Quail Call

Tall Timbers Quail Research Report • 2017

Game Bird Program Update

By Theron Terhune

The Cooperative Quail Study Investigation pioneered by Herbert Stoddard during the 1920s led the way to effective and productive bobwhite management during his time, and laying the foundation for our research investigations of today. I find it intriguing that many of the research topics Stoddard focused on during the infancy of the Cooperative Quail Investigation are those we find ourselves still studying. For example, core to his research efforts was evaluating the effects of fire on quail; re-building farm fields and supplementing lands of poor fertility; and the destruction of hatching quail by fire ants. All these topics we are currently studying to some degree. Are we any better equipped to tackle these age-long topics? Today, novel technologies are emerging almost daily offering potentially innovative ways to conduct research and approach wildlife management — from apps to drones. This technological era in quail management provides its benefits but often comes at a high price tag.

– Update continued on next page

Quail Life ... By the Numbers

1,519 {# of quail nests found on Tall Timbers since 2000}

7% of hens entering breeding season pull off a double clutch

81 nests produced per 100 hens entering breeding season...

3,349 total number individual chicks wing-tagged since 2000

57% average nest success

13 average clutch size for the entire breeding season

# of triple broods recorded **2**

4% average annual nest loss to fire ants

1 in 4 chicks survive from hatch to the fall hunting season

...44 broods produced per 100 hens entering the breeding season

$570 Per Bobwhite

{Estimated management cost to produce a wild quail in November in the greater Red Hills region}

Inside

Stoddard, for instance, did not focus much of his studies on chick ecology likely because the lack of technology and difficulty to observe chicks precluded him from doing so. This remains a key area of interest for us as we continue to focus on unravelling the mystery of chick ecology. We are now in our fourth year radio-tracking bobwhite chicks and each day seems like a new venture. To date, we have wing-tagged nearly 3500 individual chicks and radio-tagged nearly 300 chicks. And, this year alone we will be radio-tagging and tracking chicks on 4 different properties with a goal of radio-tagging 225 chicks. In addition, we have partnered with other researchers across the country to evaluate chick resource use and other factors influencing their survival. We hope that understanding both the similarities and differences among study sites will better inform habitat management as a whole. Beyond tracking individuals, insect sampling on multiple properties in the Red Hills and Albany regions and in the Carolinas continues to be eye-opening and should shed valuable insight into future habitat management.

Over the past several years we have used advancements in technology to radio-tag and monitor cotton rats, snakes, and quail chicks. We have used thermal imagery to estimate chick survival and facilitate capture of bobwhite chicks. This year we will be exploring new territory with miniature, solar-powered GPS units for bobwhites and looking into using drones for capturing spatial data pertinent to bobwhite resource use.

On the land management front, a pervasive issue in the Red Hills is the rampant spread of exotics such as Japanese Climbing Fern and Coral Ardisia. We have developed the Invasive Tracker app to afford land managers, landowners and woods staff to identify, locate and monitor treatment/control of invasive species – the app is currently pending approval in the app store. In visiting properties and talking with managers over the past several months, it has also become apparent that Bahia grass is a huge problem on some properties. In addition, some managers are concerned that soil compaction has impacted vegetation quality. We are currently looking into these concerns and hope to develop a series of experimental treatments in the near future. We would love to hear from you if you have any ideas, thoughts or would like to participate in this work.

We continue to be blessed with talented graduate students and coveys of interns and technicians. This past January we added a new Game Bird Biologist, Diana McGrath (a former student) to our team. Likewise, a former intern came back to lab to work as a wildlife technician. Two of our graduate students completed their degrees during the past year – congratulations to Diana McGrath (MS at UGA) and Aaron Griffith (MS at UT)! We also added some new blood to the Lab with two new graduate students: Michael Hazelbaker (UGA) and Katie Hooker (UF). You can read more about their projects in this or the next issue of the *Quail Call*.

In this issue of the *Quail Call* we recap the 2016 quail hatch and the 2016–17 hunting season; give an update on preliminary results for a few of our current research projects; introduce a couple new research projects already underway; and report on two projects recently completed (wild turkey resource use & bobwhite escape behavior). The research we conduct and the information we provide herein is made possible through your generous contributions to the Game Bird Program, thank you!

Game Bird Crew, Summer 2017. Back, left to right: Hunter Copolino, Will Rogers, Nathan Eldrige; front: Morgan Oberly and Diana McGrath.

TALL TIMBERS AND ALBANY QUAIL

2016 Quail Hatch and 2016–17 Quail Hunting Season Recap

By Clay Sisson and Theron M. Terhune

The per capita hatch on our study area near Albany in 2016 was only about average, but followed a near record overwinter survival from the previous year. It resulted in better total overall production than we had the previous two years, and an increase in the fall population. This was not the case throughout the region, however, as some areas experienced localized droughts that resulted in population declines by as much as 35%. The optimism properties had going into the season was dampened as hunting began, due to the unusually warm and dry weather that persisted for most of the hunting season. In fact, general consensus was that the weather during the 2016–17 hunting season was the worst that most in the area can remember. Even with all this, most properties had covey finds similar to, or slightly better than, the previous couple of years. The feeling all season on most properties was they had more quail than they were regularly finding; but they just could not catch a break with the weather. What weather there was came in January in the form of two violent storms that produced damaging straight line winds and a devastating tornado. As one manager summed it up: the rain and cold that came along with and following these storms, "was not worth the price of admission." More than a dozen properties in the Albany area had timber and structure damage from these storms. Clean up and recovery from these events was a huge undertaking and diverted staffs' attention on these properties for the remainder of the season.

In the Red Hills Region, the 2016 quail hatch got off to a quick start with some managers reporting bumble-bee sized chicks as early as late April and early May. But, our first nest by a radio-tagged hen was not incubated until the first week of May. This was quickly followed by a flurry of nesting activity resulting in good nest production, but slightly lower than average to the compared to our long-term data. However, male incubation rates were much higher (22% of all males radio-tagged incubated a nest during the 2016 breeding season) and brood production remained above the long-term average which is linked to high nest survival and lower impact of meso-predators. In addition, thanks to a mild winter (2015–16) overall clutch sizes were 2 to 3 eggs larger compared to long-term averages. Chick survival was also nearly two times better in 2016 compared to 2015, a purported boon to fall recruitment. This was corroborated by observations made during hunts of large covey sizes and mixed ages/sizes of birds reported early in the season by several managers and dog handlers. Thus, a welcomed late hatch was evident, but was not as strong compared to banner years of the past — low adult

–Recap continued on page 6

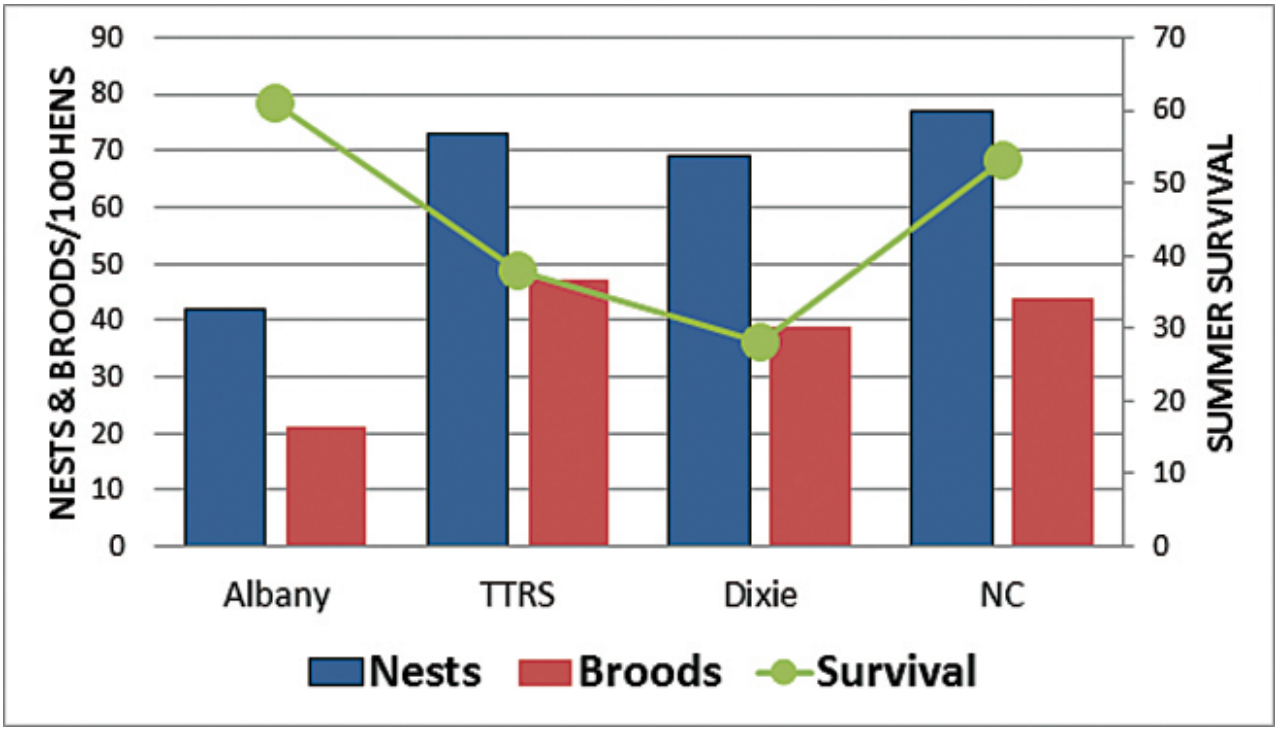
Above, tornado damage on two of the premier hunting properties in the Albany area in January 2017.

Recap continued–

survival during the breeding season resulted in fewer hens making it in August/September, and pulling of a late successful clutch. Taken collectively, 2016 season in the Red Hills was an average reproductive effort.

The net population trend in the Red Hills during the 2015–16 hunting season was relatively flat, with wide ranging variation throughout the region so that bobwhite abundance was up or down by as much as 30%, similar to Albany sites. Based on reports from managers, combined with covey call counts on numerous properties and radio-telemetry work in the region, the 2016–17 hunting season experienced similar patterns as the previous year, with reduced variation in fall abundance. On Tall Timbers, we experienced a 6–7% decline in fall abundance, from 2014 to 2015, but observed a 6-7% uptick in this past fall abundance. The 2016–17 hunting season was hot and dry early, with variable fronts well into January; hunting was good immediately prior to or following these weather events. However, some of the "best hunting conditions" came late in March during the last week of the season, or too late, which was after the season closed in mid to late March. Overall hunting in the Red Hills region, however, was still good on most properties. And thanks to good chick survival and fall recruitment, among other factors, most had more birds than their hunting records may have indicated, with larger than normal covey sizes, coupled with not so great hunting conditions for much of the season.

The good news from all this is that the same warm and dry conditions that hindered hunting success once again contributed to well above average over-winter survival. Radio-tagged quail on our study sites in Albany experienced 68% survival from 1 October 2016 to 1 April 2017, and survival on Tall Timbers during the same time period was 61%, which is above average. While not quite record numbers, this is still very good "carry over" and indicates high numbers of breeding birds entering into the breeding season. As of this writing, we continue to be warm and dry in both the Albany and Red Hills regions. As such, we are cautiously optimistic about the upcoming breeding season, given that survival and carryover were good, but we are a little concerned about the weather forecast going into breeding season. In both the Albany and Red Hills regions, we are already terribly dry and the NOAA forecast is pointing to a drier than normal spring and summer, which can have negative impacts on early nesting activity. Hopefully by the time you read this, the weather will have broken and we will be reaping the benefits of a good growing season to take advantage of a good population of breeding quail in 2017.



Breeding season reproduction stats for 2016 on 3 study sites located in the Albany and Red Hills region and one site in North Carolina.

Fresh from the Field

ONE CHICK, TWO CHICK, THREE CHICK, FOUR...

We have speculated for quite some time that snakes are capable of depredating multiple chicks from a single brood. This past season we, unfortunately, confirmed our suspicions in two different ways. First, we corroborated that a single snake may "locate" commonly used areas by bobwhite broods and return to those areas leading to multiple mortalities from the same brood (see image of corn snake with radio-tagged chick). Second, we also documented that a single snake can depredate multiple chicks during single encounter. In North Carolina, UGA graduate student Kyle Lunsford, tracked down a yellow rat snake that had depredated 4 chicks (2 chicks that were radio-tagged and banded, 1 chick banded only, and 1 chick with no tags) from the same brood (see image of yellow rat snake).

KYLE LUNSFORD

CHICKS GALORE ... GIVE US SOME MORE!

Brood amalgamation (mixing) is fairly common among bobwhites. This past breeding season we captured an amalgamated brood with 24 chicks! We wing-banded them all and radio-tagged 5 of them to better understand brood ecology, (photo at right).

KYLE LUNSFORD

Also, it is not uncommon for males to play a large role in parental provisioning and raising young — here a radio-tagged male broods chicks. (In the photo, bottom right, check out the tiny heads popping through the wings).

KYLE LUNSFORD

ALAN JACKSON

GATOR BAIT!

Apparently, gators go after eggs too. However, we have yet to document an alligator eating quail eggs. That said, researchers in central Florida have documented an adult bobwhite being depredated by an alligator.

EUCHARITID WASPS

We captured several of these Eucharitid wasps in our insect sampling this past season. Eucharitids are specialized parasitoids of ants, meaning each species is usually only parasitic of one genus of ant. Furthermore, they are one of the few parasitoids that have been able to use ants as hosts, despite ants' effective defense systems against most parasitoids. Eucharitid parasitism occurs year round, with a majority of it occurring during hot and humid months. However, the amount of parasitism that occurs depends primarily on the size of the ant colony and the number of host pupae in them, and not on the season.

