action: Management Examples from Oklahoma's WMAs

The Pushmataha Wildlife Management Area located in southeastern Oklahoma is a well-known hot spot for outdoor enthusiasts. Sportsmen enjoy white-tailed deer, wild turkey, and black bear hunting opportunities, and nature enthusiasts flock to the area for bird-watching excursions.

But in addition to the abundant recreational opportunities, the WMA also serves as a unique quail habitat management demonstration area. In 1982, 130 acres of the 19,247 acre WMA was designated as the Pushmataha Forest Habitat Research Area to discover which management practices increased the habitat quality for popular game species. For the last 30 years, managers have experimented with various timber harvest and prescribed burn techniques to provide management options for area landowners.

Management Options

After dividing the research area into 36 demonstration units, biologists implemented 10 management treatments. These treatments included a mixture of pine harvest, hardwood thinning and late-winter prescribed burns with annual to four year burn intervals. In 1984, pines were commercially thinned, and hardwoods were selectively treated with the herbicide 2, 4-D in pre-determined units. Since then, biologists have completed scheduled burns and monitored the response. Within each unit, the amount of forbs and legumes, litter, grass and woody

plants was recorded. Researchers also measured the pine and hardwood diameters and the forest density in each unit.

Before and After


Prior to the study, the research area was characterized as a closed canopy forest with a dense pine-hardwood midstory. The understory was covered with extensive leaf-litter. Biologists were able to notice vegetation changes shortly after the treatments began. In burned units, the herbaceous cover was three times that of untreated areas after the first prescribed burn. In thinned and burned units, the herbaceous cover was 21 times that of untreated sites after the first and subsequent burns. This dramatic improvement of herbaceous cover represents increased nesting opportunities for upland game birds.

Variation in returning fire intervals also creates noticeable changes in vegetation.

Savannah restoration and maintenance is integral to quail management in forested landscapes. Biologists at the Pushmataha WMA have experimented with various options and use a combination of thinning and fire regimes to manage for several game

species. Managers have found commercial thinning when followed by prescribed burning on a two to three year interval is the best way to create and maintain the early successional openings preferred by bobwhite quail. The Pushmataha Wildlife Management Area is currently applying the results of the research on a landscape level approach for historical ecosystem restoration and increased biodiversity.

The "Fire, Wildlife, Timber and Cattle Grazing Annual Field Tour" held at Pushmataha Wildlife Management Area in early October is a great opportunity for landowners to see how various management tools can be used to benefit wildlife in timbered habitats. Tours of the research area are also available by appointment to interested individuals or groups by contacting Jack Waymire, senior wildlife biologist for the Wildlife Department, at (918) 569-4329, (580) 320-3177, or by email at pushwma@hughes.net.

An in-depth look at the study and treatment results can be found online at <http://pods.dasn.okstate.edu/docushare/dsweb/Get/Document-3249/Field%20Guide%202006.pdf>. 



You will not find bobwhite in this Eastern deciduous forest in eastern Oklahoma. During the growing season, there is almost no sunlight able to reach the forest floor and thus there is little herbaceous cover. This site needs to be harvested or have timber stand improvement in order to create habitat for bobwhite.



This loblolly pine stand has been periodically burned. However, the basal area of the pines is about 100 and thus little sunlight is reaching the forest floor. While there is some shrub cover, little herbaceous plant growth exists. This site would benefit with a timber thinning to between 30 and 60 basal area if bobwhites are the objective.



This shortleaf pinelost oak forest on Pushmataha WMA is burned every 3 years and is excellent bobwhite habitat. The forest was initially commercially thinned to allow for adequate fuels to accumulate for prescribed fire.

Basal area is defined as the area occupied by the cross section of tree stems (trunks) at breast height. In other words, if you were to measure the square feet of all the tree stems at four-and-a-half feet above the ground and add this up and divide by the number of acres in a stand, you would have the basal area of that stand. A professional forester can help you determine this value. However, with a little practice you can estimate it fairly accurately by your own observation.

