

STATEWIDE QUAIL

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Abilene, Texas

September 16-18, 2015

www.statewidequailsymposium.com



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Funding was provided through the Reversing the Quail Decline in Texas Initiative and the Upland Game Bird Stamp Fund based on a collaborative effort between the Texas Parks and Wildlife Department and the Texas A&M AgriLife Extension Service.

It is my pleasure to welcome you to the 2015 Statewide Quail Symposium. Reversing quail decline in Texas is built around both education and research focused on landscape improvements to increase quail populations and investigations into diverse factors that interact to cause quail decline. These ambitious goals cannot be accomplished by any one individual, government agency or organization, but needs a comprehensive approach to solve a complex problem.



Funding (\$2,000,000) for this Texas A&M AgriLife Extension Service initiative, directed by the 83rd Texas Legislature in 2013 and authorized through the Texas Parks and Wildlife Department, launched several research and education components aimed at understanding and reducing the decline of quail.

According to studies by the U.S. Fish and Wildlife Service, quail are ranked third behind deer and dove as the state's most popular game species in an industry that exceeds \$1.5 billion annually. AgriLife Extension studies show about 65 percent of Texas hunters come from urban areas. So dwindling bird numbers not only threaten rural economies, but also reduce hunting opportunities for many urban residents.

I extend my sincere appreciation for your participation at this symposium and heartfelt thanks for your interest in helping to address the decline of quail populations in Texas. Best wishes for a successful conference.

Doug Steele

Director, Texas A&M AgriLife Extension

Reversing the Decline of Quail in Texas Initiative Advisory Committee

Justin Trail (Albany) Chair	Ronnie Howard (Falfurrias)
George Allen (Archer City)	Helen Holdsworth (San Antonio)
Marc Bartoskewitz (Ranger)	Dr. Jason Johnson (Stephenville)
Bruce Berg (Meridian)	Stan Kimbell (Wichita Falls)
Josh Blanek (San Angelo)	Terry Lee (George West)
Dr. Jim Cathey (College Station)	Mike Petter (Pleasanton)
Ken Cearley (Canyon)	Dale Prochaska (Brownwood)
Dr. Megan Clayton (Corpus Christi)	Rocky Vinson (Albany)
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Clint Faas (Victoria)	Robert Perez (La Vernia)
Stan Graff (Dallas)	Todd Swift (Uvalde)
Dr. Eric Grahmann (Kingsville)	Deborah Clark (Henrietta)
Tommy Haegelin (La Pryor)	Richie Griffin (Carrizo Springs)
Lee Harris (Hillsboro)	Dick McCallum (Dallas)
Brian Hays (Gatesville)	Irvin Welch (Hebbronville)
Cal Hendrick (Odessa)	Jim Willis (Cat Springs)

Thank you to our advisory committee members for your time and expertise!

SCHEDULE

September 16, 2015

- 1: 00 pm—Tour of Trail Ranch in Albany
- Plant ID Quiz: Kent Mills and Ricky Linex
- Quail Management Goals: Justin Trail
- Economic Impact of Quail to Texas: Kent Mills
- Defining Usable Space for Bobwhites: Dr. Dale Rollins
- Brush Sculpting: Marc Bartoskewitz
- Cropping for Quail: Justin Trail
- Texas Quail Index: Becky Ruzicka
- 5:30 pm—Conclude tour

September 17, 2015

- Moderator: Dr. John Tomeček—Texas A&M AgriLife Extension
Service, Wildlife Extension Specialist
- 7:30 am—Registration
- 9:00 am—Introductory Comments: Dr. Doug Steele
- 9:10 am—The State of Quail Hunting in Texas: Dr. Dale Rollins
- 9:45 am—Keynote Address: Dr. Fidel Hernandez
- 10:30 am—Break
- 10:50 am—Reversing the Decline of Quail Initiative: Dr. Jim Cathey
- 11:30 am—Weather and Quail: Dr. Markus Peterson
- Noon—Lunch in the Foyer
Luncheon Address: Texas A&M System Chancellor
John Sharp
- Moderator: Dr. Morgan Russell—Texas A&M AgriLife Extension
Service, Range Extension Specialist
- 1:15 pm—Quail Focus Areas: Robert Perez
- 1:40 pm—Translocation as a Tool for Wild Quail Reestablishment:
Michelle Downey

2:05 pm—Larger Landscapes for Quail: Dr. Kelly Reyna
2:30 pm—Break
2:40 pm—Point-Counterpoint—Pen Reared Quail: Cal Hendrick and
Robert Perez
3:20 pm—Point-Counterpoint—Cows and Quail: Russell Stevens
and Dr. Richard Teague
4:00 pm—Break
4:10 pm—GPS Technologies for Tracking Quail: Dean Marquardt
4:25 pm—Spatial Gradient Modeling: Matthew Schnupp
4:50 pm—Monitoring Quail and Habitat: Becky Ruzicka
5:10 pm—Attacking the Eyeworm: Dr. Ron Kendall
6:30 pm—Texas Wildlife Association and Texas Brigades Reception
hors d'oeuvres and refreshments

September 18, 2015

**Moderator: Annaliese Scoggin — Wildlife Biologist, Texas Parks and
Wildlife Department**

Updates from Texas Quail Research Institutions

8:00 am—Rolling Plains Quail Research Ranch: Dr. Dale Rollins
8:30 am—Quail-Tech: Dr. Brad Dabbert
9:00 am—UNT Quail: Dr. Kelly Reyna
9:30 am—Caesar Kleberg Wildlife Research Institute: Dr. Eric Grahmann
10:00 am—Borderlands Research Institute: Dr. Ryan Luna
10:30 am—Break
10:50 am—Highlight Event Sponsors
11:00 am—Plans for Next Biennium: Dr. Jim Cathey
11:15 am—Closing Comments: Justin Trail



Texas Wildlife Association and Texas Brigades

Abilene Reception

The Texas Wildlife Association and Texas Brigades cordially invite you to a membership reception at the MCM Elegante in Abilene.

Thursday, September 17, 2015
6:30 p.m. Cocktails and Hors d'oeuvres
Meet & Greet with TWA Leadership

MCM Elegante Abilene
4250 Ridgemont Drive
Abilene, Texas 79606

**Bring your friends to hear the TWA message and
learn more about Texas Brigades!**

RSVP to Kendra Roller at kroller@texas-wildlife.org or (800) 839-9453.

The Texas Wildlife Association is a statewide 501(c)4 non-profit membership organization that actively advocates for wildlife and natural resource conservation at the local, state, and national levels. We are absolutely dedicated to educating all persons, especially the youth of Texas, about the conservation, management and enhancement of wildlife and wildlife habitat on private land to ensure the preservation of our cherished rural heritage for future generations.

The Texas Brigades' mission is to educate and empower youths with leadership skills and knowledge in wildlife, fisheries, and land stewardship to become conservation ambassadors for a sustained natural resource legacy.



Speakers

Marc Bartoskewitz— Clear Fork Ranch Manager, Shackelford County

Dr. Jim Cathey— Texas A&M AgriLife Extension Program Leader,
Extension Wildlife Specialist, Director of Reversing the Decline of
Quail in Texas Initiative

Dr. Brad Dabbert— Professor, Quail-Tech, Texas Tech University

Michelle Downey— Graduate Research Assistant, Rolling Plains Quail
Research Ranch, Roby; Caesar Kleberg Wildlife Research Institute,
Texas A&M University Kingsville

Dr. Eric Grahmann— Assistant Professor for Research, Caesar Kleberg
Wildlife Research Institute, Texas A&M University Kingsville, San
Antonio

Cal Hendrick— Landowner and quail hunter, Tom Green County

Dr. Fidel Hernández— Endowed Professor for Quail Research, Caesar
Kleberg Wildlife Research Institute, University of Texas A&M-
Kingsville

Dr. Ron Kendall— Professor, The Institute for Environmental and
Human Health, Texas Tech University

Ricky Linex— Wildlife Biologist, Natural Resource Conservation Service

Dr. Ryan Luna— Professor, Borderlands Research Institute, Sul Ross
University

Dean Marquardt— Private Lands Biologist, Texas Parks and Wildlife
Department

Kent Mills— Rolling Plains Quail Research Ranch Advisory Board
Member

Robert Perez, Upland Gamebird Program Leader, Texas Parks and
Wildlife Department

Speakers

Dr. Markus Peterson, Professor, Department of Biological Sciences,
University of Texas at El Paso

Dr. Kelly Reyna, Assistant Professor, UNT Quail, University of North
Texas

Dr. Dale Rollins, Director, Rolling Plains Quail Research Ranch;
Statewide Coordinator, Reversing the Decline of Quail in Texas
Initiative, Texas A&M AgriLife Extension Service

Becky Ruzicka, Wildlife Extension Associate, Texas A&M AgriLife
Extension Associate

Matthew Schnupp, Biologist, King Ranch

John Sharp, Chancellor, Texas A&M University System

Dr. Doug Steele, Director, Texas A&M AgriLife Extension Service

Russell Stevens, Strategic Consultation Manager, The Noble Foundation

Dr. Richard Teague, Associate Resident Director and Professor, Texas
A&M AgriLife Research Service

Justin Trail, Landowner and Chairman of Reversing the Decline of Quail in
Texas Committee, Shackelford County



Quail Coalition



Mission Statement:

“to sustain and restore huntable wild quail populations, to encourage and educate interested youth, and to celebrate our quail hunting heritage in this region”

For More Info, Visit:

www.quailcoalition.org

Quail Coalition currently has 12 chapters based in the cities listed:

Amarillo	Huntsville
Austin	Kingsville
Dallas	Lubbock
Dalhart	Midland
Fort Worth	San Antonio
Houston	Wichita Falls

With over 3,500 members, Quail Coalition is the largest alliance of quail hunters in Texas, and raises over \$1.5 million annually for quail research and conservation. Become a member today to join our efforts to restore quail populations in our region.



