PRACTICAL WILDLIFE MANAGEMENT INFORMATION



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Variations on Releasing Pen-Raised Quail

By Ted DeVos

Pen-raised quail have been utilized for hunting purposes for decades. Even during Herbert Stoddard's day in the 1930's, people were utilizing pen-raised quail and bringing in "Mexican quail" to supplement properties that needed additional birds to hunt. In many cases, expectations were that adding birds to the population would lead to an increase in breeding birds and, hence, the wild bird population. That expectation is still common with people using pen-raised quail today. Unfortunately, then as now, pen-raised quail should be released for hunting purposes and not necessarily for "restocking" quail habitat. In the far-major-



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ity of cases, the reason that quail are not on a site is because the habitat is not suitable for quail and adding more birds does nothing to address habitat conditions. In rare cases, isolated habitat might be ideal and not harbor native quail because none are nearby and restocking might be necessary.

So what are the techniques managers utilize in releasing pen-raised quail on areas strictly for hunting or areas where they would like and expect springtime survival and summer reproduction? Release operations can be broadly divided into "pre-season" (early release) and "day of the hunt" releases. Seasonally, there are substantial differences in whether your released birds survive for days or months. During the summer, there is an abundance of food for predators that eat quail. Young songbirds, rats and mice, insects, etc., are common and readily available to predators. Quail released during this season typically have higher survival rates, but a longer time to be eaten before hunting season starts. Quail released during winter must face not only our local predators that have grown up over the summer and become adept at catching prey, but also migrant hawks and owls that grew up in the north and come here to spend the winter. It does not matter when you put out pen-raised quail, they are always released with poor predator avoidance knowledge and must learn how to avoid predators by watching their brothers and sisters get eaten! As a general rule, however, quail released during the fall typically have a better chance to survive to the spring to breed. Whereas, quail released during summer have a long time to survive 'till spring and those released in winter have extremely high mortality rates.

DAY-OF-THE-HUNT

Starting with the simplest, day-of-the-hunt (pop-up or put-out birds) releases es simply involve releasing birds in grassy habitat that can be hunted through easily. Birds are put out hours before the dogs are put down, then birds are pointed, flushed and shot. Birds are usually spun in a sack or otherwise dizzied so that they will stay where they were put. Sticking them into the base of a clump of grass often helps them hold to the release site until hunters arrive. Harvest rates are high (90-100% for good shots, considerably less for less able shooters!) and survival of birds not harvested is generally very low. These birds rarely have a chance to learn how to avoid predators before they get eaten themselves. Day-of-the-hunt releases typically consist of older birds because most producers have older birds available later during the season. Younger birds (10-14 weeks) are smaller, more agile, and seem to learn quicker than older birds.

Positives associated with this technique are that you get a good return on the number of quail released, therefore the "bird in the bag" cost is cheaper. This technique is easy to do, can be set up on the day you hunt, and requires only enough acreage to put out a few release sites (often simply a 10 acre field of broomstraw). You don't have to own many acres or "manage" any quail habitat and birds can even be released into fields of fescue, bermuda or bahaia which is some of the worst habitat for wild quail. I would hazard to guess that more of these type of quail are shot each year in the South than any other.

Negatives to this technique are that birds that were in the pen yesterday are usually reluctant to fly and tend to fly poorly for short distances. There are, of course, quality differences in birds and producers, however this technique rarely mimics wild quail hunting. Birds usually need to be encouraged to take flight by letting the dog jump in on them (not good for well trained pointers, but fun for puppies and other flushing dogs), or kicking them out of the grass. This is often distasteful for hunters

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used to hunting wild flushing pre-season released or wild quail. Even birds raised in flight-pens often only fly for 30-40 feet before landing again making quick, close shots the rule rather than the exception. These shots are often taken low to the grass making it dangerous for dogs (which are often chasing these quail) as well as to other hunters. I have often heard grumbling from pay hunters who saw more birds brought to the wagon that were caught by the dog than were shot by hunters.

PRE-SEASON RELEASE

For those hunters trying to balance having birds that act like wild quail, hunting to find those quail and enjoying hunting through habitat that has been managed to support quail (pre-season release or some other form) is the most common



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technique. Like the name suggests, birds are released sometime prior to hunting season and hunted throughout the season. Obviously, being successful with this technique requires enough quality habitat to allow the birds to survive months in the field. Being able to hunt these birds from the middle of November through February entails that the birds survive in large enough numbers to make it worthwhile hunting them in late season. If hunting or natural mortality reduces quail numbers too low it either becomes too hard to find birds or there needs to be some supplementation of quail in mid-season.

This release technique can entail the release of very young quail in summer through older birds in late fall. The similarity of all preseason releases, regardless of how early or late they are released, is that

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the birds MUST be released into good, woody, protective cover (preferably with the addition of some type feeder/watering structure) and have a ready food supply. Birds released into poor cover such as grassy flats, bicolor thickets, sorghum patches, etc. have a poor chance of staying where they are put and, consequently, it can lead to poor survival. Food needs to either be available in feeders or scattered in the thicket where they were released. Once the birds have been out 2-3 weeks, they can be fed in nearby blackberry thickets or partridge pea cover, etc. by scattering feed on the ground.

At the extreme, pre-season operations can be releasing 2-3 week old biddies with a surrogate father in summer. There has been some research using this technique by Tall Timbers Research Station in the 1980's. In this study wild male bobwhites were trapped and released with 10-15 biddies (after a brief acclimation period) it appeared that a high level of adoption occurred. This technique requires a large amount of effort and permits from Game and Fish Agencies. Survival of the biddies into summer is unknown.

In an effort to get a wilder bird in hunting sea-

son, some managers have begun releasing young (6-8 week old) pen-raised birds in summer. Typically, 2-3 birds per acre are suggested and at approximately \$2.50 per bird, a 3 bird per acre release would cost \$7.50 per acre. Very little true research has been done, however it can be safe-Iv assumed that the survivors of this release technique should exhibit good "wild bird" characteristics of tightly grouped coveys, holding well for dogs, good flight distance and speed off the ground and a unified covey rise. Survival, however would be the cost of these summer releases. Survival, while an instinct, is mainly a learned behavior and it can only be well-developed by birds watching predation occur on other quail! Releasing young birds without adults as "instructors" will usually result in low numbers of quail surviving to hunting season, therefore large numbers must be released throughout the summer. Other variations on this technique use cages to house very young quail in the field with similar results. Recommendations for this type of release are often 3-5 birds per acre through the summer. If week old chicks cost \$1.30, 5 birds per acre will cost \$6.50 per acre for birds plus pickup cost.

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The most common and most researched pre-season technique is releasing 10-12 week old birds at a rate of 1-2 birds per acre in September – October. These birds typically run in the \$3.00 range and a release of 2 birds per acre will run \$6.00 per acre. This type of release tends to be a good compromise between the high find rates of day-of-release and the high quality birds from summer releas-



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es. Typical survival rates using this technique are around 60% to hunting season, however the survivors have good survival skills (See Figures), fly well and behave as a covey. Once these birds have been out for a month, they have fairly good survival skills, but not as good as wild quail (See Fig 2). While a good release will retain birds through winter and into spring, high mortality associated with poor habitat quality, poor release technique (releasing into poor cover or lacking feed, etc), or excessively high predator populations may make supplementation during hunting season necessary.

Any release technique used should be oriented towards providing hunting opportunities and not restocking. While survival into spring and breeding can be a result of releasing birds in the summer and fall, habitat improvements will typically result in more benefits to the wild populations than the actual releases of penraised quail. However, any summer-fall releases depend greatly on quality habitat to allow birds to survive until hunting season. All summer/fall releases need to be done correctly or extreme mortality will result. Birds need to be released in protective cover and provided food and water. They need to be pampered for a month or so. Predator control at release sites in some cases may also help survival rates. Disease is also a concern and all birds should be inoculated prior to release.

While wild quail will remain the standard for elite quail hunting, not everyone has the acreage nor the resources to manage for wild quail. Pen-raised quail provide an opportunity for these hunters to work their dogs and expose young hunters to the enjoyment of birds, dogs, and guns. I would hope that those with the resources and acreage to manage habitat will do so because quail habitat management benefits so many different wildlife species.

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Converting Tall Fescue and Bermudagrass Fields into Quality Early Successional Habitat *By Craig A. Harper*

I visit a lot of properties across the South each year. Without exception, there is one recommendation I have given everyone—get rid of the tall fescue and/or bermudagrass. I have never made an initial property visit in the South (or Midwest or Northeast, for that matter) where I didn't find one of these grasses.

