41st Annual Meeting of the Southeast Deer Study Group

Stakeholder-focused, Science-based, and Data-driven:
The Gold Standard for the State Deer Management System?

February 19-21, 2018
Nashville, Tennessee

Hosted by

TENNESSEE WILDLIFE RESOURCES AGENCY

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TABLE OF CONTENTS

WELCOME & ACKNOWLEDGMENTS

The Tennessee Wildlife Resources Agency welcomes you to the 41st Annual Southeast Deer Study Group Meeting in Nashville, Tennessee. We would like to thank the Missouri Department of Conservation who hosted last year's meeting, the Tennessee Wildlife Resources Foundation, as well as all of the sponsors for their generous contributions to this meeting. (See the complete list on the back cover.)

COMMITTEES

Meeting Organizers and Co-Chairmen

James Kelly and Tim White

Paper and Poster Selection

Rob Kissell, PhD (Chair)
Craig Harper, PhD
Lisa Muller, PhD
Russ Skoglund, PhD
Roger Applegate

Moderators

Chuck Yoest (Chair)
Brad Miller, PhD
Lisa Muller, PhD
Ben Layton
Russ Skoglund, PhD
Aubrey Deck
Michael McCord
Roger Applegate

Buck Exhibit

Dale Grandstaff (Chair)
Leith Konyndyk
Ben Layton
Míme Barnes
Lynn Barrett
Eric Anderson
Chad Gann
Rusty Thompson

Fundraising and Door Prizes

Tim White (Chair)
Clint Borum
Don Hosse
Barry Cross
Ben Layton
Aubrey Deck

Hospitality

Tim White (Chair)
Melissa Raulerson
Tabitha Lavacot
Chuck Yoest
Rodney Woodson
Steve Swaw
Jamie Baggett

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Jason Harmon (Chair)
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Lynn Barrett
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Melissa Raulerson
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Site Coordination and Registration

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Tim White
Toni Brannon
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Craig Harper, PhD
Lisa Muller, PhD

Security Committee

Dale Grandstaff (Chair)
Leith Konyndyk
Eric Anderson
Scott Bauer
Dustin Deaton
Brad Bagwell
Rusty Thompson

ABOUT SEDSG

The Southeast Deer Study Group meets annually for researchers and managers to share the latest information on the most important wildlife species in North America. These meetings provide an important forum for the sharing of research results, management strategies, and discussions that can facilitate the timely identification of, and solutions to, problems relative to the management of white-tailed deer.

The Southeast Deer Study Group annual meeting is hosted with the support of the directors of the Southeastern Association of Fish and Wildlife Agencies and the states of Delaware, Maryland, Missouri, and Texas. The first meeting was held as a joint Northeast-Southeast Meeting in Virginia in 1977. Appreciating the economic, aesthetic, and biological value of the white-tailed deer in the Southeastern United States, the desirability of conducting an annual Southeast Deer Study Group Meeting was recognized and urged by the participants. Since February 1979, these meetings have been held annually for the purpose of bringing together managers, researchers, administrators, and users of this vitally important renewable natural resource. A searchable list of all presentation abstracts from 1977-present is available at SEDSG.com, as well as a list of the meetings, their locations, and themes.

The Southeast Deer Study Group was formed as a subcommittee of the Forest Game Committee of the Southeastern Section of The Wildlife Society. The Deer Subcommittee was given full committee status in November 1985 at the Southeastern Section of The Wildlife Society's annual business meeting. States participating regularly in the Southeast Deer Study Group include Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

TWS Professional Development

The 41st Annual Southeast Deer Study Group meeting can be counted as contact hours for Professional Development/Certification. Each hour of actual meeting time counts as one credit hour (no social time credit). For more information about professional development, visit The Wildlife Society website, www.wildlife.org.

Qualifying Statement

Abstracts in the proceedings and presentations at the Southeast Deer Study Group meeting often contain preliminary data and conclusions that have not undergone the peer-review process. This information is provided to foster communication and interaction among researchers, biologists and deer managers. Commercial use of any of the information presented in conjunction with the Southeast Deer Study Group Annual Meeting is prohibited without written consent of the author(s). Electronic versions of this and previous proceedings are available at SEDSG.com.

Participation of any vendor/donor/exhibitor with the Southeast Deer Study Group Annual Meeting does not constitute nor imply endorsement by the Southeast Deer Study Group, the SE Section of The Wildlife Society Deer Committee, the host state, or meeting participants.

SEDSG MEETINGS

YEAR	LOCATION	MEETING THEME
1977	Fort Pickett, VA	none
1979	Mississippi State, MS	none
1980	Nacogdoches, TX	none
1981	Panama City, FL	Antlerless Deer Harvest Strategies
1982	Charleston, SC	none
1983	Athens, GA	Deer Damage Control
1984	Little Rock, AR	Dog-Deer Relationships in the Southeast
1985	Wilmington, NC	Socio-Economic Considerations in Managing White-tailed Deer
1986	Gatlinburg, TN	Harvest Strategies in Managing White-tailed Deer
1987	Gulf Shores, AL	Management: Past, Present, and Future
1988	Paducah, KY	Now That We Got Em, What Are We Going To Do With Em?
1989	Oklahoma City, OK	Management of Deer on Private Lands
1990	Pipestem, WV	Addressing the Impact of Increasing Deer Populations
1991	Baton Rouge, LA	Antlerless Deer Harvest Strategies: How Well Are They Working?
1992	Annapolis, MD	Deer Versus People
1993	Jackson, MS	Deer Management: How We Affect Public Perception and Reception
1994	Charlottesville, VA	Deer Management in the Year 2004
1995	San Antonio, TX	The Art and Science of Deer Management: Putting the Pieces Together
1996	Orlando, FL	Deer Management Philosophies: Bridging the Gap Between the Public and Biologists
1997	Charleston, SC	Obstacles to Sound Deer Management
1998	Jekyll Island, GA	Factors Affecting the Future of Deer Hunting
1999	Fayetteville, AR	QDM: What, How, Why, and Where?
2000	Wilmington, NC	Managing Deer in Tomorrow‘s Forests: Reality vs. Illusion
2001	St. Louis, MO	From Lewis & Clark to the New Millennium: The Changing Face of Deer Management
2002	Mobile, AL	Modern Deer Management: Balancing Biology, Politics, and Tradition
2003	Chattanooga, TN	Into the Future of Deer Management: Where Are We Heading?
2004	Lexington, KY	Today‘s Deer Hunting Culture: Asset or Liability?
2005	Shepherdstown, WV	The Impact of Today’s Choices on Tomorrow‘s Deer Hunters
2006	Baton Rouge, LA	Managing Habitats, Herds, Harvest, and Hunters in the 21st Century Landscape. Will 20th Century Tools Work?
2007	Ocean City, MD	Deer and Their Influence on Ecosystems
2008	Tunica, MS	Recruitment of Deer Biologists and Hunters: Are Hook and Bullet Professionals Vanishing?
2009	Roanoke, VA	Herds Without Hunters: The Future of Deer Management?
2010	San Antonio, TX	QDM to IDM: The Next Step or the Last Straw?
2011	Oklahoma City, OK	All Dressed Up With No Place to Go: The Issue of Access.
2012	Sandestin, FL	Shifting Paradigms: Are Predators Changing the Dynamics of Managing Deer in the Southeast?
2013	Greenville, SC	Challenges in Deer Research and Management in 2013
2014	Athens, GA	The Politics of Deer Management: Balancing Public Interest and Science
2015	Little Rock, AR	Integrating the North American Model of Wildlife Conservation into Deer Management
2016	Charlotte/Concord, NC	The Challenges of Meeting Hunter Expectations
2017	St. Louis, MO	Disease: Science, Politics, Management
2018	Nashville, TN	Stakeholder-focused, Science-based, and Data-driven: The Gold Standard for the State Deer Management System?

SOUTHEAST DEER STUDY GROUP, THE WILDLIFE SOCIETY, SOUTHEAST SECTION

STATE	NAME	AFFILIATION
	Kip Adams	Quality Deer Management Association
Alabama	Chris Cook	Alabama Division of Wildlife and Freshwater Fisheries
Arkansas	Jeremy Brown	Arkansas Game and Fish Commission
	Ralph Meeker	Arkansas Game and Fish Commission
Delaware	Joe Rogerson	Delaware Division of Fish and Wildlife
Florida	Cory Morea	Florida Fish and Wildlife Conservation Commission
	Rebecca Shuman	Florida Fish and Wildlife Conservation Commission
	Steve Shea (Comm. Chair)	Shea Environmental Services
Georgia	Charlie Killmaster	Georgia Department of Natural Resources
	Tina Johannsen	Georgia Department of Natural Resources
	Karl V. Miller	University of Georgia
Kentucky	Gabe Jenkins	Kentucky Department of Fish and Wildlife Resources
Louisiana	Johnathan Bordelon	Louisiana Department of Wildlife and Fisheries
	Jimmy Ernst	Louisiana Department of Wildlife and Fisheries
Maryland	Brian Eyler	Maryland Department of Natural Resources
	George Timko	Maryland Department of Natural Resources
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	Stephen Demarais	Mississippi State University
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	Kevyn Wiskirchen	Missouri Department of Conservation
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	Jonathan Shaw	North Carolina Wildlife Resources Commission
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	Jerry Shaw	Oklahoma Department of Wildlife Conservation
South Carolina	Charles Ruth	South Carolina Department of Natural Resources
	Jay Cantrell	South Carolina Department of Natural Resources
Tennessee	James Kelly	Tennessee Wildlife Resources Agency
	Ben Layton	Tennessee Wildlife Resources Agency
	Craig Harper	University of Tennessee
Texas	Alan Cain	Texas Parks and Wildlife Department
	Bob Zaiglin	Southwest Texas Junior College
Virginia	W. Matt Knox	Virginia Department of Game and Inland Fisheries
	Nelson Lafon	Virginia Department of Game and Inland Fisheries
West Virginia	Jim Crum	West Virginia Division of Natural Resources