MOLLY-NEELY BURNHAM

"VELVET ANTS"

Insects in the family Mutillidae are often referred to as "velvet ants" because female members of the family lack wings and have coarse setae that cover most of their body, making them resemble hairy ants. To the surprise of most people, mutillids are not ants at all, they are wasps. (Males, also called "cow killers," have wings).

MOLLY-NEELY BURNHAM

CORN SNAKE JACKPOT

As part of our hardwood reduction study on Dixie Plantation we captured three corn snakes in a single trap (snake array).

KRISTEN MALONE

NEW BIOLOGIST JOINS THE GAME BIRD PROGRAM

We are pleased to announce that Diana McGrath joined the Game Bird Program in January 2017. She has taken on the task of Game Bird Biologist and will be leading the lab in all things related to quail research, monitoring, and training. Diana is a New York native where she attended Geneseo College; she recently saw the light and became a transient to the Deep South by way of her academic pursuits. Although Diana is new to the Game Bird Biologist position, she is no newcomer to Tall Timbers or bobwhite quail as she is "home bred;" she attended The University of Georgia for her graduate studies, where she worked with Dr. Theron Terhune and Dr. James Martin for her Master's degree. Diana's thesis, "Influences of hunting pressure on foraging and escape behavior of northern bobwhite," helped to shed light on factors influencing covey detection during hunting. You can find one of each of her chapters from her thesis in this *Quail Call* and the other in the upcoming *Tall Timbers eJournal*.

Diana's interests are behavioral ecology, predator-prey dynamics and landscape ecology. She is particularly interested in studying aspects related to foraging ecology, reproductive patterns and movement behavior. This type of work ultimately could have bearing on bobwhite survival, reproduction and population growth. In her spare time, Diana enjoys hiking, camping, fishing and trail running. She also loves to relax with a good book and cook all sorts of food. One of her life goals is to visit all the National Parks. Diana has already published some of her work in a peer-reviewed journal, with other papers already submitted. We are excited to have Diana join the Game Bird Program, bringing fresh energy, excitement and novel ideas to game bird research.

WILD TURKEYS FEEL 'N THE BURN

This year we had 2 wild turkeys have close encounters with prescribed fire. During the first incident fire rapidly approached the nest and the wild turkey flushed being choked out by smoke with the fire coming to within 10 feet of the nest. The wild turkey hen came back to incubate the nest only to be depredated several days later. The second incident fire creeped right up to within 6 inches of the nest but went out due to green vegetation surrounding the nest. The wild turkey hen in this case returned to the nest and completed incubation and successfully hatched a couple of days later.

AARON GRIFFITH

AARON GRIFFITH

When to run and when to hide: factors influencing escape behavior of Northern Bobwhites

By Diana McGrath, Theron Terhune, and James Martin

When a prey animal faces an encounter with a predator quick decisions need to be made as to when to flee, how to flee and where to flee — a slight miscalculation in judgement may lead to a swift capture and subsequent death. Optimal escape theory attempts to model these behavioral interactions under different conditions. Such models incorporate factors that could influence prey escape decisions and include contextual factors such as vegetation structure, habitat quality, and predator cues or endogenous factors such as prior experience levels. The effect of vegetation structure on escape behavior can be complex. Dense vegetation can impede an animals' ability to receive and interpret visual cues and therefore could increase flightiness. However, dense vegetation may also be perceived as protective cover by cryptic species. Habitat quality, therefore, could affect the cost of fleeing as missed opportunities of leaving increases with quality of habitat. One such factor that could influence this is supplemental feed as it increases food availability in a given habitat.

Northern Bobwhites display multiple escape behaviors that vary in the amount of energy expenditure required including; holding, running, flushing, or a combination of behaviors. As most quail hunters know, more successful hunter-covey interactions happen when birds hold once pointed as this allows improved shooting opportunities. Therefore to better understand what conditions promote holding behavior our research was designed to evaluate escape behavior in the context of various factors including: vegetation structure; whether or not a successful point was made by the dogs; and, prior experience levels with hunters. We also investigated whether or not distance to supplemental feed would affect escape behavior decisions by affecting the energetic cost of fleeing and the potential indirect cost of aborting quality foraging habitat.

We conducted our research on an intensively managed private property in Georgetown, South Carolina. We radio-tagged 338 bobwhites, and we monitored their daily movement patterns and general behavior multiple times a week. Every day, hunting occurred yielding 40 total hunts.

Figure 1. Graduate Student, Diana McGrath, collects vegetation metrics at a hunting encounter location post using a Daubenmire frame and a Nudds board. Measurements were taken within a buffered distance around marked GPS locations from radio-tagged bobwhites during hunts, and were collected within 3 days post-hunt.

Bobwhite behavior and locations were recorded by research observers prior to and after hunting as well as during hunts from horseback. We also recorded dog movements with GPS collars to capture paths taken by dogs during a hunt in search of coveys and determined encounter distances between hunters, coveys and dogs. Following a hunt, we collected vegetation information for all covey encounters using a Nudds vegetation density board (see Figure 1) and other vegetation metrics.

We observed 97 total encounters with radio-tagged bobwhite. Dogs pointed 50 of those encounters (51%) while missing 47 coveys (49%). Of the total encounters coveys held 49 times (50%), flushed 27 times (28%) and ran 21 times (22%). Hunters visually observed 59% of all coveys encountered, but only were successful shooting into 31% of coveys.

In attempt to understand escape behavior (i.e., holding, running or flushing) in the context of various factors

(e.g., vegetation density and height, presence of supplemental feed, etc.). When coveys were not pointed they were 1.17 times less likely to flush as compared hold and 3.58 times less likely to run as compared to hold indicating that coveys prefer to hold when perceived danger is low. In contrast, when coveys were pointed, the likelihood of flushing as compared to holding was 3.28 times less likely and nearly 3 times more likely to run (Figure 2). We also found that vegetation density at various heights influenced evasive tactics employed by coveys such that vegetation between 2 to 6.5 feet influenced behavior the most. Coveys were 2.18 times less likely to flush as compared to hold for every ~13% increase in visual obstruction , and as vegetation density increased the probability of holding behavior also increased. Thus, denser vegetation yielded increased holding behavior which may be linked to a sense of safety by coveys in thick cover. We did not find any evidence of supplemental feed influencing choice of evasive tactic (Figure 3).

While flushing is by far the most energetically costly escape behavior it also exposes the birds visually and therefore under optimal escape theory should be reserved for the riskiest situations including an increased chance of post-hunt encounters with natural avian predators such as Cooper's hawks. As such, managers should aim for conditions that stimulate holding behavior as compared to conditions that promote flushing wild or running in order to increase the number of successful hunter-covey interactions and therefore improve hunter satisfaction. Our research shows that by promoting vegetation structure between 0.6–2 m, such as having a decent scrub/shrub habitat target, managers may stimulate these conditions. In addition managers should strive to limit the amount of thick grasses that cause dense visual obstruction at or right above ground level for bobwhites and can be an impediment to scent dispersion and reducing the effectiveness of bird dogs at locating coveys.

TAKE HOME MESSAGE

A covey's ability to detect predators and perceive danger is likely interrelated with experience, habitat quality and risk of the potential evasive behavior. Similarly, predators and bird dogs alike must navigate the same palette of habitat quality at which coveys use. When doing so, bird dogs must unscramble the various scents in order to effectively locate coveys, and experienced bird dogs are likely more adept at making this happen. In our study, pointing dogs were successful in finding about half of the coveys "available" (i.e., within a detectable distance of the hunt party) during a given hunt and only about 1/3 of the total coveys on a given hunt course. We found coveys ***held*** more frequently when pointed and ***ran*** more frequently when not pointed which may be associated with coveys "detecting" the hunt party in well enough advance to evade via running being pointed or their perception of safety

–Escape behavior continued on page 10

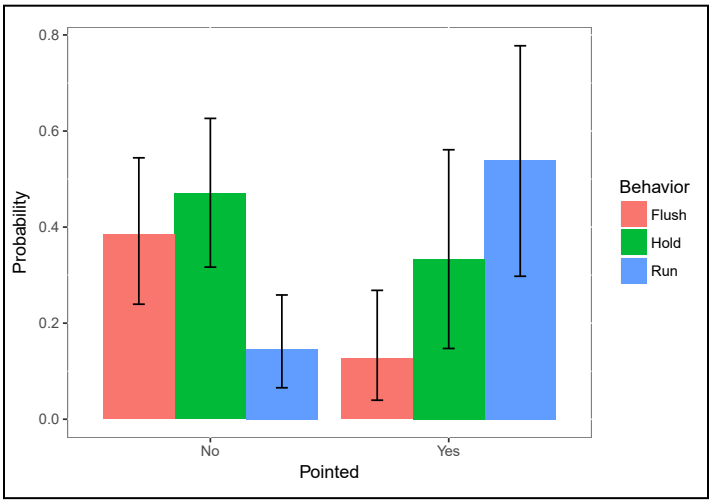


Figure 2. Results of multinomial behavior model indicating probability of three evasive tactics of bobwhites under the condition of being pointed (Yes) or not (No) by a pointing dog during hunting encounters (n= 40) from the winters of 2013 and 2014 on a private plantation in Georgetown, South Carolina. When dogs successfully held point probability of flushing by bobwhites decreased in comparison to an increase in the probability of holding or running.

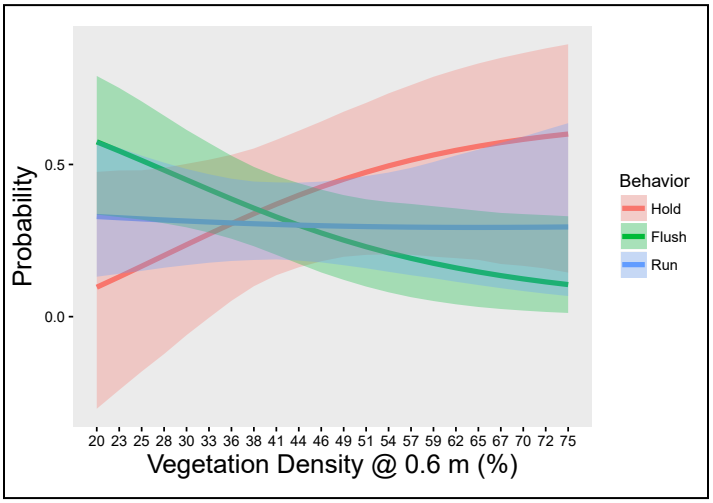


Figure 3. Effect of vegetation density at 0.6 m from ground height on the probability of evasive tactic used by northern bobwhites during hunting encounters during winters of 2013 and 2014 (n = 40) on a private plantation in Georgetown, South Carolina. As vegetation density increased at this height the probability of holding increased in comparison to flushing or running behavior.

Escape behavior continued –

was high resulting in holding behavior. Thus, intuitively, a bird dog's ability to successfully locate, parse out old versus new scent, and quickly point a covey is essential to improved shots on the covey rise, given that coveys are more likely to hold when pointed at close range. In contrast, the longer the dog(s) take to point the covey upon the initial scenting encounter (as opposed to falsely pointing "old" scent, for instance), the higher the propensity for the covey to employ alternative evasive tactics such as running or flushing. The catch-22 here is that once a covey begins to run the more likely a bird dog is to have problems locating the covey and the probability of unproductive points would increase since recent scent disguises the covey's actual location. The quality and experience of bird dogs, knowledge of a covey's home range, and speed of hunting (e.g., hunt at a faster pace) all may help to improve pointing opportunities and increase covey rises afoot.

Whereas we did not find any evidence that supplemental food influenced the choice of evasive tactic by bobwhites, most coveys encountered were typically in relative proximity to the feed line. As such, if coveys were not actively feeding during the hunt the probability of them being located by the hunt party and pointed by the bird dogs decreased. However, supplemental feeding is known to decrease foraging time and home range size making the window of opportunity for encounter smaller in both space and time. Thus, assessing whether coveys are using a feed line during a hunt would be advantageous to knowing where to hunt.

The density of vegetation cover impacted covey evasive behavior during hunt encounters such that thicker vegetation resulted in increased probability of holding and considerably decreased probability of flushing (Figure 3). This type of cover likely comes in various forms but our modelling efforts indicated that thickets (dense cover) in the 2 to 6.5-foot range was most supported compared to shorter and taller vegetation heights. Therefore, managing for these thickets may improve hunt success. A general rule we like to follow is that if you can't see over it or through it from the cab of a tractor, the thicket is likely too big, too high and/or too dense and requires management (i.e., reduction or management). One manager put it this way: "I like to manage for habitat objectives with my objective being moderately-sized thickets throughout my hunting courses, not too tall but not too short either … this is where I tend to find birds when we hunt." Whether the reason is perceived safety or inability to visually detect approaching danger and quickly evade, coveys tend to hold more often in denser vegetation supporting the utility of these "moderately-sized" thickets and maintaining or creating these habitat targets could improve hunting success. It just goes to show you that much of what we do in the realm of research is simply proving many Red Hills managers right!

