



PRACTICAL WILDLIFE MANAGEMENT INFORMATION

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Earl Says...

This weekend my hunting club will be hosting a few hunters from the AHERO organization. AHERO is a 100 percent volunteer-run, 501 (c) (3) charitable organization. More than 95 percent of all donations received go directly toward benefitting Veterans.

Military and Veteran suicide statistics are hard to pin down, but overall, the figure ranges from 20 to 22 or more suicides occurring each day.

The mission of AHERO is to reverse the upward trajectory of this statistic and, indeed, to substantially reduce their daily number. AHERO continues to work toward this goal by introducing those who have suffered serious physical and/or emotional trauma while serving to resources and programs that can help increase their overall quality of life. This includes boosting Veteran morale by:

- Developing a support network of Veterans across the country.
- Encouraging participation and engagement with others during AHERO activities and events.
- Fostering friendship, respect and empathy between participating Veterans and the community.

If you would like to help in any way, such as hosting an event or monetary donations, please contact Lee Stuckey at info@aherousa.org/donate.



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P.O. BOX 640596
PIKE ROAD, ALABAMA 36064
www.wildlifetrends.com
800-441-6826

PUBLISHER/EDITOR
Andy Whitaker

DESIGN
Walker360
2501 East 5th Street
Montgomery, AL 36107
(334) 832-4975

CONTRIBUTING AUTHORS

Dave Edwards
Dana Johnson
Brant C. Faircloth
Wes and Leslie Burger
Dr. Wes Wood
Theron Terhune
Marion Barnes
Ted DeVos
Bryan Burhans
Keith Gauldin
Rodney Dyer
Dr. Keith Causey
Ron Jolly
Dr. Stephen Ditchkoff
Tes Randle Jolly
Kevin Patterson
Ryan Basinger
G. Ryan Shurette
D. Clay Sisson
Kent Kammermeyer
Allen Deese
Scott Brown
Dr. Larry W. Varner
Jason R. Snavelly
Steve Tillmann
Mark Thomas

For Wildlife Trends editorial,
advertising, or change of address:
1-800-441-6826
info@wildlifetrends.com

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Brooding Over Bobwhite Brood Habitat

By Dr. Theron M. Terhune



Bobwhite chicks leave the nest within a couple hours of hatch, “ready-to-go”

Dr. Theron Terhune is a Wildlife Biologist and Research Scientist at a privately-owned property near Wilmington, NC and a Research Fellow at the Spatial Informatics Group – Natural Assets Laboratory (SIG-NAL). He received a B.S. and M.S. degree from Auburn University in Wildlife Science and a Ph.D. in Forestry and Natural Resources at the University of Georgia. Theron has studied gamebirds and fire-affiliated species for more than 20 years during which he has published 65 scientific articles in peer-reviewed journals and 34 popular magazine articles.

Ah, that cool, brisk air early in the morning during autumn makes me think about deer hunting, duck hunting, game bird hunting ... and, of course, growing bobwhite chicks. Yes, you read that correctly ... I said bobwhite chicks! Benjamin Franklin submitted that “If you fail to plan, you are planning to fail!” This is so true when managing for wildlife and especially wild bobwhite. Although fall signals the end of the bobwhite breeding season and the start of hunting season, it is also the time of year to be thinking about and planning for next year’s crop of birds.

Whereas bobwhite quail have a penchant for dying, they are also biologically engineered to offset their high annual attrition with

high reproductive capacity. Under ideal habitat and favorable weather conditions, bobwhite abundance can increase by 50% or more in a single year. In fact, awesome population irruptions (often known as population “booms”) are sometimes observed in the western portions of their range, such as in Texas, when optimal habitat and weather conditions collide – those populations can increase 3- to 4-fold in a single year. **What makes these rates of population increase possible?** Bobwhites are tenacious breeders and prolific nesters.

In the Southeast, nesting begins as early as late-March (in central and south Florida) and April (north Florida, Georgia, and the Carolinas) and continues into early

October. Bobwhite hens, uncharacteristic of many game birds, can successfully have multiple nests and multiple broods in a single season – sometimes they will even lay multiple clutches simultaneously. In fact, on sites with high-quality food resources, as much as 20% of hens can successfully produce a second brood and, a few may even attempt a triple brood. While uncommon, a single radio-tagged hen I once tracked using radiotelemetry produced 3 successful nests hatching 27, 18, and 16 eggs in a single season – that’s 61 chicks produced by 1 hen in a single season! Furthermore, bobwhite being the “Prince of Game Birds” are “politically correct” individuals such that males help raise the chicks with about 20%, on average, incubating



Although chick ecology remains the largest gap in knowledge for bobwhite management and conservation, recent advances in technology has afforded us the opportunity to better track young birds as well as assess their diet composition through NextGen DNA analysis using non-invasive sampling of fecal matter.

a nest thereby freeing up the hen to potentially bring off another brood simultaneously. This complex, but flexible breeding strategy make bobwhite biologically built to produce copious amounts of young birds. But the table must be properly set, with the right food and cover resources, to ensure that young birds can grow fast and survive well.

Since there is way too much ground to plow on the topic of brood and chick ecology, we will

dial in on 3 key aspects. First, we will dive into understanding the importance and vulnerability of the early life stages of young bobwhites, and then answer 2 important questions to ensure the right food and cover resources are sowed to reap the benefits of a plentiful harvest in fall recruitment. The first question is *what is quality brood habitat?* The second question is *how do you create and maintain brood habitat?*

Bobwhites live hard and die young! Even prior to hatching everything

and anything eats a quail bird – from ants to snakes to mammals to raptors (see Figure 1). Young bobwhites are tiny bumblebee-sized morsels upon hatching, making relatively small daily movements (<150 m on average), and are flightless during the first 2 weeks of life rendering them prime targets for many predators. During the first week of life, bobwhites are most vulnerable to snakes and mammals, but as bobwhites grow, raptors and mammals become their primary predators while snakes take a back seat, becoming less detrimental. A long-term, 19-year study conducted in the Southeast demonstrated that average 30-day and 90-day post-hatch survival of bobwhite was only 71% and 36%, respectively (Terhune et al. 2019; see Figure 2). This translates into only about 1 in 3 chicks, on average, that hatch make it to the fall hunting season. Moreover, in 78% of years where chick survival was above average, population increases were observed; in contrast, 70% of years where chick survival was below average, population declines were observed. This indicates that regardless of the chicken and egg argument, chick survival post-hatch is very important to maintaining or growing a population of wild bobwhite.

In this same study, it was also found that chick survival was higher later in the season compared to early in the season. In other words, birds hatching during the late hatch (August/September) survived better than those hatching in May/June (Figure 3). Although numerous factors likely contribute to this difference in survival, distribution of predation risk associated with more abundant food and cover resources is likely the driving factor. As such, a good management goal is to provide all the resources necessary for young bobwhites to grow fast and survive to the next day and next life

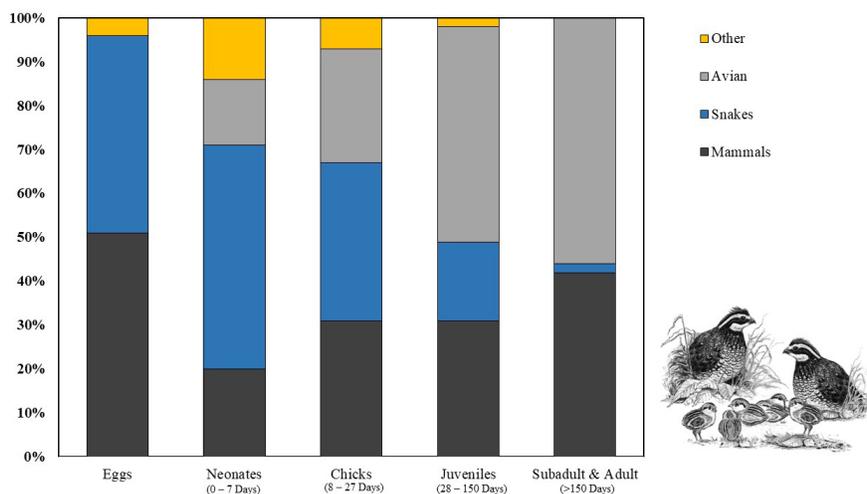


Figure 1. Proportional cause specific mortality at different life stages of bobwhite including eggs, neonates (0-7 day of age), chicks (8 – 27 days of age), juveniles (28 – 150 days of age) and subadult and adult (>150 days of age)

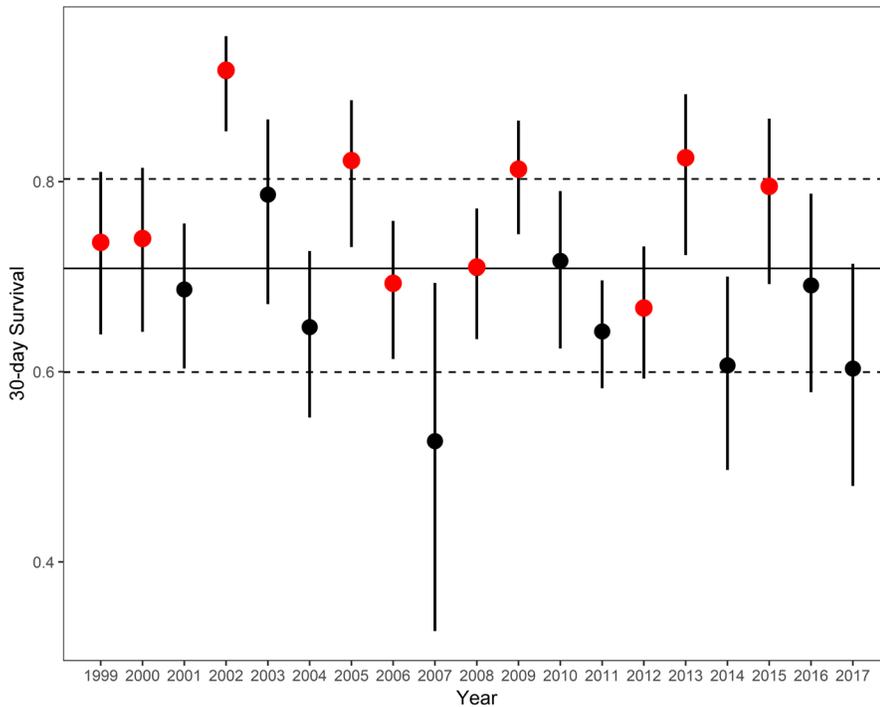


Figure 2. Annual variation in 30-day survival rates of northern bobwhite chicks on a private site in north Florida (see Terhune et al. 2019 for more details). The solid black line indicates average 30-day survival and dashed lines indicate 95% confidence intervals; and red dots indicate those years where subsequent fall abundance increased.

stage. This is accomplished by providing high quality brood/chick habitat throughout the breeding season, from May to October.