SEDSG AWARDS

CAREER ACHIEVEMENT AWARD

1996 – Richard F. Harlow
1997 – Larry Marchinton
1998 – Harry Jacobson
1999 – David C. Guynn, Jr.
2000 – Joe Hamilton
2002 – Robert L. Downing
2004 – Charles DeYoung
2005 – Kent E. Kammermeyer
2006 – William E. "Bill" Armstrong
2007 – Jack Gwynn
2008 – (none)
2009 – David E. Samuel
2010 – Bob K. Carroll
2011 – Quality Deer Management Association
2012 – Robert E. Zaiglin
2013 – (none)
2014 – Mark O. Bara
2015 – Larry E. Castle
2016 – J. Scott Osborne
2017 – Karl V. Miller

OUTSTANDING STUDENT POSTER PRESENTATION AWARD

2010 – Emily Flinn (Mississippi State University)
2011 – Melissa Miller (University of Delaware)
2012 – Brandi Crider (Texas A&M University)
2013 – Jacob Haus (University of Delaware)
2014 – Blaise Korzekwa (Texas A&M University–Kingsville)
2015 – Lindsay D. Roberts (Texas A&M University–Kingsville)
2016 – Lindsey Phillips (Texas A&M – Kingsville
2017 – Daniel Morina (Mississippi State University)

OUTSTANDING STUDENT ORAL PRESENTATION AWARD

1996 – Billy C. Lambert, Jr. (Texas Tech University)
1997 – Jennifer A. Schwartz (University of Georgia)
1998 – Karen Dasher (University of Georgia)
1999 – Roel R. Lopez (Texas A&M University)
2000 – Karen Dasher (University of Georgia)
2001 – Roel R. Lopez (Texas A&M University)
2002 – Randy DeYoung (Mississippi State University)
2003 – Bronson Strickland (Mississippi State University)
2004 – Randy DeYoung (Mississippi State University)
2005 – Eric Long (Penn State University)
2006 – Gino D'Angelo (University of Georgia)
2007 – Sharon A. Valitzski (University of Georgia)
2008 – Cory L. Van Gilder (University of Georgia)
2009 – Michelle Rosen (University of Tennessee)
2010 – Jeremy Flinn (Mississippi State University)
2011 – Kamen Campbell (Mississippi State University)
2012 – Brad Cohen (University of Georgia)
2013 – Michael Cherry (University of Georgia)
2014 – Bradley Cohen (University of Georgia)
2015 – Eric Michel (Mississippi State University)
2016 – Rebecca Shuman (University of Georgia)
2017 – Jared Beaver (Texas A&M University)

MEETING AGENDA*

MONDAY, FEBRUARY 19

1–6	Conference Registration Desk Open	Promenade
1–6	Exhibitor Set-up	Grand Ballroom East
1–6	Poster Set-up	Promenade
3–5	SEDSG Technical Committee Meeting	TBD
6–10	Welcome Social (*heavy hors d'oeuvres provided)*	Crown Ballroom

TUESDAY, FEBRUARY 20

8–10:20	Plenary Session	Grand Ballroom West/Central
10:20–10:40	Break	Grand Ballroom East
10:40–12	Technical Session 1	Grand Ballroom West/Central
12–1:30	Lunch *(on your own)*	
1:30–3:10	Technical Session 2	Grand Ballroom West/Central
3:10–3:30	Break	Grand Ballroom East
3:30–5	Technical Session 3	Grand Ballroom West/Central
5–Midnight	Downtown Nashville Excursion - *Trolleys will run continuously from hotel to downtown. Dinner on your own.*	
7–10	Light Social - *Dessert & drinks for those not going downtown*	Crown Ballroom

WEDNESDAY, FEBRUARY 21

8–9:40	Technical Session 4	Grand Ballroom West/Central
9:40–10	Break	Grand Ballroom East
10–12	Technical Session 5	Grand Ballroom West/Central
12–1:30	Lunch *(on your own)*	
1:30–2:50	Technical Session 6	Grand Ballroom West/Central
2:50–3:10	Break	Grand Ballroom East
3:10–5	Technical Session 7	Grand Ballroom West/Central
5:10	SEDSG Technical Committee Business Meeting	TBD
6–7	Pre-Banquet Social	Crown Ballroom
7–9	Awards Banquet	Crown Ballroom

*For the most up-to-date version of the agenda, visit regonline.com/sedeerstudygroup2018 and click the "Agenda" tab.

TUESDAY, FEBRUARY 20

Welcome and Introduction
James D. Kelly

Panel Discussion
Plenary Speakers

TUESDAY, FEBRUARY 20

10:40 AM-12:00 PM • TECHNICAL SESSION 1 — BRAD F. MILLER, MODERATOR

1:30 PM- 3:10 PM • TECHNICAL SESSION 2 — BEN W. LAYTON, MODERATOR

3:30 PM-5:00 PM • TECHNICAL SESSION 3 — LISA I. MULLER, MODERATOR

* Student Presenter

WEDNESDAY, FEBRUARY 21

8:00 AM-9:40 AM • TECHNICAL SESSION 4 — ROGER D. APPLEGATE, MODERATOR

10:00 AM-12:00 PM • TECHNICAL SESSION 5 — AUBREY L. DECK, MODERATOR

1:30 PM-2:50 PM • TECHNICAL SESSION 6 — MICHAEL M. MCCORD, MODERATOR

POSTER SESSION LIST

TUESDAY, FEBRUARY 20 • PLENARY SESSION

Relevancy of Deer Management in the 21st Century

Author
Steve Williams
Wildlife Management Institute

Abstract
Our nation has undergone dramatic social and technological changes in the past few decades. How has our profession adapted to these changes? Are we still relevant to the American public? As wildlife professionals, we serve as stewards of our nation's wildlife resources and manage those resources as a public trust. As deer biologists and managers, we must understand the biology and population dynamics of deer and the expectations of hunters; however, that is not all we must understand. My presentation will discuss our role as public stewards of wildlife resources and our responsibility to the public as well as to the resources. I offer the challenge that we must become more relevant to today's society and recommend changes to how we approach wildlife management. Our ability to adapt to society's expectations will determine our effectiveness into the future.

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Notes

Impact Thinking: Integrating Human Dimensions Insights into Deer Management

Author
Shawn J. Riley
Michigan State University

Abstract
Wildlife management decisions often are depicted as incorporating knowledge from three key dimensions: wildlife organisms, habitats, and humans. To a large extent, human dimensions of wildlife management refers to a body of knowledge, based on social science, about everything that is not about the organism or its habitat. Human dimensions includes knowledge-generating procedures and application of knowledge that enable and support governance of wildlife resources. As wildlife professionals seek better ways to integrate environmental and human dimensions, effectiveness of deer management – indeed, all wildlife management – could be enhanced by an approach philosophically consistent with a benefits-production focus of public trust administration. I'll explain how impact thinking is just such an approach, essentially tailor-made for strengthening adaptive management or structured decision-making processes while fulfilling public trust responsibilities. A subtle yet important component of impact thinking is a focus on what matters to stakeholders (impacts) and a reliance on stakeholders' input for identifying and weighing competing outcomes of management. Impacts are defined as the important effects of events/interactions between wildlife – deer in our case – and humans that merit management attention. Examples from research and management will be used to offer ways impact thinking might help deer management in the Southeast. In many ways, human dimensions of deer management can be viewed as a tug of war between competing values between stakeholders and occasionally within the same person. We'll explore ways to manage the tug of wars that erupt over deer management.

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Notes

Population Modeling and Data Management for Proactive Deer Management

Authors

Paul M. Lukacs[1]
J. Joshua Nowak[2]

[1] University of Montana
[2] Speedgoat Wildlife Solutions, LLC

Abstract

Consistent and defensible deer management relies on data and models. The field of wildlife biology has been lax in developing reliable data storage protocols and consistent analysis methods. Modern population dynamics modeling strives to balance statistical rigor, management utility and data integrity. We present data management and population modeling principles that can yield clear, consistent pictures of deer population dynamics. Data management represents the first step in developing consistency. Modern computer networks streamline data sharing and centralization allowing an entire agency to view all of the same data in real time. With data structures in place, population models can be developed in a consistent manor across jurisdictions. Integrated population models (IPM) provide a statistically rigorous method for combining multiple data sources along with a biological model to estimate population. IPMs also allow prediction of future population size including uncertainty to evaluate management scenarios. Prediction helps to support proactive manipulation of populations in a manner that maintains populations within objective. Finally, we present PopR as a computing advance to integrate data management, analysis and modeling in a consistent manner at the agency level.

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Notes

Linking Research and Management to Improve Decision Making

Author
Duane R. Diefenbach
USGS Pennsylvania Cooperative Fish and Wildlife Research Unit

Abstract
Deer management is ideally positioned for rapid learning about the ecological system because natural resource agencies make management decisions based upon a system of management units, which readily provides opportunities for replication of treatments and controls. However, social and political challenges often make it difficult for administrators to support research via consistent regulations or policies (i.e., manipulating seasons and bag limits according to a pre-approved research design). Also, there is an inherent tension between researchers and natural resource managers: researchers would like to address testable hypotheses whereas managers oftentimes simply need information to make decisions or inform stakeholders. For nearly 20 years, Pennsylvania has integrated deer research and management to improve management decisions. Despite the contentious political situation surrounding deer management, the agency has successfully navigated a lawsuit and legislative audit because the program is transparent in how it collects data and makes recommendations to decision makers, and has designed successive research projects to reduce uncertainties and improve the methods it uses to make recommendations. Today, the Pennsylvania Game Commission (PGC) is the only state agency in the Northeastern United States that directly incorporates habitat conditions into its model for making deer management recommendations. In addition, a similar approach is being used by the Pennsylvania Bureau of Forestry (BOF) for managing deer on 2.1 million acres of forestland. I will provide an overview of the strategies used by the PGC and BOF to improve deer and forest management decision making in Pennsylvania.