To learn more, please contact

jay.stine@quailcoalition.org

Summary:

Reversing the Decline of Quail in Texas Initiative

The long term decline of scaled quail and northern bobwhite populations across their range in Texas is a veritable wildlife tragedy. If this trend continues, quail may even disappear statewide in the long term. This loss would be catastrophic both in terms of the conservation of these native grassland bird species and the resulting loss of the treasured and historic hunting heritage surrounding quail. Reversing this trend and restoring healthy quail populations is critical, now more than ever. Doing so will help balance ecosystems and maintain all the economic and recreational benefits of quail hunting in the state.

Based on the number of hunters, quail are the third-most hunted game animal in Texas, ranking only behind deer and dove. The economic impact of hunting in Texas exceeds \$1.5 billion annually, with 65% of hunter expenditures made in rural counties. However, recent studies by Texas A&M AgriLife Extension Service indicate that approximately 65% of hunters come from urban areas. Therefore, the decline in quail numbers not only threatens the livelihood of rural Texans but also reduces popular hunting opportunities for many urban residents.



Funding of \$2 million directed by the 83rd Texas Legislature and authorized by Texas Parks and Wildlife Department launched the Reversing the Decline of Quail in Texas Initiative (RDQI) in 2013. According to Dr. Doug Steele, AgriLife Extension director:

“Reversing quail decline in Texas is built around both education and research focused on landscape improvements to increase quail populations and investigations into diverse factors that interact to cause quail decline.”

The ultimate objective is to address and reverse the trend through Extension education and research on factors that reduce quail populations. Research projects funded through this initiative will provide critical information to improve habitat management efforts on public and private lands, while educational efforts conducted through this initiative will enhance the knowledge base for land managers across Texas.

Research Component

It is well known that rainfall patterns impact quail abundance across the semi-arid portions of the state and that habitat losses are contributors to quail decline across their range. However, recent drops in quail abundance have continued even in apparently suitable habitat during favorable weather conditions. This suggests that new or unidentified threats are affecting the health and survival of Texas quail and that continuing or modified research approaches are needed to better understand the situation.

Much of the research history consists of individuals, or small groups of investigators, searching for a single cause of quail decline. Researchers have proposed a variety of factors, including predators, parasites, red-imported fire ants, pesticides, released pen-raised birds, overgrazing, drought, West Nile Virus, habitat loss, habitat conversion and others. However, none of these in isolation can explain the statewide patterns of decline over the past 40 years. Consequently, a key step is the establishment of an integrated, centrally-administered effort that includes priority research, field studies, demonstrations and educational programming dedicated to identifying and addressing both known and unidentified causes of declining quail numbers.



Release of translocated wild caught scaled quail as part of the Rolling Plains Quail Research Ranch's 'Operation Blue Transfusion.'

Thirteen research projects were funded to address quail decline and field and lab work for projects began in December 2013 and are still ongoing. Emphasis was placed on the following priority areas:

- ◆ investigations into the impact of parasites,
- ◆ examination related to the impact of toxins,
- ◆ field studies on health factors influenced by environmental conditions,
- ◆ impact of predation,
- ◆ effectiveness of translocation to repopulate depleted areas,
- ◆ diagnostic testing for diseases thought to impact quail survival, and
- ◆ genomic sequencing and bioinformatics related to quail populations.

These investigations are being conducted by different research institutions across the state including Texas A&M University, Texas A&M University – Kingsville, Texas Tech University, University of North Texas, Texas A&M AgriLife Research, and the Rolling Plains Quail Research Ranch.



UNT Quail's flight pens used to evaluate the efficacy of soft- vs hard- release for wild caught and captive bobwhites

Harvesting quail for TAMU Masters student, Hannah Ertl's research on neonicotinoid pesticides.



Extension Component

Extension is the vehicle to translate and relay research findings to agricultural producers, wildlife managers, and the general public. An important role of Extension is to raise awareness about the challenges faced by quail in our state and relay land management actions that benefit these birds. We choose to use an integrated approach to accomplish these goals, combining traditional face-to-face programs (high-touch) with novel methods using the internet (high-tech).

Texas Quail Index (TQI) A series of hands-on demonstrations, run by our County Extension Agents designed to educate land managers, hunters, and others about quail population dynamics. For more information, see TQI abstract in this program.

Quail Appreciation Days Six-hour hands-on workshops, held across the state. In total, 17 Quail Appreciation Days were held from 2014 to 2015.

QuailMasters A series of intensive classes in quail management and conservation for 'serious students of quail.' Each class consists of four 3-day sessions held at different locations across the state.

Bobwhite Brigades A youth-focused camp in its 23rd year created by Dr. Rollins. The Brigades camps give youth experience in critical thinking, communication, leadership, and team building, while learning about quail biology, habitat management, population dynamics, and ecology.



AgriLife Extension Associate, Becky Ruzicka, and County Extension Agent, David Graf, with the Rolling Plains Chapter Texas Master Naturalists at a TQI training session.

YouTube New quail-related Extension educational videos posted to WFSC AgriLife YouTube and AgriLife's Internet TV Channel, AgSmart TV, were viewed 29,000 times.



The 2015 South QuailMasters class touring premier quail properties in the Gulf Coast Prairies Ecoregion

Facebook The new Reversing the Quail Decline Initiative Facebook page grew to more than 3,400 “likes” in a short period, since January 2014.

Wild Wonderings Blog Contains articles written by undergraduates and Extension personnel in the Department of Wildlife and Fisheries Sciences that cover all aspects of quail management and other wildlife interests.

Mobile Phone Apps Two free quail-related iPhone apps, a habitat evaluator and management calendar, were developed and released to add more diversification to the delivery mediums.

Webinars In 2014 and 2015 four webinars were available for live listening and questions. The webinars covered a wide breadth of topics concerning quail management and conservation in Texas.

Quail Curriculum A curriculum aimed at high school students that uses quail biology examples to teach core concepts in math and science.

News Releases Essential to keeping research and extension education activities in the news. Available on today.agrilife.org.

The combined efforts of research and Extension education are the key in understanding the causes that challenge quail populations and relaying results to mitigate them. Partnerships with AgriLife Extension and Texas Parks and Wildlife Department are much appreciated and serve to amplify the need for quail conservation. With the knowledge gain in this effort and with the great stewardship on public and private lands, the outlook for quail is promising.

Proud partners with the Clear Fork Ranch



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To Make a Difference is Why We're Here



With more than 7074 habitat projects since 2005, impacting 505,804+ acres and getting more than 16,000 youth engaged; Quail Forever remains committed to our members, volunteers, partners and landowners to achieve our mission.

Call us to help extend that mission to help quail & other wildlife through habitat improvements, public awareness, education and land management policies and programs.

Steve Riley, CWB
Director - South Region
(402) 433-5078
Sriley@pheasantsforever.org

Laura Mclver
Regional Representative
(907) 750-2600
Lmciver@quailforever.org

ABSTRACTS



ECONOMIC VALUE OF QUAIL: SHOW ME THE MONEY

Jason L. Johnson, Texas AgriLife Extension Service, Stephenville, TX

Dale Rollins, Texas AgriLife Extension Service, San Angelo, TX

Kelly S. Reyna, UNT Quail, University of North Texas, Denton, TX

Kent Mills, Hi Pro Feeds, Snyder, TX

Funds generated and spent on the pursuit of quail (*Colinus virginianus*) hunting in Texas are sizable. We surveyed a population of quail hunters in Texas in 2000 and 2011 to assess hunter demographics and spending habits. The population of hunters for the 2000 survey consisted of members of Quail Unlimited who lived in Texas while the 2011 population consisted of the former group's successor in Texas—Quail Coalition. The initial (2000) survey was a mail questionnaire while the 2011 survey instrument was delivered electronically. We achieved response rates of 47% in 2000 but only 9% in 2011. The number of resident quail hunters in Texas decreased 72% from 1981 to 2010. Quail hunters in Texas can be characterized as white males (97%) and affluent (65% reported annual household incomes above \$125,000 in 2010). Survey respondents documented an average expenditure of \$8,606 in pursuit of quail during an average of 8.8 days of hunting during the 2010–2011 season. This resulted in a cost of \$254 per quail bagged when combined with harvest estimates provided by respondents; an estimated increase of 23% over the last 10 years.

WHAT IS “USABLE SPACE” FOR BOBWHITES?