Applying What We Know

Now that we have discussed some basic forest management, we can apply it to bobwhite quail management. The limiting factor in a forest stand for bobwhites is typically sunlight. Sunlight is needed to stimulate understory plant growth. As bobwhites require a mixture of shrub, forb, and grass cover, some amount of sunlight must reach the forest floor to provide these habitat components. Thus, we need to ensure that the canopy (overhead cover) of the forest is fairly open. Creating an open canopy can be created either by conducting a harvest (for forest regeneration) or TSI. The decision on which of these to use and how to conduct them depends on the individual timber stand.

For example, if the site has a commercially valuable timber stand, the landowner should consider utilizing a harvest. Not only will this open up the canopy for bobwhites, but substantial revenue can be acquired. If the stand composition contains mostly undesirable woody species (from a timber value standpoint), then some timber stand improvement will be needed to change that composition and improve the timber value. TSI can be used in such a way to benefit bobwhite as well. Market value and desired tree species composition will typically dictate the type of regeneration method. If conducting a clear cut, expect the site to be usable by bobwhite for about seven to 10 years. To maintain this site for bobwhites, periodic timber stand improvement will be needed, or the forest canopy will close and limit sunlight and ground cover. If using an uneven-aged harvest, the basal area after harvest should be less than 60 to maximize bobwhite production. Once the stand approaches 100, few bobwhites will be found in the stand.

Regardless of whether the stand contains marketable timber or not, some type of TSI will be needed to maintain the site in bobwhite habitat. The most common TSI practice for bobwhite is prescribed fire. Typically a fire interval of two to four years will be ideal for bobwhite in forested stands. However, this may not be ideal for timber production, as frequent fire can damage some species of trees (primarily hardwood species, but also some pines such as loblolly) and will limit regeneration of young trees. To compromise between timber value and bobwhite, a fire interval of about four years will generally work. Note: This would also be a good compromise if white-tailed deer were an objective. If bobwhites are the primary objective, or if no commercial timber market exists (such as in cross timbers forests), a two- to three-year interval would be desirable for bobwhites. In some cases, there is insufficient fine fuel to carry an adequate fire in a forest. In this case, herbicide, girdling, or cutting trees can be used to allow sunlight to reach the forest floor. Again, a basal area of less than 60 is ideal. Fire can then be used to maintain the site indefinitely. For more information about prescribed fire, see the section dedicated to the topic in this guide.

A final consideration is the management of commercial loblolly stands when bobwhites are also an objective. To maximize timber value, managed loblolly stands are normally clear cut and replanted rather than allowing natural regeneration to take place. These monotypic stands of loblolly often serve as bobwhite habitat for the first few years after planting. However, they quickly become dense and lack any herbaceous cover, as these stands are managed for straight, well-pruned trees and require a dense canopy. Also, hardwood specific herbicides are often used to minimize competition with the planted pine. While this is good for timber production, dense pine plantings and eliminating shrub cover in the understory is not productive for bobwhites. If bobwhites are an objective in loblolly pine stands, consider using periodic fire rather than herbicide to limit hardwood competition in the understory. This will maintain a shrub cover as most hardwoods



This cross timbers stand on the Blue River WMA is well managed for bobwhite. It has been thinned to a savannah (basal area less than 30) and is periodically burned to minimize litter and maximize forb production while maintaining patchy shrub cover.



This stand of shortleaf pine on Pushmataha WMA has been thinned and burned. The site has limited shrub cover, but otherwise is nearly ideal for bobwhite. Furthermore, high value wood products can be produced from sites such as this.

will resprout following fire and will also encourage forb production. In order to limit damage to young loblolly, wait until after at least the first thinning before burning so that the pines are tall enough to limit scorch to the canopy. It is recommended that landowners consult with a forester to limit tree scorch, as loblolly pines are more sensitive to fire damage than shortleaf pines. For bobwhites, maintain the mature pine stand with a basal area of no more than 100 but preferably less than 60. The amount of com-

promise made will depend on whether the primary objective is bobwhites or timber. If the landowner does not want to limit timber value by maintaining these more open pine stands, a possible scenario would be to have multiple pine stands that are of different ages, such that at any one time some of the stands are young and thus are providing habitat for bobwhite.