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Notes

Thinking Broadly: Integrating Governance Principles into Deer Management

Author
Patrick E. Lederle
Michigan Department of Natural Resources

Abstract
Challenges in deer management include an alphabet soup of diseases, deer/human conflicts, too many deer, too few deer, and a host of difficult interactions with groups interested in deer. Many of these difficulties reflect broader conservation challenges and changes in society; declining interest in the natural world, increasing interest in "our business" from non-traditional stakeholders, lack of stable funding, and declining relevancy of agencies in the eyes of the public. Despite the challenges, the fact remains that state fish and wildlife agencies are legally obligated to fulfill responsibilities under the public trust doctrine. Agencies are also expected to operate in ways that are consistent with good governance norms. The consequences of not doing so are costly, in terms of reputation, credibility, and conservation outcomes. Recently, elements of public trust thinking and good governance were combined in a set of "Wildlife Governance Principles" (WGPs) that provides a concise framework agencies can use to ensure they meet their responsibilities more effectively within the norms of good governance. WGPs are built on behaviors and practices that emphasize taking care of the public trust, using sound science, broadly engaging people, and accountability. They provide a foundation for leadership and increasing relevancy for state agencies in a changing society. Deer managers and natural resource managers in general will benefit from incorporating these principle into planning and management programs.

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Notes

TUESDAY, FEBRUARY 20 • TECHNICAL SESSION 1

A Summary: State Wildlife Agency Deer Program Goals, Plans, and Formal Reviews

Authors

Kip P. Adams, Matt D. Ross, Brian P. Murphy
Quality Deer Management Association

Abstract

Deer management is not a "one size fits all" recipe. Successful deer management requires a scientific approach that is transparent to the public and supported by hunters. We surveyed each state wildlife agency in the contiguous United States to determine the parameters used for their deer program goals, whether they had a published deer management plan, and whether their deer management program had been subjected to a formal evaluation, audit or lawsuit. Hunting opportunity was used as a program goal by 67 percent of states, followed by deer herd density (64%), and deer herd health (62%). Twenty-three states have published deer management plans, and 19 of those have been updated within the past 10 years. Ten states have been subjected to a formal deer program evaluation, and six of those have occurred within the past five years. Four states' deer management programs have been audited, and four have been subjected to a lawsuit. Given the whitetail's importance to the entire hunting industry and wildlife management system, all states should have a published deer management plan created with input from all deer stakeholder groups. The most successful deer management programs include local deer herd demographic data, combined with other local variables including environment, habitat productivity, hunting culture, and more. It is important for state wildlife agencies to use scientifically sound variables that are measurable and well defined by a public input process.

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Notes

From the Inside Looking Out: Deer Audits from the Perspective of a State Deer Biologist

Author
Gino J. D'Angelo
University of Georgia

Abstract
Under the principles of the North American Model of Wildlife Conservation, agencies are charged with managing white-tailed deer (*Odocoileus virginianus*) and other wildlife for the benefit of all citizens. Nationally, there is increasing interest from the public about management of deer populations, deer management is becoming more politicized, and state agencies are struggling to find the most productive means to include the public in decision making. Dissatisfaction by hunters about how deer are being managed or how their views are included in the management process has led to calls for audits of state agency deer management programs. I provide a case example of the audit of the deer management program in Minnesota completed in 2016. Fueled in part by hunters' concerns about declining deer numbers in some areas and a perceived lack of transparency about the deer management program, the Minnesota Office of the Legislative Auditor undertook a year-long evaluation of deer management in the state. Minnesota Department of Natural Resources had a long history of devoting significant resources to managing deer and their habitats, conducting in-state research to inform management, and an active public-engagement process. However, the deer audit provided an opportunity for the agency to evaluate their effectiveness, their shortcomings, how resources were allocated, and future needs. Successful deer management depends on our ability as managers to be adaptive in how we balance sound science with productively including the public in management. Our training of future biologists and administrators should consider the skills required to navigate these challenges.

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Notes

Science-based, Data-driven Deer Management Systems: The Mississippi Success Story

Authors

William T. McKinley[1], Phillip D. Jones[2], Stephen Demarais[2], Bronson K. Strickland[2], Jason Price[1], John Gruchy[1], Larry E. Castle[1]

[1] Mississippi Department of Wildlife, Fisheries, and Parks
[2] Mississippi State University

Abstract

Science-based management decisions are especially valuable within the politically embroiled world of deer management. The lack of needed data to drive deer management decision making led Mississippi Department of Wildlife, Fisheries, and Parks and Mississippi State University to create a statewide data collection system on private lands during the 1980s. Spatially-explicit, age-specific data on body mass, lactation, and antler size are obtained for 25,000 deer from 630 cooperators on 2.2 million acres annually in Mississippi. The current dataset, from 317,494 males and 434,828 females, has been used to evaluate local management actions, to refine biological interpretations, and to develop new management tools. Research results using harvest data have led to significant changes in how antler restrictions are incorporated into DMAP recommendations and statewide harvest regulations. Reproductive data collected during spring herd health evaluations provided the biological justification for shifting the season framework to delay hunting season by two weeks in Southeastern Mississippi. We have generated models to correct the date of harvest effects on lactation and body mass data which naturally vary across the long hunting season. Interpretation of real-time observation data collected by hunters using the Deer Hunt App allows biologists to address concerns expressed about perceptions of deer numbers. Mississippi's system of citizen-scientist sampling provides data in a cost-effective manner that can be used to inform management, to develop new tools, and to address politically charged issues.

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Notes

Blending Biological and Sociological Data to Gain Support to Improve Deer Management in North Carolina

Authors

Jonathan C. Shaw, V. Evin Stanford, Ryan T. Myers, David T. Sawyer, Bradley W. Howard, Christopher Serenari, Christopher D. Kreh, David T. Cobb
North Carolina Wildlife Resources Commission

Abstract

The North Carolina Wildlife Resources Commission (NCWRC) initiated an evaluation of their white-tailed deer (*Odocoileus virginianus*) hunting season frameworks in 2010. Staff collected biological harvest data (n = 22,560) between 2011 and 2013 to fill knowledge gaps and improve data quality. Biological and reported harvest data were used in a county-based k-means cluster analysis and best-fit analysis to establish biological deer management units and evaluate the herd. Results indicated that existing season zones were not the best fit for the herd, and multiple objectives related to deer density, age structure, sex ratio, and harvest timing were not being met by varying degrees across the state. A survey of deer hunters was developed in 2016 to determine county-level desires and potential support for regulatory changes. Most respondents (n = 33,750; 81%) supported changes to improve the condition of the herd, but preferences about specific changes varied. Using choice modeling, we identified the potential trade-offs that hunters would make to achieve desired outcomes. Results informed development of alternative deer season zones as well as management strategies to balance hunter preferences with biological objectives. The NCWRC published the biological and social survey results, and received constituent feedback during two rounds of interactive public forums, leading to proposed new regulations in January 2018. This process represents a transparent, data-driven approach to gain hunter support for sweeping regulatory changes intended to simultaneously improve hunter satisfaction and herd condition.

Contact

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Notes

Landscape-level Patterns in White-tailed Deer Fawn Survival in North America

Authors

* Tess M. Gingery[1], Duane R. Diefenbach[1], Bret D. Wallingford[2], Christopher S. Rosenberry[2]

[1] USGS Pennsylvania Cooperative Fish and Wildlife Research Unit
[2] Pennsylvania Game Commission

Abstract

We conducted a meta-analysis of white-tailed deer (*Odocoileus virginianus*) fawn survival and cause-specific mortality across North America to identify large-scale patterns in these population parameters. We used published data from 29 populations on fawn survival rates that reported a survival rate for 3–6 months, sample size, landscape description, and cause-specific mortality. We used linear models to investigate the relationship of fawn survival to landscape-level land use. We classified mortality as human-caused, natural (excluding predation), and predation and estimated the proportion of these causes in agriculturally dominated, forested, and mixed landscapes. Our model estimated average survival to 3–6 months of age of 0.422 (SE = 0.058) in contiguous forest landscapes (no agriculture) and for every 10 percent increase in agricultural land area fawn survival increased 0.067 (n = 12, SE = 0.019). Habitats with mixed forest and agricultural landscapes had greater proportions and rates of human-caused mortalities, and lower proportions and rates of mortality due to predators, than either forested or agriculturally dominated landscapes (n = 22, $P \leq 0.01$). The proportion and rate of natural deaths did not differ among landscapes even though overall mortality rates differed ($P > 0.05$). Given that neonate survival is the most variable demographic parameter for white-tailed deer, harvest management decisions may need to consider that fawn survival rates likely will be lower in forested landscapes.

* Student Presenter

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Notes

White-tailed Deer Neonate Survival in the Functional Absence of Predators

Authors

* Justin R. Dion[1], Jacob M. Haus[1], Joseph E. Rogerson[2], Jacob L. Bowman[1]

[1] University of Delaware
[2] Delaware Division of Fish and Wildlife

Abstract

Survival and cause-specific mortality of neonate white-tailed deer (*Odocoileus virginianus*) has been the focus of recent research, particularly in regards to predation mortality. An understanding of the impact of predation on survival rates requires a predator-free control population. We captured 109 neonates using opportunistic capture (n = 55) and vaginal implant transmitters (VIT; n = 54) in Delaware during 2016 and 2017. Predators (i.e., black bear (*Ursus americanus*), bobcat (*Lynx rufus*), and coyotes (*Canis latrans*)) were functionally absent from the study area. We calculated 30-day survival using a Kaplan-Meier estimator and determined the importance of covariate on survival using Cox proportional hazard models. The overall 30-day survival estimate was 0.61 (95% CI = 0.51 – 0.72). The survival estimate for neonates captured using random searches (0.76) was greater ($P <$ 0.01) than those for VIT neonates (0.53). Natural causes (n = 34) accounted for all of our observed mortality, including one potential predation by red fox (*Vulpes vulpes*). The top models included covariates for birth weight, doe maturity, and precipitation. Predation could be less of a limiting factor for survival than many studies have suggested. Data derived from opportunistically captured neonates may inflate estimates of survival and misrepresent cause-specific mortality. Although the influence of birth weight on survival has been reported previously, the impact of doe maturity and precipitation has not been documented. The current emphasis on predator management and the impact on deer abundance may be misplaced.