Dale Rollins, Rolling Plains Quail Research Ranch, Roby, TX
Texas A&M AgriLife Extension Service, San Angelo, TX

In essence, it is the summer of 2015! The concept of “usable space” was popularized by Dr. Fred Guthery at Oklahoma State University. In its simplest terms it’s defined as “suitable, permanent cover” that allows a bobwhite to call a particular site “home.” Earlier, King Ranch biologists Val Lehmann said it this way “to supply most of the needs of high populations of quail, they must be assured *continuous* use of virtually every square foot of ground.” You maximize space–time when every square foot is useable by bobwhites every day of the year. In west Texas, saturating a landscape with space-time typically means addressing brush canopy and grass cover, be it too little or too much. At RPQRR, we use our various count records (e.g., helicopter counts) to suggest where we have useable space, and areas where we do not. When we find “dead space” we ask “what’s missing here?” Generally such areas are too open, i.e., insufficient woody cover, or at least insufficient escape cover (including “quail houses”). Throughout today’s tour, we will be discussing components, thresholds, and characteristics of usable space. In rangeland settings, useable space management boils down to 2 options: (1) add or remove woody cover and (2) increase or reduce the density of herbaceous cover. For more information on Guthery’s thoughts on usable space, see <http://bollenbachchair.okstate.edu/USABLE%20SPACE--LIGHT%20VERSION.pdf>.

QUAIL CROPPING AND RANCH MANAGEMENT

GOALS: TRAIL RANCH

Justin Trail, Trail Ranch, Albany, TX

Tamara Trail, Trail Ranch, Albany, TX

Since we cannot predict when we are going to get much needed moisture, our fundamental land management goal is to manage the land and the plant community so that it is as ready as it can be to benefit from the moisture when we do get it. Combine this stewardship goal with the equally important desire to maximize opportunities for others to enjoy mixed-use recreational experiences such as first harvests, and one can gain a pretty good perspective on how management decisions are made on the Trail Ranch. The focus of the ranch tour and discussions will showcase the use and timing of a variety of management tools used to enhance food and shelter for quail such as discing and seeding, grazing management, mechanical and chemical brush management applications, and prescribed burning; all within the specific context of enhancing the wildlife experience for the long-term.

WANTED: Experienced, Custom Home Builders for Quail

Marc L. Bartoskewitz, Ranch Manager, Cook Canyon Ranch, Eastland County, Ranger, Texas; Clear Fork Ranch, Shackelford County, Albany, Texas

Have you ever built a house from the ground up, or maybe remodeled an existing home? If so, you probably followed these steps: 1.) formulated a budget; 2.) picked out or designed a floor plan; 3.) added specific items of interest to create the perfect environment; and 4.) hired a contractor to build or remodel your perfect home. Sculpting “habitat”, in this case brush for quail is really no different. First, we need to develop a plan for the specific area(s) you wish to manipulate to create better quail habitat. That plan should include the types of techniques that will be used, target species to be managed/eradicated, timing of the year to start and complete the work, a contractor bid or in-house estimate of cost to complete the project, and future follow-up needs to maintain the ideal quail habitat you were trying to create. Second, and the most crucial decision, is implementation. During implementation, it is mandatory to check on your operator/contractor at least 2-3 times daily, as they will almost always clear more brush than what is planned. Carry a softball with you to make sure escape cover is adequately spaced to within a softball’s throw. Make sure you are leaving the desired brush plants needed for good escape cover, whistling perches, and thermoregulation during the most extreme times of the year, Hot or Cold. Lastly, make sure you have a follow-up plan for the future. As my good friend Rory Burroughs says to his clients: “Brush sculpting/management is not a project, it’s a process” If you follow these simple steps towards building a better home for quail on your property, you will surely be prepared to enjoy many years of success in your quail program.

THE TEXAS QUAIL INDEX

Becky Ruzicka, Texas A&M AgriLife Extension Service, Dallas, Tx

Dale Rollins, Rolling Plains Quail Research Ranch, Roby, TX

Texas A&M AgriLife Extension Service, San Angelo, TX

The Texas Quail Index (TQI) is a series of hands on demonstrations designed to educate land managers, hunters, and others about population dynamics, habitat requirements, and other factors affecting northern bobwhite and scaled quail in Texas. At the county level, TQI fosters landowner and community involvement and provides tools for stakeholders to assess the “quail-equation” in their community. Statewide, the TQI provides an important opportunity to use citizen-science to help monitor the abundance of quail and bring attention to their importance, plight, and habitat needs. TQI teams were responsible for collecting data on quail populations, predator abundance, and habitat quality on the participating ranches and wildlife management areas using a variety of techniques. There are a total of 35 properties, public and private, participating statewide and over 95 people involved including landowners, ranch managers, Texas Master Naturalists, former Bobwhite Brigaders, AgriLife County Extension Agents, TPWD personnel, NRCS personnel, and USFWS personnel.

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THE STATUS, AND FUTURE, OF QUAIL HUNTING IN TEXAS

Dale Rollins, Rolling Plains Quail Research Ranch, Roby, TX; Texas A&M AgriLife Extension Service, San Angelo, TX

For the first time since 2008 there is palpable enthusiasm in a quail forecast. Informal reports suggest quail (bobwhite and scaled) abundance at or above long-term means. I will discuss my interpretation of the factors that have aligned to cause (permit?) such resurgence in quail abundance. I will review A. S. Jackson's ideas of population irruptions and posit the importance of protective cover (e.g., common broomweed). I will also posit ideas for habitat management to "extend" the current "boom" to ponder as we move closer to the next inevitable drought. While quail abundance has increased this year, there is also sobering news. As a lifelong quail hunter I am anxious about the future of quail hunting in Texas. Whatever "clout" quail hunters have enjoyed with policymakers is eroding. I will analyze various factors that may impinge on the availability of quail hunting, and ultimately, the population of quail hunters.

KEYNOTE ADDRESS: THE COLORS OF QUAIL SCIENCE

Fidel Hernández, Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, Texas 78363

Quail have been the subject of study for well over a century. Much is known about the species' ecology, life history, and management. Despite this long research trajectory and extensive knowledge base, quail research has failed to evolve as a science. Few concepts have emerged to unify the discipline, and thus quail science has remained mostly unchanged over the past 100 years. Here I present perspectives on quail research and discuss the creativity that will be needed to advance quail science.



Provide funding for the Texas Brigades, an innovative leadership program for high school students focusing on wildlife and natural resources

Equipment for game wardens in South Texas

Research projects at Caesar Kleberg Wildlife Research Institute, Borderlands Research Institute, University of North Texas, and the Oaks & Prairies Joint Venture

Educational programs for land owners and wildlife managers

SUMMARY OF REVERSING THE DECLINE OF QUAIL INITIATIVE RESEARCH

Jim Cathey, Texas A&M AgriLife Extension Service, College Station, TX

Populations of northern bobwhite and scaled quail have been declining throughout Texas since at least the 1970s. Much of the research history consists of individuals, or small groups of investigators, searching for a single cause for dwindling quail numbers. The Reversing the Decline of Quail in Texas Initiative represented a centrally-administered effort that included priority research, field studies, demonstrations and educational programming dedicated to identifying and addressing both known and unidentified causes affecting quail abundance. Twenty-one research proposals were received in response, to a Limited Request for Proposals to address quail decline with emphasis on the following priority areas: impacts of parasites, toxins on quail populations, field studies on quail health factors as influenced by environmental conditions, role of predation on quail survival and effectiveness of translocation for repopulation, diagnostic testing for diseases thought to impact quail survival, and genomic sequencing and bioinformatics related to quail populations. Thirteen projects were funded in the amount of \$1,117,339. These projects were conducted by elements of Texas A&M University (Department of Wildlife and Fisheries Sciences, Institute of Renewable Natural Resources, Department of Veterinary Pathobiology, AgriLife Research and Extension Center – Uvalde and Texas A&M University – Kingsville), and Texas Tech University, University of North Texas and the Rolling Plains Quail Research Ranch. Among the 13 research projects, 11 graduate students and 1 research assistant were supported and trained. Five peer-reviewed journal articles (3 published, 1 in press, and 1 submitted) and 1 thesis were completed with additional publications being prepared now.