With a little planning and knowledge, forests in Oklahoma can be productive for both bobwhites and timber production. 🐾

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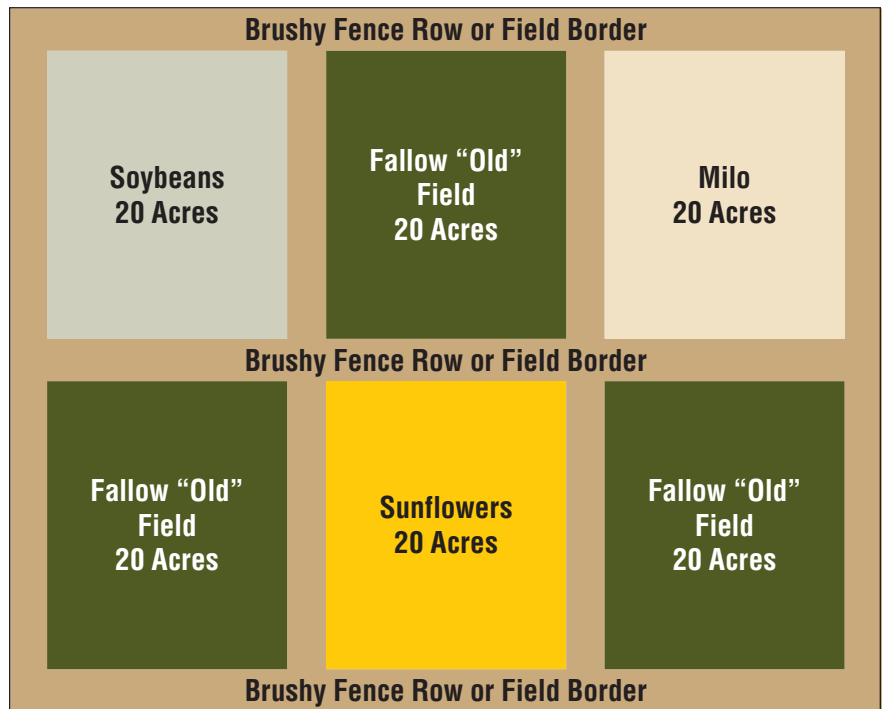
Managing Agricultural Fields for Quail

By Doug Schoeling



Oklahoma has nearly 35 million acres in farmland and is firmly seated in “America’s Breadbasket.” Winter wheat is the state’s principal crop, with over three million acres harvested in 2011. Much like the quail population, Oklahoma’s farming practices have changed. With an increasing population and decreasing farm numbers, producers have had to change their methods to maximize production to meet the demands of consumers. For example, with more efficient and larger equipment comes a need for larger tracts of farmland. While past farming techniques may have been more beneficial to bobwhite quail, habitat potential remains in modern agriculture.

In the past, quail seemed to thrive with Oklahoma’s agricultural practices. The small field size along with the mixture of fallow land or “old field” and brushy



fence rows provided quail with the required habitat components. However, agricultural practices have slowly changed with the arrival of more efficient farming equipment and increasingly larger fields. Though modern agricultural practices may no longer create the ideal conditions for quail, producers do have options and opportunities for increasing quail habitat on their property.

The Ideal Combination

In agricultural landscapes, the ideal situation for quail is a mixture of small (20 – 50 acres) fallow or “old” fields with native grass areas, crop fields, and brushy fence rows. Each of these areas can provide habitat for upland game birds. Fallow fields provide nesting and feeding areas, and crop fields provide food from waste grain. Summer crops can also be used as bugging areas for broods. Brushy fence rows are used as escape cover and as birds travel from field to field. For quail and other upland game birds to get the most benefit, these different patches should be in close proximity to each other.

Though this patchy mixture of habitat types was common in the early to mid 20th century, farming practices have changed and this blend of crop, old field and brushy fence row is infrequent in today’s landscape. More farmers are cultivating right up to the fences to increase crop production. By doing this, they have removed the weedy areas that provide food and the brushy fence rows that provide escape cover and travel lanes for many species of birds. Though this ideal combination isn’t possible across much of the modern agricultural landscape, crop producers interested in quail can consider the following practices to improve habitat and bird numbers on their properties.