What is good brood habitat?

Given that bobwhite neonates and chicks are so good at dying, quality brood habitat meeting their daily requirements is essential to minimizing predation and maximizing growth and development. Thus, brood habitat should provide both **protective cover** from predators and weather as well as abundant **food resources**.

Protective cover should provide: (1) a canopy (1 to 6 feet above ground) of shade and concealment from predators, (2) openness at ground level to facilitate movement for foraging and escape from ground-dwelling predators, and (3) easy access to denser woody structure (aka thickets) for escape, loafing and roosting cover. In addition to providing protective cover, brood

habitat, especially woody structure, provides shelter from inclement weather (excessive heat out west or excessive rainfall along the East Coast).

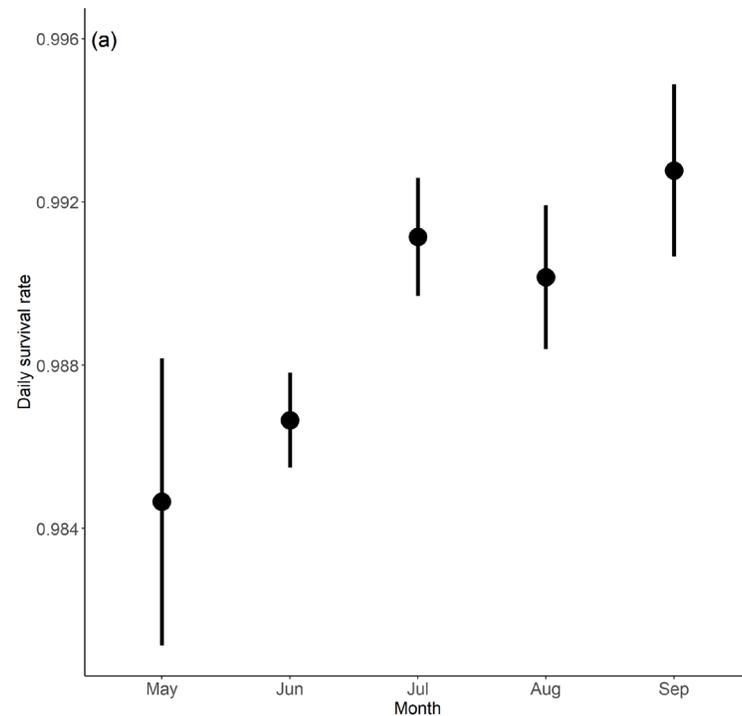


Figure 3. Northern bobwhite average daily survival with associated 95% confidence intervals for chicks delineated by month (see Terhune et al. 2019 for more details). Early hatched birds experienced lower average survival than later hatched birds.

Food resources required by young bobwhite include bugs, seeds, and greens. During early life stages (neonate and chick, especially prior to thermoregulatory independence at ~35-45 days), bugs comprise most of their diet consumption. This is for good reason! Insects provide rich proteins packed with essential sulfur-containing amino acids, not found in high quantities of vegetation or seeds. These sulfur-containing amino acids promote rapid growth and development of feathers necessary for flight and thermoregulation.

The primary insect families found in chick diets from NextGen DNA analysis of brood fecal matter include Lepidoptera (butterflies and moths), Coleoptera (beetles), Hemiptera (true bugs like stink bugs), Araneae (spiders), Orthoptera (grasshoppers), Diptera (flies, midges, etc.), and Hymenoptera (ants, wasps, bees, etc.). Whereas the exact type of bug is less important, the goal is to ensure that brood habitat provides

Snakes are a leading cause of mortality of bobwhite neonates and young chicks.

Left: A corn snake captured shortly after depredating a bobwhite quail chick.

Center: When captured we can massage or push out the snake's last meal (in this case a bobwhite chick).

Right: A master's student yellow rat snake in North Carolina which depredated 4 bobwhite chicks from the same brood..



Mammals, raptors and scores of other predators are common enemies of bobwhite chicks.

Left: Mortality evidence of a bobwhite chick, radio-tag circled in red, on a "plucking perch" of an owl.

Center & Right: A bullfrog depredated 2 bobwhite chicks from the same brood in North Carolina. You can see the bobwhite toes and radio-tag antenna sticking out of the frog's mouth. This is no doubt an anomaly but showcases that life as a quail is not easy.



high availability of an abundance and diversity of insects that are accessible (at ground level) to young bobwhites. If you are not seeing lots of bugs jumping and leaping off vegetation and pelting you in the face when you walk through the woods your brood habitat, especially for neonates and younger chicks, could likely use some work or fine-tuning.

How do you create and maintain brood habitat?

Brood habitat can be generated in many ways in the Southeast, but typically comes from aptly timed soil disturbance. The amount and intensity of soil disturbance will vary depending on both soil quality as well as weather (namely rainfall) conditions. On high quality sites, managing toward the Third Rule (1/3 native bunch grasses, 1/3



High Quality Soils

Low Quality Soils

Insect sampling using pitfall traps in high-quality (series to the left) and low-quality soils (series to the right) in unburned (UB), burned (B) and fields (F). High quality soils consistently produce more bugs in all habitat types and fields consistently produce higher bug yields than burned and unburned sites indicating that fields in poorer sites provide a much greater opportunity for bobwhite broods to forage efficiently than burned and unburned areas.



Establishing designated weed fields managed with annual disking in the fall often elicit the poster child brood cover, common ragweed, because it grows easily with properly timed disturbance and provides good protective cover above and openness at ground-level below for ease of movement as well as fostering an abundance of bugs. The accessibility, however, of bugs may sometimes be limited by the height of vegetation such that many insects feed on the foliage of the plant as seen here (red-circled regions highlight grasshoppers). Thus, managing for a diversity of heights in weed fields through rotational disking or fertilization or diversity of different plant types rather than a monoculture of ragweed can be beneficial.

woody cover, 1/3 forbs/legumes) with frequent fire (1-to-3-year fire-return interval) in the upland piney woods will in most cases provide the necessary ingredients for good brood habitat. Of the 3 habitat components, it's the forbs and legumes, commonly known as annual and perennial weeds, that are producing the most bugs. In terms of target plant species, Common Ragweed, is the poster child for brood habitat. In my journey across all 25 states of the bobwhite range, "ragweed" popped up just about everywhere and in every state where proper soil disturbance occurred. However, ragweed is only one of the plethora of weeds that can provide good protective cover and good insect habitat for bobwhite broods. In many cases, a

mixture of weeds (e.g., camphorweed, partridge pea, ragweed, etc.) is more desirable and will provide superior protective cover for broods and greater diversity of insects. Recent studies in Florida showed that burned piney woods were used at a higher rate by broods than unburned piney woods and other habitat types. It is important, however, to keep in mind that the proper scale (40-60 acre burn block sizes in a patchy mosaic of burned and unburned) of fire is being applied across the landscape on these sites.

As soil quality declines (often indicated by sandier, less productive soils), however, more intentional, and intensive disturbance may be required to elicit the vegetation

response needed to promote quality brood habitat in the form of annual weeds. In these cases, rotational disking and strip disking in the woods used in conjunction with prescribed fire or establishment of designated weed fields (see insert for more details) disked 1-2 times annually during the fall are popular and reliable methods for creating good brood habitat. One study in Georgia demonstrated that designated brood fields comprised of annual weeds were used at much greater rates by broods than other habitat types including burned and unburned piney woods. Brood fields provide excellent sources of insects and protective cover in both high- and low-quality soils compared to unburned and burned piney woods (see Figure 4). There is no hard-fast rule or industry standard for the number of weed fields needed because soil quality, rainfall amount, landowner preferences and hunting objectives, to name a few, will all influence that number. That said, on high-quality sites a low amount (0 – 10%) of designat-

BROOD FIELD ESTABLISHMENT

- **October – January**
 - Create fields by timber thinning or expanding wildlife openings, logging decks etc.
 - Remove stumps from fields by either stump grinding or excavator
 - Level out field using drag or harrow
 - Obtain soil samples of new fields – typically good to grow ragweed if newly created
- **January – February**
 - Depending on soil sample test results, apply recommended rates of lime to increase pH to 6-6.5.
 - Consider an application of chicken litter or other soil amendments to facilitate germination and moisture retention. Especially sandier fields.
 - Plant ragweed:
 - Option 1:
 - Firm up and smooth the soil surface with a culti-packer
 - Drill ragweed seed at 5-6 lbs/acre within the first <math>< \frac{1}{4}</math> inch of soil – make sure not to get it too deep!
 - Optional, add 1-2 lbs/acre of partridge pea
 - Option 2:
 - Disk field until soil is fluffy
 - Broadcast 5-7 lbs/acre and let the rain beat the seed in to the soil
 - Optional, add 1-2 lbs/acre of partridge pea

ed brood fields is typically needed, whereas a greater amount would be profitable on moderate quality soils (5 – 15%) and an even greater amount on low-quality soils (10 – 25%). These brood fields are ideally 1.5 to 3 acres in size and evenly distributed throughout the quail woods providing consistent access by broods to burned, unburned, and weed field habitats in proximity. Expansion of logging decks, wildlife openings, rights-of-way corridors, fallow field cropping, and daylighting roads can all be easy, less intrusive ways to add weedy areas using annual or rotational disking for establishing bobwhite brood habitat.