* Student Presenter

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Notes

Factors Influencing Survival of Yearling Male White-tailed Deer in Delaware

Authors

* Jacob M. Haus[1], Joseph E. Rogerson[2], Jacob L. Bowman[1]

[1] University of Delaware

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Abstract

Managing male age structure in white-tailed deer (*Odocoileus virginianus*) populations is an important objective for state managers and private landowners seeking to improve hunter satisfaction while maintaining appropriate densities. Limiting mortality in the yearling age class is often the primary consideration, and regional differences in habitat, regulations, and hunter behavior complicate our understanding of how specific factors influence survival. We used Cox proportional hazard modeling to examine the effects of distance to road, distance to forest edge, dispersal behaviors, and landownership on the risk of mortality for yearling males (n = 61) in southern Delaware. Annual survival averaged 0.60 (95% CI = 0.49 – 0.73), with hunter harvest accounting for 79 percent of mortalities. The best approximating model for risk of mortality included covariates for landownership (public/private; $P < 0.01$) and distance to forest edge ($P = 0.01$), with mortality risk increasing both on public land and in closer proximity to forest edge. Increased risk of harvest due to forest fragmentation is well documented; however, the effect of land-ownership has not been quantified, particularly when hunter objectives and behaviors differ between landownership types. We observed annual survival rates of 0.75 (95% CI = 0.62 – 0.89) for deer exclusively on private land during the hunting season, and 0.37 (95% CI = 0.18 – 0.73) for deer that utilized public land during the hunting season. Survival rates on private lands were comparable to research from properties that actively manage male age structure, but harvest of yearlings limited male age structure on public lands within the study area.

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Estimating Ecological Effects on Fawn Survival and Recruitment in South Florida

Authors

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Abstract

In South Florida, white-tailed deer (*Odocoileus virginianus*) is the primary prey of the endangered Florida panther (*Puma concolor coryi*) and an economically and culturally important game species. Due to recently reported declines in deer populations, information is needed about the factors influencing fawn survival and recruitment in this seasonally-inundated and predator-rich environment. We deployed three camera grids in the Florida Panther National Wildlife Refuge and Big Cypress National Preserve. Each 7,500-acre grid within the 135,900-acre study area consisted of 60 passive trail cameras. We individually identified 123 unique fawns in detections from December 1, 2015 - June 30, 2016. Detections were organized into spatially-referenced capture histories. We developed a spatial capture-recapture model that used these histories to estimate population parameters including number and location of births, fawn survival, and recruitment. Model estimates indicated that 213 fawns (95% CI 182-249) were born during the 2016 fawning season, of which 38 individuals (95% CI 29-48) reached recruitment (180 days). We modeled birth site location, detection probability, and survival as functions of habitat type, time since fire, daily water level, human activity, and predator activity to determine which covariates had the greatest effect on our parameters of interest. For example, we found that the density of fawn birth sites significantly decreased in open habitats, such as marsh and prairie. Our model provides a cost-effective, flexible, and non-invasive method for agencies and researchers to estimate fawn recruitment at broad spatial and temporal scales while addressing questions about the underlying birth and juvenile survival processes.

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Results From Fifteen Years of Quality Deer Management at Ames Plantation

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Abstract

White-tailed deer (*Odocoileus virginianus*) is the most pursued game species in North America. To best manage white-tailed deer, monitoring herd health, habitat quality, and hunter satisfaction are necessary. Data were collected from Ames Plantation Hunting Club in Grand Junction, Tennessee (2002 - 2016) to determine the influence of a QDM program on these factors. Pre-treatment data were collected in 2002 - 2003. Harvest restrictions were established based on these data. Buck harvest restrictions transitioned through three phases: 110" minimum gross antler score or 5.5 year minimum age [110"/5.5] (2004 - 2005), 120"/4.5 (2006 - 2009), and 125"/4.5 (2010 - 2016). Doe harvest quotas were set to achieve deer density goals. Bucks ≤ 2.5 years old comprised >90 percent of the buck harvest pre-QDM but dropped to 55 percent, 28 percent, and 23 percent during the three program phases. Doe harvests remained similar across all age classes. Dressed body weights of bucks and does remained consistent during the study. Lactation rates of harvested does remained stable. Observation data suggested a slight increase in fawn recruitment. Doe harvest per member increased 154 percent, and mature buck (≥ 3.5) harvest increased 467 percent from pre-treatment to phase 3. Hours hunted per mature buck harvest decreased by 45 percent. Buck observation per hour increased 84 percent and doe observation per hour remained constant. In 2015, 97 percent of the members expressed satisfaction with the QDM program. Ames Plantation's QDM program produced an older buck age structure, maintained the doe age structure, increased per member harvests, maintained a healthy deer herd within habitat constraints, and reduced the effort required to observe deer.

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Wildlife Cooperatives: A National Look at Programs, Acreages, and Involvement Levels

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Abstract
A cooperative is a group of landowners and hunters working together to improve the quality of wildlife, habitat and hunting experiences on their collective acreage. Cooperatives vary in size, number of participants and structure. To learn more about cooperative programs and involvement we surveyed state wildlife agencies to determine whether they have a staff member dedicated to cooperatives, if interest in cooperatives has increased during the past five years, and whether agencies have a formal cooperative program or provide incentives for landowners involved in one. Fourteen states that responded to our survey employ a person responsible for forming, maintaining and/or providing outreach to cooperatives. Twenty-one states do not have a good feel for interest level, while 12 confirmed there is greater interest today than five years ago. Twelve states have a formal cooperative program and 16 states provide incentives to landowners. We also surveyed hunters and agencies to determine the minimum and average acreage in cooperatives, as well as numbers of participants. Our surveys revealed a minimum of 3.5 million acres are in some form of formal wildlife cooperative in the United States, but could be as high as 29 million acres. Deer hunters across North America are rapidly becoming interested in and are forming wildlife cooperatives at a growing rate. State wildlife agencies that have regular contact with hunters should query their constituents about them, and should consider hiring staff members that are dedicated to working with private landowners and hunters in this capacity.

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Hunter Attitudes and Perceptions of Chronic Wasting Disease in Arkansas

Authors

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Abstract

In 2016, the Arkansas Game and Fish Commission (AGFC) detected chronic wasting disease (CWD) in 10 counties in Northwestern Arkansas. A media campaign was conducted by the AGFC to educate the public. To evaluate the effectiveness of the media campaign and to establish baseline hunter perceptions of CWD, from 7 March to 8 May 2017, we conducted a statewide telephone survey of Arkansas resident licensed hunters. Up to 12 contact attempts were made to increase the likelihood of hunter participation. A total of 1,302 interviews were conducted. The response rate was 82 percent. Nonresponse bias was not determined. We interviewed 459 hunters residing within a 10-county region where CWD had been detected (red zone), 414 hunters residing within a 13-county region immediately adjacent to the red zone (yellow zone), and 429 hunters located in other counties in Arkansas (green zone). Most (79%) hunters were “very” or “somewhat” concerned about CWD. Only 14 percent of hunters viewed CWD as a high risk to humans. Most hunters (71%) believed that hunters should be "very concerned" about consuming deer that tested positive for CWD. Approximately half (54%) of hunters believed that CWD poses a high risk to the deer population in Arkansas. One in four hunters (25%) who hunted most often in the red zone were not aware that CWD had been detected in that zone. Most (83%) hunters indicated that they were "very likely" to hunt deer in 2017. We plan to repeat our survey at 3-year intervals to track changes in hunter perceptions of CWD.

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Evaluating the Effectiveness of Antler Point Restrictions to Achieve Management Goals

Authors

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Abstract

Antler point restrictions (APRs) are designed to protect yearling male white-tailed deer (*Odocoileus virginianus*) from harvest by hunters and focus harvest on larger, older-aged males. Three hypotheses are commonly associated with these restrictions: (1) APRs advance the age structure of the deer herd where they are implemented, (2) APRs will lead to decreased doe abundance due to increased pressure on the antlerless segment of the population, and (3) APRs recruit hunters to the area due to interest in hunting where higher numbers of larger males are present. Our objectives were to test these hypotheses in Michigan. In 2013, the Michigan Department of Natural Resources implemented APRs in 12 counties in the northwest region of the Lower Peninsula. We used hunter harvest data from the Michigan Department of Natural Resources collected before and after the implementation of APR and piecewise regression techniques to evaluate the hypotheses. Results showed support for the hypothesis that APRs would advance the age structure in the populations. APRs would be a useful tool where the management goal is to advance the age structure of the male segment of the white-tailed deer herd. However, if the management goal is to increase the antlerless harvest or recruit more hunters to the area, we found no evidence that implementation of APRs would help managers achieve those goals.

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The Wisconsin Deer Management Assistance Program: Developing Relationships One Landowner at a Time

Authors

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Abstract

The Wisconsin Department of Natural Resources (WDNR) began implementing a Deer Management Assistance Program (DMAP) in 2014 to provide technical assistance to landowners in meeting property management objectives. Cooperating landowners enter into three-year agreements for a small fee and receive a suite of outreach services from the WDNR including personal interaction with their county wildlife biologist and a written management plan. We assessed attitude changes of landowners following their participation in DMAP using a non-experimental, pre-test, post-test design. Our findings suggest that DMAP participation increased landowner assessment of agency credibility and improved their understanding of deer-habitat relationships, including deer impacts to forests. In addition to these outcomes, DMAP participants reported high levels of satisfaction with the program. While initial implementation of the program has demonstrated success, challenges remain including recruiting participants, providing follow-up support, and balancing staff work load issues.