How to Make Today’s Agricultural Fields More “Quail Friendly”

- **Plant Quail Friendly Crops** — Quail populations are often attracted by the crops planted. Summer crops such as soybeans, grain sorghum (milo), and sunflowers can be used as brooding

or bugging areas. These crops provide overhead cover from predators, bare ground for travel lanes and shade during the hot summer months. Because these crops are green in late spring and summer, they attract high numbers of insects that are accessible to the quail and their broods. After summer crop harvest, waste grains from these fields can also provide winter food. When harvesting, consider leaving a few outer rows of crop standing to provide birds food during the winter.

No-till winter wheat can also be beneficial to quail populations. Because green wheat will attract insects that quail feed on, these fields can be used for food during the transition period when birds are switching from seeds to insects. Additionally, in areas of limited nesting cover birds could potentially use wheat stubble as nesting material.


- **Consider Using Smaller Fields** — Though quail can and will use an entire property if habitat conditions are suitable, many people think of this bird as an edge species. This seems especially true in agriculture systems. In reality, birds have been pushed to the “edge” where crop fields (food source) meet brushy fence rows (loafing/escape cover) and fallow or “old” fields (nesting cover). As you plan this year’s crop production, consider planting smaller, irregularly shaped fields. These random shapes will increase the amount of edge and quail habitat around the crop field.
- **Limit Pesticide and Herbicide Use** — Since quail feed on both insects and forb seeds, application of pesticides and herbicides is not considered a quail friendly practice. Fields where pesticides and herbicides are used minimally are most beneficial to quail and other upland game birds.

- **Install/Maintain Field Borders** — Field borders are strips of native grass, forbs, and low-growing shrubs at least 35 feet wide that surround crop or pasture lands. These borders should not be treated with

any chemical spray, as chemicals remove important food resources. Because field borders can become thick and unusable when left unmanaged, prescribed burning or flash grazing is often recommended on a rotational basis. Strip disking can also be used in the border to promote native forbs, providing additional food and travel lanes.

- **Reconsider Haying and Mowing Tactics** — Hay fields can provide nesting habitat for upland birds, especially if dominated by native grasses. Though haying removes cover and often increases the amount of thatch on the ground, timing of hay harvest can be especially important. If haying is in your agriculture production plan, it is best to wait until after the prime quail nesting season — mid-August. It is also beneficial to leave strips at least 35 feet wide or wider un-hayed around the edge of the field. These strips can provide cover for late nesting attempts and can provide food and cover throughout the winter. To make hayed areas even more “quail friendly,” leave a brushy component to the unmowed strips to provide escape and loafing cover.

Mowing should also be reconsidered as it removes overhead cover, removes or reduces forb seed heads, and increases thatch in quail areas. If overhead cover is limited and travel is restricted, predation can increase because escape is more difficult. Additionally, mowing reduces low-growing shrubs, which is an important quail habitat component.

With the increased efficiency of modern agriculture equipment and other changes in the farming discipline, returning to the quail friendly “small farm” landscape is unlikely. Even so, agriculture producers interested in quail habitat management can implement a few practices to make their croplands more attractive to quail. To incorporate quail into the current agriculture management plan, consider leaving adequate nesting and escape cover along the field edge, and limit herbicide or pesticide use when possible. 

7 Monitoring the Change

Prior to the mid-November quail hunting season opener, sportsmen are busy with time-honored preparations. Pointers and setters get out for field conditioning, and newly accessed lands are scouted. One's hunting season outlook is typically based on the number of birds seen during these scouting trips, but the number of coveys often remains unknown. To get a better idea of the quail population on your property or favorite hunting spot, consider adding covey counts to your preseason ritual.

Good Morning or “Koi-lee”

Coveys call in early morning; most likely to let neighboring coveys know where they will be located for the day. This “wake-up” call can be heard 30 minutes before sunrise until dawn. The clear “koi-lee” whistle is brief, averaging 30 seconds, and the daily greeting is given by a majority of the coveys within a few minutes. Calling is seasonal; beginning in September and continuing into November with a noticeable peak in mid-October. Clear mornings with low winds are the best time to hear calls. Passing cold fronts that bring high cloud cover, wind, and lower barometric pressure often lead to a decrease in calling.

Counting Quail

The survey is as easy as 1, 2, 3.

Step One: Establish listening stations at least 1,100 yards from each other. This ensures coveys are not counted more than

once, since most calls are not audible beyond 550 yards. Mark these listening stations on your property map so you survey the same area year after year.