Few landowners realize that just by eradicating these grasses, they can enhance habitat for white-tailed deer, cottontail rabbits, wild turkeys, bobwhite quail, mourning doves, field sparrows, indigo buntings, dickcissels, blue grosbeaks, yellow-breasted chats, American goldfinch, loggerhead shrikes, and many other species. And tall fescue and bermudagrass aren't the only culprits. In my opinion (and in that of a whole lot of other biologists), you can add orchardgrass, timothy, bluegrass, johnsongrass, crabgrass, goosegrass, bahiagrass, vaseygrass, velvetgrass, japangrass, and, certainly, cogongrass. Why? None of these grasses provide quality cover, forage, or seed for wildlife, none are native to North America, some are extremely invasive, and they all displace more desirable plants. Yes, I know deer may eat some of them at various times of the year, turkeys may eat bahiagrass seed, and guail and several other birds may eat crabgrass or johnsongrass seed. But why have a plant(s) that provides marginal cover, forage, or seed take up space where more desirable plants could grow ?!? Make no mistake, you can increase the carrying capacity of your property for many wildlife species just by eradicating these grasses.

Now, before you think I'm a native plant purist, let me explain. I do encourage people to promote native plants when possible and practical, but I think foremost about landowner objectives and what would benefit wildlife. Thus, I'm also a proponent of food plots, for example, if they fit in with the landowner's objectives. Of all the food plot plantings I might recommend, only a couple are native to North America. Therefore, I don't have a problem with someone using a non-native plant to meet a specific objective, as long as that plant is not



Fig. 1a; Tall fescue typically forms a dense structure at ground level. This makes it difficult for young bobwhites and turkeys to travel through the field, limits seed and invertebrate availability, and precludes the seedbank from germinating.



Fig 1b; When sod-forming grasses, such as tall fescue and bermudagrass, are eradicated, an open structure is created at ground level and the seedbank is able to germinate. Forbs provide a protective umbrella canopy of cover, protecting quail or turkey broods feeding and loafing underneath.



invasive and there is not a more valuable native plant that would meet the same objective. Please be aware, however, that food plots are only a very small component of habitat management and often are not necessary for landowners to meet their objectives. Also, it is important to remember food attracts wildlife, but cover holds them. If you want to hold more wildlife on your property, you should be most concerned about enhancing cover, and that includes cover within your woods and your fields. For those wildlife species listed above, if you want to see more of them on your property, one of your top priorities should be renovating your fields and eradicating undesirable plant species (whether native or not).

What do you want?

Aside from food plots and other agricultural areas, you need to manage your fields to provide quality "early successional" habitat required by the wildlife species listed above. Quality early successional habitat includes certain grasses, forbs, and scattered shrubs that represent distinct resources for food and cover. Many native grasses, such as broomsedge bluestem and little bluestem, provide quality nesting cover for bobwhites and enable you to use prescribed fire to maintain an early seral stage. Forbs, such as pokeweed, ragweed, partridge pea, native lespedezas, and beggar's-lice, provide forage for deer, brooding cover for young quail and turkeys, and seed for a variety of birds. Scattered shrubs, such as blackberry, wild plum, and sumac, provide soft mast and seed for many wildlife species, as well as loafing cover for quail and rabbits, nesting structure for several songbirds, and one of the most important factors for quail and rabbits-winter cover. Before you think of winter cover as thermal cover, please realize winter weather is not a limiting factor for quail or rabbit populations in the South. A place to hide from predators, however, is often a limiting factor during winter.

Underneath this cover of early successional plants (at ground level) should be an open environment. This is provided when thatchforming grasses (such as tall fescue and



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bermudagrass) are removed. The forbs present should provide what I have called an "umbrella canopy," with cover overhead, yet open below. This enables small wildlife to travel throughout the field and not just along the edge of the field. This open ground structure also enables young quail and turkeys to easily pick up seed and search for invertebrates. It is not desirable for quail to expend more energy trying to navigate through a field than they obtain from the food they find! As they feed, they should be protected from overhead predators, not exposed and forced to use the woods where they are hammered by Cooper's hawks.

Be aware, properly managed early successional habitat does not look "pretty" to most folks. Many landowners, especially farmers, absolutely cringe when they see a field of "weeds" and "wild grasses." Think of it this way-when you walk into a field, you should feel just as likely to jump a rabbit or covey of birds in the middle of the field as you are along the edge. "Edge" species are looking for desirable structure. That type of structure is often found along the edge of the field because the interior of the field is not managed accordingly to suit their needs. Your objective should be to create a *field of edge*. Without question, this is just as attractive to deer and turkeys as it is to guail and rabbits.

How to get there

Your first step in removing tall fescue and bermudagrass is to prepare the field. A very common mistake is for landowners to spray problem plants with a herbicide before the field is ready. It is absolutely critical to get the site ready and spray at the correct time. If you try to spray a field of tall fescue or bermudagrass with plant debris from the previous growing season over the field, you are not going to be happy with the results. "Clean" the field by burning, haying, or grazing. You want to spray fresh growing grass, not senescent stems and leaves from last year.

Tall fescue

Tall fescue is a perennial cool-season grass. It makes most of its growth during the cool months of the year, not in summer or win-

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Fig 2; Just a few years ago, this was a tall fescue field void of wildlife. Now, the perfect composition and structure has been created to benefit a wide variety of wildlife. Native grasses for nesting structure; forbs for umbrella cover, forage, and seed; and an open structure at ground level that provides dusting opportunities and enables seed and invertebrates to be picked up by broods that are able to travel throughout the field, not just along the edge. Now, wildlife abounds in the field.





Fig 3; Tall fescue should be sprayed in the fall to achieve the best kill. This field was hayed in September to prepare it for spraying in October. Preparing a field prior to spraying is critical for maximum herbicide effectiveness. Photo courtesy John Gruchy

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ter. In spring, tall fescue grows rapidly using carbohydrates stored in the root system prior to winter. If you spray tall fescue in the spring, you will typically not get as good of a kill as you will in the fall because in the fall, tall fescue is sending carbohydrates down into the root system, preparing for winter senescence. When you spray in the fall, you don't have to use as much herbicide and you will get a better kill.

Prepare tall fescue fields for spraying by burning, haying, or grazing in September. This is critical. If you simply mow (bushhog) the field, there will be considerable material left on the field and much of your herbicide application will not contact growing grass later when you spray. If you have no other option than mowing, then do so fairly frequently through the summer to keep vegetation height relatively low and prevent thatch build-up. Next, allow the grass to grow through October and spray with 1.5 quarts per acre of a glyphosate herbicide (with surfactant) when the tall fescue is 6 – 10 inches high in early November.

The field should appear brown and dead through winter. Winter annuals (such as henbit, purple deadnettle) may germinate through winter. If so, spray with 1 quart per acre of a glyphosate herbicide. If quality early successional habitat is your object, an imazapic herbicide (such as Plateau or Journey) may be used at this time, but I prefer to wait until spring, just before green-up. This provides better residual control of undesirable warm-season plants (such as johnsongrass, crabgrass, broadleaf signalgrass, curly dock, sicklepod, jimsonweed, wild mustard, wild onion, and cocklebur) that are about to germinate. If you intend to plant a food plot, do not use Plateau or Journey because they are not labeled for agronomic crops and the residual imazapic may kill your crop as it germinates (depending on what you are planting). There are other preemergence herbicides you can use prior to planting a food plot (such as Pursuit or Prowl H2O).

Bermudagrass

The same process should be taken with bermudagrass, except the timing and herbicides are different. Bermudagrass is a perennial warm-season grass. Therefore, it should be

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sprayed in summer when it is actively growing. Prepare the field for spraying the previous winter or spring. Burning in March is recommended. Just before or during flowering (about midto late June, depending on your location) is the perfect time to spray, but don't let it produce seed before spraying! Bermudagrass is tough. There is no single herbicide application that will completely eradicate all the bermudagrass. There will always be a few areas that need spot spraying the following year. Nonetheless, the best herbicide application that research has identified is 48 ounces of Chopper or 24 ounces of Arsenal AC (both with surfactant) per acre. These herbicides do a fantastic job of eradicating bermudagrass, but expect to do some "mop up" next summer.

What's next?

Your next step is to be patient and evaluate what germinates from the seedbank. The seedbank is that collection of seed occurring naturally in the top few inches of soil. Usually, tall fescue and bermudagrass form a carpet over the ground, precluding the vast majority of seed in the seedbank from germinating. When you remove this carpet, you stimulate the seedbank to germinate. Often, a most desirable composition of early successional plants await release. Sometimes, however, another layer of undesirable plants must be eradicated. For example, you might remove the carpet of tall fescue only to find bermudagrass, johnsongrass, and/or crabgrass awaiting release. Don't be discouraged! The only way to get rid of these non-native scourges and enhance your field is to treat them methodically with the appropriate herbicides. Spraying is not a onetime deal. Don't be surprised if you have to spray a field 3 or 4 times with selective herbicides over a 2- to 3-year period to get rid of problem plants. And you may still spot-spray some later, such as sericea lespedeza, whose hard seed continues to germinate from the seedbank for several years after spraying the existing cover. But, by that time, you will be fine-tuning the plant composition in the field and enjoying a positive response by wildlife.