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Notes

Social Dominance Increases Pelleted Feed Consumption by White-tailed Deer in South Texas

Authors

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Abstract

Providing pelleted feed for white-tailed deer (*Odocoileus virginianus*) is a common management practice in Texas. Previous research has shown that not all deer consume the same amount of supplemental feed, suggesting that social interactions at the feed sites may restrict access to the feeder for subordinate deer, such as young and female deer. Social dominance at feed sites may benefit dominant deer by reducing competition. Changing deer density and supplemental feeder density may change the accessibility of supplemental feeders. To test these hypotheses, pelleted feed was provided year round, ad libitum within three, 200-acre enclosures on two ranches in South Texas with the following numbers of deer and feeders, respectively: 20/1, 60/1, and 60/3. We used stable carbon isotope ratios ($\delta^{13}C$) in deer serum to estimate supplemental feed in deer diets during March 2015. Social interactions at the feed sites were analyzed using trail cameras that recorded 30-sec videos with no delay in March 2015. Elo Rating in Program R was used to recreate the social hierarchy within each enclosure. We used a mixed model to determine the effect of a deer's Elo rating (dominance) on supplement consumption within the different treatments. As a deer's dominance increased, feed consumption increased ($P < 0.01$), but the importance of dominance was greatest in the 20/1 treatment ($P < 0.01$). These results suggest that during spring, dominance at feed sites allow those deer to consume more supplemental feed but that the effect of dominance on feed access diminishes at high deer densities.

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Effects of White-tailed Deer Density and Deer:feeder Ratio on Population Growth Rates

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Abstract

In South Texas, many landowners provide supplemental feed to maintain high white-tailed deer (*Odocoileus virginianus*) populations for hunting. However, it is not well known how this affects the fitness of their populations. This experiment was carried out on two ranches in Dimmit County, Texas. Our goal was to determine the effects of different population densities and deer-to-feeder ratios on population growth rates ($\lambda_t = N_{t+\Delta t}/N_t$). The experimental design was randomized, complete block with two blocks and five treatments. The treatments on each ranch consisted of five 200-acre enclosures with deer and feeders in ratios of 20:1, 40:1, 60:1, 60:3, and 80:4. We counted individual deer births and deaths from 2013 to 2017 using remote camera surveys, annual helicopter capture data, and found dead deer. Birth and death records were used to reconstruct the population and thereby estimate the number of deer in each enclosure during May each year. We used these population estimates to calculate λ-apparent population growth rates for each enclosure, which were then compared among treatments. Preliminary results (2013 - 2015) suggest significantly higher growth rates in the 60:3 and 80:4 vs. the 60:1 treatments ($P < 0.05$). If this holds true for the full dataset, it will indicate that with higher population densities, competition at limited feed sources can cause lower population growth rates. With the cost of feed and the time required for feeding considered, maintaining healthy, high deer populations could be impractical for many managers.

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Effects of White-tailed Deer Density and Feeder Density on Antler Growth

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Abstract

With rising popularity of intensive white-tailed deer (*Odocoileus virginianus*) management, it is important to understand whether deer density affects antler growth, especially considering expenses managers incur to maximize antler potential. Our objective was to determine whether deer density and feeder density influences antler growth among age classes. Photo files of known-age, ear-tagged bucks were created from trail camera images in five, 200-acre enclosures on both Comanche and Faith ranches in Dimmit County, Texas. Treatments were: 20 deer and one feeder; 40 deer and one feeder; 60 deer and one feeder; 60 deer and three feeders; and 80 deer with four feeders. Software BuckScore® was used to calculate gross Boone & Crockett (GBC) scores for bucks aged 1.5-8.5 years old during 2015 - 2016. Data were analyzed using a PROC MIXED model in SAS. In 2015, mean GBC score decreased 13.46 inches for 1.5-year-olds ($P < 0.01$; n = 21) and 9.08 inches for 2.5-year-olds ($P = 0.0575$; n = 18) from low- to high-density. However, when the deer/feeder ratio was constant, there was no effect on GBC score for yearlings ($P = 0.54$; n = 18) or 2.5-year-olds ($P = 0.48$; n = 26). There was no difference in mean GBC score in 2016. Social exclusion from food sources may have contributed to differences in younger bucks, while older, more dominant bucks have priority access and are not limited by nutrition. When provided with adequate nutrition year-round, it appears bucks can overcome a density effect on antler growth upon reaching maturity.

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While Males Fight, Females Choose: Male Phenotypic Quality Informs Female Mate Choice in Mammals

Authors

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Abstract

Theoretical support exists for male secondary sexual characteristics to signal quality and promote female choice. However, there is little, if any, evidence to support this theory in male-male competition breeding systems. Using white-tailed deer (*Odocoileus virginianus*) as a model species, we manipulated antler size, body size and age of bucks while controlling for other allometrically related traits and allowed estrus does the opportunity to choose between pairs of segregated bucks with large or small antlers, large or small body size, and old or young age. Segregating bucks removed intrasexual male competition and isolated the effects of female choice. Using various behavioral indications of female choice, we demonstrate that does prefer bucks with large antlers to those with small antlers ($P = 0.002$). Surprisingly, does showed no preference for body size ($P = 0.645$) or age ($P = 0.356$). Because antler size is heritable in deer, this female preference for larger antlers may be adaptive by increasing the reproductive success of her male offspring. Our unique antler manipulation study supports antlers functioning as ornaments to females in male-male competition breeding systems.

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From the Bottom Up: Nutrients Influence Diet Selection in a Wild Ungulate

Authors

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Abstract

Soil nutrients and their availability are responsible for plant growth and ultimately the structure of vegetative communities, potentially influencing diet selection. Natural selection should favor selective foraging behaviors in deer to choose among the myriad of nutrients available in plant communities to meet their physiological requirements. We designed a two-tier cafeteria-style experiment where we measured plant nutritional quality and white-tailed deer (*Odocoileus virginianus*) use on 1) 15 species of herbaceous forages, and 2) two species of herbaceous forages where we directly manipulated soil nutrient availability through nutrient augmentation. We tested the hypotheses: 1) deer use across forages would be influenced by forage nutritional quality and predicted use would be best explained by avoidance of toxic nutrients, and 2) soil nutrient availability would influence plant quality and subsequently affect plant selection by deer. Indeed, our analyses indicated deer selected forage species of low neutral detergent fiber and sulfur concentrations, the mineral used to propose the nutrient avoidance hypothesis. However, deer also selected for crude protein supporting the theory of nutrient maximization. We also confirmed soil nutrient availability indirectly influenced diet selection. Nutrient augmentation directly altered phosphorus concentrations within forages, and plant phosphorus concentration explained 47 percent of the variation in diet selection. Thus, our data indicate deer use both nutrient maximization and avoidance to balance diet selection and that plants mediate the indirect effects of soil nutrient availability on herbivore diet selection.

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How Do They Weather the Storm: White-tailed Deer Movement and Habitat Selection During Hurricane Irma

Authors

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Abstract

Extreme weather events can have dramatic impacts on biological systems. However, little information exists on how large mammals cope with such events. Hurricane Irma hit Southwest Florida on September 10, 2017, where we were monitoring 84 white-tailed deer (*Odocoileus virginianus*) with GPS collars. The eye of hurricane Irma passed within 13 miles of our study area bringing 11.74 inches of rain and sustained winds of 134 mph. We utilized this opportunity to examine survival, movement patterns, and habitat selection of deer during such an event. No collared deer died during the storm. Deer movement patterns differed by sex, but habitat selection did not. Movement rates of females were 49 percent greater during the storm (P = 0.003) compared to a seven days before and after the storm, while males did not significantly alter movement rates (P = 0.58). Further, 64 percent of females and 14 percent of males left their seasonal home ranges during the storm; home range size was not a determinant as to whether deer left their seasonal home range, rather this behavior was sex specific. On the day of Hurricane Irma, deer selected pine-dominated uplands, and avoided freshwater marsh and wet prairies. To our knowledge, this study is the first to use GPS collar data to elucidate survival, movement rates, and habitat selection by deer during a hurricane. More broadly, our results demonstrate the resiliency of a species that inhabit frequently disturbed ecosystems.

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Use of Passive Camera Grids to Monitor Activity Patterns of White-tailed Deer

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Abstract

White-tailed deer (*Odocoileus virginianus*) activity rates are typically calculated using GPS collars on a sample of individuals that may not be representative of the population, but trail cameras allow managers to non-invasively monitor population-level activity patterns. We deployed cameras (one camera/50 acres) on four 2,500-acre grids in Southwestern Georgia with different herd characteristics and management regimes. Between September 2014 and February 2017, we collected 174,048 observations of deer while simultaneously collecting weather data. We used linear mixed effects models to assess the effects of seasonal and environmental factors on activity rates. Diel period was the best predictor of doe behavior across all seasons, with crepuscular activity rates being greater than day or night. The best predictor of adult buck activity in most grids was biological season, with the greatest activity occurring during the rut. However, in the lowest density grid diel period was a better predictor of activity than biological season, with greatest activity occurring during night. During most biological seasons, temperature was the best predictor of doe activity with a negative relationship. Activity of all demographic groups increased during the 2016 drought, while the influence of other individual weather factors differed among biological seasons. Our results support previous research regarding seasonal and diel activity, and provide new insight into influences of weather patterns on deer activity.