Step Two: Arrive at your listening station 45 minutes before sunrise and listen for each covey’s morning greeting until sunrise. Mark the approximate location of the covey on your map, along with the time of the call. Often, multiple birds will call from the same covey while facing different directions. This can give the impression of multiple coveys, so be conservative in the number of individual coveys you record. Once the survey is complete, you might attempt to walk up the coveys to verify multiple coveys, gauge distances and obtain a count of individual birds. Only one listening station per person can be surveyed per morning because the calling session is so short. If other hunters are conducting surveys during the same time

on adjacent points, compare covey locations and times to ensure each covey is only counted once.

Step Three: Analyze your results. You can obtain a crude measure of quail density by assuming the survey area for each point is equal to 196 acres, a 550 yard listening radius. If you were able to get an estimate of covey size, multiply that number by the number of coveys heard for a total number of individual quail. If you were unable to get a reasonable estimate of birds per covey,

COVEYS CALL IN EARLY MORNING; MOST LIKELY TO LET NEIGHBORING COVEYS KNOW WHERE THEY WILL BE LOCATED FOR THE DAY.



it is recommended that you use the number 11. For instance, if four coveys were heard, the density would be: $196 \text{ acres} \div (4 \text{ coveys} \times 11 \text{ birds/covey}) = 4.5 \text{ acres/bird}$.

Calling behavior is not always consistent due to weather variations and the number of coveys present. To control influence of weather, avoid surveying during times of high wind and/or cloud cover. Because calling is a social behavior, presence or absence of other coveys could influence your survey. Coveys will be more vocal if they hear a nearby covey, and are less likely to call when they do not hear other coveys. Because of these variations, relating density estimates to hunting success is difficult. Consider using the categories defined in Fred Guthery's *Beef, Brush and Bobwhites* when interpreting covey call data: low (three or fewer coveys per point), average (five coveys per point), or high (more than eight coveys per point). As a reference, one to two birds per acre is


associated with good hunting while two to five birds per acre is considered fair.

Conducting fall covey counts is a great way to estimate the density of quail on your property or favorite hunting spot. Although covey counts require early morning trips to the field, the results are valuable and can help you decide your opening morning hunting location. Covey counts can also be taken from the deer stand. As with all surveys, accuracy is improved with multiple points and at least two observations per point. Repeating the survey annually should show population trends on your property, and may even help focus your management activities.

Monitoring the State's Quail Population

Instead of conducting thousands of covey counts every year, the ODWC monitors the state's quail population with biannual county roadside surveys. Every year

in August and October, biologists survey a predetermined 20 mile route that is representative of the county. Observers count the number of quail observed along the route to provide an index of quail abundance. Juvenile birds are classified into age groups so that reproductive success and timing can be analyzed and compared to other years. With the exception of the two most urban counties — Tulsa and Oklahoma — each county has at least one survey route. Seven larger counties, including Beaver and Pittsburg counties, have two survey routes.

After the October roadside survey, the Upland Game Biologist analyzes the data and the results are reported in the Quail Season Outlook. Statewide quail population trends are determined in addition to six regions — northwest, north central, northeast, southeast, south central, and southwest. The 2012 surveys marked the 23rd year for the roadside survey. 



Researchers with OSU are using another type of survey — “bird dog surveys.” Researchers use bird dogs to “point” out coveys, and they record the info on the covey ranging from the time of day it is observed to the number of birds in the covey.

Fall Covey Count Data Sheet

This data sheet can be used to record the number and location of quail covey's heard during the fall covey count. Counts should be conducted on clear, calm mornings. Arrive at the listening station 45 minutes before dawn and end the survey at official sunrise.