RESEARCH PROJECT UPDATES

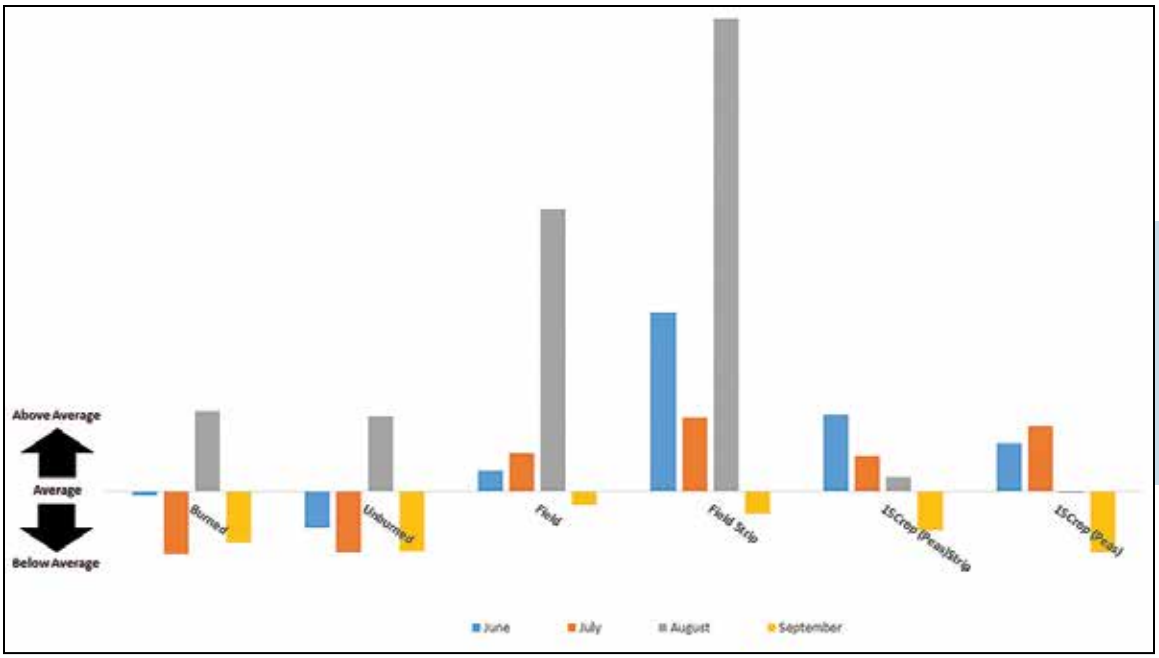
This bug's for you!

At present, brood ecology represents the biggest gap in knowledge of northern bobwhites and was identified as the primary need for research in April 2016 by the Tall Timbers Board of Trustees. The Game Bird Program was tasked with investigating various aspects of brood ecology to better understand population drivers of northern bobwhite quail germane to practical on-the-ground habitat management. As such, in May 2016 we launched a large-scale study on brood ecology to better understand how specific management actions influence bobwhite chicks. The ultimate goal of this research is to develop best management practices (BMPs) to inform site-specific management. Site-specific management is requisite to maximizing bobwhite abundance on a property, especially in the context of differing soil (sandy versus clay) and cover types (i.e., native versus old-field). One of our first questions was related to insect abundance, diversity and cover among properties in the Red Hills and Albany regions.

Throughout the summer we sampled insects monthly on 7 different properties as part of this large research effort. We sampled insects in burned and unburned areas, fallow (weed) fields, and planted crops (e.g., cowpeas/soybeans, cotton, and peanuts) using pitfall traps and DVACs.

Alex Jackson equipped with a DVAC and ready to sample insects.

Reggie Thackston installing pitfall traps to collect insects.



Relative insect abundance delineated by habitat type: burned, unburned and field (fallow field, fallow field strips, crop strips planted in cowpeas and whole fields planted in cowpeas).

PRELIMINARY RESULTS SUMMARY:

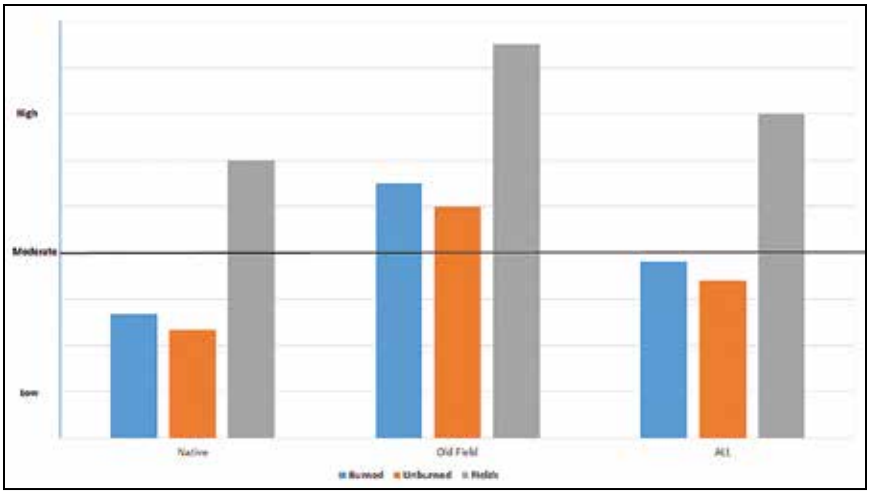
- Insect abundance seems to vary substantially from month to month and among sites with a significant drop from August to September.
- Native grounds seem to harbor fewer overall insect numbers than old-field areas.
- Relatively little variation exists in insect abundance between burned and unburned piney woods.
- Annual disked fallow (weed) fields provide the greatest amount of insects year-round compared to all other cover types, and fields planted in cowpeas hold more insects than burned and unburned piney woods.
- Planted crop fields do not produce as many insects as fallow (weed) fields but cowpeas yield more insects than other planted crops in cotton and peanuts.

–Bugs continued on page 12

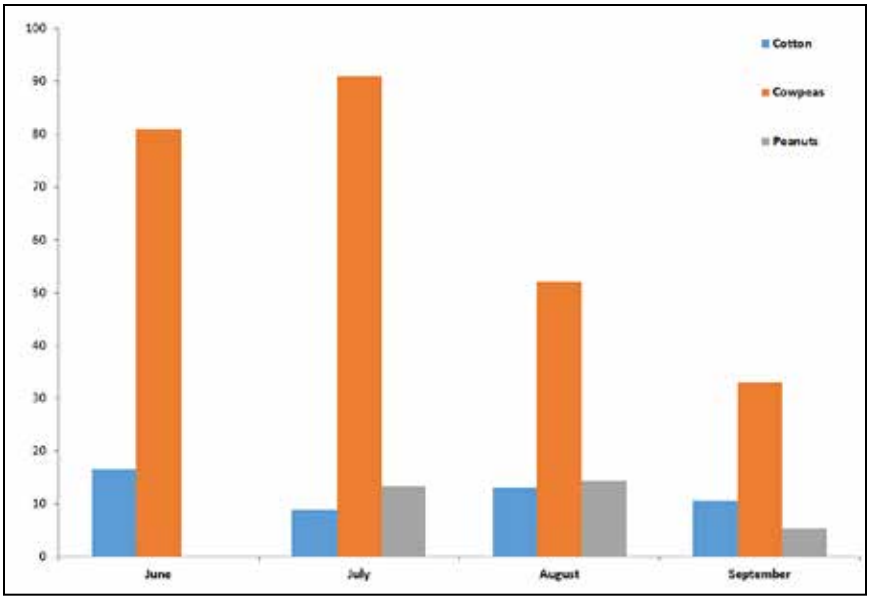
Bugs continued–

It is important to remember that these data are only from one year so adjustments in management may be premature at this point. In addition, just because a particular cover type has more insects does not necessarily mean that other covers types do not provide adequate insects for chick development, growth and good survival. This will be a focus of our future research.

At right, common insects found in pitfall traps.



Insects observed in burned, unburned and fields delineated by native versus old-field habitats.



Insect volume in planted fields delineated by month and crop type.

Insect samples from pitfall traps depicting difference between old-field and native ground among unburned (UB), burned (B) and fallow field (F) habitats.

Digging deeper into the mound of evidence to understand the impact of RIFA on bobwhite nest survival

By Theron M. Terhune

Project Collaborators: Angelina Haines, Clay Sisson, Bob Gitzen, Chris Lepcyzk, and Bill Palmer

Red-imported fire ants (hereafter, RIFA) were introduced to the United States in the 1930s, and by the late 1980s, they were prevalent on millions of acres in the southeastern U.S. Some researchers have documented the impacts of RIFAs and noted their direct and indirect attack on bobwhites; many concluded that they are often detrimental to bobwhite populations and go so far to say that they are a major reason for the declines of quail in many parts of their historic range. One study even submitted that: "RIFA can completely eliminate ground-nesting birds in a given area." Are they really that big of a problem?

Before we begin to point the finger at the mounds, let's paint the backdrop of today's canvas. Given that most RIFA colonies are polygamous, meaning there are several fertile queens per colony, they can multiply at a very high rate and spread very rapidly. In fact, they can multiply and expand their range at such a fast clip they often out-compete native ants for space and resources, thereby reducing their competition by up to 90% in some areas. RIFAs take advantage of disturbed areas, such as cow pastures, mowed areas near roadways, and recently burned areas to create colonies. The absence of natural predators, effective competitors, and specific diseases do not typically limit their populations or dampen their insatiable expansion. Thus, it is understandable that one of the most common questions we are asked nowadays is: "do fire ants negatively impact quail?" It is a valid question and one we hope to tackle one mound at a time over the next few years through intentional research. A first initial peek into RIFA impacts on quail is understanding to what extent they impact nesting, and specifically nest survival.

It is important to note from the outset that RIFAs are just one of scores of known nest predators of quail but they remain largely uncontrolled despite their invasive nature. They are direct nest predators of bobwhites, and have been noted by other researchers to decrease survival rates of hatched chicks

through harassment — although this is something we are currently investigating ourselves. Fire ants also compete for similar invertebrate species as bobwhites and other wildlife. However, the degree of their impact on the success of bobwhite nests, and the environmental variables that influence the severity of that impact, is still debated. For example, climate is hypothesized to influence the aggression of RIFA, and may increase the severity of their impact on nest success in a given year. These unknowns were the impetus for our recent inquiry into bobwhite nest survival. From more than 23 years of data collected at the Albany Quail Project and Tall Timbers study sites, we used more than 3,200 nests to conduct an in-depth analysis of nest survival. We looked at rates of nest loss to RIFAs and how weather, soil type and soil moisture contributed to that loss.

THE UPSHOT

We found that bobwhite nest survival varied by soil type, timing during nesting season, and weather. Specifically, bobwhite nest loss due to RIFA was higher for the Albany sites compared to Tall Timbers (see Figure 1, 2 & 3). Our results indicate that the direct impact of RIFA predation on overall bobwhite nest survival is generally low, with only a 4% average loss for all our study sites combined. However, predation was higher (as much as 15%) in some years and on some areas of the study region. We believe the reason for the disparity between nest mortality by site is related to subtle vegetation differenc-

– RIFA continued on page 14

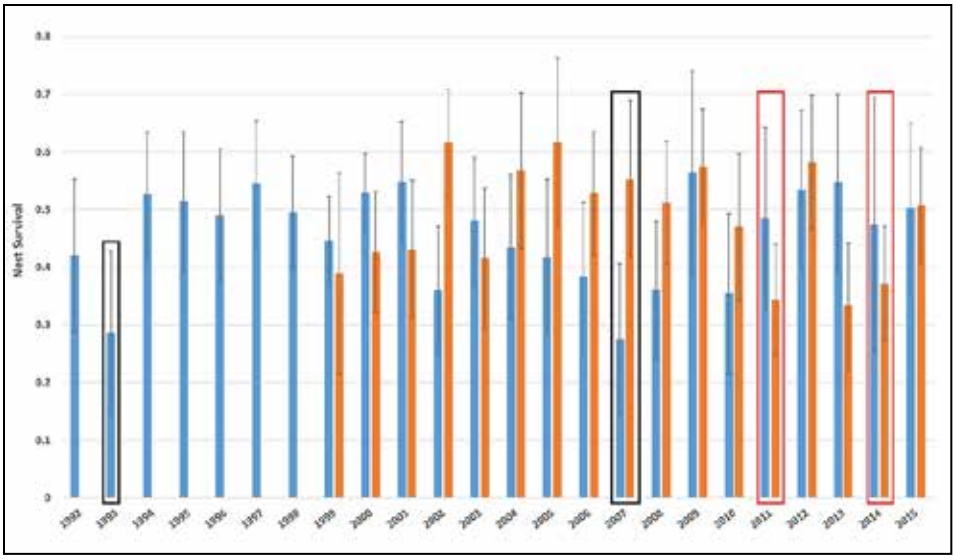


Figure 1. Nest survival for northern bobwhites on Tall Timbers (orange bars) and Albany (blue bars) sites from 1992–2015; black and red boxes indicate those drought years for Albany and Tall Timbers sites, respectively.