Seedbanks vary dramatically from area to area and site to site. Most often, on sites that



Fig. 4; Doesn't this bermudagrass look great? It is dead! 24 ounces of Arsenal AC does a fantastic job of eradicating bermudagrass, provided the field has been prepared and sprayed at the correct time. Don't be fooled, however, some spot spraying will be necessary next year. Photo courtesy John Gruchy



Fig. 5; This was a tall fescue hayfield from about 1970 – 1999. The field was then cropped in Roundup Ready corn and soybeans for 6 years (2000 – 2005). This eliminated the tall fescue. The seedbank germinated the following growing season (2006). This picture was taken in July 2007. Eastern gamagrass, broomsedge bluestem, pokeweed, blackberry, native lespedezas—this is quality early successional habitat, and none of it was planted!



Fig. 6a; Burning is by far the best way to set back succession and maintain quality early successional habitat. Not only is it ecologically sound, it is cheap, easy, and safe, provided the appropriate precautions are taken and implemented by experienced personnel.



Fig. 6b; It is irresponsible and dangerous to burn fields without a firebreak. By disking a strip one or two tractorwidths wide around the field, a sufficient barrier is put in place to contain prescribed fire when used sensibly.

were recently cleared of woods, a desirable seedbank is intact. However, in some fields, the seedbank has been depleted of desirable species and planting is necessary to develop quality early successional cover. This is easily accomplished by planting a variety of native grasses and forbs readily available through seed dealers. Various shrubs (such as wild plum, staghorn sumac, American crabapple, elderberry, and hawthorn) are also available for planting if needed.

How to keep it

Early successional habitat becomes late successional habitat if the site is not managed (disturbed) periodically. Over the course of 3 – 5 years, fields often become rank with senescent vegetation and the attractiveness for wildlife lessens as the structure and composition changes. Fields are best managed by burning and/or disking. Mowing (bushhogging) is not recommended, as it only piles debris on top of the ground, reduces seed availability, makes travel by small wildlife more difficult, and suppresses the seedbank.

Burning

Burning consumes the old vegetation, creates an open structure at ground level, and recycles nutrients, which stimulates additional fresh growth. Fields are normally burned in early spring, just before spring green-up. This retains cover in the field through winter and does not disrupt any nesting season. Woody encroachment can be problematic, especially sweetgum, winged elm, red maple, boxelder, and green ash. To control undesirable woody growth, burn late in the growing season (September). Burning at this time reduces woody stem density as effectively as herbicide applications. If you see undesirable woody stems becoming numerous, hold off burning in spring and simply wait until September to burn. If undesirable woody species are sparse, you can simply spot spray them using Arsenal AC or Garlon 3-A (depending upon species). Fields usually need burning every 2 - 4 years, but the fire return interval is entirely dependent upon the responding vegetation composition and structure.

Burning fields requires firebreaks. A disked strip 1 to 2 tractor-widths wide around the field helps preclude fire from escaping the field. Firebreaks can be left fallow to encourage plants from the seedbank, or firebreaks can be planted to warm or cool-season forages or grains to provide an additional food source. The arrangement of a block of cover and a strip of food, as opposed to a block of food and a strip of cover, is very important in terms of holding wildlife on your property.

Disking

Many folks are reluctant to burn, or are in areas where they cannot burn. In these situations, disking may be used to set back succession and influence plant composition. Disking, like burning, improves the structure at ground level, facilitates decomposition of senescent vegetation, and stimulates the seedbank. Disking old-field habitats, however, usually requires a fairly heavy off-set disk.

Disking can also be completed following burning to influence vegetation composition. If grasses dominate the site, disk areas in November through February to stimulate additional forb growth. If you are in the Mid-South, you can disk into March. Disking later than this will stimulate undesirable warm-season grasses (such as johnsongrass, crabgrass, and broadleaf signalgrass) if they are still present in the seedbank. I like the vegetation composition to be approximately 50 percent native warm-season grasses and 50 percent forbs, with an open structure at ground level and scattered shrubs not more than 100 yards apart. If grass coverage exceeds 70 percent, I will disk in late winter or burn in September to encourage more forbs.

Frequency of disking is similar to that for burning; however, if you want to stimulate more annual forbs, disk more frequently. If mourning doves are a primary interest, for example, annual disking will promote seed producers, such as ragweed, tropic croton, 3-seeded mercury, redroot amaranth, fall panicum, and foxtail grasses. Without a perennial grass component, heavy disking is not necessary. You can even retain several perennial forbs with light disking, such as pokeweed, native lespedezas, beggar's-lice, trailing wild bean, and perennial sun-



Fig. 7; An offset disk is the perfect implement to set back succession and stimulate additional forb growth where native grasses have become too dense and there is not enough forb cover, such as this field of switchgrass.



Fig 8; This is what an old-field managed for wildlife should look like—native grasses and forbs with clumps of scattered shrubs, not more than 100 yards apart. Two 15-bird coveys can be found regularly in this 20-acre field during fall and winter. Quail and turkey broods are commonly seen during summer. The forbs present provide a virtual smorgasbord for deer and several fawns are always hidden throughout the field during June and July. Rabbits are everywhere and early successional songbirds buzz around like bees. Photo courtesy John Gruchy

flowers. These plants produce seed eaten by bobwhites and many other birds, and provide excellent brooding cover for quail and turkeys. An increase in forbs also improves forage for white-tailed deer. Across the South, diet studies have consistently shown forbs represent 50 – 80 percent of a deer's diet during spring and summer. Perennial grasses are ranked last. Regardless, wildlife habitat is improved by simply getting rid of the tall fescue and/or bermudagrass cover and working with the natural seedbank.

Perspectives

It is difficult for most people to appreciate the beauty of "weeds." It is not difficult, however, for a bobwhite, a cottontail, an indigo bunting, a wild turkey poult, a field sparrow, or a white-tailed deer to appreciate them. If you want to see more of these species on your property, you must learn to view broomsedge, beggar's-lice, and brambles differently. You must realize "clean, green, and even" is not a good thing for wildlife. Eradicating tall fescue,

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bermudagrass, and other species of non-native perennial grasses will promote native grasses and forbs and enhance habitat for wildlife, often without planting anything.

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Craig A. Harper is an Associate Professor and the Extension Wildlife Specialist at the University of Tennessee. Dr. Harper specializes in applied habitat management for upland game species and maintains an extension and research program dedicated to this effort. He and his co-authors recently published Native Warm-Season Grasses: Identification, Establishment, and Management for Wildlife and Forage Production in the Mid-South. This 200-page full-color manual contains hundreds of pictures and is replete with data, tables, figures, and graphs, detailing how to establish and manage native warm-season grasses and associated old-field habitats. It can be purchased through UT Extension at http://www.utextension.utk.edu/publications/ wildlife/default.asp.

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Movement Patterns of Mature Bucks *By Stephen Ditchkoff*

How many television shows have you seen where the hunter describes how they "patterned" the deer they shot? They knew the deer was going to be there because of the scouting they had done. How many magazine articles have you read where the author describes how they had learned the habits of a particular deer by watching him for several years? Of course, their attention to detail and commitment to understanding their quarry enabled them to succeed where so many have failed.

The reality is that individual deer are extremely difficult to pattern, if not impossible. Good hunters use their knowledge of the biology of deer to identify locations where there is a good probability of seeing bucks. Great hunters use their knowledge of the biology of deer to identify locations where there is a good probability of seeing mature bucks. Story tellers describe to you how they used their skills as a woodsman to learn the habits of a deer they had been watching for several years, and how they applied their knowledge of his habits to outsmart him.

A lot can be learned from the spatial patterns (daily and seasonal movements) of white-



A group of mature bucks in a bachelor group during August. The deer in the middle was a 6.5 year old deer and was radio collared during the previous winter.

tailed deer, and understanding their patterns can undoubtedly improve our effectiveness as hunters and/or managers. However, a few glimpses of a deer in the woods, combined with a few pictures from game cams, does not begin to describe the spatial pattern of a deer, much less enable a hunter to predict where a specific deer will travel. A more scientific approach is required to develop an understanding of the spatial ecology of white-tailed deer, but even highly technological approaches will not predict where an individual deer will move to next.