Observer Name: _____

Survey Date: _____

Start Time: _____

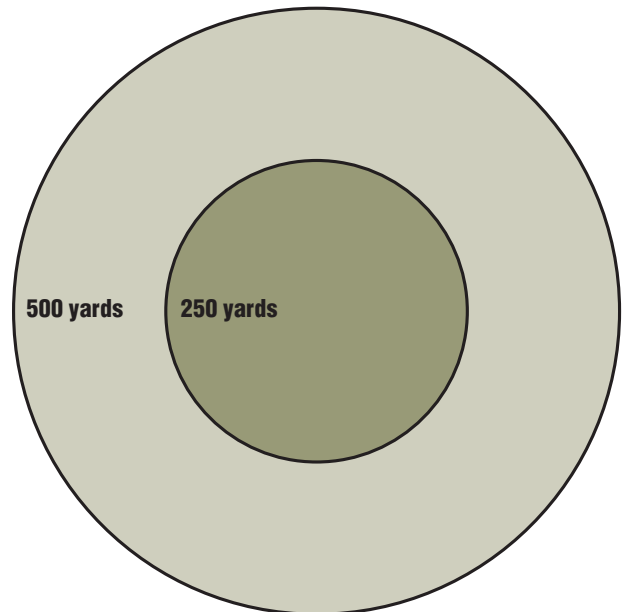
End Time: _____

Station Number: _____

% Cloud Cover: _____

Temperature: _____

Wind Speed: _____



Adjusted Covey Estimate:

Total # Coveys Heard	X	Adjustment Factor*	=	Fall Covey Index

***To adjust for social calling behavior, multiply the number of coveys heard by the following factors:**

Number of Coveys Heard	Factor
1	0.53
2	0.85
3 – 4	0.87
5 or more	0.94

For Example: If you heard two coveys calling during the survey:

$$2 \times 0.85 = 1.7$$

Your adjusted covey estimate would be 1.7 coveys for the 196 acre survey area.

Additional Wildlife Management Resources

The Noble Foundation (Technical assistance, plant identification guides)
noble.org

Natural Resource Conservation Service (Technical and financial assistance, prescribed burn planning)
nrcs.usda.gov

The Oklahoma Department of Wildlife Conservation (Technical and financial assistance, upland updates)
wildlifedepartment.com

Oklahoma Cooperative Extension Service (Technical assistance)
oces.okstate.edu

The Nature Conservancy
nature.org

National Wild Turkey Federation
nwtf.org

Quail Forever
quailforever.org

Tall Timbers Research Station
talltimbers.org

Rolling Plains Quail Research Ranch
quailresearch.org

National Bobwhite Conservation Initiative
bringbackbobwhites.org

Texas A&M AgriLife Extension Service
agrilifeextension.tamu.edu

Caesar Kleberg Wildlife Research Institute
ckwri.tamuk.edu

K-State Research and Extension
ksre.k-state.edu

Texas Tech University
ttu.edu

Farm Service Agency
fsa.usda.gov



8 ODWC Invests in Research

By Allan Janus and Dwayne Elmore

Beginning in 2012, ODWC partnered with Oklahoma State University to conduct quail research in northwestern Oklahoma. This research is being conducted on Packsaddle and Beaver WMAs, which both contain large areas of native shrubland that provide habitat for bobwhite quail. Packsaddle WMA is dominated by shinnery oak shrublands while Beaver WMA primarily consists of sand sagebrush shrublands. Both of these areas historically have supported abundant bobwhite populations. Additionally, scaled quail occur on Beaver WMA. However, similar to the remainder of the state, quail numbers at both WMAs are currently low due to drought conditions.

The current research has multiple objectives that will be carried out over the next few years to better understand bobwhite ecology and management. First, the impacts of prescribed fire and grazing on quail are being evaluated at both

WMAs. While these are common practices recommended for quail, specifically how quail respond to these management practices within these western Oklahoma shrublands is not entirely understood. Additionally, how weather affects quail is a major focus of this research. Both of these objectives are primarily carried out by using radio transmitters attached to quail. Throughout the year, researchers bait walk-in funnel traps to capture quail. They then slip a radio transmitter that weighs approximately 7 grams over their head. The transmitter emits a signal on a specific frequency that the researchers can monitor. If the quail does not move for several hours, the transmitter broadcast pulse changes which signals to the researchers that the quail is likely dead. Quail are tracked several times each week to determine survival, movement patterns, and habitat use. How quail use various patches of habitat that

are created under the combination of prescribed fire and grazing will be of interest to land managers throughout the state.