WEATHER AND QUAIL ABUNDANCE IN TEXAS

Markus J. Peterson, Ecology and Evolutionary Biology Program, Department of Biological Sciences, University of Texas at El Paso (UTEP), El Paso, Texas, USA

Wildlife biologists and hunters have long recognized that the “boom or bust” northern bobwhite (hereafter bobwhite; *Colinus virginianus*) abundance typically observed in semiarid regions of Texas—such as the South Texas Plains and the Rolling Plains—was related to weather. Although wildlife ecologists quantified this relationship for California (*Callipepla californica*) and Gambel’s quail (*C. gambelii*) as early as the 1950s, similar work began in Texas during the late 1990s. Bridges et al. (2001) found that the Modified Palmer Drought Severity Index (PMDI) could account for most of the variability in numbers of bobwhites and scaled quail (*C. squamata*) counted by Texas Parks and Wildlife Department (TPWD) biologists among years along roadsides during August in 5 semiarid ecoregions. The PMDI was unrelated to bobwhite production in the Gulf Prairies and Marshes, however, where much greater precipitation occurs. Since this study, researchers using different analytical approaches and/or data have found similar results. For example, in South Texas fewer bobwhite hens nested, nesting rates were lower, and the number of juveniles per adult harvested by hunters was much lower following dry periods. Similarly, April–August precipitation accounted for 94% of the variance in the number of juveniles per adult counted in hunter bags in South Texas (2001–2008). This ratio decreased with June–August mean maximum temperatures. Across 6 Texas physiographic regions, the number of bobwhites on TPWD roadside counts decreased with increasing June temperature and livestock density. Low temperatures can ameliorate the negative effects of drought, and high temperatures can suppress the positive effects of spring and summer precipitation in South Texas (1940–1997). This occurs because high temperatures occurring in semiarid regions can be lethal to bobwhite embryos, disrupt hatch synchrony, and reduce egg viability. In semiarid regions of Texas, weather accounts for nearly all variability in quail abundance among years.

BOBWHITE QUAIL FOCUS AREAS IN TEXAS

Robert M. Perez, Texas Parks and Wildlife Department, Austin, Tx
Jim Giocomo, Oaks and Prairies Joint Venture, Round Rock, Tx

Bobwhites have suffered major declines across their entire range over the last several decades. Although portions of Texas are considered some of the last strongholds for the species, numbers have sharply decreased in recent years primarily due to long-term drought and habitat loss. In an effort to halt and potentially reverse declines in key areas of the state, Texas Parks and Wildlife Department (TPWD) was authorized by the Texas Legislature to spend \$4M of Upland Game Bird Stamp funds to develop Quail Focus Areas. The funds were awarded through 15 Habitat Enhancement Grants to 13 conservation partners. Quail Focus Areas include 23 counties where partners are working together to enhance existing quail habitat and create new acres of habitat in a “focused” effort that concentrates resources to the degree that potential impacts can be measured through bird and habitat monitoring. Counties were chosen along the receding edge of population loss where quail are sparse but not gone and average rainfall is sufficient to support habitat restoration. The focus area approach is modeled after the National Bobwhite Conservation Initiative’s “Coordinated Implementation Program” that aims to ultimately assist 25 states with focus area development. Texas is one of the first states to participate in this multi-state effort (www.bringbackbobwhites.org). The goal is to demonstrate models of success in various regions of the state, show how quail habitat can be restored and to provide hope and inspiration to Texas Land Stewards.

TRANSLOCATION AS A TOOL FOR RESTORATION OF WILD QUAIL POPULATIONS

Michelle C. Downey, Caesar Kleberg Wildlife Research Institute, Texas A&M University– Kingsville, Kingsville, TX

Dale Rollins, Rolling Plains Quail Research Foundation, San Angelo, TX

Fidel Hernández, Caesar Kleberg Wildlife Research Institute, Texas A&M University –Kingsville, Kingsville, TX

The practice of translocating wild animals in an attempt to establish, reestablish, or supplement wildlife populations has been practiced for over a century. This management tool has been utilized for several game bird species, such as the prairie-chicken (*Tympanuchus cupido*, *T. c. attwateri*, *T. pallidicinctus*), greater sage-grouse (*Centrocercus urophasianus*), wild turkey (*Meleagris gallopavo*), mountain quail (*Oreortyx pictus*), scaled quail (*Callipepla squamata*), and northern bobwhite (*Colinus virginianus*). However, translocation of wild quail has yielded mixed results. Since 2013, we initiated the translocation of wild-trapped scaled quail and bobwhites into recently depopulated habitat ($n = 5$ sites) in the Rolling Plains of Texas to evaluate the use of translocation as a management tool for quail. Here we discuss results on survival, site fidelity, and reproductive effort of translocated bobwhites on 1 of these sites and provide management recommendations for increased likelihood of translocation success based on the collective evidence of game bird translocation research.

LARGER LANDSCAPES FOR QUAIL

Kelly S. Reyna, UNT Quail, University of North Texas, Denton, TX

Northern bobwhite populations (*Colinus virginianus*) have exhibited a declining trend across their range since the inception of their monitoring. The ultimate cause of their decrease has been largely attributed to habitat loss and fragmentation which has stimulated considerable research. Most of these studies have been conducted at the ranch or patch level implicating many proximate factors as contributors to the bobwhite population decline, grossly overlooking their impacts at a landscape level. As a result, these studies have provided insight only into the occurrence and status of bobwhite meta-populations in discrete habitat remnants and have likely influenced conservation decisions in a negative manner. This quail science discrepancy is perhaps an artifact of a dearth of basic knowledge of landscape-level requirements for effective quail conservation. Of primary concern is our lack of understanding the amount of habitat needed to attain a sustainable population of northern bobwhites. Additionally, we do not understand the needed habitat configurations or the relationship between species occurrence and landscape patterns on a large landscape level. Attempts have been made to address these issues, in very few studies, primarily with anthropologically derived computer models. In the few instances where empirical data have been collected at the landscape level, findings have drastically differed from computer models which, in hind sight, had been fueled with data from patch-level studies. It is unrealistic to expect quail populations to return to peak levels through quail science, conservation, or management at a patch-level. Ultimately, the long-term persistence of northern bobwhites depends on maintaining breeding populations across their range and through time, thus, this is a call for scientists to shift focus to quality landscape-level investigations into how the extent and configuration of quail habitat at the landscape level are associated with parameters such as population age structure, breeding success, and trends in population size.

POINT-COUNTERPOINT ON PEN-REARED QUAIL:
THE VALUE AND BENEFIT

B. Calvin Hendrick, Tom Green County Landowner, West Texas Quail Hunter

We have lost a generation of quail hunters. Have we also lost a generation of quail supporters? I hope not. Beginning in 2005, the West Texas quail population suffered devastating losses. As a result, many die-hard quail hunters stopped hunting quail. Many of our youth hunted deer, predators and other animals. However, they did not hunt quail. These youth are now adults, and they probably have never hunted quail. This is not a problem, it is a disaster. The release of pen raised quail is not a restoration effort, but instead, an effort to stoke the hearts of young quail hunters. If future generations are not quail hunters, do you think they will support quail? People financially support what interests them. If they are not interested in quail, they may not financially support quail research or quail restoration. Is it too late? Maybe not, if we act now with intention and determination. I use my daughter as an example. She is 19. She has hunted deer and big game since she was 12. She had never been quail hunting because we had very few birds. She showed no interest in quail hunting. Last year, in a last ditch effort to get her interested, I bought pen-raised quail from a reputable breeder. She had a great time and loved every minute of chasing birds and shooting them. A teenage girl that had never hunted suddenly became a supporter of quail and quail hunting. My discussion will address the value and benefit of pen-raised quail. If we do not introduce new hunters to quail hunting, in 20 to 30 years, do you think they will be attending a statewide quail symposium or supporting quail research and habitat improvements?

POINT-COUNTERPOINT ON PEN-REARED QUAIL: CONS

Robert Perez, TPWD, La Vernia, TX

The failure of pen-reared quail to survive and reproduce in the wild is well documented and the stocking of these birds is not a viable option for restoring wild quail populations. Some interrelated causes of failure examined to date include: 1) inability to avoid/escape predation, 2) sedentary behavior, and 3) slower flight speed compared to wild bobwhite. Despite numerous peer-reviewed publications over the last 70 years that clearly demonstrate the inability of pen-reared birds to survive in the wild, the continued use of pen-reared birds will likely continue as a tempting “quick-fix” approach to quail declines. Pen-reared bobwhites have long been used as quarry in shooting preserves. But there needs to be a clear distinction made between shooting preserve management and wildlife management as they are not interchangeable. More recently, pen-reared bobwhite have been used as supplement to commercial hunting operations during the “bust” years. When used in this manner there are potential negative impacts to wild populations that warrant further investigation including: increased harvest of wild birds, disease and parasite transmission, increased predator abundance, habitat displacement, and integration of pen-reared birds into wild coveys.

POINT-COUNTERPOINT ON COWS AND QUAIL: CONS

Russell L. Stevens, The Samuel Roberts Noble Foundation, Ardmore, Oklahoma

Aldo Leopold, in his 1933 book *Game Management*, stated “game can be restored by the creative use of the same tools which have heretofore destroyed it – axe, plow, cow, fire and gun.” Therefore, people have recognized for many years that grazing management is not always beneficial to quail. However, statements such as “if pastures are in good shape for cattle, then they’re good for quail” are incorrectly used to justify management decisions favoring cattle. Quail are often at the losing end of this battle even when landowners try to manage simultaneously for cattle and quail, primarily because the two species have different needs. Managing for cattle attempts to create high quality, high volume, somewhat uniform, grass production to optimize animal performance and production. Cattle producers target grasses and attempt to eliminate bare ground and reduce forbs and brush in favor of homogenous pastures. Often, areas less suitable for cattle grazing are where management for quail occurs. If prescribed fire is used, the objectives are usually to improve forage quality for cattle and or control brush with grazing commonly deferred following the fire. Improper cattle stocking rate is a major contributor to poor habitat quality for quail. Overstocking cattle for prolonged periods of time reduces nesting cover, plant diversity, and reduces screening cover required for feeding, loafing and security. Generally, moderate stocking rates are best in areas receiving ≥ 30 inches of rain and light stocking rates are best in areas with < 30 inches. Conversion of native range to introduced pasture and forb and brush control to increase forage volume for cattle also reduce habitat quality for quail. Management for quail should include the use of prescribed fire along with a strategic [temporal and spatial] distribution of cattle, stocked at a light to moderate rate. These practices increase patchiness and diversify plant communities and structure. Despite the benefits to quail and other wildlife, these grazing and management techniques are rarely implemented.