There are three aspects of the spatial patterns of deer that should be of particular interest to hunters and managers. An understanding of these patterns should improve a hunter's knowledge of buck movements during the breeding season, which should translate into improved hunting success. First, bucks display particular characteristics of movement during 24-hour periods, which I would describe as primary movements. Second, the sum of all primary movements (secondary movement pattern) during the breeding season defines the home range of a deer. The third aspect of the spatial ecology of bucks could be defined as tertiary patterns, and I would describe the tertiary pattern of deer movement as shifts in home range from year to year.

Herein I describe the results of a 3-year study on the movement patterns of mature male white-tailed deer during the breeding season. The population that we studied was comprised of more than 50% mature (3.5 years old or greater) males and was open to public hunting. We affixed radio collars to 80 bucks that ranged in age from 2.5 to 9.5 years, and collected data using radio telemetry.

Primary Movements

We located individual deer every 3 hours for a 24-hour period to try and develop an understanding of how bucks moved across the landscape during a typical day. We did this approx-

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imately 500 times during the 3 year period, and developed a pretty interesting data set, which is unique to the best of my knowledge.

The standard movement pattern that we documented during the breeding season can be seen in Figure 1. Deer would move at least 3 miles on average during a 24-hour period (note that this estimate is the minimum distance moved, as the deer could have wandered considerably between consecutive locations), and as you can see, their movement track could almost be described as random as they repeatedly crossed their home range in search of does. Even after following these animals continuously, and doing this with some individuals over 25 times, it was still impossible to predict where that deer would move to next.

While collecting data, it became apparent that younger males frequently exhibited different patterns of movement than older males during a 24-hour period. Older males almost always followed the pattern shown in Figure 1. But, younger males (2.5 years old and younger) often displayed long, linear movement patterns during a 24-hour period. This can be seen in Figure 2. These young bucks would often begin moving in one direction, and continue moving in that direction for half a day, and then turn around and return during the next 12 hours. In Figure 2, you can see that the deer stayed in one general location for the majority of the day, and then began a long exploratory movement. We detected the beginnings of this movement between locations 7 and 8.



Figure 1. Eight consecutive locations of a mature buck (6.5 years old) during a 24-hour period. Note the random pattern to the movements.



We hypothesize that these movements were exploratory, and were a response to the presence of a large number of more dominant, mature males in the population. While searching for does, we suspect that the younger males were continuously subjected to aggressive encounters with dominant bucks. As a result, they would occasionally venture on an exploratory movement to assess if breeding opportunities were greater in other areas.

In one case we found a young male that moved about 2 miles to another area during the breeding season, stayed there for approximately a week, and then returned to his original home range. But, this was the exception, as males normally did not stay any place other than their original home range for longer than a few hours. We suspect that they never located any areas with improved mate availability, as there was a high density of mature bucks across the entire study area.

The other general observation that was apparent was: bucks rarely stopped moving during the peak of the breeding season. Most people have heard that bucks move 20-22 hours per day during that period, and our observations support that notion.

Secondary Movements

Home range size of deer during our study was not dissimilar to home range sizes reported for male deer in other studies. The mean home range of deer in our study during the



Figure 2. Eight consecutive locations of an immature buck (2.5 years old) during a 24-hour period. Note the long exploratory movement between locations 7 and 8.



breeding season was 1,200 acres. This is on the high end for the Southeast, and may be a function of the lower deer density (30 deer/mile2) on our study area as opposed to what is commonly found in other areas of the region. As a landowner or manager, you need to understand what this means from a management perspective. In essence, when you see a deer or capture a deer with a game cam, you need to understand that he may be on the edge of his home range (or in the middle). Based upon what we found with our 24-hour data, and the propensity of bucks to traverse their entire home range during a single day, it is entirely possible that he will be over a mile away in a few hours.

Another noteworthy pattern that we detected was the lack of a consistent pattern of how an individual deer utilized his home range during the breeding season. During summer, we were very good at predicting the locations of individual bucks based upon where we had seen them before. Some bucks we could predict would be on a food plot in the afternoon, and our prediction would prove correct 50% of the time. Others could be found at specific locations as well, feeding on the same plant communities evening after evening. We had the ability with one particular mature deer to stop the truck at a specific corner, and see him 4 out of 5 evenings during the last hour of daylight: he was almost always within about 150 yards of that corner. If we didn't see him immediately, we would climb into the bed of the truck for a better vantage, and often see him feeding in the surrounding brush. If we still couldn't get a glimpse, we would grab the telemetry gear to make sure he wasn't dead. More often than not he was right there, but just not visible.

These patterns were not apparent during the breeding season. At any particular time of the day, it was possible to locate a buck at any point in his home range. There was no tendency for an individual to use the same bedding area on consecutive days (although I am sure that they did use the same bedding areas more than once as these are creatures of habit), so it was impossible to predict that a specific deer may approach a feeding area down a particular trail. One evening they could be seen traveling

along the edge of a hardwood drain. The next evening the same deer would be located in a thicket 1.5 miles away, only to be found across his home range area on an oak ridge where does could be found feeding on acorns. This same consistent lack of pattern was apparent in both immature and mature bucks.

Tertiary Movements

The final characteristic of deer spatial patterns can be defined as tertiary movements. These are the similarities (or lack of) in home ranges from season to season or year to year. We have the ability, without the use of fancy radio telemetry gear, to get an idea about the extent to which an individual buck ranges with the use of game cams. By carefully examining pictures from game cams, and sightings by hunters, we can form a rough estimate of the real estate that is used by a particular deer. This is good use of technology and an intelligent way in which to begin the task of outsmarting a buck. But, you should be aware of some of the pitfalls of this approach.

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This is the individual whose home ranges are depicted in Figure 3. This photograph was taken approximately 3 weeks after he was captured. He was 6.5 years old in the picture and grossed 177 Boone and Crockett points.



Figure 3. Breeding season home ranges during 2 consecutive years of a buck that was 7.5 years old during the first year. This shift in home ranges between years is standard among bucks.

First, preseason scouting (game cams and visual observations) is a fantastic way to select the wrong area to hunt a specific deer. The bucks in our study frequently used different home ranges during the spring and summer than they did during the breeding season. In some cases, these home ranges could be separated by several miles. Thirty percent of our deer shifted their area of core use (area where they spend the majority of their time) by over half a mile between the breeding and nonbreeding seasons. What this means is that some of the deer you are scouting on your land in August may be several miles (or at least a half mile) away come hunting season. In one case, we had a deer that would spend the spring and summer a distance of five miles from his breeding home range: this occurred during three consecutive years. So, if you pass up or miss a buck during the season, and you don't see him on cameras during spring or summer, don't fret. He may very well still be alive. Of course, deer on your property during the spring and summer may not be there during the breeding season.

The next aspect of our tertiary movements to consider is the difference in breeding season home ranges from season to season. On average, there was 53% overlap between a specific buck's breeding season home range one year and that during the next. This pattern was very consistent from animal to animal and from year to year. You should expect these shifts in home range, and understand how they could influence your approach to hunting an animal that you had chased during a previous season. To put it simply, there is only a 50% chance that the buck will ever walk anywhere near a location you choose to hunt (if you are choosing your stand placement based upon last year's knowledge).

Figure 3 provides a good example of the pattern, or lack of a pattern, that I am describing. In year 1, the deer had a home range of 900 acres. During year 2, the home range size of the deer was similar (1,047 acres), but only 435 acres (41.5%) of that range overlapped that of the first year. I hypothesize that these bucks are keying in on perceived availability of does, which is a function of availability of seasonal foods. More specific, in this case, the diversity of oak species and availability of

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Wildlife Trends

acorns on the study area caused does to concentrate their feeding efforts in different areas each year, and this buck adjusted accordingly.

The take home message from this data set is: don't fool yourself into thinking you know more than you do about the animal that you are pursuing. His patterns of movement are more complex than we give credit for, and this can be the downfall of a hunter who is overconfident in his or her preparation for the hunt. To me, this data set highlights the importance of understanding deer and deer movements, not the movements of a specific deer. Use your knowledge of deer and deer biology to put yourself in a position for success, and maybe you'll see the deer you hope to see.

Stephen Ditchkoff is an Associate Professor at Auburn University. At Auburn, Steve teaches both undergraduate and graduate courses in Wildlife Science and conducts research with white-tailed deer and wild pigs. He can be contacted at 334-844-9240 or ditchss@auburn.edu.

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Inoculation: Understanding the Science and Benefits of this Century Old Technology

By Curtis Jennings

Introduction

As summer comes to a close and thoughts of fall seeding become imminent, planning for a successful crop is only half the battle. Implementation of sound agronomic practices along with the help of Mother Nature will ensure that you and the intended recipient of your labors will benefit to the fullest potential.