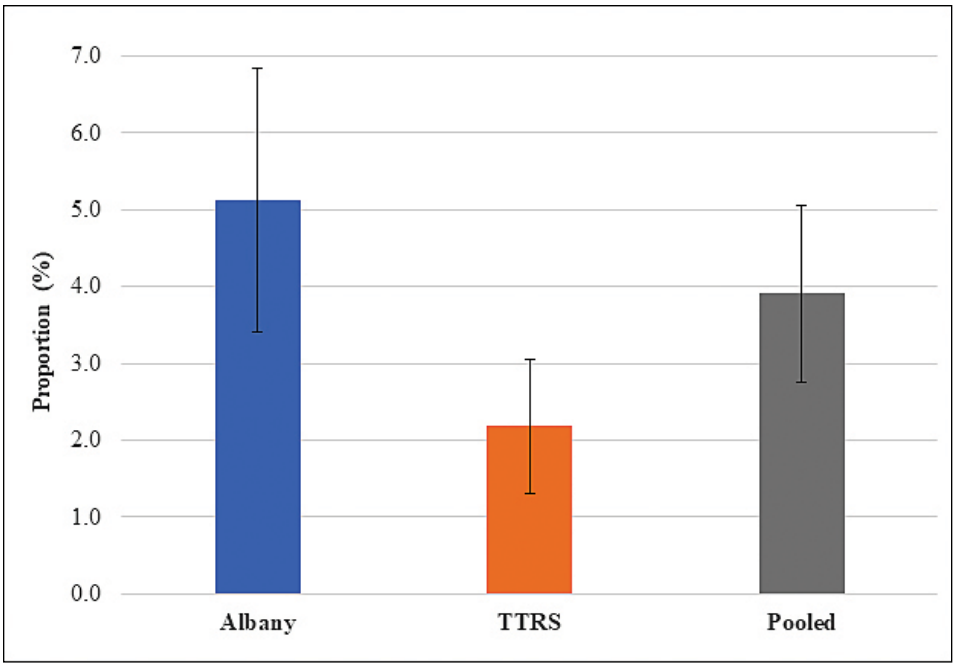
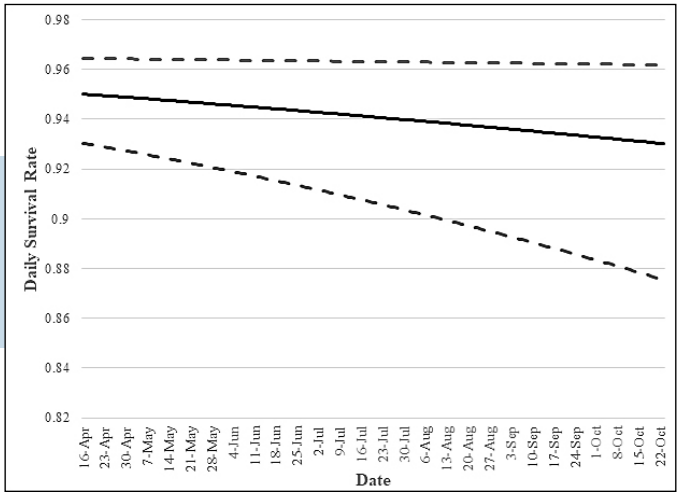


Figure 2. Average annual proportion (%) of nests (n = 3207) depredated by red-imported fire ants during the course of the study on Tall Timbers and Albany sites.

Figure 3. Average daily survival rate for Northern Bobwhite nests depredated by ants with respect to time of season.



RIFA continued –

es related to either or both soil characteristics and climate affecting RIFA densities and/or their impact on bobwhite nests. For example, the Tall Timbers and the Red Hills area receive approximately 8–10 inches of annual rainfall, more than the Albany sites, which may influence vegetation conditions depending on timing and amount of rainfall each year. These types of variations in climate, precipitation, or level of dryness is known to impact RIFA foraging behavior. Additionally, Albany sites and soils are more drought prone and tend to experience higher rates of depredation at pipping by RIFA (see Figure 2).

We also found that nest survival significantly decreased relative to time of season and soil moisture, especially during periods of extreme dryness which is linked to higher temperatures and lower precipitation levels typical later in the breeding season compared to earlier in the season. We used drought conditions and level of dryness (measured by the Keetch-Byram Drought Index [KBDI] in our study, where high values equal increased dryness and lower values indicate greater moisture). We found this measure of dryness to be an indicator of nest survival such that at low (<200) and high levels (>400) of KBDI resulted in lower daily nest survival rates compared to normal moisture levels (200–400 KBDI). It is unclear from our study why this is the case, especially when KBDI is low (i.e., soil moisture is high). We expect, however, that when KBDI levels are low (i.e., moisture is high) mammalian

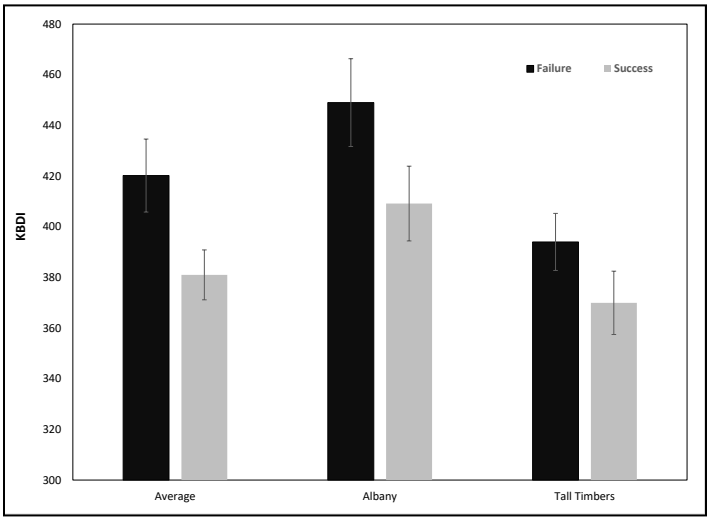


Figure 4. Probability of nest failure and success delineated by Albany and Tall Timbers sites relative to soil moisture conditions (measured using the KBDI such that higher values indicate dryness and lower values indicate high soil moisture).

nest depredations might increase as a result of favorable scent conditions due to increased moisture. When KBDI was high, and drought conditions persist, lower nest survival ensued and specific loss to RIFA increased in our study (see Figure 4).

Notably, significant annual variation in nest survival in our data only occurred in 2 of 24 years on each study site. During 3 of these 4 incidents the KDBI was higher than the long-term average and considered drought conditions based on the Palmer Drought Index, particularly during the breeding season: in 1993 (KBDI = 545) and 2007 (KBDI = 524) for the Albany sites, and 2011(KBDI = 480) and 2013 (KBDI = 245) for Tall Timbers. These years also had the lowest bobwhite nest survival for their respective sites (Figure 1). In light of declining nest survival throughout the breeding season and KBDI being higher in August/September, the potential impact of RIFA on the late hatch is biologically important, especially during drought years. This is of particular interest given that the late hatch can be a purported boon to overall productivity, fall recruitment and population growth.

Taken collectively, given low nest depredation by RIFA and generally positive population trajectories on our study sites, it seems like RIFAs are hardly a problem. Majority of nest loss to RIFAs was a result of direct mortality of chicks during pipping, but this is when investment by adult bobwhites is high. In addition, drought conditions may have a negative impact on pipping such that it becomes more difficult (and, thus, takes longer) for pipping chicks to break out of their shell, rendering them more vulnerable to RIFA depredation. With that said, the greatest threat of RIFAs to bobwhite may come indirectly via decreasing the number of other invertebrate species and potentially causing a disruption in nutrient cycling, food webs, pollination, decomposition and seed dispersal. These are areas we hope to look at in the future.

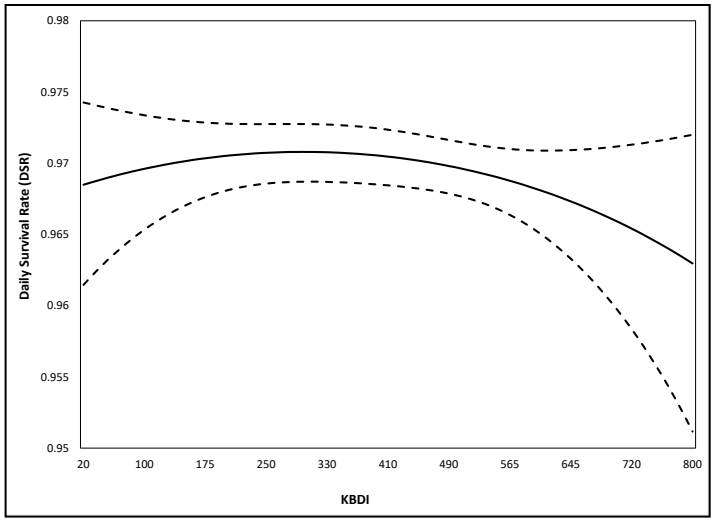


Figure 5. Daily nest survival as a function of soil moisture (measured using the KBDI such that higher values indicate dryness and lower values indicate high soil moisture) for all sites combined.

TAKE HOME MESSAGE

Although the overall impact of RIFA predation on bobwhite nest survival is low, we found evidence suggesting that these impacts can be site specific and magnified during drought conditions, especially in conjunction with the late hatch. But, nest loss to fire ants of 2%-5%, on average, is not much of a concern for a species that has high reproductive potential, like bobwhites, under favorable conditions. It is obvious that healthy bobwhite populations are capable of compensating for the loss of nests to RIFAs. Therefore, during most years control of RIFA is not necessary.

The impact of RIFA, however, may be more problematic on some sites when soils and climatic conditions are more

– RIFA continued on page 16

RIFA continued –

drought prone or where higher densities of RIFAs occur. In these scenarios, RIFA removal may be an option for land managers trying to maximize bobwhite populations, but more experimental research is warranted to determine whether the cost of treatment results in lowering actual RIFA abundance and improving nest survival, otherwise the benefit likely will not outweigh the cost. At the moment, the cost of directly reducing RIFA populations by treating large acreages is not economical and the potential deleterious impacts on other species remains uncertain — i.e., few options on the market solely treat RIFAs without negatively impacting native ants, which are well-known beneficial ecological engineers. Until more information is available, we recommend that the best management strategy for bobwhite populations is mitigating overall impact of nest loss to RIFA by increasing productivity through traditional means which includes habitat management, supplemental feeding and manipulating the mammalian predator community to yield higher adult survival and increased nest production.

Does supplemental feeding for northern bobwhite impact wild turkey resource use?

By Aaron Griffith and Theron Terhune

Project Collaborators: David Buehler, Tyler Pittman, Roger Shields, and Danny Caudill

Supplemental feeding for Northern Bobwhites has gained in popularity over the past couple of decades such that nearly 95% of private quail plantations in the Red Hills and Albany regions now implement this practice. The practice has also gained traction in the Carolinas given that the benefits to bobwhites have now been documented in Texas, southwest Georgia and north Florida. However, in some states this poses a problem for turkey hunters and private landowners managing for quail because feeding for bobwhites may be considered baiting of Wild Turkey. Thus, legally hunting turkeys in these states requires that supplemental feeding practices be halted during (or prior to in some states) the turkey season – otherwise citations could be issued for hunting over "bait." On the other hand, state wildlife agencies and policy makers are faced with a similar conundrum but at a different level when tasked with establishing turkey hunting seasons and harvest regulations.

GPS tag on a wild turkey.

The *Public Trust Doctrine*, an instituted legal principle by the U.S. Supreme Court in 1842, established state and federal government as trustee over natural resources "too important to be owned" that are critical to the well-being of modern society and future generations. Therefore, decisions on baiting and supplemental feeding of game species must be regulated by governmental controls if those practices transfer private property rights onto wildlife, jeopardize public access to wildlife, or jeopardize the health or well-being of wildlife resources. Thus, the conservation and management of exploited species, like bobwhites and turkeys, is not to be taken lightly especially in the face of rampant land use change, usable space and habitat fragmentation. In doing so, considerable stakeholder pressures often subject decision makers to opposing forces such that one decision gains favor among some and disrepute among others.

Given that hunting and hunters are major economic, political and conservation powerhouses in North America, their influence on wildlife policy and regulation are salient and ubiquitous with respect to game species. Aside from political ramifications, altering wildlife policy such as hunting regulations and legalizing broadcast supplemental feeding may also have critical biological consequences (e.g., potential increased harvest rates associated with feeding). Taken collectively, it is understandable why some states have not made regulatory changes to allow wild turkey hunting where supplemental feeding for bobwhites

occur without research advocating that the practice does not have negative consequences for non-target species.

The debate and concern over supplemental feeding for bobwhite impacting wild turkeys was the impetus for our research over the past couple of years. We radio-tagged or GPS-tagged 55 wild turkeys on Dixie Plantation and Tall Timbers, and we monitored them intensively to gain an understanding of how they used available resources such as drains (hardwood hammocks, lowland hardwoods, etc.), fallow fields or wildlife openings managed as brood fields for bobwhites, upland pine, planted pine, roads and feed lines established for bobwhite. We were particularly interested in how turkeys used habitats/resources under 2 differing spatial contexts, the landscape scale (i.e., total area of interest) and within home range scale. So, what did we learn?

FALLOW FIELDS OR WILDLIFE OPENINGS ARE IMPORTANT TO WILD TURKEYS

Compared to other cover types, fallow fields were the most influential on turkey resource use at both spatial scales. The greatest difference between probabilities of use relative to other cover types was seen with fields at the home range scale, suggesting that fields fulfill important ecological requirements by turkeys, especially at fine spatial scales (see Figure 1). Fields, for example, offer a wide variety of resources to turkeys during important reproductive periods of their annual cycle. They provide ample food in the form of forbs, soft mast, and insects for both adults and poults. Vegetative structure in fields provides protective cover from above enemies and easy mobility at the ground level for poults, increasing their survival and overall fitness. Anecdotally, we observed that adult hens relocated poults to fields immediately following hatch and largely remained there until poults fledged and were better equipped to fly to roost. Some hens even selected fields as nesting sites. This was particularly evident at the start of the breeding season, when cover crops (e.g., wheat) were planted in the fields and before fields are overgrown; turkeys ostensibly capitalized on increased detectability of approaching predators and other threats. Gobblers may also use fields as strutting areas for attracting mates.

WHEN IT COMES TO DRAINS AND HARDWOODS, CONTEXT AND SIZE MATTERS!