POINT-COUNTERPOINT ON COWS AND QUAIL: PROS

Richard Teague, Texas A&M AgriLife Research, Vernon, Texas

Maintaining or enhancing the productive capacity and resilience of rangeland ecosystems is critical for the continued support of people who depend on them for their livelihoods, especially in the face of climatic change. This is also necessary for the continued delivery of ecosystem services derived from rangelands for the broader benefit of societies around the world. As we have degraded most of the land we have managed we need to manage to regenerate ecosystem function and the ability for managers to restore earning capacity. Multi-paddock grazing management has been recommended since the mid-20th century as an important tool to adaptively manage rangelands ecosystems to sustain productivity and improve animal management. Moreover, there is much anecdotal evidence from producers that, if applied appropriately, multi-paddock grazing can improve forage, livestock production and wildlife habitat. My goal is to provide a framework for rangeland management decisions that support the productivity, biodiversity and resiliency of rangelands. I outline the ecology of grazed ecosystems under free-ranging herbivores and under single-paddock fenced conditions. Second, I explain five principles underpinning the adaptive management actions used by successful grazing managers and the ecological, physiological, and behavioral framework they use to achieve desired conservation, production, wildlife and financial goals. Third, I outline adaptive management principles needed to successfully manage rangelands subjected to varying environmental conditions and mitigate the damage caused by adverse climate conditions.

EVALUATION OF A GPS BACKPACK TRANSMITTER FOR NORTHERN BOBWHITE QUAIL RESEARCH IN NORTH CENTRAL TEXAS

Dean Marquardt, Texas Parks and Wildlife Department, Granbury, Texas

Luke Scroggs, Department of Wildlife and Fisheries Sciences, Texas A&M University, Texas

Collin Weise, Institute of Renewable Natural Resources, Texas A&M University, Texas

Kevin Skow, Institute of Renewable Natural Resources, Texas A&M University, Texas

Robert Perez, Texas Parks and Wildlife Department, La Vernia, Texas

Kevin Mote, Texas Parks and Wildlife Department, Brownwood, Texas

Brian L. Pierce, Institute of Renewable Natural Resources, Texas A&M University, Texas

Radiotelemetry has been the standard method for monitoring Northern Bobwhite Quail (*Colinus virginianus*) movements and habitat use. Spatial data collected using telemetry-based may induce bias due to triangulation error. Technological advances such as Global Positioning Systems (GPS) has increased ecologists' ability to accurately evaluate animal movements and habitat selection. We evaluated the effectiveness of a <3 gr Pinpoint GPS unit used on bobwhite quail. The PinPoint GPS incorporated a lightweight rechargeable battery and a very high frequency (VHF) transmitter. We conducted a series of static tests to evaluate performance in varying types of vegetative canopy cover and terrain. The test was conducted using 17 transmitters, in five different canopy cover densities on two different locations. These canopy cover consisted of: bare ground, 25 percent cover, 50 percent cover, 75 percent cover and simulated nest selection. The PinPoint units averaged 49 locations per test across a variety of user defined schedules. Spatial accuracy was high across all experimental habitat types, with >90% of all locations falling within 5 m of actual location (median = 2.3 m). Our results indicate that high resolution GPS packages may have the potential to provide increasingly reliable information on quail movement ecology and habitat selection at a higher resolution than conventional methods.

SPATIALLY EXPLICIT DENSITY DATA OF NORTHERN BOBWHITES ON KING RANCH, INC., TEXAS

Matthew J. Schnupp, King Ranch, Inc. and Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX

Chad J. Parent, Boone and Crockett Quantitative Wildlife Center, Michigan State University, Lansing, MI

David B. Wester, Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX

Humberto L. Perotto, Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX

Leonard A. Brennan, Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX

David G. Hewitt, Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX

Northern bobwhites (*Colinus virginianus*) are an economically and culturally important game bird for the state of Texas and private landowners like King Ranch, Inc., Texas. Estimates of bobwhite density are essential for making sound management decisions. Helicopter surveys have been extensively used to estimate the density of bobwhites on South Texas rangelands but given that variables like weather and habitat influence bobwhites significantly, density and distribution can vary considerably across the landscape. For example, areas of King Ranch, Inc. in South Texas had an estimated density in 2011 of 0.22 bobwhites/ha ($n = 162$ observations; 95% CI: 0.17–0.28 bobwhites/ha; coefficient of variation: 12%) compared to 2014 estimates of 1.18 bobwhites/ha ($n = 969$ observations; 95% CI: 1.08–1.29 bobwhites/ha; coefficient of variation: 5%). Therefore, landscape-scale, spatially explicit density data would be beneficial for the management of bobwhites. We used geospatial helicopter survey data collected on King Ranch, Inc. rangeland (269,611 ha) to determine landscape-scale bobwhite density and distribution. These data were collected from September helicopter surveys (approximately 6,706 km/year) from 2011 to 2014. We related the spatially explicit density data to habitat data from the Texas Ecological Systems Classification Project and rainfall data from 81 rain gauges. The application of these results will assist in making sound bobwhite management decisions.

THE QUAIL EQUATION: MONITORING QUAIL AND HABITAT ON PRIVATE LANDS

Becky Ruzicka, Texas A&M AgriLife Extension Service, Dallas, TX

Dale Rollins, Texas A&M AgriLife Extension Service, San Angelo, TX

Monitoring fluctuations in quail populations on a piece of land is key to understanding the impact of management decisions—for good or bad. Quail managers have many different tools, or methods, available to them to measure changes in quail abundance and quality of habitat. Each method has its own special inference with regards to what it can tell you about your quail population. Implementing a comprehensive program and interpreting the data you collect can be daunting. Here I will outline methods that we have used in the Texas Quail Index and give suggestions for how they may best be incorporated into your operation. Methods used in the Texas Quail Index to monitor abundance are spring call counts, fall call counts, and roadside counts. To help land managers get a handle on what quality quail habitat looks like, we use a standardized habitat evaluation form that scores the key components of quality quail habitats. Game cameras are used to monitor predator species, particularly during the nesting season. Also during nesting season, dummy nests can be a good hands-on learning experience. The protocols to implement all these methods for monitoring quail populations and habitat are available online at wildlife.tamu.edu/quail/texas-quail-index or on the WFSC AgriLife Youtube channel: www.youtube.com/user/WFSCAgriLife.

PARASITE INFECTION IN NORTHERN BOBWHITE AND SCALED QUAIL IN THE ROLLING PLAINS

Ronald J. Kendall, The Wildlife Toxicology Laboratory, Texas Tech University, Lubbock Texas

Extensive research on wild quail across the Rolling Plains ecoregion has proven parasitic infections with both the eyeworm (*Oxyspirura petrowi*) and cecal worm (*Aulonocephalus* sp.). Our continuing work reveals the underestimation of the extensiveness and intensity of parasitic infections in wild quail in the Rolling Plains and the threat this may pose to wild quail survival and reproduction. It has been determined that particularly with eyeworm infections, these can proceed to epizootic events in a matter of just a few weeks. In addition, it has been documented that these parasitic infections can be quite intense in the Rolling Plains and we have confirmed that they are now endemic throughout the region. In addition, eyeworms are not just located under the nictitating membrane in quail but are more present in the rear of the eye particularly within glands and ducts that could be highly relevant to visual acuity. Already we have documented the presence of edema and hemorrhaging in eye tissue of wild quail infected with eyeworms. We are also concerned with extensive cecal worm infection because we are finding heavy infections in quail. Continuing research in the field and laboratory using a "Weight of the Evidence" approach continues to support the hypothesis of detrimental effects of parasitic nematode infections in quail in the Rolling Plains. Therefore, concomitant with research progress on field and laboratory effects of eyeworm and cecal worm infection within wild quail, we are developing and field testing a treatment strategy that includes a medicated feed.