Regardless of whether brood habitat is easily obtained from burning your piney woods or requiring intentional establishment and annually maintenance of designated weed fields, all too often we get so caught up in producing bugs that we lose sight of the importance of woody structure (thickets) for bobwhite broods. A recent study showed that woody cover (e.g., shrub cover like American beau-

tyberry, briars, or young hickory or oak saplings) was used at greater amounts than expected for roosting and protective cover by bobwhite broods (Kubecka et al. 2021). This habitat provides not only protective cover from predators at night but may also provide thermoregulatory benefits during inclement weather like excessive rainfall.

A recent study (Terhune et al. 2019) found that chicks are particularly vulnerable to rainfall during the first 30 days of life, post-hatch. For

example, they indicated for every rainfall event greater than a quarter inch that a brood encounters during its first 30 days following hatch, there is an average of 12-16% reduction in chick survival, and cumulative or successive rain days can exacerbate brood loss (see Figure 5). Similarly, as the amount of rainfall a brood encounters during the first 30-days post-hatch, chick survival dramatically decreases (see Figure 5). These numbers truly underscore why a wet June

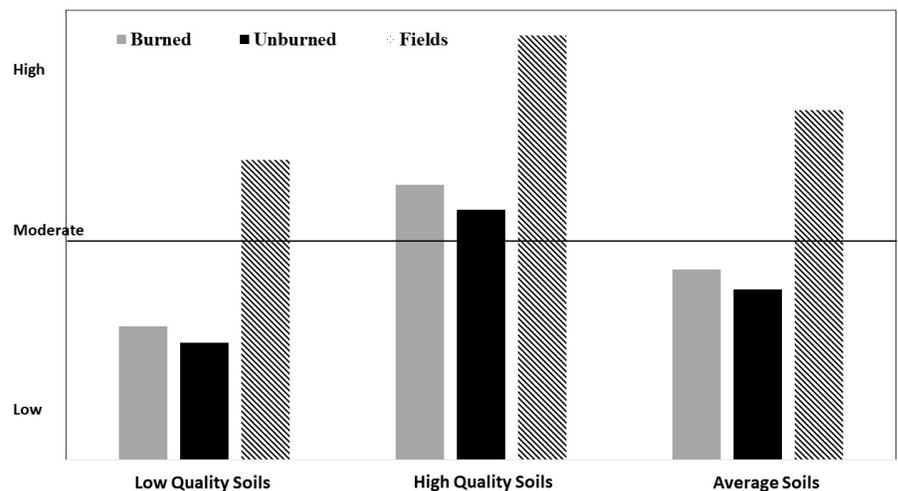


Figure 4. Relative insect abundance in burned, unburned and designated brood (“weed”) fields for poor to high quality soils.



Proper application is important to creating and maintaining high-quality brood habitat in the upland piney woods. Frequent (1-3 years) fire return intervals are required to maintain openness at the ground level and provide moderate amounts of bare ground (5- 20%) required by broods and chicks to facilitate movement, escape ground-dwelling predators and foraging

and July can be too much for bobwhite chicks and are generally not good for overall fall recruitment. Notably, this study was conducted on a site in the Red Hills, where the soils are more clay-based, and binds moisture and moderate temperatures are better than the sandy, low-fertility soils of the Albany region. As a result, bobwhite chicks

on properties with well-drained soils, like in the Albany region or the Carolina sandhills, may very well cope with rainfall events better than those in the Red Hills region. In contrast to abundant rainfall, lack of rainfall and extreme heat are known to also impact reproduction. For example, the effect of droughts on bobwhite abundance,

adult survival, and adult reproductive effort and success has been documented in Texas, but drought effects on bobwhite chicks and fall recruitment are largely speculative. Woody structure and canopy from vegetation and trees, even hardwoods, can provide thermal refuge in extreme heat.

That said, in some areas the bobwhite manager is constantly fighting woody cover and hardwood encroachment due to high-quality soils and/or abundant rainfall whereby excessive woody cover can inhibit growth of desirable plants such as forbs and legumes required by bobwhite broods. However, in other areas the manager is struggling to create and maintain woody cover. Depending on the timing of the hatch, edaphic conditions, and burn regime, deficient woody structure could be a limiting factor for bobwhite broods on your property. Generally, the “grassier” an area the greater the limiting factor woody cover might be which could be attributed to numerous factors such as fire frequency, fire timing and intensity or poorer soil conditions. A delicate balance of woody cover and hardwoods will provide the much-needed habitat broods need for roosting, escape and loaf-

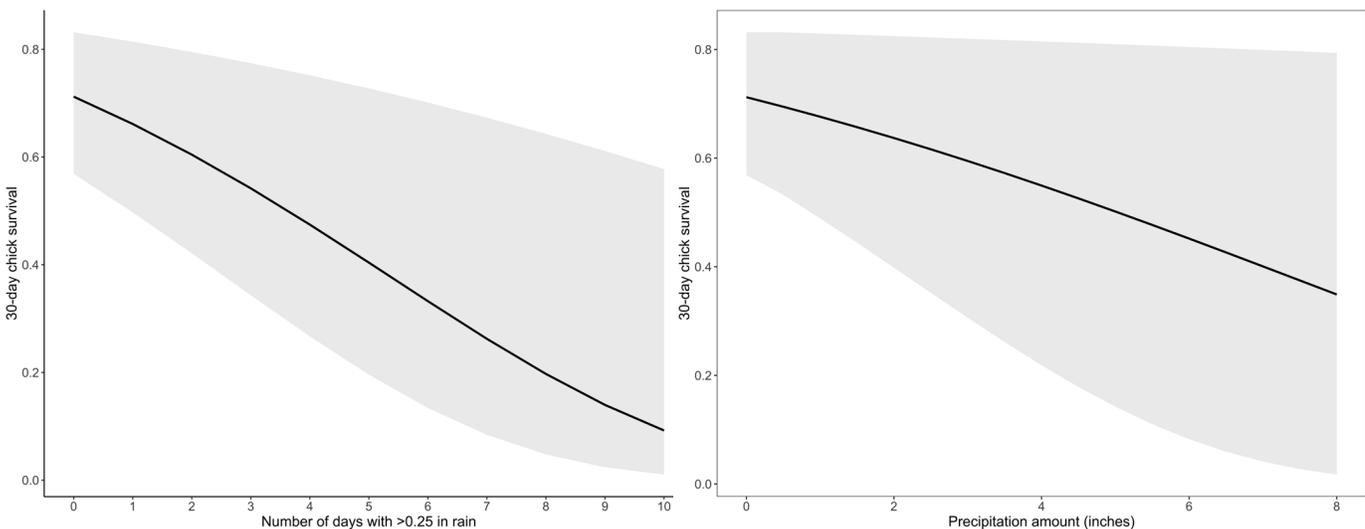


Figure 5. Thirty-day northern bobwhite chick survival estimates with associated 95% confidence intervals relative to (a) the number of significant (>0.25 inches) rain events and (b) the amount of precipitation. As the number of individual rain events increases and/or the amount of rainfall occurring during the first 30 days of a chick's life reduces survival.



A commonly overlooked vegetation component required by bobwhite broods is woody structure. Bobwhite broods commonly use sites (roost) with abundant woody cover more often compared to expected and what's typically available (random). These thickets provide concealment from predators and protection from excessive rainfall both during the day and nighttime while roosting.

ing throughout the summer. As such, when walking or riding your property a general rule is that you should be able to see a shrub thicket every 150 m (~490 feet) or so which is about an 8-iron approach shot from one thicket to the next. If woody cover is limited on your property, reducing the fire frequency, or altering the fire timing (burn earlier [Jan-Feb]) may release woody growth. An alternative approach is to plan carefully and plant woody patches using native bareroot seedlings such as plum, bayberry, and wax myrtle, depending on your geographic location.

Aside from manipulating habitat, predator control (removal of mesomammals) and supplemental feeding can have positive impacts on chick production, chick survival, and fall recruitment. One study in the Southeast showed that predator control may increase chick production by as much as 43% and could also potentially increase chick survival by as much as 15-20%. In 2 other studies, we found that chicks consumed supplemental feed at a

much earlier age than previously thought. While insects remain greatly important for growing healthy, robust chicks, greens and seeds are regularly consumed at the neonate stage and increasingly so during the chick and juvenile stages. In Florida, bobwhite chicks consumed milo as early as 7 days of age and chicks in North Carolina have been found to consume wheat as early as 5 days of age. Thus, feeding smaller grains such as milo and wheat during the breeding season may provide a consistent seed source to supplement insect diets and native seed stock, especially when native food resources are limited due to weather or poor soil conditions.

Take Home Message

Chick ecology marks the largest gap in knowledge for bobwhite management and conservation. However, advances in technology and recent research demonstrates the importance of chick survival to recruitment into the fall. In fact, a 10% increase in chick survival

could result in about a 24% increase in fall abundance – that's a rather large return to the gun! As such, an important driver of population growth is chick survival. One can increase chick survival by providing ample food and cover resources near roosting cover (such as woody shrub cover) to maximize growth and development and reduce predation risk. Soil disturbance through proper application of prescribed fire, rotational disking, strip disking or intentional brood field establishment will help to promote good cover and food resources for bobwhite broods. Implementing predator control and providing supplemental feeding using smaller grains during the breeding season may also profit chick production and chick survival resulting in increased fall recruitment and a greater number of birds to hunt.

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Stocking forage for a quality largemouth bass fishery may be necessary in your waterbody to establish a new forage base, or to boost an existing one.

Stocking Fish

By Scott Brown

One of the most common fish management techniques used today for improving fish population numbers and/or accelerating sportfish growth is to stock fish. Lake owners are always asking “should I stock more bass, bream/panfish, catfish or forage”? If your lake already has had largemouth bass stocked, then generally the answer is no more bass are needed, but usually several need to be taken out. But with today’s advancements in fisheries management and our knowledge of largemouth bass genetics, stocking additional largemouth bass may be a positive action in certain situations. Starting a new species or boosting an existing forage species is never a bad idea.