Drains, or hardwood hammocks, were particularly important to turkeys at the landscape scale, whereas drains became less important to turkeys at the home range scale. At the landscape level, a positive correlation existed between proximity to drain

–Turkey research continued on page 18

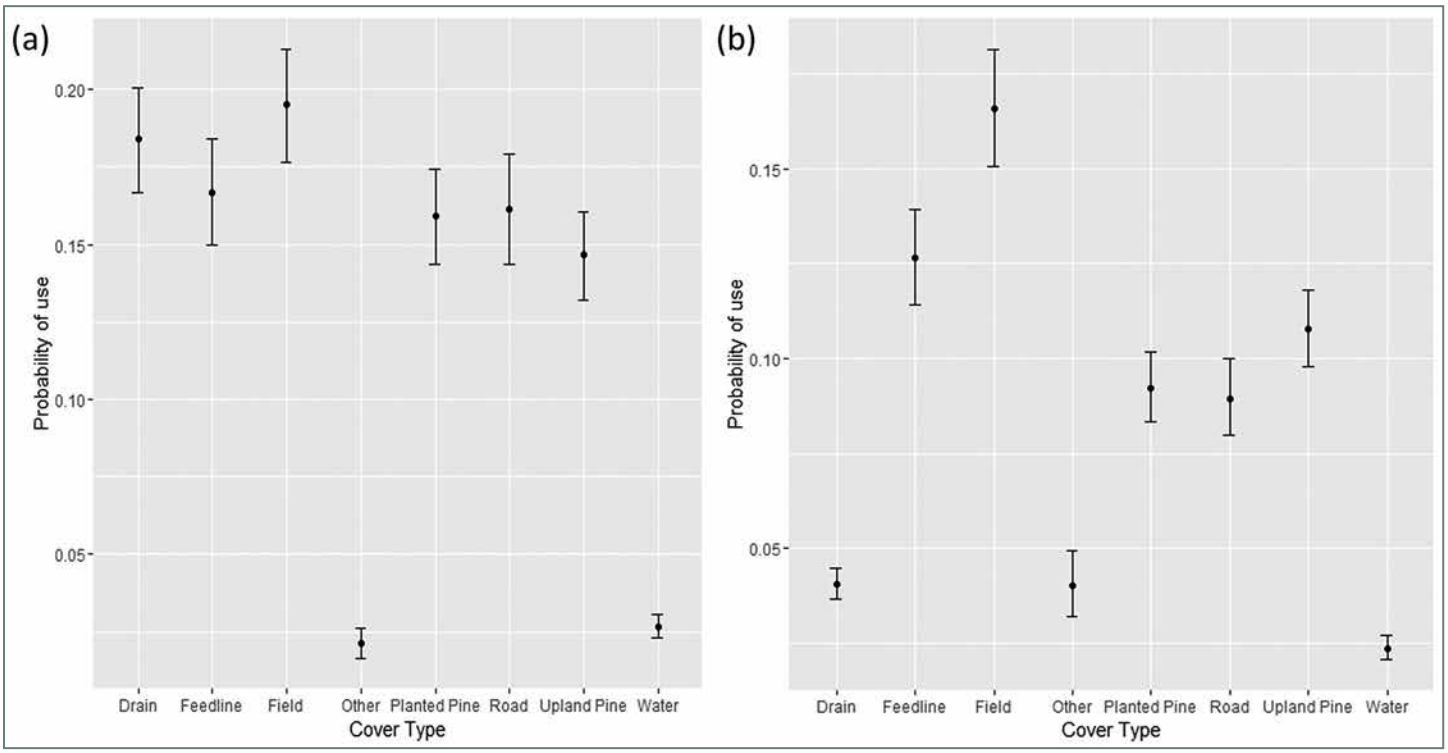


Figure 1. Probability of use as a function of cover type for wild turkeys on Tall Timbers and Dixie Plantation, 2014-2016, at the landscape scale (a) and home range scale (b).

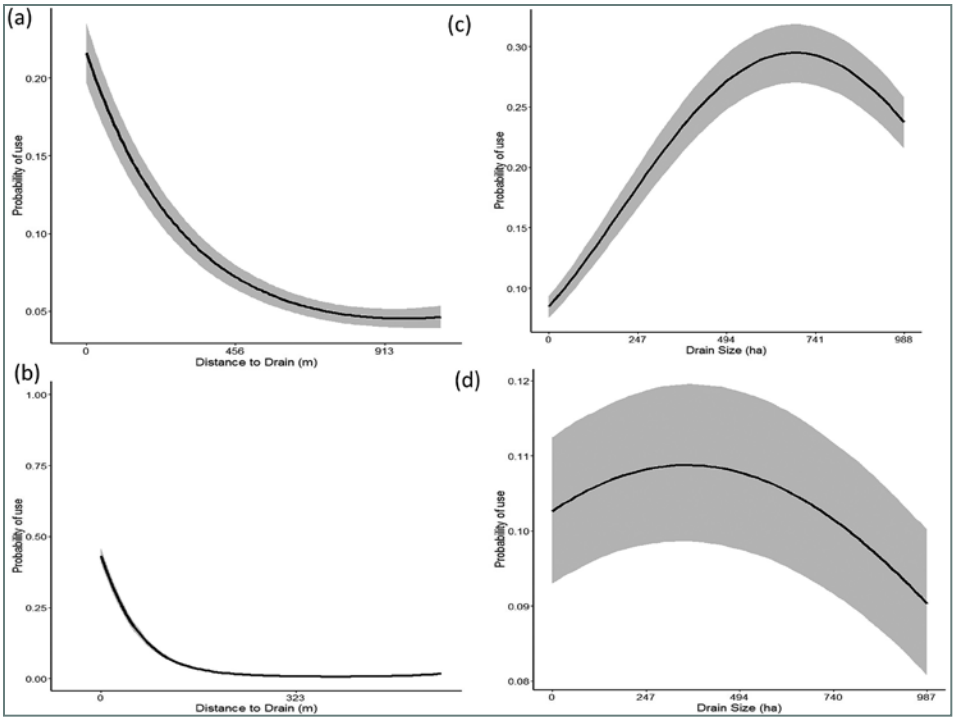


Figure 2. Probability of use of drain a a function of distance to drain and drain size for wild turkeys at the landscape scale (a & c) and home range scale (b & d).

Turkey research continued–

and increased probability of use, intuitively suggesting that turkeys were more likely to use an area if a drain was nearby. Turkey use of drains exhibited the greatest disparity between landscape scale and within home range habitat selection. This indicates drains are requisite to holding or attracting turkeys at the landscape scale (i.e., to an individual property), but have much less influence on daily movements. It has been proposed that turkeys use drains for traveling, roosting, feeding, loafing, and thermoregulation during the summer. The scientific literature provides scores of examples of turkeys choosing roosting sites near water and accompanying drains. These drains are a source of hard and soft mast comprising, at times, the majority of turkey diets, during the fall and winter.

The value of large drains for turkeys has long been documented, but explicit drain size in relation to resource use has never been examined. Stoddard suggested turkeys required drains of "considerable acreage," but did not indicate an explicit size. The width of drains is also known to influence turkeys such that some researchers suggested minimum drain widths of 84 m to be effectively useful for turkeys. In our study, we found that turkeys exhibited a strong selection towards large drains at the landscape scale with the optimum drain size for turkeys being approximately 700 ha (or ~1729 acres) and at the small scale large drains (>375 ha or >900 acres) are also desirable (see Figure 2). The selection tendency by turkeys underscores the importance of maintaining and preserving large contiguous drains rather than smaller interspersed drains at the landscape scale. With that said, smaller drains are also used by turkeys, but less frequently, particularly for temporary roosting sites during large circuitous movement forays which are common for gobblers during breeding season.

SUPPLEMENTAL FEED BY WILD TURKEY RELATIVE TO OTHER HABITAT TYPES USED

Turkeys exhibited a greater selection for feed lines at the landscape scale than compared to the home range scale (see Figure 3), and feed lines ranked third among all cover types in predicting probability of use across the landscape. While the probability of use decreased at the home range scale, probability of feed line use was magnified relative to other cover types, apart from fields (see Figure 1). Probability of use decreased as distance to feed line increased at both scales. However, selection was greater at the landscape level than the home range level. Thus, feed lines may be more likely to influence where a turkey establishes a home range, but less likely to dictate daily travel patterns within the home range. This is likely a result of relatively low fidelity to specific areas of a feed line whereby feed line use was distributed across the individual's home range rather than spatially concentrating turkeys. In contrast to our study, other researchers evaluating the impacts of using feeders and/or food plots have demonstrated heavy use by turkeys, concentrating turkeys and purportedly negative consequences on survival. That said, broadcast feeding via feed line distribution is quite different from localized feeding stations

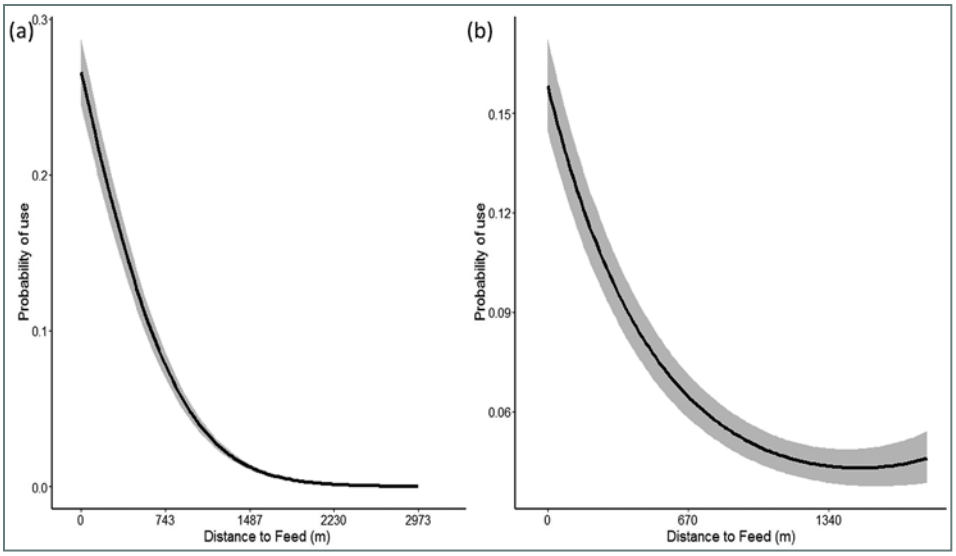


Figure 3. Probability of use as a function of distance to feed by wild turkeys after landscape scale (a) and home range scale (b) on Tall Timbers and Dixie Plantation.

or even food plots which has both ecological and functional consequences.

It should also be noted that given intensive management and frequent application of fire for bobwhite on our study sites coupled with abundant annual rainfall in the Red Hills, native food resources are not typically limiting on our study sites. However, on sites where food is more of a limiting factor the benefit of supplemental feed may be more advantageous, and potentially concentrate turkey, especially when cover conditions are poor or during years of harsh weather (i.e. droughts) such as harsh winters commonly observed in northern States. Future research should investigate how broadcasting supplemental feed alters wild turkey behavior and resource use in the northern parts of their range. In the Southeast, however, we infer based on our results that supplemental feeding for bobwhites when applied appropriately (distributed via broadcast) does not concentrate turkeys and likely has minimal impact on harvest rates.

TAKE HOME MESSAGE

Previous research has shown that prescribed burning on a 2–3 year fire return interval is ideal for wild turkeys, and given that a 2-year fire return interval is optimal for bobwhites in the Southeast management objectives for both turkeys and quail align quite nicely. For example, it is well-known that fallow fields can provide benefit to bobwhite broods and chicks, especially in areas of lower-quality soils. Our results indicate that intentional management for wild turkeys should incorporate fallow fields or wildlife openings which is congruent with quail management in many respects. These fields provide cover beneficial to mate selection, brood rearing, and nesting for wild turkeys. However, despite some similarities (e.g., prescribed burning and fields) among management practices there are some subtle but important differences to consider, if wild turkeys are a primary objective. Intensive bobwhite management often focuses on reducing drains in both scope and size, with aims of increasing habitat for bobwhites and reducing predation. However, we found that this practice may have negative consequences for wild turkeys such that proximity to drains and drain size proved important determinants of resource/habitat use. Therefore, we recommend maintaining large contiguous drains (>375 ha) where feasible to ensure adequate grounds for loafing and roosting by wild turkeys — in many cases, these habitats are not ideal for bobwhite management anyway. Allowing fire to burn into the drains, or creep into them, may also provide added benefit through creation of "soft-edge" transitional zones and roosting sites for young poults on the edge of upland pines, fields, and drains. Thus, interspersed fields among upland sites within close proximity to large drains provide an ideal balance of food and cover requisite for turkey resource use.

The creation of feed lines may also provide benefits to turkeys within their home range, but it is uncertain as to the ecological function they provide be it mode of travel, foraging, brood rearing or other. Despite the ability to ascertain the probability of use for various cover types, we could not unequivocally determine why they were being used. We found that roads provide similar functions to feed lines and were used by turkeys throughout our study. Taken collectively, whereas we observed moderate use of feed lines by turkeys, especially at the home range

–Turkey research continued on page 29

NEW PROJECT:

Do common agricultural crops impact bobwhite chick habitat use and survival?