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The Role of Drought as a Predictor of Hemorrhagic Disease in the Eastern United States

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Abstract

Hemorrhagic disease (HD) is the most important viral disease of white-tailed deer (*Odocoileus virginianus*) in the United States. The forces driving apparent increases in HD are poorly understood, particularly where the disease has recently been severe in northern latitudes. Drought is suspected of being one of the risk factors for HD. We seek to evaluate the role of drought severity in both space and time on changes in HD reports across the Eastern United States for the last 15 years. Our objectives were to: 1) develop a spatiotemporal model to evaluate if drought severity explains patterns of HD presence; and 2) determine if drought varies in importance over the present range of HD in the Eastern United States. Historic data from an annual HD survey conducted by the Southeastern Cooperative Wildlife Disease Study and from the United States Drought Monitor were used for this analysis. For 23 states and for each year (2000 - 2014), county-level covariate data were compiled. We used a generalized linear mixed model to explain HD presence and evaluated the spatiotemporal predictors across the region of study. Drought severity was a significant predictor of HD presence and the significance of this relationship depended on latitude. This relationship was greater at northern latitudes, while the effect of drought was reduced in southern latitudes, where the disease is enzootic. While drought severity does increase the probability that HD will be detected at a county level, our research points to the underlying role of acquired herd immunity across the enzootic-to-epizootic disease gradient.

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Understanding Hemorrhagic Disease: Are Maternal Antibodies Against EHDV Protective for Fawns?

Authors

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Abstract

Hemorrhagic disease (HD) is caused by epizootic hemorrhagic disease virus (EHDV) and/or bluetongue virus, and can cause large-scale mortality in white-tailed deer (*Odocoileus virginianus*). However, the apparent impact on deer populations throughout their range varies. These variable patterns of infection and disease are most apparent when comparing southern and northern populations. Numerous host, virus, vector, and environmental factors explain these patterns. Among potential host factors involved, previous studies in white-tailed deer demonstrated that innate resistance and previous exposure to EHDV are important factors. Additionally, although maternal antibodies against EHDV are known to persist in fawns for 3-4 months, the importance of these antibodies has not been investigated. Our objective was to determine the role of maternal antibodies in the protection of fawns against EHDV-2 infection and disease. Fawns (n = 10) were removed from does at 2-3 days old and hand-raised. Fawns were divided into two groups, EHDV-2 antibody positive (n = 6) and EHDV-2 antibody negative (n = 4) and were inoculated at four to eight weeks of age. Animals were monitored daily for clinical signs and blood was collected for virology, serology, and hematology on 0, 3, 5, 7, 10 and 14 days post inoculation (dpi). Antibody negative fawns all developed viremia, had mild clinical signs, and seroconverted. For antibody positive fawns, two developed a transient and low-titer viremia and four had no detectable viremia and no increase in antibody titer by 14 dpi. These data demonstrate the importance of maternally derived antibodies in protecting fawns from EHDV infection and disease.

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Evidence of Drought Impacts on White-tailed Deer in the Southeastern United States

Authors

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Abstract

Evidence suggests extreme drought influences white-tailed deer (*Odocoileus virginianus*) forage selection and quality in the Southeast, possibly decreasing nutritional carrying capacity and limiting lactation during late summer. However, the topic has received little attention, probably because the region normally receives high annual rainfall. Thus, we analyzed a dataset containing information on 2,578 female deer and fawns collected in Alabama during late winter to early summer of 2001 - 2017 to determine age-class specific effects of drought on body mass and *in utero* productivity. Specifically, we used county-level drought data from May – September of the previous growing season, a time that coincides with gestation, lactation, and the summer stress period for deer in Alabama. Our data did not support an effect of drought on adult (2.5-5.5 years old) or yearling female body mass or productivity. However, fawn body mass decreased from an average of 71.8 lb. (SE = 2.0) during normal rainfall years to 59.3 lb. (SE = 3.8) during dry years. Body mass of older (≥6.5 years old) females decreased from an average of 113.4 lb. (SE = 1.4) during normal rainfall years to 102.4 lb. (SE = 2.3) during dry years. In addition, *in utero* productivity of older females decreased from an average of 1.70 fawns/doe (SE = 0.06) during normal rainfall years to 1.43 fawns/doe (SE = 0.13) during dry years. These findings are consistent with the hypothesis that drought disproportionately affects very young and old deer, and could have implications for population growth rates during abnormally dry periods.

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Environmental Influences on Ages Estimated from Tooth Replacement and Wear

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Abstract

White-tailed deer (*Odocoileus virginianus*) are often aged by tooth replacement and wear (TRW). It is unknown whether environmental factors or visual bias influence estimated TRW age. For instance, sandy soils may accelerate tooth wear, whereas supplemental feeding may have the opposite effect. Further, visual cues, such as body size and antler size, may influence estimated TRW age. Cementum annuli (CA) is another ageing technique that is unbiased; thus, the differentials between TRW and CA may provide information about external influences on TRW ages. We obtained CA and TRW ages from 7,389 male deer harvested on King Ranch during 2000 - 2014 and performed a mixed-effects analysis, with the difference between CA and TRW ages as the dependent variable, antler size, feeder site density, body mass, soil characteristics, and harvest date as exploratory variables, and TRW as a random effect. Results indicated that fixed effects explained little of the variation in age differences (r^2 = 0.01). The largest influence came from body mass; the greater the body mass, the higher the TRW age than the CA age. This indicates that visual bias may influence TRW age; however, the effect size was small (β = 0.01). Sand and supplemental feed had small influences on age differentials. Our results agree with previous studies that differences between true ages and estimated ages are likely a function of variability in teeth among individual deer. Despite the variability, CA and TRW were ± 1 year 70 percent of the time, indicating that TRW has value for management purposes.

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Genetic Structure of Breeding-Pen, Enclosed, and Free-range White-tailed Deer Across Southcentral United States

Authors

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Abstract

Restoration of white-tailed deer during the mid-1900s resulted in genetically admixed free-range populations across the Southeastern United States More recently, captive-cervid breeding pens have the potential to add genetic complexity to native populations through mongrelization. However, little is known about the genetics of deer inside these facilities and if they are distinct from geographically proximate wild populations. We assessed the genetic structure in six breeding pens across Southcentral United States and geographically proximate free-range deer. For three of these pens, we also assessed associated enclosures wherein breeding pen deer had been released into native populations. Measurements of pairwise FST revealed most breeding pens were moderately differentiated from enclosures and free-range populations (0.014 – 0.061) whereas enclosures and free-range populations were more genetically similar (0.001 – 0.045). Alternatively, population assignment tests revealed clear distinctions between each breeding pen and its respective high fence enclosure or free-range populations, while there was little difference between high fence enclosures and associated free-range populations. Though differentiation may not be high, our findings show that breeding-pen populations can be distinguished from native deer using genetic assignment methodologies. However, determining whether mixing of breeding pen and native deer has occurred is more difficult due to varying rates of introgression, the eventual dilution of genetic signatures in populations where non-native deer have been released, and the already admixed nature of free-range populations. Future research will assess the rate at which differentiation deteriorates between breeding pen populations and free-range deer when they have been backcrossed with each other.

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Dam Mass and Litter Characteristics Affect Aging Fetal White-tailed Deer

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Abstract

Breeding timing of white-tailed deer (*Odocoileus virginianus*) informs management and is of great interest to hunters. The current fetal growth curve for estimating conception and fawning dates in the Southeast was developed in South Carolina and has not been independently evaluated. Given fetal growth rate differs between the Northeast and South Carolina, we questioned if the South Carolina model would be accurate given regional variation in body weight of deer in Mississippi. We developed a predictive model using 110 fetuses with known ages of 54 to 175 days. Our model includes fetal forehead-rump length (FRL), dam weight, number of siblings, fetus sex, and the interaction between sibling number and sex with individual dams as a random effect ($P < 0.001$). The predictive value of our model ($r^2 = 0.981$) was equivalent to the SC model ($r^2 = 0.981$), which uses only FRL. However, when comparing accuracy of fetal age estimates for our ten lightest dams ($\bar{x} = 86.7$) and ten heaviest dams ($\bar{x} = 153.2$), our model differed by only 0.2 days while the SC model differed by 4.0 days. When comparing accuracy of estimates for samples taken mid-gestation (FAD = 95-137) and early gestation (FAD = 54-94), our model differed by only 1 day while the SC model differed by 2.3 days. We suggest that our predictive model will generate more accurate fetal ages under a range of variation in dam body weight and sample timing.

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A Comparison of Survey Methods for White-tailed Deer

Authors

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Abstract

Infrared-triggered camera surveys are a popular technique for white-tailed deer (*Odocoileus virginianus*) estimation because they are less invasive, less labor intensive, and more cost effective than other methods. Current camera survey methods, however, rely on the use of bait as an attractant, exposing estimates to biases due to the unequal detectability of animals. N-mixture modelling uses spatially and temporally replicated point counts to estimate populations of unidentified animals and distinguishes non-detection from true absence without bait. Few studies have directly compared baited, un-baited, and unmarked camera survey methods for deer estimation. We conducted an un-baited and baited camera survey at Pilot Mountain State Park, North Carolina, from July 1 - September 29 and September 30 - October 14, 2016, respectively. Photos were analyzed using Jacobson et al.'s (1997) buck:doe ratio (BDR) method and point counts were aggregated by hour. Environmental covariates were calculated from satellite imagery and incorporated into abundance models. We had a total of 1,658 and 60,508 deer visits for un-baited and baited surveys respectively. BDR density estimates increased by 61 percent and sex ratios (females:males) decreased nearly twofold between un-baited and baited surveys, indicating unequal detectability between sexes. N-mixture model estimates were 30 percent lower than BDR estimates, but have predictive capabilities and a measure of uncertainty lacking from the BDR method. Managers should adopt a collaborative approach to effectively monitor deer populations. This study improves the effectiveness of cameras as a survey tool by providing managers with a better understanding of biases involved in generating population estimates.