One classification of fall seeded crops that have shown to provide a multitude of benefits is legume plants. Whether the intent is for production agriculture with a crop such as alfalfa or more in tune with recreation in the form of a food plot for wildlife with a blend of clovers, legumes require more attention at planting than do most crops to assure success. One step in making sure the legume gets the proper start is seed inoculation. In the following paragraphs, the science along with the proper use of inoculants will be discussed to ensure you will have a successful fall seeding experience.

The History of Inoculants

Legumes have been used in crop rotations since the time of the Romans. However, it was not



Cross section of nodulation

until detailed Nitrogen balance studies became possible, that they were shown to accumulate Nitrogen from sources other than soil and fertilizer. In 1886, Hellriegel and Wilfarth, German two scientists, demonstrated that the ability of legumes

to convert N2 from the atmosphere into compounds which could be used by the plant was due to the presence of swellings or nodules on the legume root, and to the presence of rhizobium bacteria found within these nodules. Two years later, a biological and economical advantage was shown when pure bacteria were added to the seed at planting, thus leading to the beginnings of commercial manufacturing of legume inoculants for crop production.

The Science of Inoculation

The process of inoculation is the application of commercially available rhizobia bacteria to the legume seed or into the soil where a legume will be planted. Rhizobia are the active ingredient in all legume inoculant products.

Nitrogen is the most limiting nutrient for plant growth. A legume plant's ability to use nitrogen from the air is the best known benefit of growing legumes, but the least understood. Approximately 79% of the air is nitrogen gas. However, it is not in a form that plants can use. In reality, it is not the plant that removes nitrogen from the air, but the plant specific rhizobium bacteria, which live in small tumor like structures on the legume's root system called nodules. The bacteria can take nitrogen gas from the air (N2) and transforms it into ammonium (NH4) which can be used by the plant. This ammonium is the same form as in ammonium nitrate (34-0-0) and ammonium sulfate (2 1-0-0) fertilizer. This nitrogen fixation process between the legume plant and the rhizobia bacteria is referred to as a symbiotic (mutually beneficial) relationship. Each organism receives something from the other and gives back something in return. Rhizobia bacteria provide the legume plant with nitrogen in the form of ammonium and the legume plant provides the bacteria with carbohydrates as an energy source.

"The Nitrogen Cycle"

Handling and Application

The proper application of an inoculant is a critical piece in ensuring success over the life span of the legume. Rhizobium bacteria move very little once they are placed into the soil, approximately 1/8 inch per year. Therefore it is crucial that the inoculant be applied to the seed prior to seeding or placed directly into the seed trench furrow. Placing the inoculant in a high concentration where it can enter into the root zone and quickly attach to the root system and begin the nitrogen fixation process is key to achieving vigorous growth and quick canopy closure. A lack of nitrogen slows the process and invites other problems.

When purchasing inoculant, it is important to buy the proper strain of bacteria for the legume to be planted. Legumes are rhizobium specific, meaning only the correct rhizobium will infect the root system and go through the nitrogen fixation process. For example, those bacteria that will effectively nodulate soybeans are unable to generate nodulation for clover plants. Most inoculant manufacturers list the legumes each inoculant will treat directly on the package, but if there is a question contact the seller or the manufacturer directly. The inoculant should be purchased when buying the legume seed several weeks in advance of the estimated planting time. This allows time for the retailer to order the seed and/or inoculant if it is not kept in stock.

"Properly Inoculated Seed"

When using inoculant, remember to care for the inoculant properly. Inoculants do require



Properly inoculated Seed



more care than the average chemical or seed treatment product because they contain live bacteria susceptible to environmental conditions during storage. Always store inoculant in a cool (34-70° F), dry place, and never expose the package or contents to direct sunlight. This rule also applies to pre-inoculated seed. Always use the product prior to the printed expiration date listed on the package. Calibrate equipment to be used to ensure proper rates and placement of the inoculant into the soil. Read and follow product labeled directions for optimum performance. Most humus based inoculants require the use of a slurry to uniformly coat the seed. The slurry aides with the adhesion process of the inoculant to the seed to prevent dusting off before planting. When making the slurry, use only non-chlorinated water as the wetting agent. It is best to make the slurry outside of the planter box or drill and allow the seed to dry for a few minutes before planting. However, do not expose the slurry to direct sunlight and plant the seed as soon as it dries. Leaving the inoculant on the seed for extended periods of time will cause depletion of the rhizobium. A general rule of thumb is to plant as soon as possible after inoculating, and re-inoculate if the seed is not planted within 5 days after application. Finally, before mixing inoculant with other seed treatments, such as fungicides, consult the inoculant dealer or manufacturer to determine if the bacteria will be adversely affected.

Factors that Affect Nodulation

A number of environmental factors can impact nodulation of legume plants or the

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The Nitrogen Cycle



depletion of native rhizobium in the soil. An inoculant product should be used when there is a reason to believe that soil populations of rhizobia are low or the native rhizobia are no longer effective. Here is a list of factors that should be considered in determining the need for a commercial inoculant.

- Soil that has not been host to a specific legume in the past 3 years.
- Soil with a pH of less than 5.8. (The pH should be adjusted by liming prior to inoculation).
- Soil with a pH of more than 8.5.
- Soil organic matter levels less than 2 %.
- Drought or flooding.
- Topsoil conditions exceeding 800F.
- Soil Erosion
- Use of soil treatments including fumigants.

Evaluation of Nodulation

Evaluating nodulation may seem difficult due to its unseen presence. However, it can be a fairly simple procedure if done at the appropriate time during the growth stage. The late vegetative stage is a good time to dig up a few plants to look at the root structure and to evaluate nodulation. Approximately 4-6 weeks after emergence is typically when nodules begin to form. Plan to use a garden spade or shovel rather than just pulling the plant out of the ground. Soaking the plants in a bucket of water will help remove excess soil clods without removing nodules. On edible beans, soybeans, peanuts and other legumes which have been planted in the spring, there should be several nodules located on or around the taproot. For the alfalfa and clovers, which have been growing for a year or two, the nodules will appear on the lateral roots and will be long and

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slender in shape. Nodules usually increase in size and number as the plant matures. Fewer nodules may be an indication of a problem that resulted from plant stress. On the other hand, a great number of nodules are no guarantee of effective fixation, as native Rhizobia may have formed many of the nodules. The native-based nodules are likely to be fixing nitrogen much less effectively than nodules formed by commercial inoculant strains.

"Cross Section of Nodulation"

When evaluating nodules, keep in mind you are looking for overall nodule mass not just quantity. For example, ten small nodules with a mass of 50 grams will be as effective as four large nodules with a mass of 50 grams if all are pink or red in color indicating nitrogen fixation.

With a sharp knife, slice open a few nodules and check for color. Visually, nodules that have been created from a high potency commercial inoculant will be pink and preferably red in color. This reddish pink color is the indication of an active nodule and its color is derived from leg hemoglobin, a pigment containing iron that is necessary for nitrogen fixation. If the inside of the nodule is light tan, white, green, or black the nodule is inactive with little or no fixation occurring.

The Benefits of Inoculation

Taking the time to inoculate legume seed properly at planting not only provides immediate benefits, but can also pay dividends long after the initial crop has been harvested. In virgin soils to a particular legume, crop failure will result without inoculating the seed. However, in those soils that have been host to the particular legume in the past, decreased plant vigor, lower production potential, and overall plant health may suffer leading to more serious problems such as disease if the seed is not properly inoculated at planting.

Due to the efficient nitrogen fixation process and the ability of the legume to convert this "free" nitrogen eliminates any need for application of costly commercial fertilizer during the life span of the legume. This benefit can also be realized into the next cropping season as well. Depending on the legume planted (alfalfa and clovers are typically rated the highest in this category) and length of time the legume was in the ground, a well nodulated legume plant typically leaves behind between 55 to 300 pounds of nitrogen in the soil that is readily available for the next crop. This left over nitrogen is in an organic form unlike commercial fertilizer and cannot be leached out through the soil over time. With todays high cost of commercial fertilizers this is a definite savings to the immediate crop following a legume.

Increased forage quality and protein content is another immediate benefit to a properly nodulated legume. All legumes average more pounds per acre when properly nodulated, which increases total crop production and income. Recent studies have also shown that protein levels in legumes increase by as much as 7% over untreated checks that received no inoculant. Whether a legume is planted for a food plot or cover crop for wildlife, this increased level of protein should be a factor in determining needs for additional protein supplements.

Legumes are also excellent soil builders. Legume plants decompose rapidly, thus increasing the organic matter in the soil, which in turn improves its physical, chemical, and biological condition. By inoculating, the legume's optimum level of bio-mass and or production is obtained, thus maximizing its full potential as a soil builder while doing so in a low cost, environmentally safe manner.