Project Collaborators: Michael Hazelbaker (MS student at University of Georgia), James A. Martin, Clay Sisson, and Theron Terhune

Northern bobwhite chicks require high-energy food in the form of insects for rapid growth and development, and protective cover from predators as well as for thermoregulation. Previous research conducted both in the Red Hills and Albany area has centered on what constitutes quality brood rearing habitat through the lens of tracking adult bobwhites while rearing their young. From this research we have found some similarities and differences among plantations located in the Red Hills compared to those in the Albany area, with respect to what is needed to produce quality brood habitat. Similar among regions is the need for managers to produce ample forbs and legumes such as annual weeds (e.g., ragweed, camphorweed, and goldenrod) to provide quality foraging grounds for insects and bobwhite chicks alike. Different among regions, however, is how one manages for that habitat. In the Albany area and properties with poorer soils, weed fields disked annually are often necessary, whereas these fields are less important on most properties in the Red Hills. Given abundant rainfall during most years and higher quality soils in the Red Hills, frequent application of fire in piney woods often produces very high quality brood habitat, especially in recently burned areas. Many properties in the Albany area even fertilize weed fields to provide a jumpstart on brood cover while many properties in the Red Hills plant annual agricultural crops in their fields.

Cotton field at Dixie Plantation.

MS student Michael Hazelbaker holds a bobwhite with a radio.

On some working lands and plantations, agricultural crops provide a much needed revenue stream for bobwhite management. However, the question remains unanswered as to whether the monetary gains of growing annual crops outweighs the potential "cost" to growing chicks. In this new research study, we will investigate what, if any, value annual crop plantings of corn, cotton, and soybeans provide bobwhite chicks. Specifically, we will determine insect abundance among these common annual crops compared to burned and unburned piney woods and fallow (weed) fields. We will also evaluate habitat use of chicks relevant to annual crop production, and which of these resources provides the best advantage to chick survival.

NEW PROJECT:

Experimental manipulation of an alternate prey species—does quail survival benefit?

Project Collaborators: Katie Hooker (PhD Student at University of Florida), Bob McCleery, Bill Palmer, and Theron Terhune

It is well known that good quail populations are a function of numerous factors, and few factors receive more attention than the direct impact of predators. This is for good reason given that quail are "good at dying" and have low overall life expectancy. Predators, being opportunists, will often prey on what's most abundant and easiest to capture. On many well managed properties, quail are what is most abundant, with the exception being, in some years, when a small, rather drab looking, and less charismatic critter—the hispid cotton rat (*Sigmodon hispidus*)—becomes the "king" of the palate to the predator's delight.

Over the years, the Game Bird Program at Tall Timbers has monitored small mammal communities—in particular, cotton rats. In doing so, we have documented the keen relationship between cotton rat abundance and fall bobwhite abundance, as well as annual survival. When cotton rats ebb and flow, quail abundance seems to correlate quite closely (see Figure 1). Why is this the case? Alternate prey sources such as cotton rats lighten the predation pressure on quail so that snakes, hawks and meso-mammals shift their focus from quail and toward that which is most abundant. Previous research has shown that feeding can elicit an increase in cotton rats as they are known to produce larger numbers of litters and potentially more litters when supplemental feed is readily accessible. This new project is designed to experimentally manipulate cotton rat numbers to better understand how the presence of cotton rats "buffer" against predation. We hope to determine what, if any, demographic variables of bobwhite are most sensitive to fluctuations in alternate prey species, such as the cotton rats. For example, we hypothesize that fluctuations in cotton rat abundance influences chick survival and predict that during peaks in cotton rats chick survival will improve.

PhD student Katie Hooker with a cotton rat.

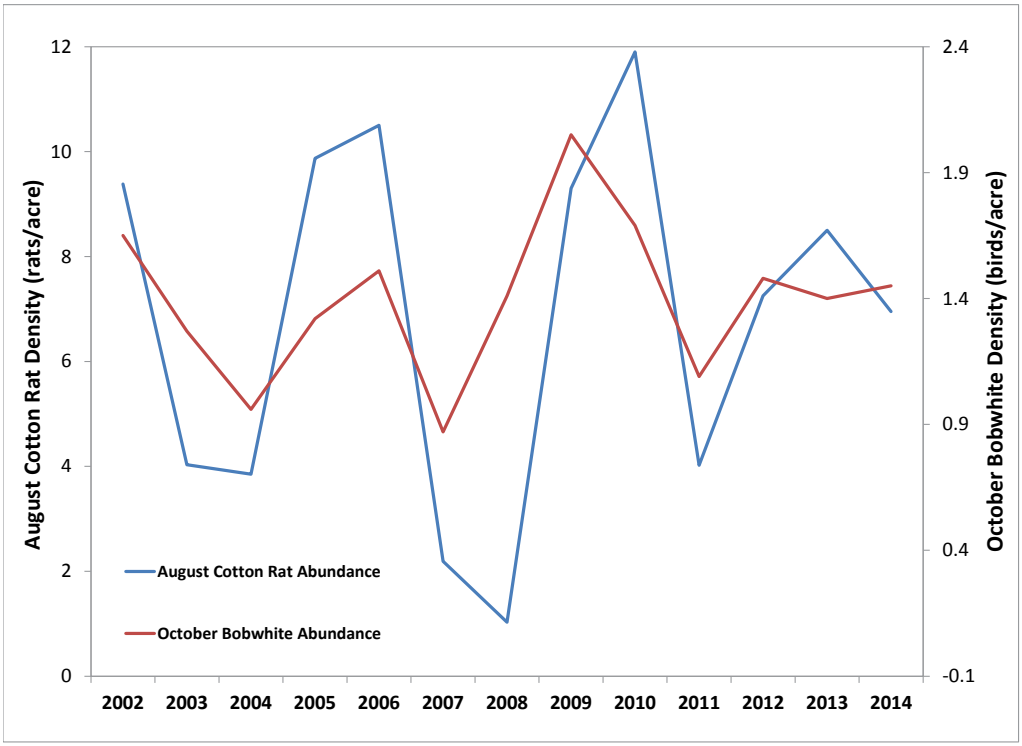


Figure 1. Late summer cotton rat abundance and early fall bobwhite abundance on Tall Timbers, 2002-2014.

BEYOND THE RED HILLS

Tall Timbers Carolina Regional Quail Project—works to help make the past the present

By Reggie Thackston

One has only to read the likes of Ruark, Rutledge and Babcock, or listen to the recollections of some old time bird hunters, to know that the Carolinas, just like Florida, Georgia, Alabama and other areas of the Southeast, were once prime destinations for those seeking high quality bobwhite hunting. However, across most southeastern landscapes bobwhite populations are a mere fraction of what they were in the early-to-mid 1900s. That said, there are notable exceptions where landowners are successfully applying science-based management at the appropriate scale and intensity to turn back the clock to the "glory days" of bobwhite hunting. In essence this is what the Tall Timbers Carolina Regional Quail Project (CRQP) is seeking to do; i.e. work with landowners and land managers to "Make the Past the Present."

The genesis of this effort stems from the Tall Timbers Board of Trustees through a recently developed 10-year Strategic Plan. This plan sets goals to geographically expand and intensify efforts at working with partners to restore fire dependent systems for bobwhites and other associated game and non-game species. The CRQP is a perfect fit for this strategy and more formally builds on previous efforts that began in the 1920s with Mr. Herbert Stoddard, and have since been continued at varying levels by Dr. Bill Palmer, Dr. Theron Terhune and Jerald Sholar.

In a nutshell, the CRQP serves as a conduit to deliver research-based cutting edge science to property owners and managers who can put it on the ground—where it counts! Categorically, CRQP provides technical assistance, education/outreach, and policy advocacy. Specific products include site visits, verbal and written management recommendations, monitoring training, assistance with mapping and data analysis, field days, seminars and management presentations, input on policy issues facilitating prescribed fire and intensive bobwhite management; and working with conservation partners to increase funding and support for bobwhite restoration on private and public lands.

An overall synopsis of CRQP efforts during 2016 include: 34 site visits to 16 properties; assisting with two landowner meetings; making three management presentations to over 200 attendees; co-authoring five management articles and serving on the South Carolina Quail Council. In the realm of current research, the CRQP includes participation in a multi-state insect sampling project measuring insect abundance and diversity across a variety of brood habitats.

Little Hobcaw Plantation manager, Eric Moody and Tall Timbers Regional Game Bird Biologist, Reggie Thackston look at the ongoing habitat renovation being conducted under the guidance of a CRQP wild quail restoration plan.

"Little Hobcaw Plantation", a 3,680-acre property near Kingstree, South Carolina, formally owned by Bernard Baruch, later by James Sigmon and now by Southern Pine Plantations, provides one example of how CRQP delivers Tall Timbers' science-based quail management to help guide management and ensure the greatest return on investment. A CRQP plan for intensive habitat renovation is being applied on "Little Hobcaw" with the ultimate goal being a fully restored high density wild bobwhite population (see photo). This is being conducted in a multi-phase process where intensive habitat renovation will be

coupled with supplemental feeding and predator management. Once habitat renovations are in place and cover has adequately responded we will conduct translocation of wild birds to jump start the population recovery. Mark your calendars as current plans are to hold the Tall Timbers, Game Bird Program's Annual Carolina Fall Field Day there in October 2017.

At present CRQP is being remotely coordinated through a half-time position. Obviously, it will be most effectively implemented through the full time presence of a Tall Timbers' Game Bird Program Biologist, centrally located in the Carolinas. However, for that to occur funding must be commensurate with supporting the position and the program to the tune of about $120,000 per year. Reaching and sustaining this funding level will require broad based and long-term support. In this regard, work is ongoing with leadership from the South Carolina Department of Natural Resources, Quail Forever and others to help get the ball rolling for the formation of a type of South Carolina (SC) quail coalition dubbed the SC Bobwhite Partnership Fund. Once established, the coalition purpose will be to raise funds in support of both CRQP and public land quail management. This effort is modeled after a somewhat similar and successful effort in Florida and Georgia. Plans are to continue to refine this approach and engage other states that may have interest in bridging their state quail plans with Tall Timbers' efforts.

So with all that said, how did the 2016 season stack up for the Carolinas? With few exceptions, hunting reports were down. This was largely due to the back to back heavy rain events in 2015 and 2016 that appear to have hammered late hatched broods and even adult birds on some Low Country sites. This coupled with a very dry fall and abnormally warm temperatures made for significantly reduced covey find rates and lower hunt quality. However, overwinter survival, a primary driver of bobwhite populations, should be good on properties under intensive management with high quality habitat. We hope that this will set the stage for a strong rebound in 2017. That of course, again, depends on the ensuing summer and early fall weather conditions and we're keeping our fingers crossed.

If you have a passion and desire to see bobwhites and bobwhite hunting grow in the Carolinas please consider supporting CRQP and thereby have a part in "Making the Past the Present!" For information on CRQP contact, Tall Timbers Regional Game Bird Biologist Reggie Thackston at 478-993-7248 or rthackston@ttrs.org.

SAVE THE DATE!!
Friday, October 6, 2017

Tall Timbers' Carolina Regional Quail Project Field Day at Hobcaw Plantation – Nesmith, SC

- an ~11,000-acre property near Wilmington, NC
- currently a translocation site where we are conducting an intensive research project

Red Hills and Albany plantations contribute significantly to range-wide restoration efforts

By Theron M. Terhune and Clay Sisson

It seems to be a broken record with each new Quail Call published that we continue to translocate more and more birds each year. This year we set yet another record—translocating 753 birds! Is there an end in sight? Why do we continue to translocate birds?

The fact of the matter is wild bobwhites are in high demand, more so now than ever before. The landscape once produced bobwhites as a natural by-product of normal anthropogenic land-use, but in today's landscape, things are quite different. Today, the landscape is highly fragmented, forged by urban areas and continued urban growth, with suppression or exclusion of fire on pinelands, prairies, and sand hills; and, intensive and aggressive row crop cultivation across the Southeast and up the eastern coast. This landscape we have shaped is not nearly as resilient to random processes, such as inclement weather, as it once was. As a result, natural recolonization of bobwhites following habitat improvements or restoration is substantially limited compared to days of old. This makes the utility of translocation a much needed tool for bobwhite population recovery.

In the face of range-wide population declines, the National Bobwhite Conservation Initiative (NBCI), a strategic recovery plan for bobwhites, specifically calls for intentional habitat management with an emphasis on the establishment of habitat epicenters to facilitate population sustainability and recovery. The call to halt or reverse population declines is predicated on habitat management and bobwhite response to such management. It is not good enough to just produce the habitat, we must produce the birds. Therefore, we continue to focus our work with private landowners throughout the Southeast to improve habitat through intentional management, but in many respects, habitat management is the easy part compared to bringing back wild birds in some places. In these cases, translocation is an invaluable conservation tool, but requires a consistent and reliable source of birds. This is where private landowners in the Red Hills and Albany regions have stepped up to the plate and answered the call. Since 2003, landowners in the plantation community here in the Red Hills and Albany regions have contributed more than 4,600 birds for an estimated economic value of $3.4 million. This is a significant contribution toward the recovery of nearly 70,000 acres of wild quail lands, and one that would not be possible without the numerous landowners who have generously donated wild quail. You know who you are—we truly thank you!

At right, Dan Small releasing birds on a farm in Maryland as part of our translocation efforts in the Mid-Atlantic region. Photo Courtesy of Dan Small.

Life on the edge: woody cover improves bobwhite survival in northern periphery of their range

By Theron Terhune

Project Collaborators: Adam Janke, Bob Gates, and Bob Long

In the 2014 Quail Call, we reported on the habitat cooperative project we launched in the Mid-Atlantic region. At that time, Tall Timbers began working with the Center for Environment and Society at Washington College, the Chester River Field Research Station, New Jersey Audubon, and Maryland Department of Natural Resources to establish core landholdings serving as population hubs for bobwhites. The Eastern Shore of Maryland has become a lauching pad for this work, given the existing mosaic of farmland, woodlots and relatively minimal urban influence. We are pleased to announce that through a grant with Maryland DNR this project has budded into a larger intiative — dubbed the Natural Lands Project.