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Preliminary Development of an Unbaited Camera Survey Technique for Estimating Densities of White-tailed Deer

Authors

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Abstract

The most widely employed method of estimating population parameters of white-tailed deer is likely the baited camera survey technique. While the protocol is relatively easy to follow, the process of identifying individual bucks can be difficult and time consuming, no error terms are estimated, and the use of bait is illegal in some places and may be used only outside of hunting seasons in others. In addition, there have been relatively few improvements to using cameras as a survey tool over the past 20 years, therefore the need to investigate and implement recent advances in ecological modelling approaches are warranted. We propose a novel technique for generating parameter estimates using a spatially explicit modelling approach with only the use of trap level count data. We conducted passive (un-baited, 1/50 acres) and baited (1/100 acres) camera surveys on four 2500-acre camera grids in Southwestern Georgia in 2014 and 2015. September baited camera survey density (deer/mile^2) estimates for the four properties were 95, 79, 51, and 44, and preliminary passive survey estimates (95% CI) during October were: 67 (60-75), 42 (38-50), 39 (35-47), and 26 (23-34), respectively. The passive survey produced lower estimates and it is still uncertain if the passive model is underestimating or if the baited estimates are inflated. While the passive model is still under refinement and beta testing of the model will be necessary before full deployment, the use of un-baited cameras shows promise for generating population estimates without the need to identify individual deer.

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Notes

Buck, Doe, or Fawn? Factors Influencing Accuracy of Deer Classifications in Game Camera Images

Authors
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Abstract
Game cameras are widely used to survey deer and estimate herd characteristics, including sex ratio and fawn recruitment. Numerous studies have investigated accuracy and sources of error in these surveys; however, observer error has received little attention despite the potentially significant influence it could have on accuracy. Our goal for this project was to estimate error in observer classifications of deer images and investigate factors influencing the accuracy of classifications. We solicited a diverse group of 726 respondents to participate in an online survey which gathered pertinent individual information (i.e., profession, level of experience using game cameras for deer) and asked participants to classify a set of 96 known age/sex deer images as either buck, doe, fawn, or unknown. Survey images were from both day and night and of deer at varying distances in order to evaluate the influence of these factors. Regression analysis indicated that observer profession and level of experience using game cameras for deer significantly influenced accuracy of responses, with wildlife biologists and observers indicating a "High" level of experience being the most accurate groups. The sex/age of deer in images was also a significant predictor of accuracy, with buck images being 4.73 and 11.47 times more likely to be correctly classified than doe and fawn images, respectively. Misclassification of deer likely is an important source of error in camera surveys that varies according to observer and image characteristics.

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Development of a Biologically Centered Habitat Monitoring Technique: SPIDER Transect Method

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Abstract
Overabundance of white-tailed deer (*Odocoileus virginianus*) can have negative effects on woody vegetation. I developed the SPIDER transect method to quantify an area impacted by deer overbrowsing. Browse line height of woody vegetation deer consumed was measured from forest floor to first encountered horizontal, twig-sized limb (≤ 0.8 inches in diameter). One browse-line height measurement was taken at 164 feet increments, along each of 8 transects (each transect radiated out from a central starting point and followed magnetic directions; N, S, E, W, NE, NW, SE, SW), within 16.4 feet of the transect line. No pre-determined length (distance from central starting point) was used for transects because the objective was to quantify the area of overbrowsing. The end point for each transect was established when 3 consecutive measurements were 21.7 inches or less (typical height in study region most prone to deer browsing) or the park boundary/lake was encountered. I compared area evaluated and time expended (effort) with the traditional belt-transect method. The SPIDER transect method had 3× fewer transects that were at least 20× longer and evaluated an area 50× larger (865 acres) with 50 percent less effort compared to the belt-transect method (15 acres). The quantifiable area is an advantage of the SPIDER method that is not obtained using the traditional belt-transect method; in this study, woody vegetation in a 752-acre area around a park campground exhibited overbrowsing. The SPIDER transect is a wildlife-centric, efficient method that could be beneficial for prescribing and evaluating management recommendations.

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Notes

Bias Correction of Ground-based Distance Sampling for Deer Density Estimation at Land Between the Lakes

Authors

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Abstract

Road-based density estimates of white-tailed deer (*Odocoileus virginianus*) are prone to being biased high when using distance sampling. The amount of bias, however, is unknown without an independent estimate produced using random sampling. Road-based density estimates were produced each winter from 2011 through 2017 in Tennessee and Kentucky on Land Between the Lakes National Recreation Area. Our objective was to assess the bias of the road-based population estimates in 2017 using an independent estimate based on vertical-looking infrared imagery and distance sampling. A total of 17 and 13 transects was sampled from the ground in Kentucky and Tennessee; 20 transects spaced approximately 440 yards apart were sampled from the air in both states. A total of 155.7 mi and 106.4 mi of transects was sampled each year from the ground in Kentucky and Tennessee, respectively. A total of 468.6 mi and 260.1 mi of transects was surveyed from the air in Kentucky and Tennessee, respectively. Ground-based estimates were 13.9 deer per mi^2 in Kentucky and 22.0 deer per mi^2 in Tennessee, whereas the vertical-looking infrared estimate in Kentucky was 10.2 deer per mi^2 and 19.2 deer per mi^2 in Tennessee. Ground-based distance sampling estimates compared to the vertical-looking infrared-based estimates were not statistically different, though point estimates of the ground-based results were biased high 26.6 percent and 12.7 percent in Kentucky and Tennessee, respectively. If management decisions rely on ground-based population estimates, bias should be assessed periodically to correct for the bias using a random sampling approach as with vertical-looking infrared imagery.

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Behavioral Response of White-tailed Deer to Coyote Predation Risk

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Abstract

Behavioral responses of prey to predation risk can affect lower trophic levels. White-tailed deer (*Odocoileus virginianus*) increase vigilance in response to coyote (*Canis latrans*) presence, but vigilance responses to spatiotemporal variation in coyote abundance are unknown. Therefore, we examined the relationship between deer foraging behavior and coyote abundance on two 2,500 acre study areas in Georgia, USA during 2010 - 2013. We used baited camera traps during fall and winter to quantify deer behavior (i.e., feeding or vigilant), and estimated coyote abundance using fecal genotyping to noninvasively mark and recapture individuals. During 2011 and 2012, coyote removals were implemented on each study area. Coyote abundance (i.e., predation risk) varied spatiotemporally, and was a predictor of foraging behavior during at least one season for all sex-age classes of deer except juveniles. Adult males were more sensitive to predation risk in winter, after the breeding season, whereas adult females were sensitive to predation risk during both seasons, but more so during fall when fawns are at greater risk. Yearling males were more sensitive to predation risk than adult males, and juveniles were least sensitive to predation risk, likely because of inexperience and high energetic demands. Reproductive chronology explained sex-specific and seasonal antipredator responses to predation risk, but there was a non-linear relationship between indirect predator effects and direct predation risk for some sex-age classes. Our results suggest deer detect and respond behaviorally to variation in coyote abundance. Due to the widespread distribution of deer and their interactions at multiple trophic levels, the ecological implications of this finding may be wide-reaching.

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Reproductive Response of Coyotes to Intensive Control for Deer Management

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Abstract
Considerable interest in coyote (*Canis latrans*) control has developed among white-tailed deer (*Odocoileus virginianus*) managers aiming to improve fawn recruitment. Research from the Western United States indicates that coyotes may increase reproductive output in response to intensive persecution, but little is known about basic coyote reproductive parameters in the Southeast, much less reproductive response to control efforts. Our objective was to quantify litter size, pregnancy rate, and fecundity in a previously unexploited coyote population in South Carolina, and to evaluate the effect of exploitation on these parameters. We examined reproductive tracts from 235 female coyotes trapped during 2010 - 2012. The number of coyotes trapped was similar among years, indicating that the population recovered following trapping each year, but it shifted toward a younger age structure during trapping. Adult reproductive parameters all tended to increase from pre-trapping through the trapping period, but differences were not significant, and fecundity of the population actually was lower during 2011-2012 than prior to trapping. Reduced population fecundity was attributable to the increased representation of juveniles in the population, which rarely bred, coupled with a concurrent decrease in adults, which accounted for most breeding. Thus, we observed only weak evidence for compensatory reproduction in response to trapping pressure and conclude that population recovery was achieved primarily through immigration from neighboring areas rather than in situ reproduction. High immigration rates as indicated herein render coyote populations extremely difficult to control.

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Does White-tailed Deer Browsing Cause Changes in Volume and Mast Production of South Texas Plants?

Authors

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Abstract

Intense browsing by white-tailed deer (*Odocoileus virginianus*) typically results in a reduced canopy volume and mast production of woody plants. Adaptations to herbivory, such as compensatory growth, and the presence of supplemental feed may reduce the effects of intense deer browsing. Our objectives were to determine if (1) woody plant canopy volume and mast production of spiny hackberry (*Celtis ehrenbergiana*), blackbrush acacia (*Acacia rigidula*), and guayacan (*Guajacum angustifolium*) decreases with increasing deer density and (2) if maintaining a ratio of 20 deer/feeder reduces the effect of increasing deer density. Matching pairs of each plant species were located in June 2013, and one plant/pair was randomly selected to be caged to eliminate deer browsing. During July 2013 - 2017, canopy volume of each plant was estimated by measuring total plant height and diameter at 0.82 ft height increments, and mast production was estimated by counting the number of fruits present in a 0.28, 0.42, or 0.71 cubic ft frame. Preliminary results show there was no effect on canopy volume or mast production of guayacan, spiny hackberry <4.92 ft tall, blackbrush acacia <4.92 ft tall, or blackbrush acacia >4.92 ft tall ($P > 0.05$). Spiny hackberry canopy volume >4.92 ft tall increased with increasing deer density with one feeder ($P < 0.05$). This plant appears to follow the grazing optimization hypothesis by compensating for tissue removed by deer. However, there is no obvious evidence of 'browse lines' or reductions in mast production.