There is a difference between stocking a lake for the first time and supplementally stocking an established lake. First, knowing a little life history about the species present and or that you want to stock is necessary, or your lake manager will help decide what fish will thrive in your particular area, with habitat present and water chemistry in each of your waterbodies.

Stocking New Lakes

Prior to stocking a new lake, you need to set your management goals before the first fish goes in. Many landowner mistakes are made at the time of stocking because there was no plan and the plan gets changed after the initial direction and then time and possibly money

Scott Brown is a Biologist and regular contributor to Wildlife Trends Journal with over 35 years experience in research and managing natural resources throughout the Southeast. Scott founded Southern Sportsman Aquatics & Land Management in 2007 and now has clients from Texas to Florida and into the Carolinas. Contact him at tazmanlabs1@gmail.com or (336) 941-9056.

is wasted overcoming the initial stocking mistakes. Do you want a trophy bass lake, high-quality bluegill/redear sunfish, channel catfish, black crappie or all-around good fishing lake for several species?

If you want a general all-around good fishing lake, then start by stocking some of your forage species such as bream 500-750/acre (75% bluegill/25% redear sunfish) and small forage (minnow-type fish) which are usually mosquitofish and/or fathead minnows at a rate of 1,000/acre each species in the fall. Bass get stocked the following spring/early summer at a rate of 50-100 largemouth bass (Northern or Florida strain, depending on where you are located). Channel catfish can be stocked at 25 per acre every-other year if desired. If you take out more or less channel catfish than anticipated, this can be adjusted accordingly. After 3-5 years, golden shiners can be stocked at a rate of 100/acre if another forage species is desired. When stocking pure Florida's outside their natural home range, any Northern Strain bass that enters the system and begins breeding with the Florida bass will begin to weaken the gene pool. When Florida and Northern Strain largemouth bass are crossed, every subsequent generation starts reverting back to the Northern strain.

If a trophy largemouth bass fishery is desired, forage should be stocked 6-18 months ahead of predators such as largemouth or smallmouth bass, or striped bass hybrids. Stock 1,000 bluegill/acre along with 2,000/acre mosquitofish and/or fathead minnows. We like to do both, because the fatheads will quickly disappear after the small bass are stocked due to predation, but mosquitofish usually continue to thrive with quality shoreline habitat and provides forage for young

bass. Stocking forage well before the predators allows them time to reproduce before numbers start to dwindle. Not stocking redear sunfish into a trophy bass fishery is advised because they grow slower and do not reproduce in numbers like the bluegill. For a trophy largemouth bass fishery, I recommend stocking pure Florida's, the Northern/Florida cross, or all Female Florida strain largemouth bass. If stocking all females, stock every other year to simulate a natural length frequency and assure you have quality fish to catch well into the future and not just the life span of the first stocking. Again, if all females are used, the inadvertent male that enters the population will begin the natural reproduction process and if that male is of Northern strain, the Florida gene pool will be diluted over time. A year after small predators have been stocked, adding threadfin shad and/or golden shiners is advised for additional forage. Remember, that for trophy bass management, you need to provide forage of all sizes for all sizes of bass present. The first two years all predators are small, but as the first couple year class's grow, forage size also needs to increase, which is why you overstock forage in a new lake so some will outgrow the bass and become breeders helping the forage population to maintain numbers and maximize bass growth. To maximize bass growth, you must maximize forage numbers that include various sizes. **YOU CAN NEVER HAVE TOO MUCH FORAGE** to grow trophy bass.

If your lake is large enough (generally over 25 acres, but we have some clients with excellent bass and crappie populations in five-acre ponds) and has an adequate supply of threadfin shad, golden shiners and/or silversides (glass minnows) then stocking black crappie can be

performed. I recommend starting in the middle or lower end of the recommended stocking amounts that range from 50-100 per acre.

Stocking Established Lakes

As stated in many of my articles, largemouth bass stocking in an existing lake is very rare, but in some situations can benefit the bass fishery. Adding pure strain Florida bass to a Northern bass population will naturally generate crosses, producing the faster growing, more catchable, but shorter-lived Tiger Bass/Gorilla Bass/F1. To better improve this stocking, only stock pure Florida females into your waterbody that contains Northern males and females. If this is done, I recommend marking each Florida female fish with a fin clip so when caught in the future, it is not removed accidentally during small bass removal each year. These stocking techniques have been proven to improve a bass fishery, however, now you're adding bass to a population you are already removing fish from, so removing more bass becomes the task. When adding largemouth bass to an existing population, stock no more than 15-25/acre.

Largemouth bass growth rates can be accelerated with the decreased numbers of bass and increased forage. This statement is actually more accurate when talking about biomass (weight of individuals and total weight of all in a particular species or group). One big bass needs to consume large numbers of small forage to grow, but exerts lots of energy to gather that food, so it needs even more of that food source. Larger bass exert less energy when the forage size is larger and fewer are required to obtain the same amount. This is important when analyzing largemouth bass size to forage size. These need to be addressed and properly matched.



In other words, 10 lb. bass do not get that big if they are only chasing and consuming 1–2-inch minnows or shad all the time. The 10 lb. bass reaches that size when a steady diet of 6-8 inch and sometimes larger forage is consumed. We occasionally come across fish populations with several 4-6 lb skinny bass in a waterbody loaded with 1–3-inch forage, but we frequently come across bass populations with high numbers of 10–15-inch bass, no 1–3-inch forage and lots of large 9–11-inch bream/panfish. This is why electrofishing a lake is important, because all gaps can be identi-

As summer progresses, so does vegetation growth. Leaving some vegetation for habitat is advised, but if needed spot treating nuisance vegetation during summer will help maintain a better water chemistry balance and reduce fish stress or potential die-off. Once water temperatures cool, a larger treatment of nuisance vegetation can be executed if needed.

Electrofishing will help identify areas of your fish population needing a boost or indicating a new introduction of forage species that will benefit something else already present and can help after a fish kill to determine what species need to be restocked. (Photo credit: Andy Whitaker)

fied and a proper management strategy developed addressing the entire fish assemblage and not just the top predator. Typically, a stunted bream/panfish population with no large individuals present is the sign of a quality bass population and a quality bream population with lots of 8-10 inch or bigger bream is associated with a stunted bass population.

When creating or improving a largemouth bass, striped bass hybrid or crappie forage base, having multiple species in different size groups present helps supply the forage required to grow quality/trophy sportfish from birth. We always try to establish several species of forage for predators. This can allow

some forage species, once greatly reduced in numbers, to bounce back if the bass have started targeting something else. A forage base of minnows, bream, shad and shiners as opposed to one species is best. This ensures bass at different life stages and sizes can readily have food available. The more forage available at all life stages, the better growth rates with uninterrupted growth as they move from one forage size and/or species to the next. This translates into quicker growth and greater numbers of larger bass.

There are many kinds of largemouth bass forage species. This includes minnows, mosquitofish, grass shrimp, bream/panfish, gold-

en shiners, shad (both threadfin and gizzard), Tilapia, trout, yellow perch and crayfish. There are instances where largemouth bass have been documented with small bass (cannibalism), crappie and catfish in their stomachs, but unless it's a unique situation these are not in a largemouth bass's regular diet nor would we normally recommend managing for or stocking any of these as a forage for bass. We have seen in a large private waterbody in Central Florida where the bass are feeding regularly on armored catfish (brown hoplo) due to the lack of more desirable forage. On occasion, largemouth bass eat insect larvae, insects, frogs, tadpoles, snakes, turtles and ducklings, but these are not a steady food source and will not be covered in this article as viable or practical forage to be stocked. These are consumed on occasions or during a short time period each year when the opportunity presents itself.

With most forage species we recommend stocking only native species that have the opportunity to survive and naturally reproduce. Sometimes these species occasionally need restocking in the future if the bass reduce their numbers to where they cannot repopulate. There are a few species that can be stocked that are not native, knowing the individuals that are not consumed will perish due to water temperatures either rising or falling.

The most frequently stocked and most common largemouth bass forage is **bream/panfish**, and usually **bluegill**. Bluegills are prolific breeders and can sustain a population even under heavy predation from a quality largemouth bass population. Their growth rates and the lake's carrying capacity can be greatly increased through supplemental feeding with high quality fish feed. Once stocked, this species



Golden shiners are not present in a manmade lake. Once the bream become established, stocking golden shiners for largemouth bass, striped bass hybrids and/or black crappie will benefit those species. This big one is a breeder or food for a big largemouth bass.

rarely needs to be re-stocked, unless it is to jump start a stunted bass population with too many bass of one size, not growing into the next size class. These can be stocked into an existing waterbody at 250-750/acre depending on the current predator sizes and numbers.

The second most frequently stocked forage for bass is the **threadfin shad**. It requires fair water quality, but if you want them to live more than a few months, an algae bloom (green water) is required to keep them alive and to allow them to establish a self-sustaining population, which is the same for gizzard shad. If you stock threadfin shad into a clear lake they will eventually die from lack of food, as they feed on the planktonic algae. If you understand they will need to be restocked and have the budget, it is quite acceptable to annually or biannually (spring and fall) restock threadfin shad. Threadfin shad are susceptible to thermal die offs when water temperatures get below 40° F. Threadfin shad are generally targeted by small to intermediate size bass (up to 20 inches), striped bass, hybrids and crappie as they usually have a maximum size of approximately four inches but can reach six if in a nutrient rich environment. We recommend stocking threadfin shad at a rate of 700-1,000/acre. Gizzard shad grow much slower in



Bass love to feed on bluegill, but there are higher protein foods that promote even faster growth that can be stocked.

the North than in the South. In the South, gizzard shad can reach sizes beyond what a trophy bass can consume and become a problem fairly quickly as opposed to a solution. If you have threadfin shad and gizzard shad 8-14 inches long, but not much larger, you have forage for all sizes of bass, including trophy (10-15 lbs) bass. I have observed 13-plus lbs largemouth bass with 15-inch-long gizzard shad in their mouths. Big bass require big forage!