The Natural Lands Project (NLP) is spearheaded by Washington College and Dan Small. The objective of the NLP stems from our orginal concept of working with private lands and landowners to balance natural lands on working farms to increase wildlife habitat, improve water quality and provide quality habitat for bobwhites. A focus of this work is establishing native warm season grass plantings along marginal crop lands based on research we conducted in the region since 2009.

Since tracking bobwhites on two sites in Maryland and one in New Jersey over the past few years, we have learned there are some similarities, as well as numerous differences, compared to a quail's life on southern plantations. First, winters get much colder and there is this thing called "snow" that presents grave problems for foraging bobwhites. Second, the predator context is wildly different in Maryland and New Jersey compared to the South. Third, the lack of fire culture is often an impediment to quality habitat management and maintenance. And, finally, woody cover is often limiting on properties in the Mid-Atlantic States.

SNOW AND QUAIL

Bobwhite populations have persisted for decades in northern states in spite of harsh winter weather. In fact, history demonstrates that about 1 harsh winter can be expected every 7–10 years in the Mid-Atlantic region. During these winter events, it was common to observe plummeting quail numbers the year following a harsh winter with ample snowfall (see Figure 1a). Until recently though, bobwhite populations would respond within 2–3 years following these harsh winters, returning to previous population levels. During the winter of 2009–2010, however, bobwhite populations plummeted to near exctinction on a couple of sites being monitored in Maryland. It took nearly 7 years, more than twice as long compared to historical population responses, for these populations to recover to their previous density (see Figure 1b).

DAN SMALL

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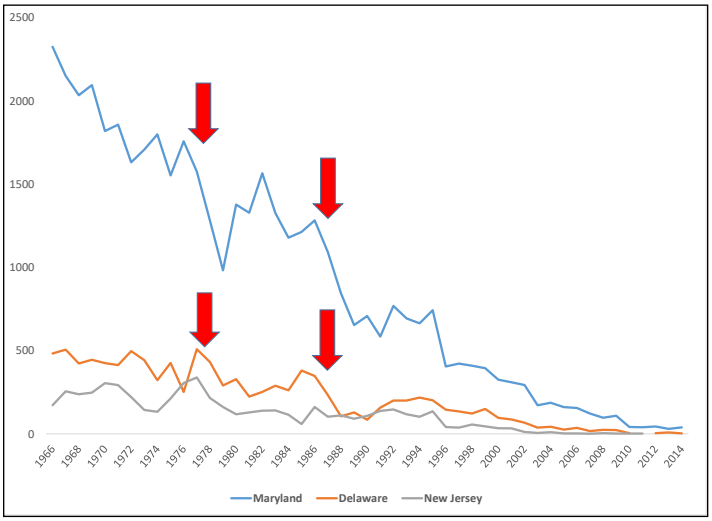

Figure 1a. Breeding Bird Survey data indicating bobwhite abundance (1966-2014), in Mid-Atlantic states. Red arrows indicate years of heavy snowfall events. Note that population decreased, but responds within 2–4 years post-event, except in 2009/2010.

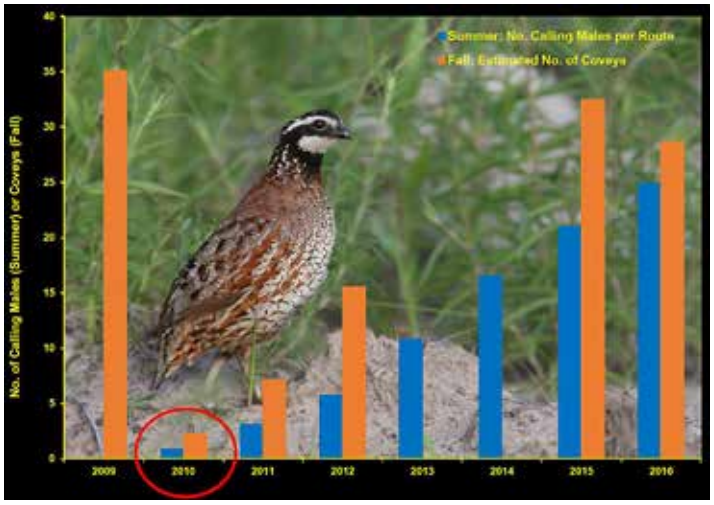

Figure 1b. Bobwhite abundance on a study site in Maryland; red cirlce indicates first year following harsh winter weather event.

I believe this is result of two factors. First, many of the properties on the Eastern Shore of Maryland consist of farmland. Many of these farms used to produce bobwhites as a natural byproduct of land-use by way of small farming practices, with the integration of hedgrows, fencerows, and the like breaking up fields and providing ample winter cover. In today's landcape, these areas are limited to steep, over-grown drains producing limited cover for bobwhites, especially during winter. But previously, bobwhites persisted on numerous farms, even into the 1950s, '60s and much of the '70s, because the landscape was more resilient to winter events, and better poised to respond following heavy snowfall years. Today few farms anchor coveys, resulting in fewer birds remaining following a harsh winter. Second, and related to the first, bobwhite survival is typically lower on many farmland sites due to lack of adequate over-winter cover. Specifically, woody cover in the form of shrubs, vines, briars and brambles is often lacking. We have found that this cover is essential for bobwhites to survive winters at a level for population persistence or growth, esepcially during years of harsh winters and ample snowfall.

WHY DO HARSH WINTERS CAUSE POPULATION DECLINES?

The bottomline is that bobwhite survival during harsh winter weather is very low. This is a direct result of both exposure to predators (due to lack of cover for protection) and an inability to access food during prolonged periods of snow cover. We have found that adult bobwhite survival in Maryland and New Jersey can be similar to or even better than many southern plantations during years when mild winters occur and predators are kept in check. But, when predator management is not employed, adult survival is substantially reduced and, importantly, adult survival is downright dismal during years of harsh winter weather. Red foxes, for example, are abundant in northern farm landscapes and wreak havoc during snow events, caching several bobwhites in a matter of a few days.

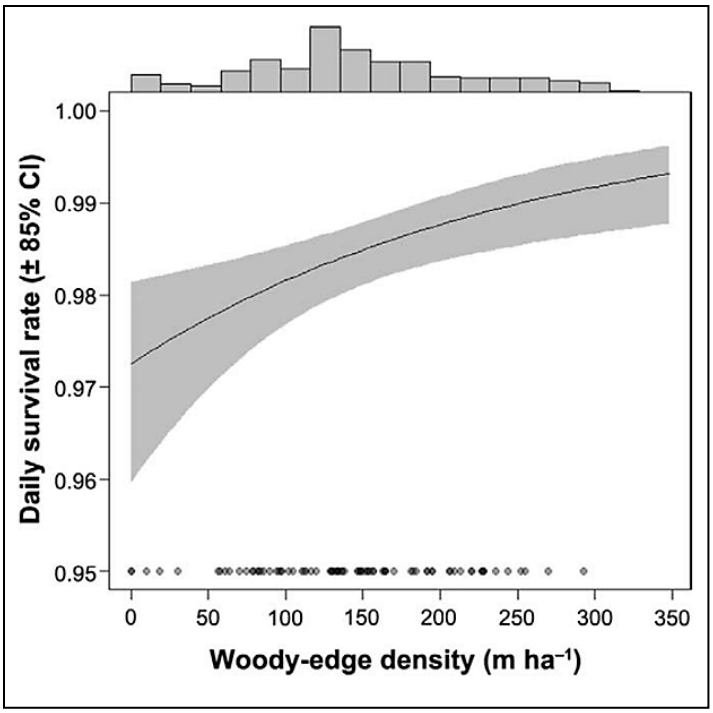

Figure 2. Relationship between daily survival rates and woody cover. As woody-edge density increases, daily bobwhite survival increases. Figure courtesy of Adam Janke.

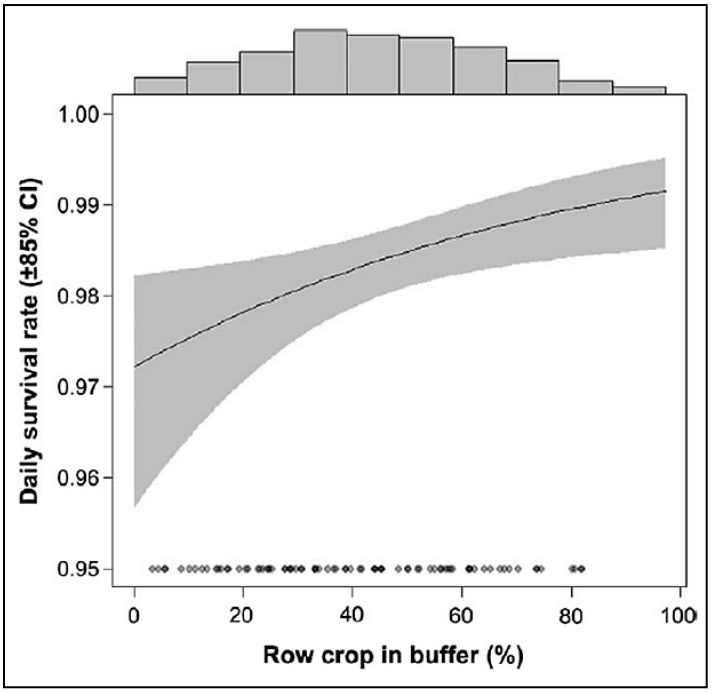

Figure 3. Relationship between daily survival rates and field buffers. As proportion of field borders increase daily bobwhite survival increases. Figure courtesy of Adam Janke.

Avian predators also capitilize on bobwhites exposed on the backdrop of a white blanket.

In cooperation with Dr. Robert Gates at Ohio State University and Dr. Adam Janke at Iowa State University, we evaluated bobwhite survival and the effects of winter weather on survival and population trajectories in Ohio and Maryland. We found that when woody cover was prevalent, daily survival was much improved (Figure 2). Likewise, when field buffers/borders were readily available, bobwhite survival increased (Figure 3).

We also found that temperature did not influence survival of bobwhites, as much as snow depth or prolonged periods of snow cover (see Figures 4 a & b). Finally, we found that harsh winter events are linked to regional patterns of population declines (not just localized impacts), so that when snow accumulation exceeds normal levels, regional bobwhite abundance is negatively impacted for several years following the winter events (see Figure 5); and, the greater the snow accumulation, the more pronounced the population declines.

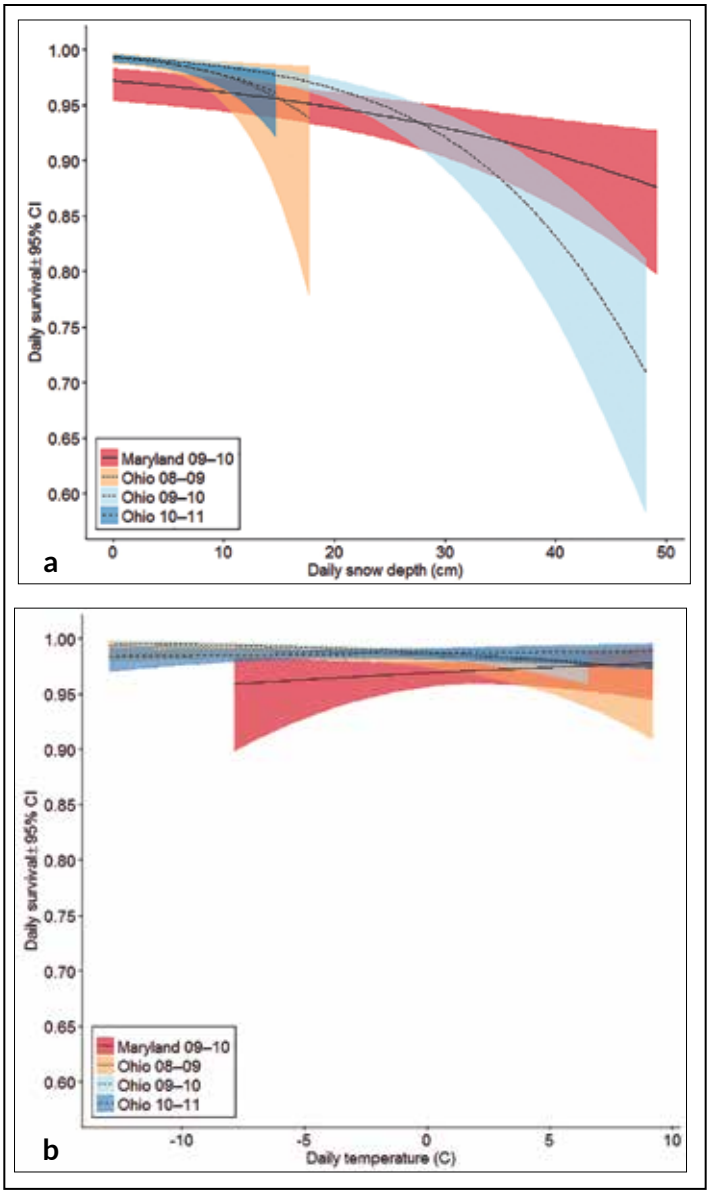

Figure 4a & b. Predictions of survival evaluating the influence of snow depth (a) and temperature (b) on daily survival rates of northern bobwhites radio-marked on study areas in Ohio and Maryland during December 2009–February 2010. Shaded regions represent 95% confidence intervals on predictions.