Researchers have installed multiple weather stations at both WMAs which will allow precise data on precipitation and temperature to be collected throughout the year. These stations are being used to examine nesting timing, success and abandonment in relation to local weather patterns. These data in combination with extensive quail population estimates in both the spring (breeding population) and fall (covey numbers) will assist ODWC in better estimating bobwhite populations prior to each hunting season.

One limitation of past research has been determining chick survival. Typically, researchers flush chicks from a radio-marked hen quail. However, many of these chicks do not flush and thus

survival estimates of the chicks are inaccurate. To better understand chick survival, researchers will begin trapping a limited number of quail chicks to attach small radio transmitters to them in 2013. This will provide detailed information on individual chick survival relative to the vegetation community, management actions and weather events.

While this research project is in the early phases, ODWC and OSU have already collected a tremendous amount of information about quail. Populations were initially low on both WMAs with less than 2 males detected per spring whistle counts in May-June. Despite this, a total of 536 quail have been fitted with radio transmitters due to a tremendous trapping effort. Typical with quail, mortality has been high on adults with common causes of mortality being avian and mammalian predation. Quail are using a variety of different plant communities on the WMAs, but some trends of habitat use are becoming apparent. Within a few years, detailed habitat use data will be available. During the summer of 2012 researchers found very low reproductive effort with only 47 nests detected. This is likely related to the extended drought in northwestern Oklahoma. Thus, it was not surprising that fall covey counts yielded low population densities on both WMAs.

While we know that weather is the



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trump card for bobwhite populations, providing habitat is essential to ensure that when weather does cooperate, bobwhites can adequately respond. This research project is intended to provide land managers with the best information possible to predict bobwhite populations each year while increasing quail production within the bounds afforded by local weather conditions.


In addition to the extensive research efforts at Packsaddle and Beaver River WMA's, the ODWC is also contributing to a Texas based research project. Operation Idiopathic Decline (OID) is a comprehensive multi-state effort investigating the role of disease and parasites in the decline of bobwhite quail.

Seven research projects were funded as part of the Operation and researchers from multiple Texas universities are investigating the prevalence of various pathogens including avian influenza, quail pox, and quail bronchitis. Researchers are also looking at the occurrence of parasites like intestinal coccidia and eyeworms. Biological samples are provided by six OID quail trapping teams stationed throughout the rolling plains region. Teams are sent into the field in mid-August and again in early October. Three "Bobwhite" teams are stationed in Texas, and two are located in Oklahoma. An additional team was formed in 2012 to capture and sample scaled quail in west Texas.

ODWC biologists lead the Oklahoma

trapping teams and sample birds from 10 western Oklahoma WMA's. During the two week trapping session, biologists set and check the baited funnel traps twice daily, once in early morning and again in evening. Once a bird is captured, age and sex is determined, and the weight and condition of the bird is recorded. Blood and other biological samples are taken and birds are banded to ensure all future samples are unique. All samples are transported to a Central Receiving Lab in Lubbock, Texas and then distributed to the respective investigators. Each sample is given a six digit identifier so that the location of the sample remains anonymous. Trapping teams spend two days on each WMA before moving on to the next trapping location.

Biologists also set and check mosquito, tick, and roach traps in an effort to identify the potential disease and pathogen vectors. Dry ice (which emits carbon dioxide) is used to attract both mosquitos and ticks. Roaches are collected in commercially available traps. Vector trap success has been low due to the extreme drought of 2011 and 2012. Once samples are distributed to the respective labs, researchers process the samples and screen for various pathogens, parasites, or contaminants.

To date, ODWC biologists have provided nearly 400 samples to the research project. 2013 is the third and final year of the project. 



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Outdoor Oklahoma

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For more information about managing your property for quail, contact one of the following:

Tell Judkins
Upland Game Biologist
405-301-9945

Josh Richardson
Private Lands Supervisor
405-637-7324

ODWC
Wildlife Division
(405) 521-2739

Brett Cooper	Northwest Region Private Lands Biologist	405-740-9830
Lauren Auld	Southwest Region Private Lands Biologist	405-397-1599
Kyle Johnson	North Central Region Private Lands Biologist	405-590-2584
Rosalee Walker	Northeast Region Private Lands Biologist	918-607-1518
Leah Lowe	Southeast Region Private Lands Biologist	405-206-7720