Another common self-sustaining forage is the **golden shiner**. These can be grown on small pellet fish feed and are common throughout the Mid and Southern states.



A well-established forage species is a must to maintain a trophy largemouth bass fishery. These small threadfin shad are great food for smaller largemouth bass, striped bass hybrids and black crappie.



These tilapia from a lake in Florida are mostly too large for largemouth bass forage, but in states north of there they can be stocked at two-to-three inches in early spring and provide food and growth for largemouth bass and striped bass hybrids all spring, summer and fall until they die off.

Some landowners even build a separate shiner pond on their property where they grow and feed just shiners, remove annually by seining or cast netting and stock into their “bass lake” as a forage source. If trying to establish a naturally reproducing shiner population in an existing bass population, you must stock both small and large individuals so the bass cannot consume them all before they spawn. Shiners, if established, can feed both small and large bass, striped bass, hybrids and crappie, if the populations remain balanced.

Fathead minnows are a common starter forage stocked in a new pond situation for small largemouth bass or large bream if present. They are difficult to get established. If you have a lot of flooded timber and submerged logs they may begin to spawn, but generally they live until consumed. Since they do not

get over three inches, they are only forage for small bass and become unimportant once bass individuals begin reaching 12 inches. In a new lake, once these are gone, restocking is generally not necessary if there are bream/panfish present. We recommend stocking at a rate of 1,000-2,000/acre.

Mosquitofish are a better alternative to fathead minnows. They are native throughout many areas and reproduce and survive better than fathead minnows. A large, single stocking of mosquitofish will sustain their population numbers and feed small bass forever if adequate habitat is present. We recommend a stocking rate of 1,000-2,000/acre.

Tilapia, yellow perch and trout stocking have become popular. These fish generally will die either from water too warm or cold,

depending on the species and where you are located. Tilapia are stocked in early spring, once water temperatures will remain above 55-60° F. They will grow and reproduce until the following winter and die once water temperatures drop below 55° F. During this time, largemouth bass and striped bass hybrids are on full feed and will consume many of them. We recommend stocking 100/acre. Yellow perch and trout are the opposite, where you stock them in the fall and they will die off from warm water temperatures (80 and 70 ° F, respectively) in late spring/early summer. Although largemouth bass feeding does slow down as temperatures lower, they will feed throughout winter and prior to these species dying off, big largemouth bass will consume many of them before switching over to another food source, which gives time for resident forage to grow and spawn



Stocking the proper number of grass carp is tricky, and once they get this size they are not consuming nearly as much plant material as desired.

before becoming a preferred forage target. We recommend stocking small trout and yellow perch no more than 100/acre. All these forage species will consume pellet fish feed during their respective times of year in your pond. In early spring, if feeding the trout or yellow perch occurred over winter, harvesting these fish for consumption is recommended before they perish. These species add another sportfish of opportunities. Before engaging in the stocking of any of these species, understand that it may be an annual event, and that

your state's laws must be reviewed carefully on the stocking of such species, as a special permit may be required, or the species may be banned.

Stocking **crawfish** has also become popular in some areas to supplement a waterbody's natural forage base. Although native in most areas, their reproduction and survival rate in a quality large-mouth bass fishery is poor and they do require restocking once the bass have knocked the numbers down to levels from which they cannot

recover. We recommend stocking at a rate of 25 lbs./acre if into a new predator-free waterbody and 50 lbs./acre if predators are already established. Use only native crawfish; do not introduce species non-native to your area.

We never recommend stocking **grass carp** into a new waterbody. Establishing desirable quality habitat (vegetation) is a must in a new pond. However, grass carp can be used to maintain a habitual, invasive plant species after it has been treated with an herbicide. Never stock grass carp at high rates to reduce or eliminate plants without first treating with herbicide. Grass



carp are best used as a tool to maintain low amounts of vegetation, not reduce or eliminate it. Water chemistry problems and algae issues can follow, if over stocked. Before treating and stocking grass carp, properly identify all the plants in your lake for herbicide selection and how well grass carp will control the target plant present, and other desirable plants. Grass carp consume many plant species, and do not consume many other plant species, so first determine the reaction to your actions before making mistakes. The two biggest grass carp use mistakes are over stocking and stocking for a target plant they will not eat. Here is a link that lists common plants and the herbicides that work best, and the effectiveness of grass carp to control that plant: <http://www.southernsportsmanaquatic-sandland.com/herbcarpuse.pdf>. Depending on the target plant species, stock between 3 and 10 per acre. You can stock at a lower rate, but repeat every 3-4 years so you would not have all carp present the same age and that will die around

Generally, stocking largemouth bass into an existing population is not performed, but with today's knowledge of bass genetics and options hatcheries offer, in some situations stocking can be done and greatly improve future growth of bass offspring

the same time. This spreads out the sizes, promotes steady vegetation consumption and spreads out the cost. These are more decisions best to be made by your lake manager, who has experience in these situations.

Stocking After a Fish Kill

After a fish kill, have an electrofishing survey done to get a snapshot of what species remain and in what numbers. Usually, a fish kill does not kill 100%, but in rare occasions it will. Determine the severity and adjust previous stocking numbers to your unique situation. Again, erring on too much forage and too few predators is better than the opposite. Once predators start breeding, it does not take long for them to repopulate, and the fewer in the ecosystem the faster those few grow.

As you can see there are many options for improving a lake's fish population using stocking. Multiple

forage species and sizes are imperative to grow trophy or quality largemouth bass. Variable sizes of forage are as important as the species present. The better your habitat, the more likely you are to have some of these species establish and naturally reproduce eliminating or reducing future stockings. Stocking is an essential management tool for lake and pond management. It can be used to enhance an existing population or introduce an entirely new sportfish or forage species to your waterbody. There is more to stocking grass carp than throwing a bunch in and watching the weeds disappear. Do a little research and know what you are doing or consult a qualified professional regarding stocking before making costly mistakes setting you back time and/or money.

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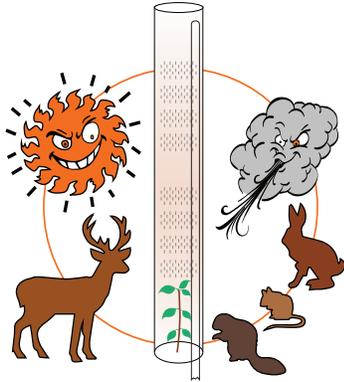


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Herbaceous Seed-Producing Plants and Their Importance for Bobwhite Quail and Other Native Bird Species.

By Ryan Shurette



G. Ryan Shurette is a Certified Wildlife Biologist and Owner/Guide of DragSmoker Fishing Guide Service. Contact him at 256-404-5814.

Some plants are great habitat components because they make a lot of arthropod biomass for birds and other wildlife to eat. Others are important for the seeds and fruits they offer. Herbaceous legumes can often provide the best of both worlds. Legumes are probably the most important family of seed-producing plants for Northern bobwhites.

It is generally accepted that eating a balanced diet, especially one that contains plenty of fruits and vegetables, is one of the key requirements for good health. Most folks are therefore mindful of what they eat. But sometimes it is easy to forget about all the seeds we, as humans, consume. Sure, we sometimes snack on sunflower seeds, or enjoy sesame seeds on our burgers. But when we take a closer look at the list of the world's most common foods, we can then appreciate the fact that breads (made from the seeds of wheat, rye, and other grains), the large variety of beans and peas, corn (and corn products), rice, and many others all come from seeds, and we can then see how important they are to humans on a local and global scale.

The same concept is true for many wild bird species, and the seasonal availability of seeds to many birds is truly a matter of survival, not just preference. What makes seeds so valuable as a food resource? We all know that seeds are propagules for the reproduction of flowering and some non-flowering plants. The dormant plant embryo is obviously contained inside, but the parent plant also packs the seed with the energy reserves the embryo will need to germinate, often in the absence of sunlight. Depending on the species and nature of their germination and dispersal, seeds may be small if they are likely to germinate quickly on top of the soil or other exposed substrate, or if likely to be buried under deeper soil or debris, they may be large and

choked full of carbohydrates, fats, and other essential nutrients to allow the growing embryo to successfully sprout, develop, and even build a few leaves, before those nutrient reserves run out. After that, a seedling can generally make its own food using photosynthesis. All of these stored nutrients are what makes seeds such important food resources to humans and wildlife.

For wild birds, summer in the fields and open woodlands is a time of plenty. During the warmer months, insects and other arthropods and invertebrates abound. Even seed-eating birds like Northern cardinals, Indigo buntings, Chipping sparrows, Eastern towhees, and American goldfinches can easily catch them. Virtually all passerine

bird species prey heavily on these nutritious arthropod food sources to kick-start fat reserves and pay the heavy toll required to lay and incubate eggs and raise offspring. However, when the summer ends and the cool winds of autumn begin to blow, insects become scarce and most of the bird species that stay for the winter must rely on other forms of nutrition. Since birds are warm-blooded and can thermoregulate just like we can, they can usually make it ok as long as they have enough food. Seeds are the resources that provide many species the energy needed to survive the frigid winter nights. It is common knowledge among wildlife managers that Northern bobwhite quail, Wild turkey, and Mourning doves seasonally target grain crops like wheat, corn, and millets. However, these traditional commercial agricultural crop plants, as well

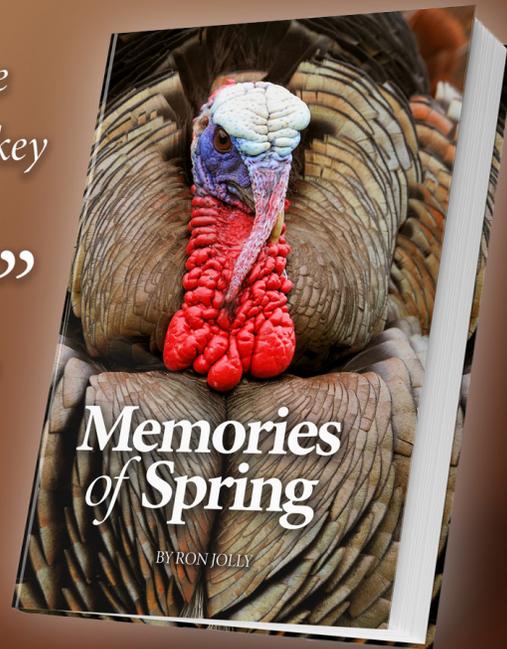
as the many trees and shrubs that produce seeds and fruits that are utilized by wildlife will not be the focus of this discussion. Instead, in this article we will concentrate on herbaceous seed-producing plants that are most important to native birds, including Northern bobwhite quail.