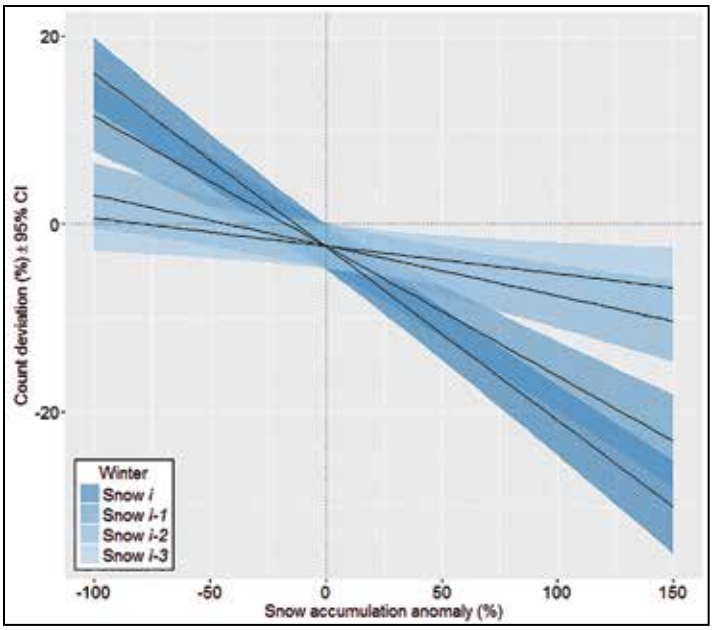

Figure 5. Predicted relationship between Northern Bobwhite count deviations on North American Breeding Bird Survey Routes (n = 128) and route-specific snow accumulation anomalies in the preceding winter (i) and 1–4 year lags. Zero count deviations and snow anomalies represent average values while positive and negative values indicate above and below average values, respectively. Shaded regions represent 95% confidence intervals on predictions.

TAKE HOME MESSAGE

Intentional habitat management is critical to bobwhite survival and population persistence in the Mid-Atlantic region, especially in the face of harsh winters and heavy snowfall events. Given the potential of prolonged snow cover during winter, estalishing year-round cover in the form of field buffers and woody cover (brush thickets) is vital for bobwhites, and maintaining this habitat with prescribed fire is important. I have found that a target goal of maintaining 25% year-round cover (i.e., non-agriculture, quality habitat) for bobwhites is ideal among farm dominated landscapes in the Mid-Atlantic region to ensure adequate cover during the winter. Lastly, when managing for bobwhite life on the edge, it is recommended to

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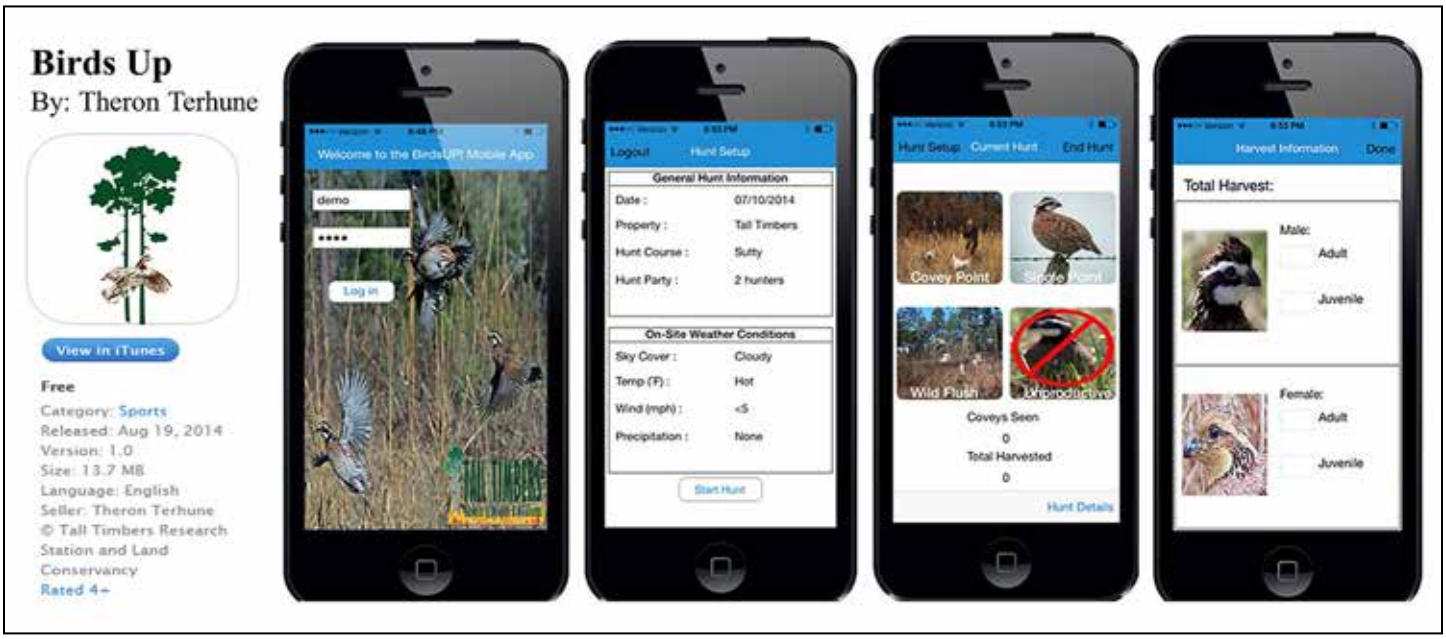
TOOLS & TECHNOLOGY

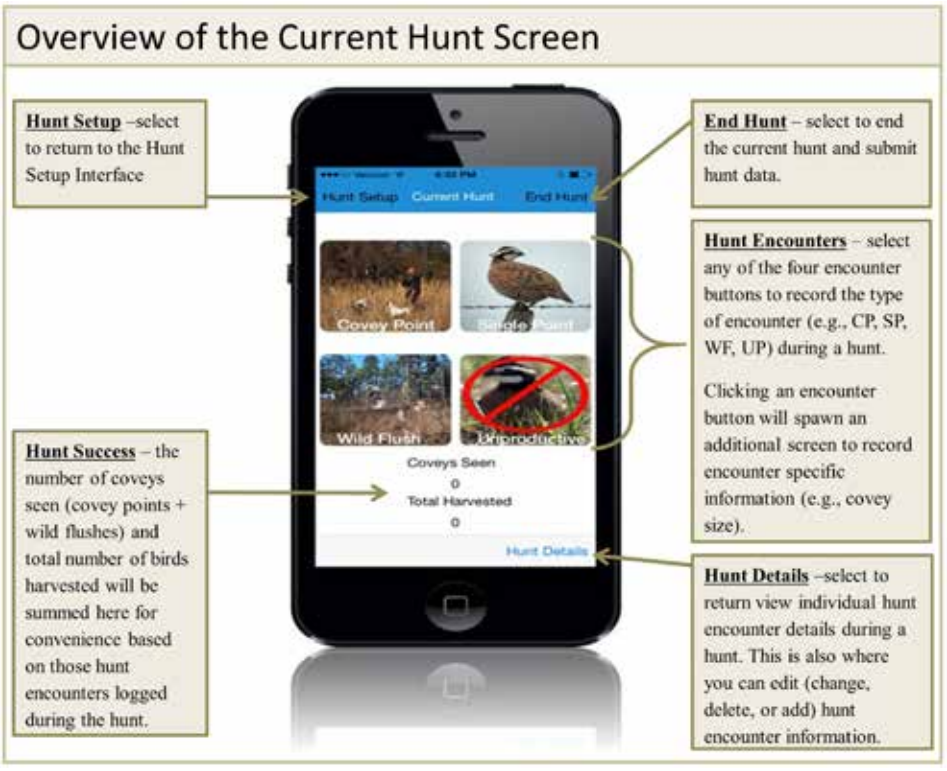


Birds Up – a quail hunting iPhone App

By: Theron Terhune

Many southern hunting plantations, and ranches out West, have collected quail hunting information such as covey finds for dozens of years. Traditional means of collecting these data has, to date, consisted of mostly paper records using hunt cards, hunt slips, or notebooks. During the past decade, land owners and land managers have begun to convert these data from a paper format stored in file cabinets to a digital format using computers and applications such as Microsoft Excel. Yet, entering this data is both labor-intensive and time-consuming; for many properties this data entry requires several days, to even several weeks at the end of each season, which may delay summarization, evaluation and analysis. However, the advent of smart phones and mobile devices has made it easier than ever to collect this type of data in the field, as well as collect additional information, such as locational position, on-the-fly.

Therefore, our primary objective in designing **Birds Up** was to provide an easy-to-use tool for recording quail hunting information for landowners and land managers. In addition, this information will aid the Game Bird Program at Tall Timbers to identify regional pulses in hunting success, and help to



Birds Up continued

advance quail research. For instance, the data collected using this app should help to shape our knowledge of age structure and reproductive output at a broad scale and afford a better understanding about how large-scale management is linked to fluctuations in northern bobwhite population levels. In addition to providing site-specific hunt success information, we also anticipate that data collected using **Birds Up**, over multiple years and multiple properties, will help to address habitat questions at local and regional scales.

The name of the app was affectionately derived from the repeated declaration of the phrase "Birds Up!" as birds flushed wild during quail hunts in the Red Hills and Albany regions. The **Birds Up** app was designed and tested by quail hunters; and additionally, it was vetted and beta-tested for an entire hunting season (2013–14) by local plantation landowners and managers in the Red Hills region. It is still very much a work in progress and we look forward to hearing from you on ways we can improve the app and better serve your needs. Contact Theron (tterhune@talltimbers.org) for more information or to get signed up and start recording your quail hunting data.

Turkey research continued from page 19–

scale, broadcasting supplemental feed should not be viewed as baiting when evenly distributed across the property under the context of bobwhite management.

Life on the edge continued from page 27–

prepare for the worst and hope for the best. Therefore, in addition to habitat management, implementing a predation management program may help to mitigate bobwhite mortality, and supplemental feeding, particularly following heavy snow events, will provide an immediate source of food when native food resources are unavailable due to snow accumulation.

OTHER NEWS

12th Annual Georgia-Florida Turkey Invitational provides support for the Game Bird Program

On April 30th, the annual Georgia-Florida Turkey Invitational Kick-off Dinner was held for the twelfth year at Osceola Plantation, Thomasville, Georgia. Many thanks to our hosts the Williams and Parker families. Dr. Theron Terhune and his graduate student Aaron Griffith provided the evening's entertainment, which focused recent wild turkey research they are conducting in the Red Hills region and central Florida in cooperation with the Florida Fish and Wildlife Commission. Theron outlined parallels of Stoddard's land mark research on northern bobwhite and wild turkeys among the plantation community compared to today's research and general management philosophy. Aaron then stole the show by providing recent research results on wild turkey resource use and explained how supplemental feeding for quail likely has little impact on the concentration of wild turkeys and their harvest rate. He also described the relationship of gobbling activity to nesting chronology and hunting season implications. Proceeds from the event benefit the Game Bird Program at Tall Timbers.

The next morning, nearly 30 teams took to the woods hoping to sweet-talk a gobbler. Two-man teams hunted their own lands and returned for the weigh-in at noon. Judge Ricky Lackey, National Wild Turkey Federation Biologist, conducted the weigh-in.

Team Reggie Thackston & Clay Sisson won the overall invitational with a gobbler that had a 10-15/16"beard and 1-6/16" 1-5/16" spurs. They were awarded the perpetual Georgia/Florida Turkey Invitational trophy. Matthew Carlton and Josh Hoffstetler took second place, and third place went to Bill Palmer and Jim Karls.

First place in the Youth Division went to Ryan Gaston. The Calcutta cash prize was won by Eddie Davis and Joey Collins with a whopping 22-pound, 4-oz. gobbler. Second place went to Team Reggie Thackston/Clay Sisson (20 lbs., 6 oz.) and third place went to Team Matthew Carlton/Josh Hoffstetler (20 lbs., 4 oz.).

Winners Reggie Thackston and Clay Sisson with their awards and the perpetual trophy; Dr. Theron Terhune looks on.

2016–17 Game Bird Research Team

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Morgan Oberly, Game Bird Technician

William E. Palmer, PhD, Director of Research, President/CEO

Eric Staller, MS, Natural Resources Coordinator

Albany Quail Program (AQP)

Clay Sisson, Director

Adam White, Wildlife Technician

Dixie Plantation

Randy Floyd, Land Manager

John Michael McCormick, Wildlife and Land Management Technician

David Sisson, Wildlife and Land Management Technician

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Aaron Griffith, MS Student, University of Tennessee

Angelina Haines, MS Student, Auburn University

Ryan Haley, MS Student, Delaware State University

Michael Hazelbaker, University of Georgia

Katie Hooker, PhD Student, University of Florida

Alex Jackson, MS Student, University of Georgia

Kyle Lunsford, MS Candidate, University of Georgia

Kristen Malone, PhD Candidate, University of Florida

Dylan Orlando, MS Candidate, University of Georgia

Katie Belleville, an intern, attempts to locate a radio-tagged bobwhite.

Brad Roberts, MS Candidate, University of Georgia

Kaili Stevens, MS Student, University of Delaware

Seth Wood, MS Student, University of Georgia

Research Interns

Jessica Beach

Katelyn Belleville

Hunter Copolino

Chase Cross

Nathan Eldridge

Katelin Griffith

Lindsey Partymiller

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Andrew Trocheck

Aaron Yappert

Volunteers

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Read why dog movements are recorded with GPS collars in the article, "When to run and when to hide: factors influencing escape behavior of Northern Bobwhites," – page 8.