Curtis Jennings is co-founder of INTX Microbials, LLC, a full-line inoculant and water adjuvant manufacturing company based in Kentland, IN. www.intxmicrobials.com Curtis oversees sales for the company and has been involved in the inoculant industry since 1998. Curtis received a Bachelor of Science degree in agriculture and a Masters of Business Administration degree from Tarleton State University, a part of the Texas A&M University system. He resides in Brady, Texas with his wife Genna and their son Jace.

Successful Wildlife Management On a Working Farm: A Case Study

By Wes and Leslie Burger

Jimmy Bryan has been operating his 5,200acre B. Bryan Farms, Inc. (BBF) in northeast Mississippi for more than 45 years. A successful cattle and rowcrop operation located in the Black Prairie Physiographic region of Clay County, the farm is diversified with a profitable cattle operation (cows/calves, stockers, and a conditioning facility) and corn and soybean production. The rowcrop fields are situated in the floodplain of Town Creek and Hanging Kettle Creeks, which converge near the southern boundary of BBF.

Mr. Bryan fondly recalls bird hunting as a boy along the many miles of Osage orange hedgerows that criss-crossed this family farm, but until recently, it had been several decades since he had seen a covey rise over his bird dogs. As the farming operation grew in size and efficiency, his business boomed, but bobwhite populations plummeted. Nine years ago, Jimmy decided it was time to do something to restore the quail hunting that he enjoyed as a young man. Additionally, he developed a new appreciation for the magnitude of soil erosion created by the cattle and cropping and its effects on water quality in Town Creek. He started looking for ways to integrate conservation into his farming operation. "What I'm trying to accomplish here," he states, " is to go back to what I remember as the best days on this farm. My goal is to bring it back to that, [to] try to make it as productive as I can, along with having all the recreation and entertainment that I can have, and to pass this on, not only to my children, but to my grandchildren, and whoever might come down the line." (See sidebar for information on how to order a copy of the DVD in which Mr. Bryan and other producers describe how they have integrated conservation practices within working farms).

Historically, wildlife habitat and populations in agricultural settings were a by-product of farming practices. In contrast, in today's highly-mechanized farm landscapes, creation of wildlife habitat must be intentional. But this often means that producers have to decide between the personal cost of lost commodity production and the more elusive societal and personal benefits of "con-



servation." But the tradeoff is not necessarily "acre per acre" or "dollar per dollar." Farmers are aware that portions of their farm are not as productive as others. For example, poorly drained areas, field margins, and highly erodible lands are often lower yielding and can be net-negaprofit regions tive (costs more to plant than returns in yield). Enrolling these areas conservation in а

Pasture buffers connect isolated patches of habitat, holding birds on the landscape during winter and providing corridors that facilitate movement.



practice with financial incentives can actually increase net profitability. Producers also recognize that continued soil loss through erosion is not a good long-term strategy and everyone benefits from clean water.

Fortunately, a suite of federal farm programs are available to help landowners convert these low-profit or high-erosion areas into wildlife habitat while still maintaining successful commodity production. A new planning product from the NRCS Wildlife Habitat Management Institute called "Creating Early Successional Wildlife Habitat Through Federal Farm Programs" (http://www.whmi.nrcs.usda.gov/technical/fieldb order.html) assists landowners in applying a systematic planning process for defining management practices to meet specific wildlife conservation objectives and identifying the government conservation programs under which these practices can be implemented. It also contains descriptions of cost shares and incentive payments associated with the various In this document, the planning programs. process is illustrated with 3 real-world case studies. One of the featured case studies is B. Bryan Farms in Clay County, MS. The Bryan Farm case study is expanded upon in this article to illustrate how one landowner integrated conservation practices across his working farm

The Problem

B. Bryan Farms had several resource concerns common to many agricultural systems.

The Osage orange hedgerows Jimmy remembered hunting during his boyhood had been removed to increase farming and grazing efficiency; those that remained were trampled by cattle, which diminished their effectiveness as wildlife cover and streamside stabilizers. The prairie grasses native to this part of Mississippi had been replaced with sod-forming, exotic, forage grasses (fescue and Bermuda), thereby eliminating nesting habitat for bobwhite and grassland songbirds. Heavy grazing of sloping pastures left little residual cover, and run-off during rainfall events created substantial head-cutting erosion and stream bank destabilization. Annual plant communities what farmers call "weeds" and quail use as brood-rearing habitat— had been eliminated



Chickasaw plum planting in pasture corridor provides loafing habitat for broods and secure covey headquarters during winter.

from rowcrops, field edges and pastures. "Hard" edges, rather than "softer" transition zones, stood between rowcrops or pastures and woodlots. The net effect of all these situations was the loss of nesting, brood-rearing and winter cover for quail and other wildlife species and the degradation of riparian habitat and water quality.

As the quote at the beginning of this article demonstrates, Jimmy Bryan's goal for BBF is to run a profitable, diversified cattle and rowcrop operation in the context of a land ethic based on environmental stewardship. Working with resource professionals (including the local NRCS office and Mississippi State University), he identified a suite of conservation practices that would minimally impact his production systems, but provide substantial returns on soil, water, and wildlife conservation. His specific management objectives were to control erosion in pastures and croplands, improve bank stability and water quality in Town Creek, and restore bobwhite populations to huntable levels. A comprehensive soil and wildlife conservation plan was developed, one that used a combination of federal conservation programs (primarily buffer practices available in the Continuous CRP) and voluntary practices to accomplish his conservation objectives.

The Solution

With the availability of Continuous CRP

(Conservation Reserve Program), the implementation of conservation buffer practices began in 1998 on Bryan Farms. Conservation buffers can reduce soil erosion, enhance water quality, provide escape cover for bobwhite, and forage and breeding habitat for deer. Forested Riparian Buffers (CP22) are a specific type of conservation buffer designed to restore shrubs and trees in streamside zones. Riparian areas in both croplands and pastures are eligible for the CP22 Forested Riparian Buffer practice and Jimmy implemented this practice across his In pastures, cattle were entire operation. fenced out of 100- or 150- ft-wide zones along streamsides, and a mixture of 5 oak species were planted. To improve seedling survival and enhance habitat for bobwhite. fescue was



Native warm-season grass pasture simultaneously provides forage for cattle and nesting and brood rearing habitat for bobwhite.



Native warm-season grass CP33 habitat buffers planted around crop fields provide nesting and brood-rearing habitat for bobwhite.

eradicated prior to seedling planting using 1.5 qt of Glyphosate/ac. Cost-share assistance was provided through the CRP to offset 90 % of the establishment expenses. Signup incentives and annual rental payments offset opportunity costs of taking this land out of production. In 2000, BBF enrolled an additional 35 acres in 180-ft-wide riparian buffers under CP22. However, when he established these fences he left an additional 20 - 30' between the fence and the buffer. The extra width inside the exclusion fence was to allow for maintenance of an annual herbaceous community or food planting adjacent to the riparian buffer. Although no incentive payment or cost-share was associated with this 20 feet, Mr. Bryan voluntarily added it to the conservation practice to provide flexibility in bobwhite management. Today, 358 acres are protected in riparian buffers.

Patches of wildlife habitat in an agricultural landscape historically would have been connected through corridors of additional cover, such as fencerows or fallow field borders. Recreation of these corridors across BBF upland pasture was not a program option in CP22. However, in Mississippi the Wildlife Habitat Incentive Program (WHIP) and Environmental Quality Incentive Program (EQIP) had wildlife corridor practices that were applicable, allowing Mr. Bryan to create a total of 100 acres of 30- to 100-ft-wide fenced pasture buffers (Photo 1). These strips were planted to a variety of cover types, including mixed upland oaks and lespedeza/partridge pea, Chickasaw plum shrub plantings, native warm-season grasses and food plots (Photo 2). Prior to planting of these corridors in 2001, fescue was eradicated in the buffer areas with 1.5 gts of Roundup®./ac. Today these pasture buffers are providing soil conservation, improved water quality, bobwhite nesting and brood-rearing cover, winter covey headquarters and grassland songbird habitat.

In addition to riparian buffers and WHIP/EQIP corridors, Mr. Bryan also installed 32 acres of voluntary buffers with no incentive or cost-share payments. Several miles of fence needed replacing, but rather than removing the old fence, the location of the new fence was

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moved 30 – 60 feet into the pasture to create a boundary corridor. Within this fenced region, 3 rows of mixed upland oaks or plum thickets and 20'of kobe lespedeza were planted.

In 2004, 194 acres of upland habitat buffers (CP33) (Photo 3) were established around agricultural field margins. Habitat buffers 60- to 120-ft were planted to native warm-season grasses (Indian grass, big bluestem, little bluestem) and wildflowers (partridge pea, wild sunflower, and black-eyed Susan). These borders are allowed to succeed naturally, but are maintained in an herbaceous plant community with periodic disking on a 3-year rotation. The specific objective of this practice was to add brood-rearing and nesting habitat to the rowcrop landscape and to further enhance connectivity between cover types.