QUAIL RESEARCH UPDATE FROM ROLLING PLAINS QUAIL RESEARCH FOUNDATION

Dale Rollins, Rolling Plains Quail Research Ranch, Roby, TX

Lloyd LaCoste, Rolling Plains Quail Research Ranch, Roby, TX

Bradley Kuběcka, Rolling Plains Quail Research Ranch, Roby, TX

The Rolling Plains Quail Research Foundation (“Foundation”) was created in 2006 with the inception of the Rolling Plains Quail Research Ranch (“Ranch”), a 4,720-acre research and demonstration site in western Fisher County. Our mission is to “sustain Texas’ wild quail hunting heritage for this, and future, generations.” Our mantra is “here at the Ranch, *everything* points to quail.” Since 2007 the Ranch has conducted a number of studies to assess various population indices (e.g., helicopter counts), habitat management practices (e.g., quail-friendly approaches to prickly pear management), predator-prey relationships (e.g., coyotes, roadrunners), quail restoration techniques (e.g., translocating wild-trapped quail), and monitoring various quail-related metrics (e.g., arthropod dynamics, Texas Horned Lizards). Off-site, the Foundation funded the most comprehensive study of disease in bobwhite populations (dubbed “Operation Idiopathic Decline”). In recent years we have been evaluating translocation of wild-trapped bobwhite and scaled quail as a means of “jump-starting” stagnant populations. The Ranch seeks to conduct long-term research to better understand the dynamics of bobwhite and scaled quail in west Texas, and provide management alternatives for mitigating the effects of drought on quail abundance. For more information on our quail odyssey, see www.quailresearch.org.

THE QUAIL-TECH ALLIANCE

C. Brad Dabbert, Department of Natural Resources Management, Texas Tech University, Lubbock, Texas

The Quail-Tech Alliance Program was initiated in January 2010 with a mission of reversing quail decline. The Quail-Tech Alliance is a research and demonstration project coordinated between Quail First, a 501(c)(3) organization, and the Department of Natural Resources Management within the College of Agricultural Sciences and Natural Resources at Texas Tech University. A 38-county study area has been delineated, largely within the Rolling Plains of Texas, for this program. The individual ranches are called “anchor” ranches because they anchor quality quail habitat throughout the 38 county region. Anchor ranches are provided with recommendations for quail habitat improvement and quail harvest numbers. They also host research or demonstration projects during one year of the five-year project. Additionally, each ranch receives recognition in project newsletters, at field days, on the project website, and with promotional items including a gate sign. This presentation will discuss Quail-Tech Alliance research projects in a variety of areas including demography, nutrition, and disease resistance. Highlights will include a supplemental feeding method that increases adult October to April survival by as much as 50%. This feeding method also increases reproductive output with hens nesting earlier and longer and producing more nests than birds not receiving supplemental feed.

UNT QUAIL: INNOVATIVE QUAIL RESEARCH, CONSERVATION, AND EDUCATION

Kelly S. Reyna, UNT Quail, University of North Texas, Denton, Texas

UNT Quail is a comprehensive quail research laboratory at the University of North Texas with a mission to foster sustainable quail populations through innovative research, conservation, and education. The integrative research of UNT Quail includes investigations into northern bobwhite genetics, physiology, embryology, toxicology, and population dynamics. Projects take place in the state-of-the-art laboratory and within our largest quail conservation region, the 2 million acre North Texas Quail Corridor. Projects associated with the Quail Decline Initiative have revealed the efficacy of acclimation for translocated and captive reared quail, differences in predator avoidance between captive reared and wild bobwhites, and have identified neonicotinoids as a teratogen. These innovative efforts and major findings further our scientific understanding of the northern bobwhite population decline and contribute to knowledge used by land managers to increase the species' abundance.

CURRENT QUAIL RESEARCH AT THE CAESAR KLEBERG WILDLIFE RESEARCH INSTITUTE

Eric D. Grahmann, Caesar Kleberg Wildlife Research Institute, Texas
A&M University-Kingsville, Kingsville, Texas

Fidel Hernández, Caesar Kleberg Wildlife Research Institute, Texas A&M
University-Kingsville, Kingsville, Texas

Leonard A. Brennan, Caesar Kleberg Wildlife Research Institute, Texas
A&M University-Kingsville, Kingsville, Texas

Timothy E. Fulbright, Caesar Kleberg Wildlife Research Institute, Texas
A&M University-Kingsville, Kingsville, Texas

Alan M. Fedynich, Caesar Kleberg Wildlife Research Institute, Texas
A&M University-Kingsville, Kingsville, Texas

Fred C. Bryant, Caesar Kleberg Wildlife Research Institute, Texas A&M
University-Kingsville, Kingsville, Texas

The Richard M. Kleberg, Jr. Center for Quail Research at the Caesar Kleberg Wildlife Research Institute carries 3 full-time quail professors, 5 additional professors studying quail part-time, 3 post-doctoral graduates, and nearly 20 graduate students. Such attention devoted to quail has furthered our understanding of quail ecology, management, and sustainable harvest across South Texas and other regions. Our scientists are currently conducting studies on the northern bobwhite, scaled quail, and Montezuma quail. Specifically, research is focused on general ecology, genetics, habitat use, management, restoration, parasites and disease, surveys, and harvest. This presentation will give a general overview of ongoing and recently completed research projects that are being conducted at the Caesar Kleberg Wildlife Research Institute.

QUAIL ECOLOGY IN THE TRANS-PECOS REGION OF TEXAS

Ryan S. Luna, Borderlands Research Institute & Department of Natural Resource Management, Sul Ross State University, Alpine, Texas

Louis A. Harveson, Borderlands Research Institute & Department of Natural Resource Management, Sul Ross State University, Alpine, Texas

The Trans-Pecos region of Texas, which incorporates a portion of the Chihuahuan Desert, is blessed with an abundance and diversity of quail species that is second to none. It hosts 4 species of quail including scaled quail (*Callipepla squamata*), Gambel's quail (*Callipepla gambelii*), Montezuma quail (*Cyrtonyx montezumae*), and northern bobwhite quail (*Colinus virginianus*). Of the quail species that inhabit the Trans-Pecos, no species is more widespread and more important both ecologically and economically to the Chihuahuan Desert Borderlands than the scaled quail. Studies conducted by Borderlands Research Institute have evaluated home range, nest site selection, survival, and the influence of supplemental feeding on the aforementioned factors. The study was conducted on 3 ranches in the Trans-Pecos of which 2 provided supplemental feed year round (one using milo, the other quail blocks); the third study site did not provide any form of supplemental feed. Quail across the three study areas were trapped, banded and had radio-telemetry devices attached. Movements, recruitment, and survival have been assessed yearly since 2012. The results of these studies have indicated that supplemental feed does have an effect on survival, nesting success, and home range size. Overall, these studies are being used to assess population trends of quail in the Trans-Pecos, and help determine factors that can help bolster current populations.

ABSTRACTS

from research funded by the

*Reversing the Quail
Decline in Texas Initiative*



RELOCATING SCALED QUAIL INTO FORMER RANGES IN THE ROLLING PLAINS OF TEXAS

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Tyler Berry, Rolling Plains Quail Research Foundation, Rotan, TX

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Scaled quail were once common across the western half of the Rolling Plains, before disappearing suddenly about 1988. We evaluated the efficacy of translocating wild-trapped scaled quail as a means of recolonizing former range. Translocation of scaled quail as a restoration technique has not been investigated. A small-scale pilot study ($n = 14$ birds) conducted in 2013 at Rolling Plains Quail Research Ranch (RPQRR) proved successful (11 of 14 radio-marked birds survived from 1 May —1 Nov 2013; 3 coveys were established, with a minimum known population of 32 birds as of 1 Nov 2013). Given this initial success, we translocated a total of 79 scaled quail in March 2014 and incorporated a soft-release technique using Surrogators™ to sequester birds for 30 days prior to release. This release showed 62.7% survival during the breeding season (1 May — 31 Aug). These females attempted to nest a total of 40 times with a success rate of 61.5%. No additional releases have been made at RPQRR as we deem the translocation a success as of June 2015. Encouraged by this success, we translocated a total of 45 “hard-release” and 43 “soft-release” birds, which included 22 and 17 radio-marked females, respectively, to the Matador Wildlife Management Area. Preliminary analyses of these data suggested lower survival, less reproductive output, and greater dispersal than observed at the RPQRR. We suggest additional translocations of scaled quail be conducted using a soft-release technique. Such efforts should first be conducted in areas where scaled quail were known to occur within a reasonable time period (perhaps since 2010).

ARE NEONICOTINOID INSECTICIDES INFLUENCING BOBWHITE QUAIL DECLINE IN TEXAS?

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Despite intensive research effort on Northern Bobwhite Quail (*Colinus virginianus*) in recent decades, the mechanism of their decline is still unclear. Because bobwhites are often associated with agricultural areas in the state of Texas, we evaluate the possibility that widespread use of neonicotinoid insecticides may be influencing their overall abundance. Our objectives were to: 1) analyze historical neonicotinoid use and quail abundance data in the state of Texas to determine if a correlation exists, and 2) collect quail from three field sites across the state to test for signs of neonicotinoid exposure. Currently, we are running generalized linear mixed model analysis to identify trends in historical data collected from Texas Parks and Wildlife Department and the North American Breeding Bird Survey from 1978 - 2012. In our model, we account for co-variables that could influence quail abundance, including: land use (e.g. agricultural cover and developed areas), breeding season precipitation, summer mean maximum temperature, and the Palmer Modified Drought Severity Index. Additionally, in fall 2014 and spring 2015, we hunted or trapped a total 57 bobwhites from field sites near Abilene, TX, Edinburg, TX, and Sealy, TX, and began analysis for tissue damage and chemical residues. Histological evaluation of liver, kidney, spleen, and gonadal tissue showed hepatocellular vacuolation (accumulation of lipids in the liver; n = 10) and testicular degeneration (n = 3) in some quail. Although these anomalies are consistent with known effects of neonicotinoid exposure, we are awaiting results

from chemical analysis (in process) of liver tissue and crop contents to further our understanding of the source of tissue damage we found. Furthermore, we expect the combination of our historical and field analyses to shed light on factors affecting quail decline in the state of Texas.