Which seed is most important to a wild bird? The answer is, of course, a seed worth eating that is available at the time the bird needs it. This may seem to be a strange and oversimplified answer to such a broad question, but consider the plight of a typical bobwhite or sparrow. Wild birds must locate their food each and every day. Sometimes all they find to be available are a few high quality (large and/or highly nutritious) seeds. At other times and locations, they may find abundant stands of low or medium quality

seed-producing plant communities. Some backyard birds (like Carolina chickadees and Purple finches) would argue that proso millet and black oil sunflower seeds are the best choice, mainly because they can just belly up to a bird feeder that never seems to run out. Some managers may spread milo or wheat along bare roadsides throughout the fall and winter. In that scenario those seeds are probably readily available and are easy to fill up on and therefore they may be the best choice. Sometimes seeds can be abundant, and of high quality, yet inaccessible due to the thatch of sod-forming grasses like Bahia, Dallis, Bermuda, or Fescue. So, the tradeoff of availability (seasonal abundance) at the time the bird needs to eat, and quality (size, and fat and protein content) of the seed creates a kind of matrix that will determine what is the best seed

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for a bird. This matrix is further complicated by forage habits, physiological adaptations, and range of individual bird species, as well as harshness of conditions, etc. For example, most seed-eating birds have gizzards that help them grind seeds and break their hard coats. Some species however have more efficient seed-digesting systems than others. Also, while almost all seed-eating birds have thick stubby beaks for cracking seeds, some smaller species obviously might have weaker mandibles and less leverage, a force that is required to handle larger seeds. Therefore, different species of birds will prefer and focus on different species of herbaceous plant seeds. Rodents and insects often compete for seed resources too so when a seed falls to the ground the clock often starts ticking for its availability.

Just as different birds have different physiological adaptations, wild birds also use different strategies for accessing seeds. “Niche partitioning” allows multiple seed-eating species to occupy and forage in the same habitats. In an eastern Texas study by Allaire and Fisher (1975), three species of sparrows (Bachman’s sparrow, Field sparrow, and Chipping sparrow) were observed to have significantly different foraging traits. Bachman’s sparrows were observed to forage almost exclusively for cast seed on the ground, while the other two species often located and consumed seeds from low broadleaf vegetation and grasses that had not yet been cast. Field sparrows frequently perched on grasses and small stems containing uncast seeds or seed heads, riding them down to the ground where they accessed and consumed them. This study also noted that Chipping sparrows were much more gregarious than the other two species and tended to forage for seed in winter flocks of as

many as 50 individuals. American goldfinches are also known to forage in small flocks and they also commonly perch, and pluck seeds the ripened seeds of thistles and sunflowers (*Helianthus* spp.) from the standing plant.

We have established that different birds prefer and utilize different species of seeds, but there are certainly some herbaceous plants that are “better” than others for quail and other birds. Generally speaking, **legumes** are any member of the pea family and they are known for their high protein content (in the leaf and foliage as well as in their seed). Deer and other wildlife managers know that it is not uncommon for peas and other legumes to contain upwards of 30% crude protein. Some plants are great habitat components because they tend to serve as good warm-season insect habitat and therefore they make a lot of arthropod biomass for birds and other wildlife to eat. Others are important for the seeds and fruits they offer. Herbaceous legumes can often provide the best of both worlds. Depending on the specific location and the local soil characteristics, legumes are often the most important group of plants when it comes to high quality seed production for bobwhite quail and some other ground-foraging birds. Most legumes produce relatively large seeds. They are also significant because they have a hard durable seed coat which allows them to persist through the fall and winter months, even into spring when many other seeds have degraded. One of the most popular legumes among quail managers is **partridge pea** (*Chamaecrista fasciculata* and *C. nictitans*). These two similar species are easy to identify by their small bi-pinnately compound leaves and abundant showy yellow flowers that form in late summer. Although



Partridge pea stands can create model foraging conditions in summer for brood-rearing bobwhites, as well as in the fall when they have dropped their seeds. The stems are far enough apart that bare, open ground can be accessed while still having plenty of cover overhead.

they do not contain nectar, partridge pea flowers produce abundant pollen resources, and they are sought after and pollinated by bumblebees, honeybees, and other long-tongued bees. From August through October the plants form and set abundant hard black seeds that are highly prized by bobwhites and other seed-eating songbirds. Partridge pea stands create model foraging conditions in summer for brood-rearing bobwhites, as well as in the fall when they have dropped their seeds. The stems are far enough apart that bare, open ground can be accessed while still having plenty of cover overhead. Access to bare ground and the seeds that lie there is critical to bobwhites and other weak scratching birds. Although partridge pea can be readily established by planting (typically during Feb-March), it can usually be encouraged by soil disturbance and established from the existing seedbank by fall disking or frequent prescribed burning. Besides bobwhites, partridge pea

seeds are also commonly consumed by Mourning doves.

Partridge pea is certainly popular, but other native legumes such as **bush-clovers** (*Lespedeza* spp.) and **tick-trefoils** (*Desmodium* spp.) are also important producers of highly nutritious seeds. **Native lespedezas** (including creeping; *L. repens*, trailing; *L. procumbens*, roundhead; *L. capitata*, slender; *L. virginica*, and hairy; *L. hirta*) grow in open woodlands, along roadsides, forest edges, and in old-fields. **Hairy** and **roundhead lespedezas** (typically having cream-colored flowers), as well as **slender lespedeza** (clusters of lavender pink flowers), grow upright to a height of about four to five feet, while the other two species (both producing lavender pink or purple flowers) have running habits and grow low to the ground. All five species produce hard dark seeds that are preferred by seed-eating birds. Asian varieties of lespedeza (like bicolor; *L. bicolor*, and sericea; *L. cuneata*) have been used traditionally in southern quail management but these species can become invasive in open, burned habitats, and are therefore now commonly controlled with herbicide by landowners and wildlife managers. Bobwhites and many songbirds readily consume the hard black seeds of bicolor, and the seed is of good quality, but this species can form dense monoculture stands that do not carry fire well. If extensive enough, a bicolor stand can suppress native plants that provide brood-rearing and nesting habitats. Unfortunately, the same habitat management activities (especially burning to increase sunlight reaching the forest floor) that promote abundant native herbaceous ground cover can also spread bicolor. This plant is becoming especially invasive in forests with dry clay soils.

Tick-trefoils (also sometimes called beggarweeds) are also excellent seed producers in the late summer and into the fall and winter months. This group of plants look very similar to the lespedezas (both typically have leaves with 3 leaflets) but the tick-trefoils produce segmented fruits called loments. Each small pea-like seed is encapsulated in a seed pod that has tiny hooklets covering the outside. Each sticky segment of the loment can break apart, and as any quail hunter knows very well, easily hitchhike in an animal's fur or on a person's field jacket or pants. **Wild Desmodium** seeds are typically one of the most important foods for bobwhites in the Southeast. Some common species include **stiff** (*D. obtusum*), **smooth** (*D. laevigatum*), and **prostrate** (*D. rotundifolium*) tick-trefoils. These varieties are fairly common in open woodlands and along rights of way where there is at least some available sunlight. All three have pink or purple flowers in late summer and drop seeds in fall and early winter.

Other "miscellaneous legumes" such as **pencil flower** (*Stylosanthes biflora*) and **dollarleaf** (*Rhynchosia reniformis*) typically occur scattered along roadsides, edges, and in open woods, and both have yellow flowers. Pencil flower is found across the Southeast from Texas into to the New England states, while dollarleaf is typically found only in the sandy soils of the coastal plain. **Wild bean** (*Strophostyles umbellata*) occurs across the eastern US and it is a vine-like species that produces a few long black bean pods per plant. Mourning doves and bobwhites prefer the fuzzy bean seeds that are released when the beans ripen and dry. **Spurred butterfly peas** (*Centrosema virginianum*) also produce trailing vines that build and cast good quality seeds. All of these miscellaneous legumes are readily consumed by quail and other songbirds, but rarely do they occur in dense stands and therefore their availability limits their importance in many southeastern forests. **Vetch** (*Viscia* spp.) on the other hand can form dense stands, espe-



In the Southeast, common ragweed (*Ambrosia artemisiifolia*) and giant ragweed (*A. trifida*); which can grow to twelve feet tall) are the most common and most important varieties. Ragweed stands can make good cover and both species produce abundant seed that is high in fat and protein. (Photo in public domain)



Many *Desmodiums* (also called tick-trefoils or beggarweeds) are excellent seed producers in the late summer and into the fall and winter months. Wild *Desmodium* seeds are typically one of the most important foods for bobwhites in the Southeast.

cially in fallowed croplands and it can be semi-important for bobwhite and other songbirds in some cases. Indigo bunting for example, is known to focus on vetch seed when it is available. However, wild vetch produces seeds much earlier in the season (typically in summer) than many of the aforementioned legumes, and it often grows amongst grasses and other lush summer vegetation that render the cast seeds inaccessible. Bobwhites supposedly browse the foliage of vetch in summer.