To further enhance loafing and winter cover for bobwhite, in 2004 and 2005, Jimmy established 120 chickasaw plum shrub plantings. Each planting was a 36'x 36' clump of plums planted on 3' centers. Within 4-5 years these plantings will develop into thickets that will provide loafing cover for broods during the summer and secure covey headquarters during winter.

Additional nesting and brood-rearing habitat for quail and songbirds was created by converting 232 acres of fescue pasture to native warm-season grass pasture (Photo 4). Substantial conversion costs (~ \$140/ac) were offset with cost-share assistance through the US Fish and Wildlife Service's (USFWS) and



Constructed wetland provides migratory habitat for ducks and foraging habitat for shore and wading birds.



Wildlife Mississippi Partners Program and EQIP. A regime of herbicide, prescribed burning and planting was used to eliminate fescue and establish native warm-season grasses. Mr. Bryan began rotationally grazing this native grass pasture in 2006. Despite an exceptional-



B. Bryan Farms in 1996.

ly dry growing season, the cattle pastured on these drought-tolerant grasses still achieved acceptable daily weight gains. Research conducted through Mississippi State University is currently underway to determine the specific benefits to cattle grazed during summer

> months on these native grasses as compared to those on non-native cool-season grass (fescue)(Photo 1).

Although his management focus is on creating yearround habitat, Mr. Bryan also plants several miles of grain food plots. He uses conventional tillage coupled with Roundup Ready, sovbeans in areas that he wants to kill fescue. After 2 seasons of cropping, the fescue is eliminated and the site is prepared for native grass establishment or shrub planting. Alongside his riparian buffers and shrub corridors he plants strips of milo to provide winter food. He rotates the locations of food plots to create fallow annual weed patches that provide brood habitat. Throughout his CP33 buffers, along field margins, and in odd areas he has liberally sown partridge pea. Periodic disking or prescribed fire will perpetuate these plantings forever.

Although he does not duck hunt, Mr. Bryan enjoys seeing migrating waterfowl and wading birds using his property. To provide these species with dependable habitat and his grandson with a place to duck hunt, Jimmy constructed a 20acre wetland (Photo 5) in a low, occasionally flooded portion of his property along Town Creek. Cost-share and technical assistance available through the USFWS/Wildlife

Mississippi Partners Program and WHIP allowed him to enhance local water quality and provide migration habitat for waterfowl and shorebirds.

The Results

Jimmy Bryan has made a substantial investment in conservation. This has occurred over time as his priorities have evolved from maximizing economic profits to developing a sustainable, diversified agricultural operation that demonstrates excellent stewardship of natural resources. In implementing an enterprise-wide conservation program, BBF has used a combination of federal farm programs and voluntary practices to simultaneously control erosion, improve water quality, and enhance wildlife habitat. With the implementation of each successive management practice, wildlife benefits grew as habitat increased in quantity and quality and became more interconnected.

Before initiating his various conservation practices, BBF consisted of 58% fescue pasture/hayfields, 25% crop fields, 15% woodlands and 2% development. Today, BBF is composed of approximately 38% pasture/hayfields, 21% rowcrop, 15% woodlands, 24% conservation practice, and 2% development. Erosion has been reduced substantially and, as a result, water guality in Town Creek, Hanging Kettle Creek, and downstream water bodies has improved. Bird surveys along field margins demonstrated 6-9 times greater abundance of wintering sparrows on fields with conservation borders. During the breeding season, grassland/shrub bird species, including bobwhite, common yellow-throat, indigo bunting, and dickcissel, were more abundant on bordered edges than conventional crop-field margins. During September, hundreds of blue- and green-winged teal settle on his managed wetland. In December and January, mallards, pintails, and other big-ducks regularly loaf on the wetland, feeding on the resources he carefully cultivates. Woodducks are year-round residents, nesting in the boxes Jimmy erected.

Although it is still early in the management program, bobwhite populations are also responding. When he first began to implement conservation practices his property had only 5-



The lack of idle native grass and weedy habitats limit bobwhite populations in agricultural landscapes. In late 2004, USDA Farm Service Agency's (FSA) launched their Northern Bobwhite Quail Habitat Initiative aimed at creating 250,000 acres of native grass

buffers along agricultural field borders in 35 states. Under the Continuous CRP, financial incentives are available to producers for creating Habitat Buffers for Upland Birds (CP33) on cropland. Eligible producers will receive annual rental payments for the length of the contract (10 years), plus bonus incentives and cover establishment and maintenance cost-shares. Besides benefiting bobwhite quail and farm economics, these buffers will also benefit other birds, mammals, reptiles, amphibians, and aquatic species. Additional environmental benefits include reduced soil erosion from wind and water, increased soil and water quality, and improvement of the overall on-farm ecosystem. Program sign-up is underway at local FSA offices and eligible land may be enrolled at any time until a state's allotted buffer acres have all been enrolled or December 31, 2007. Producers interested in CP33 should contact their local FSA office for more information. Mississippi State University, along with number of cooperators, recently developed a DVD to promote the CP33 practice. The DVD was developed for agricultural producers, and explains both the economics and wildlife benefits of the CP33 practice. A brochure was also developed to assist national promotion of the practice. Both the DVD and brochure are effective tools that can be used by natural resource agencies, conservation groups, and others to promote the CP33 practice to producers. Anyone interested in obtaining a copy of the DVD or brochure should contact Wes Burger at Mississippi State University, Department of Wildlife and Fisheries, Mississippi State, MS 39762-9690; 662-325-8782; phone: email wburger@cfr.msstate.edu. Single copies are free, and larger orders can be purchased for a nominal cost. Don't miss out on this opportunity to promote quail habitat practices in your area!

7 wild coveys. A survey conducted by Mississippi State this past fall documented 40 coveys. Granted, this is still not a high density bobwhite population, and Jimmy is not yet satisfied, but it is not bad for a working farm. Mr. Bryan is optimistic. Last year he bought 2 new bird dogs. The past couple of seasons, his dogs have consistently found birds, as many as 7 coveys on one morning. But he thinks he can do even better. This year he ratcheted up his



B. Bryan Farms in 2007 illustrating conservation practice implementation.

management even further, establishing an additional 171 acres of NWSG, 9500 ft of additional shrub corridors, 2900 ft of bicolor plots, and 129 summer grain foodplots. Mr. Bryan is sold on wildlife conservation and he has found federal farm bill programs a valuable tool in helping him to accomplish his stewardship objectives. He calls this "a win-win" situation. "We get fair compensation in establishing [the program], we get erosion control, we get habitat

> for birds, and we're building what we want for the future to pass on to our children and grandchildren." B. Bryan farms clearly demonstrate that wildlife management can be successfully integrated with cattle and rowcrop production on a modern working farm.

Wes Burger is a Professor of Wildlife Ecology in the Department Wildlife and Fisheries of at Mississippi State University. Wes received a dual major B.S. in Biology and Mathematics at Murray State University and a M.S. and Ph.D. in Wildlife Biology from the University of Missouri-Columbia. His research interests include bobwhite population ecology, impacts of federal farm programs on wildlife populations and response of early successional bird species to forest and agricultural management regimes.

Leslie Burger has B.S. and M.S. degrees in Biology from Murray State University and University of Missouri, respectively. She has conducted field research from the Galapagos Islands to Hudson Bay and several places in between. She has held professional positions with the Missouri Department of Conservation an assistant as research biologist and Vertebrate Ecologist. She currently works full time home schooling the Burger's three sons.

Management Calendar August/September

Implement habitat enhancement plans.

Summer is a good time to implement habitat enhancement projects that require heavy equipment such as timber harvests, road development, roadside enhancement areas, new hunting opportunities (such as hub & spokes, sinderos, etc), and creating new food plots. All of these projects or activities will add wildlife value to your property. Although tackling these projects during late summer is fine, try to plan future projects of this nature so that they can be implemented earlier in the growing season. This allows a longer time during the growing season for these areas to "recover". Timber harvests or dozer work that is done late in the growing season often results in poorer quality wildlife habitat because plants have not had time to re-colonize. Additionally, these areas are not as aesthetically pleasing during the following winter. However, completing these projects is more important than when

they are implemented. If you are unsure of how to enhance your property, seek the advice of a professional biologist. Most experienced biologists can envision what enhancements will benefit your property, wildlife and hunting, where enhancements should be made, and can provide guidance on the easiest way to achieve the desired results.

Begin flooding duck ponds.