Our mission:
“to sustain Texas’ wild quail hunting heritage for this, and future, generations.”

Join us for our annual field day
Friday, September 25.

Check out our website for details; sign up for e-Quail Newsletter and our Facebook page.

DATA MINING: COMPARATIVE HABITAT SELECTION OF FERAL HOGS AND NORTHERN BOBWHITES IN SHRUB-DOMINATED RANGELAND.

Susan M. Cooper, Texas A&M AgriLife Research, Uvalde, Texas

Shane S. Sieckenius, Texas A&M AgriLife Research, Uvalde, Texas

Feral hogs (*Sus scrofa*) are known to eat the eggs of ground-nesting birds, yet the extent to which they impact northern bobwhite (*Colinus virginianus*) populations is unknown. Nevertheless, the persistent increase in numbers and distribution of feral hogs is of concern to managers of quail. By using former data-sets to compare habitat use and selection of feral hogs and bobwhites, we provide guidance on the rangeland habitats where feral hogs are most likely to impact bobwhite populations. We combined information on the movements of 40 GPS-collared feral hogs on a large ranch in south Texas in 2003-2006; with 10 years of spring call-count data for bobwhites on the same ranch and on 3 nearby properties. The only habitat selection shown by bobwhites was for upland areas on deep sandy soils. This habitat consisted of native grassland interspersed with mottes of brush. In spring and summer, when quail have nests on the ground that are vulnerable to predation by mammals, feral hogs were strongly associated with water and densely vegetated riparian habitats which are not suitable nesting habitat for quail. These areas were characterized by clay soils. Although bobwhites and feral hogs selected different habitat types, contact rates will be influenced by the distribution of networks of creeks and drainages allowed hogs to infiltrate into drier rangeland areas where bobwhites nest. The attraction of feral hogs to cultivated fields and food plots may reduce their interaction with bobwhites. In spring, feral hogs prefer to be in fields rather than foraging in rangeland habitats where bobwhites are nesting. Also the strong preference of feral hogs for use of irrigated fields at night in spring and fall provides a vulnerability that hunters and trappers can exploit in order to reduce hog populations.

IS CHRONIC EXPOSURE TO LOW LEVELS OF AFLATOXINS INVOLVED IN THE QUAIL DECLINE?

Susan M. Cooper, Texas A&M AgriLife Research, Uvalde, Texas
Andrea L. Silva, Texas A&M AgriLife Research, Uvalde, Texas

There is concern that the increased use of grain-based feed supplements for wildlife may expose quail to chronic low levels of aflatoxin poisoning. Aflatoxins are fungal toxins that contaminate grain and can be a problem in improperly stored animal feeds. Consumption of even small amounts of aflatoxins can result in liver damage, and immunosuppression. In wild birds these effects may be expressed by lower reproductive output and increased susceptibility to predators, parasites and diseases. At the population level this could result in a gradual decline in abundance. To assess the effects of intermittent ingestion of low levels of aflatoxins by quail, we conducted feeding studies on 15 pairs each of northern bobwhites (*Colinus virginianus*) and scaled quail (*Callipepla squamata*). For 25 weeks (March through August 2014), encompassing the breeding season of quail, we fed 3 replicate pairs of quail on diets that included twice weekly access to 20 g of cracked corn contaminated with aflatoxin B1 at the levels permitted for livestock (100 ppb), deer corn (50 ppb), and birdseed (20 ppb), plus an aflatoxin free control. The schedule mimics wild quail sporadically visiting a source of supplemental feed. Intermittent consumption of aflatoxin contaminated feed had no measurable effect on the health, body weight and feed consumption of either species of quail. Similarly, we found no effects of aflatoxin consumption on the number of eggs produced, egg weight and yolk weight. A survey of aflatoxin contamination in corn produced in Texas indicated that only a few loads exceeded aflatoxins levels permitted in feed corn. Thus, it appears that exposure to aflatoxins from supplemental feed sources is unlikely to be a factor contributing to the long-term decline of northern bobwhite and scaled quail populations.

USE OF *EXTINGUISH PLUS*TM TO REDUCE RED IMPORTED FIRE ANTS AND INCREASE NORTHERN BOBWHITE ABUNDANCE

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Northern bobwhites (*Colinus virginianus*) have declined throughout Texas since the 1970s. Previous studies have documented the negative effects of red imported fire ant (RIFA, *Solenopsis invicta*) on bobwhite populations through direct predation and indirect reduction of small invertebrates an important food of bobwhite chicks. In 2013 and 2014, large areas of the Attwater Prairie Chicken National Wildlife Refuge (APCNWR) in Colorado County, Texas were aerially treated with *Extinguish Plus*TM which targets ants. Our study took place on this refuge and our objectives included evaluation of the impacts of (1) RIFA treatment on RIFA abundance, (2) RIFA treatment on invertebrate abundance, and (3) invertebrate abundance on bobwhite brood survival. We trapped, banded, and radio-collared bobwhites in areas treated and not treated from May 2014 through May 2015. We also collected RIFA and invertebrate abundance data on areas treated and not treated during the 2014 and 2015 bobwhite nesting seasons. Treatment reduced RIFA by 79%. However, significantly ($P = 0.019$) lower invertebrate biomass was found in treated areas. Data suggest that treatment with *Extinguish Plus*TM did not increase bobwhite abundance. Our results differ from previous studies and this may be due to time since treatment and differences in environmental factors between treated and non-treated areas.

SURVIVAL, MOVEMENTS, HABITAT USE, AND REPRODUCTIVE SUCCESS OF NORTHERN BOBWHITES AND SCALED QUAIL TRANSLOCATED FROM THE SOUTH TEXAS PLAINS TO THE ROLLING PLAINS OF TEXAS

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We have initiated a project whose purpose is to examine the feasibility of relocating quail from a relatively dense, stable population to an area where they are absent, but where suitable habitat is available and timely recolonization is not expected because of factors such as isolation. Translocation of wild quail from donor populations to newly-managed lands has been a successful technique in the Southeastern United States. Mountain quail have also been relocated in Oregon with similar success. This translocation technique might also be successful in the Rolling Plains of Texas. However, properties in the Rolling Plains might not harbor sufficient numbers of northern bobwhites to be a source population to attempt translocation, and scaled quail are not readily available. Populations in South Texas appear to be more stable because of more frequent precipitation and related plant growth. Properties where northern bobwhites and scaled quail are abundant in South Texas might be donors for properties trying to re-establish populations following drought or habitat improvement. It is yet unclear if quail locally-adapted to South Texas conditions can survive and reproduce in the Rolling Plains. A successful protocol for translocating quail from South Texas to the Rolling Plains would provide many management benefits. Knowledge of the feasibility of relocating wild northern bobwhites in Texas is very limited. If relocation is successful in Texas then it might help to restart wild populations in areas where habitat has been restored but recolonization by wild birds is unlikely. We started a pilot study to test initial responses of northern bobwhites and scaled quail in March 2013. A sample of quail (27 bobwhites and 25 scaled quail) were captured in Webb and Zapata counties in South Texas and transported 582 miles to Collingsworth County. Every precaution was taken to reduce stress and minimize contact with humans. Birds were also treated with

an intramuscular injection of vitamin E and selenium to mitigate potential transport myopathy conditions. Individual quail were placed into groups (by species) from 10-13 individuals and released at various locations on the Mill Iron Ranch in Collingsworth County in the Eastern panhandle of Texas. Fourteen bobwhite hens and 17 scaled quail hens were radiomarked to monitor survival and behavior. Initial losses in the first 2 weeks were minimal, but severe winter weather events during late spring 2013 and predation drastically reduced survival. All scaled quail translocated succumbed to weather, predation, or could not be relocated by the start of summer 2013. Two bobwhite hens (14% survival) were recorded alive through the 2013 nesting season and through the duration of battery life of the radio collar. One hen was on adjacent property which we could not access, but was recorded alive through August. The other hen was observed paired with a male and attempting to nest, however, no successful nest was recorded due to one nest predation. We are now in the midst of examining the feasibility of fall and spring translocation efforts. We look forward to providing data from this release in the future. We hope that this study will yield data that will allow development of an effective translocation protocol to the Rolling Plains of Texas.