Moving on from legumes, many broadleaf forbs are also good seed-producers. **Ragweed**, for example, is an herbaceous (sometimes semi-woody) annual that cannot be left out of this discussion. There are over a dozen species of ragweed in North America. In the Southeast however, **common ragweed** (*Ambrosia artemisiifolia*) and **giant ragweed** (*A. trifida*); which can grow to twelve feet tall) are the most common and important varieties. Ragweed stands can make good cover and both species pro-



White-throated sparrows rely heavily on the seeds of smartweed (*Polygonum* spp.) in fall and winter in many locations. (Photo by National Park Service)

duce abundant seed that is high in fat and protein. Like many legumes, these seeds can persist on the plant or on top of the soil well into the winter, making them a very valuable source of nutrition. Several sparrow species, dark-eyed juncos, and bobwhites are known to utilize ragweed during late fall and into the winter. Just like partridge pea, a dense stand of ragweed, often produces ideal conditions underneath its canopy for both bugging in summer and foraging for seed in fall and winter. Birds can forage in relative safety while being concealed from hawks and other avian predators. Many bobwhite managers hold ragweed as the absolute most important plant on their property. It is hard to disagree with that considering the various benefits to quail and upland seed-eating birds. Established ragweed stands can be maintained periodically (ragweed is a pioneering annual and therefore it needs frequent disturbance) with growing season prescribed fire, herbicide release applications, and rotational heavy disking. But what if ragweed is completely absent on

a property? Establishment can also be as simple as fall or summer disking in some situations where the seedbank holds the species (especially in fields or on lands with a history of disturbance or farming over the past few decades). In other cases, ragweed seed may be absent, and planting commercially available seed may be the best option of building ragweed stands over time.

Woolly croton (*Croton capitatus*) is another notable seed-producer for Mourning doves and Common ground doves. It usually occurs as scattered individual plants, but it can also sometimes form stands. Some managers plant it for doves or other gamebirds, and I have seen strong preference by bobwhites for feeding in dense stands of planted croton. On one particular property a covey or two of bobwhites would repeatedly take refuge in a large croton stand and would be there almost every time I went into the stand. After kneeling down to investigate the conditions beneath the croton canopy I could clearly see why. The numerous

brown croton seeds were everywhere on the bare ground, and there was essentially a completely closed vegetative canopy about 2 ft tall over the buffet of seeds. There was simply no need for the birds to leave it. Foraging on the open ground while visually searching for seeds can be dangerous for a small bird. Sharp-shinned and Cooper's hawks are always on the lookout for them. In a Texas study by Worthington et. al. (2004) Northern cardinals preferred the seeds of croton as well. As far as other forbs go, seeds of **goldenrods** (*Solidago* spp.), **native sunflowers** (*Helianthus* spp.) **asters** (*Aster* spp., *Symphiotrichum* spp.), and many other broad-leaf herbs are consumed to varying degrees by native wild birds. **Smartweed** (*Polygonum* spp.) is another very important forb. White-throated sparrows rely on it heavily in fall and winter.

When it comes to edible seeds,

bunchgrasses are typically less important than some of the previously mentioned plant families. While bunchgrasses do provide important nesting and foraging cover and serve as fine fuels for periodic fire (which, in turn, is important for maintaining early seral conditions), they typically offer little in the way of nutritious seeds. Henslow's sparrows are known to sometimes eat **wiregrass** (*Aristida* sp.) seed but they are known to avoid other bunchgrass seeds like **little bluestem** (DiMiceli, 2006). Other grasses, however, can be very important seed producers. In the 1975 Texas study mentioned earlier, grass seeds were the most popular fall and winter food resource among all three target sparrow species.

Crabgrasses (*Digitaria* spp.), **panic grasses** (*Panicum* spp. and *Dichanthelium* spp.) and **foxtails** (*Setaria* spp.) ranked among the most consumed seeds, with

Bachman's sparrow focusing on crabgrasses, while Chipping and Field sparrows shared a similar fall and winter diet of mainly panic grasses and foxtail millets. Grass seeds are typically very important to sparrows in fall and winter. Judd (1901) recorded the winter diet of Song sparrows across Canada and 26 states as containing mainly the seeds of grasses (24% grass seeds; most of which was *Digitaria* spp.). Martin et al. (1951) noted that seeds of foxtail grasses (along with smartweed; *Polygonum* spp., and ragweed) were the main winter foods in Song sparrows across the Northeast and in the Pacific regions. **Crown grass** (*Paspalum* spp.) is a different variety of grass that is consumed by bobwhite quail, but it is not a primary food in most situations.

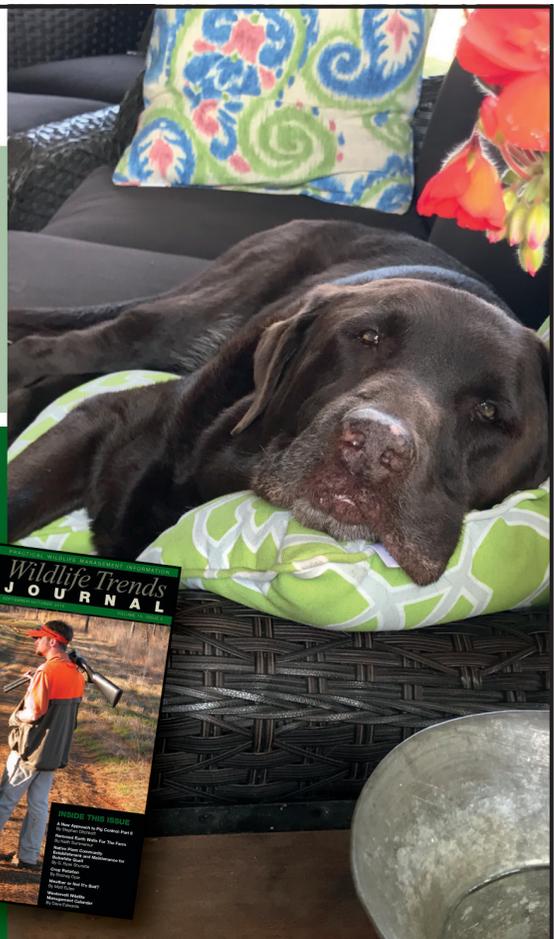
Sedges (Cyperaceae family) are sometimes overlooked by wildlife managers, but they can serve as

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Crabgrasses (*Digitaria spp.*), panic grasses (*Panicum spp.* and *Dichanthelium spp.*) and foxtails (*Setaria spp.*) rank among the most consumed grass seeds in many sparrow species. *Dichanthelium* shown on left and *Setaria* on right.

valuable cover and as sources of seeds, especially in wet open habitats.

Nutrushes (*Scleria* spp.), which are in the sedge family, were found to be very important for Henslow's sparrows in southern Louisiana (DiMiceli, 2006).

Beaksedges (*Rhynchospora* spp.) and **Muhly grass** (*Muhlenbergia* sp.) were also commonly utilized in open pine savannahs and wet pine flatwood communities by those Henslow's sparrows. Nutrushes, as well

as *Carex* spp., provide seeds and cover for other wetland sparrow species including Savannah sparrows and Swamp sparrows.

In summary, native herbaceous plant seeds are a critical food resource for Northern bobwhites and many other North American wild birds, especially in the non-breeding seasons. Different birds have different niches and can therefore utilize seeds of many different plant species on the same landscape, and across a diverse range of habitats. Legumes and forbs are known to be especially important for bobwhites, whereas several species of forbs and grasses are favored by some sparrows. However, availability and seasonality will dictate which seeds are preferred, and which are actually consumed, by an individual bird on a given day.

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Wildlife Trends Journal Management Calendar

Dave Edwards



Dave Edwards is a certified wildlife biologist and regular contributor to *Wildlife Trends Journal* and other hunting/wildlife publications. Dave was honored as QDMA's 2007 Deer Manager of the Year and nominated in 2011 as Alabama Wildlife Federation's Wildlife Conservationist of the Year. Dave is President of Tall Tines Wildlife & Hunting Consultants, Inc. Contact him at TallTinesConsulting@gmail.com or 912-464-9328.

Prepare dormant season prescribed burn plans and initiate burns as weather permits.

Fire is a management strategy that is relatively cheap to implement and results in better habitat for wildlife. If you have pines on your property, fire is an essential tool to improve wildlife habitat and should be on your annual task list. However, burn plans need to be well thought out and completed well ahead of time. With the exception of longleaf pine/coastal plain areas, most understory burning in the Southeast is conducted during

the winter dormant season. Acceptable relative humidity, temperature, fuel moisture, and steady, persistent winds often occur during this period. Cool season burns are generally conducted between December and spring green up. In the Deep South, try to conduct burns before March 15 to avoid destroying turkey nests. Cool season or winter burning is not only a good way to reduce fuel loads and control undesirable hardwoods in a pine stand (which reduces the chances of a wildfire that can be detrimental), but is also a great way to stimulate new understory plant growth which will result in quality

Fire is one of the most effective tools to create and/or improve quality wildlife habitat in southern pine forests.

food sources for wildlife. Fire rotations (interval of time between burning the same area again) vary depending on your goals and habitat types but are generally every 2-5 years to promote quality wildlife habitat. It is also a good idea to strategically plan your burns so that you always leave some areas unburned. How much area to burn will depend on your specific property and habitats. However, do not feel that you must burn large areas (50-100 acres or more) to make a difference and create quality wildlife habitat. Relatively small burn areas in the 5-10-acre range are easily done in a couple hours and

will make a difference. Always check local burning laws and consult with an experienced burn manager before lighting a woodland fire. The U.S. Forest Service or your State Forestry Commission are great sources for obtaining more information regarding burning in your area. Check with the US Forest Service for information regarding prescribed burning as well as examples of a burn plan. It is also a good idea to coordinate your burns with a professional land manager that has experience burning.