Teal are usually the first ducks coming down the flyways as they migrate south for winter. Although it depends on where your property is located, you should expect to start seeing teal in late August through mid-September. To accommodate these waterfowl and/or to attract them for the early teal hunting season, flood at least 30% of your duck pond. To be most attractive, make sure there are some open water areas within the flooded area. The main reason for not flooding the entire duck pond is



oration caused by flooding. Seed deterioration rates. or the amount of time it takes for a seed to breakdown after being flooded, vary among different plant species. Most native wetland plant seeds are well adapted to flooded conditions and will last up to 3 months under water. However, most agriculture crop seeds breakdown much quicker. Thus, you only want to flood enough of your pond to provide early arriving teal with a food resource. Begin flooding the remainder of the pond in late October for the main flight of ducks. This will ensure the seeds you've worked hard to produce will remain longer into the winter to provide food and attract ducks. If you have never shot early season teal, you're missing some fun. Teal respond to calling and work decoys well and they fly fast in tight flocks which makes for some fast and furious shooting – notice I said shooting and not killing!! – they are tough to hit!

Service tractors, ATV's, and other mechanical tools.

As you know, equipment such as tractors, ATV's, and chainsaws are required to implement your wildlife management program. Because late summer is somewhat of a slow period for equipment use, it is a great time to perform maintenance or service. I recommend developing a maintenance sheet that includes all your equipment and keeping records of service. This will insure that equipment is taken care of and will be in good working order for the fall activities such as food plot planting and preparing your property for hunting sea-Don't forget about tractor implements son. such as grain drills, mowers, or harrows. We even keep a maintenance sheet for small tools like weedeaters and pressure washers.

Attend wildlife management seminars or deer management short-courses.

There are normally several wildlife management oriented seminars or short-courses happening during late summer and early fall. Attending these educational events are a great way to learn more about how to manage your property to enhance the recreational and wildlife value. These events also provide opportunities to speak with wildlife and fisheries biologists as well as other landowners. Check with your friends at *Wildlife Trends* to find out which events are in your area or which organizations you may need to contact. Another good resource for educational events is land grant universities that have Cooperative Extension Services.

Prepare areas to plant wildflowers.

Installing wildflower areas is an excellent management strategy for recreational properties. Wildflowers not only enhance the aesthetics of a property, but provide excellent foraging areas for turkeys and quail. The wildflowers attract a multitude of insects which are high in protein. Insects are the primary food source for turkey and quail chicks which require a high protein diet. Adults consume many insects as well. I can remember harvesting a turkey in



July/August 2007

Florida during the old fall season that had over 100 grasshoppers in its crop! The best time to establish a wildflower area is in the fall. I recommend a mix that is suited for your area that includes annuals and perennials. If properly managed, wildflower areas are easily maintained for several years. If you are creating a new wildflower area, prepare the ground just as if you were planting a food plot. That is, create a smooth, firm, clean seedbed. Refer to the planting instructions for the mix you plan to use. Most blends recommend planting well into fall after temperatures have dropped some to prevent germination of the perennials until spring. If you already have wildflower areas, you probably have a few flowers that will persist through late summer, but most have faded. Assess the wildflower areas. If bad weed problems exist (over 50% of the area is covered with weeds), mow the area then apply a broadleaf selective herbicide a couple weeks later once the weeds are actively growing again. However, if possible (if the weeds are not overwhelming), allow the area to sit until early to mid September. Holding off and applying this management strategy in September will provide more protection for fall wildflowers that will be germinating soon. Mowing the area will scatter seed and stimulate germination.

Start preparations for fall food plots.

It is difficult, if not impossible, to establish successful food plots without preparation. Planting quality food plots is a process that may span over several months, not a weekend. There are several factors that influence the suc-



Westervelt's Dave Edwards Earns Al Brothers Professional Deer Manager Honors

Dave Edwards, manager of Westervelt Wildlife Services, has been named the Quality Deer Management Association's 2007 Al Brothers Professional Deer Manager of the year. The Award annually goes to a full-time wildlife habitat manager for contributions to deer, deer hunting and deer management.

Dave earned a bachelor's degree in Wildlife & Forest Conservation from the University of Florida, and a master's degree in Wildlife Management from Mississippi State University.

In his role as manager of Westervelt Wildlife Services, he oversees a team of biologists and other staff that implements Quality Deer Management guidelines on more than 1 million acres across the southeastern U.S.

Dave has been a regular contributing author to *Wildlife Trends* for several years and we are proud to have him as part of our team. Congratulations Dave!



cess of a food plot program. Among the most important are establishing a well thought out food plot plan, ensuring proper soil fertility and pH, preparing a firm, smooth seed bed, only planting under favorable conditions, and controlling weeds. Each of these activities plays an important role in the success of your food plots. Here are a few tips on planting this fall:

- Test soil early and apply required lime (preferably at least 6 months prior to planting). It takes time for the chemical process to take place and effectively change the soil pH. If you didn't lime in spring or early summer, go ahead and apply it now...better late than never.
- Order seed and fertilizer as early as possible to ensure it is ready when you are.
- Ensure plots are relatively smooth. This takes time and should be done well ahead of planting dates. If you are broadcast planting, simply drag the field just before planting to provide good seed-soil contact. A cultipacker is very useful for this as well.
- Have your seed beds ready, but don't fall into the trap of planting too early. September is often a very dry month. Mid-October is ideal in most areas of the Southeast. This is when we start getting regular cold fronts that bring rain. Planting too early normally results in disease (mostly army worms), poor planting success due to droughty conditions, or if you receive adequate rain the food plot is knee high and less attractive to deer by the time gun season arrives.
- Adding annual reseeding clovers such as crimson or arrowleaf into your fall plantings will increase the quality and nutritional value of your food plots. With proper management, these clovers will regenerate again next fall which will save you money on seed costs.
- Use exclusion cages to monitor deer use and plot performance. An exclusion cage is a small "tube" of fence staked to the plot that is used to keep deer from eating the crop in a very small area. Cages are normally 2-3' foot in diameter and 3-4' tall. This prevents deer from

eating the crop within the exclusion cage which allows you to assess plot growth and deer use of the plot.

If you added annual clovers to your food plots last fall, September is the time to apply management to regenerate the food plots.

Incorporating reseeding annual clovers into your fall plantings will allow you to extend the plots wildlife value by providing quality food sources through early summer. Without them, fall plots of small grain such as winter wheat and oats generally become less productive and thus less valuable for wildlife by early spring. If you have planted annual clovers such as crimson or arrowleaf clover, allow them to flower and seed out - which normally occurs in April -June depending on which growing zone you are in. The flowers are important for game birds, particularly quail and turkey poults. Flowers attract insects which are an important component in the diet (source of much needed protein) for very young turkeys that were hatched this spring. Although plots generally get weedy after the clover has seeded out (which isn't always a bad thing), leave these plots alone until early fall. About 3 weeks to a month prior to planting time, mow the plots as low as possible, allow a week or so for the weeds to start growing again, and apply glyphosate (RoundUp) to knock them out and prep the plot for re-planting. If weeds were thick, you may consider burning the thatch off to expose bare ground (burning also enhances clover seed germination). Once the weeds die (or have been burned off), spread fertilizer, lightly disk the plot to expose bare ground and "stir up" the residual clover seed from last year, then plant annual small grains (wheat and oats). The key to the whole process is to not disk the food plot too deep. After the first planting, and if you've allowed last year's clover to seed out, annual clovers will reseed and come back every year - which not only provides great nutrition and extends the life of your fall annual plots, but will save you money on seed.

Limb roads

Because the growing season is essentially over, late summer or early fall is a great time to trim over-hanging limbs from your property's interior roadways. Interior or secondary roads can become a jungle in just one growing season if not maintained. Have you ever ripped the exhaust pipe off your tractor with an over hanging limb, or had a limb slap you across the face while driving a tractor down an overgrown road? Trimming limbs will help prevent equipment damage and/or personal injuries while using these roads. Removing these limbs will help these roads dry out quicker by allowing sunlight and wind exposure on the road and in some cases will enhance natural wildlife foods along the roadsides due to the added sunlight.

Check, repair and place new hunting stands

The best time of year to re-locate or place new deer stands on your property is in late winter after the deer season has ended or very early spring (before green up). The temperatures are cool, leaves are still off of the trees, and deer sign from the past hunting season is still fresh. Placing stands during this time also allows deer to get used to seeing them. If you are leaving a stand that is strapped or fastened to a tree in the woods over the summer, be sure to loosen up the straps to allow for the trees growth over the growing season. Late summer and/or early fall is when you need to revisit these stands to tighten them back up, inspect for loose nuts/bolts, rotten or lose wood, or any other safety hazards. This is also a good time to check the shooting rails, padding, and trim shooting lanes where needed in preparation for hunting season. However, do not over do the shooting lanes. Small openings are all that is normally needed to identify and shoot deer.



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