A SCALAR APPROACH TO QUAIL POPULATIONS AND ENVIRONMENTAL CONSTRAINTS IN THE ROLLING PLAINS OF TEXAS: A CONTINUATION WITH DATA FROM THE LA NINA YEARS

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Ecologists have long recognized the influence of weather on abundance and range extent of a variety animal species. The northern bobwhite (*Colinus virginianus*; hereafter bobwhite) is an excellent model for exploring the ability of specific microclimates to serve as refuge against severe weather conditions. We conducted a mensurative field experiment in the Rolling Plains of Texas, a semi-arid ecosystem on the southwestern periphery of bobwhite range, to determine whether native bunch grasses apparently suitable for bobwhite nesting could sufficiently reduce ambient temperature below harmful levels for eggs during 2014. We compared temperature at 126 paired locations (63 random and 63 nesting), each with 2 sensors (~10cm and ~60cm above ground) at each location throughout the nesting season. Mean temperature was higher at nest height in random locations ($\bar{x} = 39.71$, SE = 0.0534) than at nest height in nesting cover locations ($\bar{x} = 37.11$, SE = 0.0511). Mean temperatures at ambient height in nesting and random locations were essentially identical ($\bar{x} = 35.9641$, SE = 0.0456 and $\bar{x} = 36.3935$, SE = 0.0465, respectively). During the course of our study, 67.4% of temperature readings occurred between 0 and 40°C ($\bar{x} = 37.30$, SE = 0.025), a temperature range suitable for bobwhites. Based on our results, potential bobwhite nesting cover provides adequate thermal refuge in the Rolling Plains by maintaining cooler, moister microclimates than surrounding random points. Given that bobwhite eggs would otherwise experience potentially lethal temperatures without these thermal refugia, nesting vegetation is a critical component of bobwhite niche space in semi-arid regions. Many contemporary land uses, however, degrade or destroy bunch grasses and thus decrease realized niche space availability through time for bobwhites. Conservationists working with bobwhites and other species that require bunch grasses in semiarid regions should develop land management strategies that maximize the availability of these thermal refugia across space and time.

MEETING QUAIL MANAGER NEEDS: DEVELOPMENT OF AN EASY-TO-USE QUANTITATIVE METHOD FOR THE DETECTION OF AFLATOXIN AND METHODS TO CONTROL THE FUNGUS *ASPERGILLUS FLAVUS*

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Populations of northern bobwhites (*Colinus virginianus*) have steadily declined in the United States, prompting wildlife managers to provide supplemental feed. Grain can contain aflatoxin, which is a harmful fungal metabolite of *Aspergillus flavus* and *Aspergillus parasiticus*. Our objectives were to compare immunoassays for the detection of aflatoxin that can be performed by a rancher easily and inexpensively and to assess common grain storage methods of wildlife corn that can shed light on how to reduce aflatoxin production. We used lower division college-aged students with no laboratory training to test the precision, accuracy, and ease of use of commercially available quantitative aflatoxin tests. Differences occurred among the products concerning the ease of use, but accuracy and precision were similar among the commercially available tests. Training is required to properly quantify aflatoxin concentrations in grain. Also, all quantification tests require specialized equipment; thus, tests are fairly expensive to conduct (i.e., 1000's US dollars). We placed wildlife corn in open air, barn, and pavilion environments, and in metal containers, aluminum containers, and plastic containers, which mimicked feeder-type structures. We determined weekly aflatoxin levels and grain moisture content. In addition, we monitored weather parameters (daily temperature, relative humidity, and dew point) inside and outside of each storage structure. Grain moisture and aflatoxin concentrations fluctuated weekly within each type of storage container ($F_{150, 700} = 7.23$, $P < 0.0001$) and ranged from 10.4–97.5% and 0–1,200 ppb, respectively. Each storage type

contained corn samples that exceeded recommended aflatoxin levels deemed safe for wildlife within 2 weeks. After 8 weeks of storage, aflatoxin concentrations began to increase significantly in each storage method. Condensation build-up within metal storage containers increased mold growth on corn, which subsequently resulted in greater aflatoxin concentrations of corn along the sides of such containers compared to corn sampled within the center of the same container. Black light tests, qualitative tests, and quantitative tests that use small grain samples (<10 g samples) potentially mask the aflatoxin concentration of grain. Obtaining a low aflatoxin concentration does not necessarily mean low concentrations will occur thereafter, and vice versa. A high concentration of aflatoxin could be followed by a low concentration of another sample within the same bag of grain because aflatoxin is rarely, if ever, evenly distributed throughout grain. We recommend storing grain <2 months and to thoroughly clean and dry wildlife feeders often.



EFFECTS OF NEONICOTINOID EXPOSURE ON EMBRYONIC DEVELOPMENT AND CARDIOVASCULAR HEALTH IN NORTHERN BOBWHITES

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Since their emergence in the early 1990s, neonicotinoid pesticides have grown exponentially in popularity to become the world's most widely used insecticides. Although there is considerable research concerning the lethality of neonicotinoids, their sub-lethal and developmental effects are still poorly understood, especially with regards to non-mammalian species. The goal of this research is to observe the effects of the neonicotinoid imidacloprid on physical and physiological development of northern bobwhite (*Colinus virginianus*) embryos, *in ovo*, at various stages of development. Bobwhite eggs ($n = 250$) were injected with imidacloprid concentrations of 0 (sham), 10, 50, 100, and 150 g/kg of egg mass, administered on developmental day 0 (pre-incubation), 3, 6, 9, or 12. Embryos were staged and dissected on day 19 and heart, liver, lung and kidney were measured and preserved for future DNA testing. Results show treatment groups with severe physiological defects and organs which differ significantly in mass from sham specimens. Future research will include transcriptomic analyses evaluating how genes influence susceptibility to the insecticide.

RESTORATION TECHNIQUES FOR NORTHERN BOBWHITES AND THEIR RESPONSE TO SIMULATED PREDATOR ATTACKS

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Isolated populations of northern bobwhites (*Colinus virginianus*) have declined causing many quail managers to attempt population restoration by releasing captive-reared bobwhites or translocating wild bobwhites. Here, we evaluate three restoration techniques: (1) release of captive-reared bobwhites, (2) translocation of bobwhites from high densities to low densities, and (3) release of captive-reared and translocated bobwhites acclimated on site prior to release. These results show that captive-reared birds have reduced survival and fewer nesting attempts when compared to translocated birds and that acclimation time was not a factor. We hypothesize high mortality rates were caused by captive-reared birds exhibiting different predator avoidance behavior than wild birds. Captive-reared and wild-trapped bobwhites were subjected to independent predator simulations and their responses were recorded on high definition video. Threat recognition time, reaction type, and reaction time was recorded for comparative analysis. Pen-reared birds recognized the simulated raptorial and terrestrial predator threats quicker than wild-trapped birds ($P = 0.002$), but reaction times were not different among groups ($P = 0.646$). However, the type of reaction was different among groups where pen-reared birds typically flushed immediately upon recognizing either simulated predator as compared to wild-trapped birds which typically ran or held when subjected to the raptorial threat and showed little to no observable reaction to the terrestrial threat. These results reveal a potential loss of a holding trait in pen-reared birds, resulting in a quicker revealing of their position in the presence of a threat, thereby increasing their risk of predation.

HABITAT FACTORS INFLUENCING GRASSLAND BIRD ABUNDANCE: AN EXAMPLE USING NORTHERN BOBWHITE QUAIL IN TEXAS

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Grassland birds are declining at an alarming rate, commensurate with losses of grassland habitat. An icon of grassland birds, the Bobwhite quail (*Colinus virginianus*), is one of the most intensively studied bird species, with over 3,500 publications dedicated to its natural history, autecology, and management. Yet, despite this enormous amount of research, the species has undergone a substantial long-term decline. While previous research has identified several biotic factors which influence abundance in a stochastic manner (i.e., short and long term weather fluctuations, disease), researchers have speculated that habitat loss due to anthropogenic land use change is the most likely cause for the long-term decline.

PARASITE INFECTION IN NORTHERN BOBWHITE
(*COLINUS VIRGINIANUS*) AND SCALED QUAIL
(*CALLIPEPLA SQUAMATA*) IN THE ROLLING PLAINS
ECOREGION OF TEXAS AND OKLAHOMA

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Extensive research on wild quail across the Rolling Plains ecoregion has proven parasitic infections with both the eyeworm (*Oxyspirura petrowi*) and cecal worm (*Aulonocephalus* sp.). Our continuing work reveals the underestimation of the extensiveness and intensity of parasitic infections in wild quail in the Rolling Plains and the threat this may pose to wild quail survival and reproduction. It has been determined that particularly with eyeworm infections, these can proceed to epizootic events in a matter of just a few weeks. In addition, it has been documented that these parasitic infections can be quite intense in the Rolling Plains and we have confirmed that they are now endemic throughout the region. In addition, eyeworms are not just located under the nictitating membrane in quail but are more present in the rear of the eye particularly within glands and ducts that could be highly relevant to visual acuity. Already we have documented the presence of edema and hemorrhaging in eye tissue of wild quail infected with eyeworms. We are also concerned with extensive cecal worm infection because we are finding heavy infections in quail. Continuing research in the field and laboratory using a "Weight of the Evidence" approach continues to support the hypothesis of detrimental effects of parasitic nematode infections in quail in the Rolling Plains. Therefore, concomitant with research progress on field and laboratory effects of eyeworm and cecal worm infection within wild quail, we are developing and field testing a treatment strategy that includes a medicated feed.

INTEGRATING QUAIL GENOMICS WITH ECOLOGY, DISEASE, AND PARASITOLOGY

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