Trap and remove nest predators

If managing for wild turkeys and quail are goals on the property you hunt, don't overlook the value of removing nest predators such as raccoons and opossums. Having said this, attempting to control predators should not be a priority if you are not actively managing the land to promote quality turkey habitat. Creating and maintaining quality habitat should be the highest strategy on the list for managing turkeys. Wild turkey is a species that responds quickly to good habitat management such as thinning timber, burning, understory control, food plots, roadside management, etc. However, research has clearly demonstrated that nest predators, particularly raccoons, can significantly impact nesting success rates and thus turkey population growth. Not only will they eat the eggs, but they may even kill the vulnerable hen turkey while incubating the nest. Winter is a great time to trap and remove nest predators. This is also when hunters spend the most time at a property. Trapping offers a great mid-day management activity during a weekend at the camp. The key in being successful and efficient is to pick good trap locations. Water sources, feeders, and



Winter is generally a slow time for equipment use and is a great time to perform annual maintenance.

food plots can be good places to start. There are many effective traps available. The most common are live traps (cage traps) and steel traps (leg hold traps). If you use leg hold traps, I recommend “soft-catch” or offset jaw traps. These traps do not damage the foot of the trapped animal in the event that you catch a dog or other non-target critter. If you have never trapped before, you will learn a lot by trial and error. I recommend doing a little homework by surfing the web and YouTube to learn effective techniques. One more thing to know is that nest predators are prolific and have relatively high reproductive rates. This means that populations can rebound quickly. To be effective in controlling nest predators and helping turkeys and quail, you must significantly reduce nest predator populations and continue to aggressively remove them each year.

Conduct maintenance to equipment

As a land manager, quality/working equipment is essential to success. While the list of equipment

used to manage hunting/recreational properties is wide ranging, most managers have, use, and need the basics such as farm tractors, tractor implements (such as harrows, mowers, grain drills, spreaders, sprayers, etc.), UTVs, chainsaws, and other mechanical “hand tools”. To remain in good working order, this equipment will require proper maintenance. Without maintenance, these tools will begin to wear down until they eventually break. This can result in costly repairs and added downtime in which nothing can be done until the machinery or equipment is fixed. Nothing is more frustrating than planning a food plot planting project, getting everything ready, finally getting the right weather and soil moisture, then having a tractor or implement breakdown. There are two forms of maintenance. The first being repair maintenance, which is conducted once the equipment has started to malfunction or has completely broken down. Preventative maintenance is a program designed to prevent equipment from failure – resulting in less repair maintenance. Preventative



maintenance varies depending on the equipment but generally consists of checking/replacing fluids, seals, filters, hoses, blades, batteries and/or electrical parts, screws/bolts, etc. In a nutshell, it is giving equipment some love before neglect results in breakdowns. Winter is a great time to conduct preventative maintenance on equipment. Doing so can be a relatively easy project between hunts. Of course, there's absolutely no way to avoid breakdowns and damage in the long term. No matter how much care you give your equipment, it will ultimately breakdown. However, preventative maintenance certainly slows down functional decline but also helps keep equipment in reasonably good shape in the event that you decide to trade it in or sell for new. On larger more complicated equipment like farm tractors, skid steer machines, back hoes, etc., keep in mind that maintenance must be done properly to be effective. For this equipment, consider an annual "checkup" by a professional. Although hiring a professional mechanic to perform preven-

tative maintenance and checkups will be an expense, it is money well spent. Part of your preventative maintenance program may include hiring a mechanic each winter to visit your "equipment shed" to perform checkups. One of my philosophies is that if you take care of your equipment, it will take care of you.

Prepare deer stands for the off-season.

Once deer season ends, it is a good idea to "summer-ize" your hunting stands. That is, to ensure they are in good working order next season there are a few things to do. Ladder and lock on stands should be loosened or removed from the tree to allow the tree to grow during summer and prevent it from absorbing the attached chain or strap of the stand. This not only protects the stand from potential damage, but is good for the tree. If the stand is not going to be removed from the woods, remove any cushions or seat straps and burlap/camo covers that may be on a stand. This will pro-

long their life and prevent the weather or critters from ruining them before the next season. Cushions and covers should be removed from tripods or other stands as well. Although they should already be secured, double check the tie downs and anchors of a tripod. There are two kinds of tripods – those that have blown over and those that will. Making sure they are securely anchored will reduce the chances of a tripod getting blown over. Shooting houses should be cleaned out and sealed up as much as possible. Sealing them (meaning closing the door and windows) will reduce damage by squirrels, owls, etc. It will also reduce wasps as well (notice I said reduce). Cleaning shooting houses out in late winter is much nicer than trying to do it in August! Obviously, all climbing tree stands and pop-up blinds should be removed from the woods and stored over the summer. When "summerizing" ladders and lock on stands, it is VERY important to revisit these stands just before hunting season starts again the next

year to reattach the chains/straps and tighten everything up. One trick we use to identify stands that are “safe and ready to hunt” is to tie a piece of flagging onto the stand once it has been tightened and checked. Use the same color flagging for each season. For example, this year we are using blue flagging. Next year we will use a different color, say yellow flagging. So, if a hunter gets to a stand this season and does not see the blue flagging, they will know that the stand may have been overlooked and/or has not been checked and secured.

Assess and flag or mark wildlife improvement projects such as new food plots, plot expansions, wildlife clearcuts, new roads, and roadsides that will be widened.

Because temperatures are cool (or cold) and the leaves are off trees where you can generally see better in the woods, winter is a great time to assess and mark areas where trees will be harvested or dozier work will be needed. Having the leaves off is certainly a big help because you can see what you are doing and visualize areas that you are flagging. Projects that may need to be marked or flagged include small bedding areas that will be created with chainsaws (can run the chainsaw during the winter too while it is cooler), new food plot areas or expansions on existing plots, areas along roadsides that need attention next spring, etc. Besides flagging areas that will require heavy equipment and drier conditions, winter is also a good time to mark areas that will be planted in wildlife friendly orchards, supplemental hardwoods, areas to plant hedgerows for quail through fields, etc. Marking these areas in winter will not only be more pleasant for you and allow you to see what you are doing, but



Although it can be done anytime, winter is my preferred time to identify and mark significant improvement projects such as food plot development or expansions.



With food sources at their lowest of the year, along with the rigors of breeding season, providing deer with a high quality food source will help them recover and enter spring in good condition.

will ensure you are ready to tackle these projects when conditions are right. Also, flagging in winter gives you time to think more about the areas you have flagged out before the project is implemented. The last thing you want is to be flagging just ahead of a logging crew and having to make hasty decisions on where you want a new food plot to be created.

Create a wind map of your property to help you have more successful deer hunts.

A deer's nose is its best defense. Through my career as a wildlife biologist, I have been fortunate to have worked and hunted with many "lucky" hunters – those that seem to cross paths with the biggest bucks on the property year in and year out. These are the guys you

see in magazines standing under a barn wall full of mounted bucks. Generally speaking, I am not one that believes in "luck". To me, luck is where preparation and opportunity meet. All of these hunters did their homework to understand how and why deer (particularly the mature bucks they were hunting) used the property and set up stands accordingly. They all seem to have different thoughts on where and when to hunt the stands. However, the single common strategy used among ALL of these hunters was they closely monitored wind and only hunted stands under favorable winds. That is, they only hunt areas when the wind is right – carrying their scent away from where they expected deer to come from. Although I routinely wear ScentLok and spray myself with

odor neutralizers before heading to a stand, I am a firm believer that if a deer gets downwind, it is over (at least in most cases). On properties that have hills or draws, wind will behave differently across the property. As wind hits ridges or tree lines it is diverted and results in the wind changing directions at given points on the property. You may be surprised that a true north wind can generate a south wind in some locations on a property. Something else that will cause "odd" winds is large bodies of water such as a lake or river. In the morning, cool air in the woods is often drawn out to the warmer water area creating different wind currents than the true wind reported. The opposite can occur in the evening. These situations often occur under light wind conditions. To create a wind map, simply record the true wind (wind direction without interference – wind the weatherman reports), then visit various spots on the property where deer stands are located and record the actual wind at these spots. Many hunters collect and record wind information over time, like while they are hunting, then compile what they have collected to create a wind map. Once generated, a wind map is a valuable tool that will help you select which stand to sit resulting in more successful hunts. Of course, you still need to be in the right place at the right time. But these "lucky" moments happen more often when you have prepared and selected a stand where your scent is not a factor.

Provide supplemental feed for deer.

Even in the South, late winter can be a nutritionally stressful period for deer. They have endured the rigors of breeding season and natural food sources can be limited. Providing supplemental feed during

this time can boost energy and nutrition. This recommendation/activity is directed towards land-owners or managers that have done a good job managing the natural habitat, food plots, and deer herd conditions. That is, before thinking about starting a supplemental feeding program for deer on your property, you need to take care of the “important” things first. In other words, you cannot hang shutters if you do not have a house – and you will not grow big bucks and a healthy herd with supplemental feed alone. It is a supplement to other management strategies and activities. However, when done in combination with other core management practices, supplemental feeding can be valuable for deer. Be sure to check your local game laws before providing feed on your property. Many states do not allow the use of feed during hunting season. Ideally, providing supplemental feed throughout the year is best, but supplemental feed will be most

used and most valuable for deer in late winter and summer. These are periods when natural food availability is at its lowest. So, if you have a limited budget and cannot or do not want to feed throughout the year, provide it during the periods deer need it most.

Collect fetal data from harvested whitetail does.

If breeding season or rut occurs in your area before or around Thanksgiving, and your hunting season extends into late December of January, you should be able to collect and measure fetuses from does harvested later in the season. Similar to human fetuses, the age of deer fetuses is determined by their length. Commercially produced fetus scales are essentially rulers that can be used to measure and ultimately determine age of the fetuses. White-tailed deer fetal scales can be obtained from the National Deer Management

Association. Knowing the date of harvest along with the age of the fetus allows you to determine the day of conception. With an adequate sample size of fetal data, this information can provide much insight to your deer herd’s reproductive performance as well as the length and peak of the rut in your deer herd. This not only helps you determine when to put in for vacation next year (during the rut), but the length of the breeding season will shed light on the adult sex ratio of the herd. A tighter sex ratio will result in a shorter more intense rut due to increased competition for mates, while an unbalanced sex ratio will likely be represented by a long, weak rut due to less competition and length of time it takes bucks to breed the abundant doe population. This information, along with hunter observation data, is a great and free way to help assess the status and success of your deer management program.

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