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Peak Breeding Times for Tennessee's White-tailed Deer Population Based on Deer-Vehicle Collisions

Authors

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Abstract

Deer-vehicle collisions have been used to predict peak breeding periods for white-tailed deer (*Odocoileus virginianus*) in some states. The assumption is that, all things being equal, deer move more during the breeding season and when the breeding season is at its peak, deer are more prone to being hit by vehicles. Our objective was to spatially model the peak of the breeding season across Tennessee. Spatial modeling was based on 13,516 deer-vehicle collisions locations that occurred from October 1, 2012 through December 31, 2016, collected from TITAN, the Tennessee State database housing vehicle collision information. We used interpolation and data-mining techniques to analyze spatially explicit deer-vehicle collisions using GIS. Clustered counties reflected specific weeks during the 3-month period in which deer-vehicle collisions occurred. Ten different areas across Tennessee exhibited a peak in deer-vehicle collisions thought to be correlated with the peak of breeding ranging from November 8-15 to December 8-15. Total primary and secondary road lengths in each county accounted for about 43 percent of the variation ($r^2 = 0.427$, $P < 0.001$). Further research is needed to correlate the peak of the rut based on fetal backdating in each of these areas to validate the relationship between breeding peaks and deer-vehicle collisions.

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Notes

Camouflage Patterns are Highly Heritable but Predictability Varies among Three Populations of White-tailed Deer

Authors

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Abstract

If ungulate neonate cryptic coloration provides a survival advantage, it should be heritable and adapted to their prevailing environment. However, recent changes in land-use and predation pressure may have created a mismatch between previously adapted camouflage and the current environment. In Mississippi, row crop agriculture has altered some landscapes while recovery of native predators and establishment of novel predators may apply new directional pressures. We assessed if spotting characteristics of neonate white-tailed deer (*Odocoileus virginianus*) were heritable and if they accurately predicted region of origin, indicating adaptation to specific environmental characteristics. Spotting characteristics were highly heritable, suggesting specific characteristics may provide an adaptive advantage. Camouflage patterns were moderately distinctive for neonates with lineages originating in the Lower Coastal Plain and Thin Loess (≥ 67 percent neonates accurately classified into their respective region) supporting previous selection for specific patterns at the regional level. However, camouflage patterns failed to predict region of origin for neonates originating from the Delta region (0%), suggesting disruption of previous adaptation. Of the three regions, the Delta is the most heavily converted from forested habitats, with over 70 percent in agriculture, while the Lower Coastal Plain and Thin Loess are less than 40 percent and 21 percent agriculture, respectively. Given that camouflage patterns are heritable and neonates displaying successful camouflage patterns should display increased survival, the lack of a predictable pattern within the dynamic Delta landscape suggests that major land use changes and new predatory pressures may have disrupted the neonate cryptic coloration best suited to this population's current environment.

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Effects of White-tailed Deer and Supplemental Feeder Density on Woody Species Composition

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Abstract

Researchers in North America have observed a shift in woody plant species composition as white-tailed deer densities increase, but this shift has not been documented in highly variable environments like South Texas. Our research was conducted on 2 ranches in Dimmit County, Texas. Each ranch contains six 200-acre enclosures, and each enclosure was assigned one of the following treatment combinations: 0 deer/1 feeder, 20 deer/1 feeder, 40 deer/1 feeder, 60 deer/1 feeder, 60 deer/3 feeders, and 80 deer/4 feeders. In 2004, we established 20, 164-ft transects in each enclosure. During June 2012 - 2017, we estimated woody plant canopy cover by species using the line intercept method. We used non-metric multidimensional scaling to detect and display patterns over time in woody species composition. We used an index of multivariate dispersion to compare average similarities in composition among treatments, and then regressed the index on year to detect changes in variation in species composition over time. Preliminary results suggest that patterns in community composition vary between ranches and among enclosures. Transect trajectories were not directional and were difficult to associate with particular treatments. The index of multivariate dispersion indicated that variation in community composition was reduced in the 80/4 treatment relative to the 0/1 and 20/1 treatments on one ranch. Woody plant community changes over time are the result of a complex interplay of initial species composition and treatment. When deer/feeder density had an effect, this effect was to reduce variation in community composition and thus potentially limit habitat stability.

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Effects of Loblolly Pine Thinning on White-tailed Deer Forage and Stand Economics

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Abstract

Planted stands of loblolly pine (*Pinus taeda*) compose approximately 19 percent of forested land in the Southeastern United States Many landowners are interested in managing these plantations both for timber production and to provide quality habitat for game species such as white-tailed deer (*Odocoileus virginianus*). Deer forage availability generally increases with decreasing basal area in pine stands, so mid-rotation thinning can be used to improve habitat quality. However, the tradeoffs among thinning intensity, forage production, and stand economics is not well understood. Thus, we designed an operational-scale, manipulative experiment to evaluate the effects of three thinning treatments (i.e., residual basal area of 40, 60, and 80 ft^2/ac) on deer forage availability and stand net present value (NPV). We selected five loblolly pine stands (90-130 acres/stand) in Georgia's Piedmont, divided each stand into three treatment units, and randomly assigned one of the three thinning treatments to each unit. We collected pretreatment basal area and woody vegetation data during January - March 2017, implemented thinning treatments during March - July 2017, and measured percent cover of moderate- to highly-preferred deer forage plants during July - September 2017. Understory vegetation increased in all treatments in the first year following thinning, although percent cover of deer forage did not differ among 40 ft^2/acre ($\bar{x}$ = 16.44, SD = 13.34), 60 ft^2/acre ($\bar{x}$ = 16.57, SD = 12.19), or 80 ft^2/acre ($\bar{x}$ = 18.94, SD = 13.14) treatments. We expect differences to manifest during the next three years of monitoring, during which we will also use timber growth models to compare NPV among thinning treatments.

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Impacts and Influence of Deer Density on Corn and Soybean Yields in Western Kentucky

Authors

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Abstract

In the Midwestern United States, corn (*Zea mays*) and soybean (*Glycine max*) are two of the most abundantly grown crops. White-tailed deer (*Odocoileus virginianus*) commonly feed on these crops when available, and yield losses are often attributed to their browsing. Recent research has suggested that deer may not have as negative of an impact on crop yields as previously thought. Deer density has been suggested as a predictor of damage within local areas; however, the link between density and crop damage is not well established. Our objectives are to determine the impacts of deer browsing on corn and soybean, and determine if deer density correlates to yield loss in Western Kentucky. To estimate the impacts deer have on crop yields, we systematically assigned one of two treatments (i.e., protected and no protection) to plots in three distance classes (32.8 ft, 98.4 ft, and 164.0 ft) from a wooded field edge during the 2017 growing season. We established and harvested 180 plots of corn across three farms and 156 plots of soybeans across two farms. Deer density was estimated using both the Jacobson branch-antlered buck method and a point-based distance sampling method. Another field season will occur in 2018, doubling the number of farms (n = 8 total) and respective plots from 2017. Project results are meant to inform localized deer management efforts, and identify when damage permits are applicable to corn and soybeans producers.

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Strategic Use of Deer Management Cooperatives in Landscape Conservation Planning

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Abstract

Habitat fragmentation and loss are the leading causes of decreasing global biodiversity and create barriers for conservation delivery. Engaging private landowners to achieve landscape-level conservation is widely practiced; however, established mechanisms to encourage voluntary conservation practices are lacking. White-tailed deer (*Odocoileus virginianus*) management by landowners and deer hunters is an increasingly popular conservation tool available to conservation planners. Annually, 12 million deer hunters use approximately 356 million acres for lease or ownership. However, targeting deer hunters for landscape-level conservation planning has not been explored. Deer management cooperatives (DMCs) are a novel approach by private landowners and hunters working collaboratively to improve deer herd and hunting quality. DMCs are defined as 'a group of landowners and hunters voluntarily working together to improve the quality of wildlife (e.g., white-tailed deer), habitat, and hunting experiences on their collective acreage'. By aggregating multiple properties to cooperatively manage collective acreage, hunters and landowners may facilitate a larger, more connected, land area within the landscape matrix. The potential increase in cooperative habitat management conducted within DMCs may increase conservation value within the surrounding landscape and to conservation planners. Thus, DMCs may provide a method to counter decreasing connectivity between habitat patches. We quantify the habitat configuration and conservation value of DMCs compared to the surrounding landscape using FRAGSTATS® software. We compare habitat configuration, patch size and patch connectivity between DMCs and surround landscapes to illustrate the utility of DMCs as a conservation-planning tool to increase functional connectivity for species other than white-tailed deer within a fragmented landscape.

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Variation in White-tailed Deer Antler Size: Effects of Age, Landscape Composition, and Physiographic Province

Authors

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Abstract

Spatial variation in landscape composition can influence phenotypic expression in wildlife species and can improve management efforts to express certain phenotypic traits. We evaluated the influence of age, landscape composition, and physiographic province on white-tailed deer (*Odocoileus virginianus*) antler characteristics using data from 16,622 male deer (age range: 1.5-3.5+ years old) harvested between 1997 - 2016 across five physiographic provinces in Georgia, USA. Age and physiographic province influenced antler size index (ASI; $P < 0.001$). For example, ASI of yearling males was greatest ($\bar{x}$ = 53.37; SE = 0.39) in the Upper Coastal Plain and least ($\bar{x}$ = 46.23; SE = 0.51) in the Lower Coastal Plain physiographic province. Given the differences in ASI among physiographic provinces, we evaluated how landscape composition within each physiographic province influenced ASI of 7,325 yearling (1.5-year old) males. Yearling ASI was positively related to increasing coverage of cultivated crops and suburban-urban areas (e.g., parks, small housing developments). Conversely, evergreen and deciduous forested cover consistently had a negative effect on ASI, except in the Ridge and Valley physiographic province where evergreen was positively related to ASI. Wildlife managers and hunters should recognize the effects of age, landscape composition, and physiographic province when setting antler size expectations.

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Cowpea Biomass Response to Seeding Rate, Planting Date, and Herbicide Intensity Level

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Abstract

White-tailed deer (*Odocoileus virginianus*) management can be extremely involved requiring a specific plan developed to meet the intended goals. Among these practices are establishing food plots that provide quality forage to meet nutritional demands of the herd when browse is limited. In the Southeast, cowpeas (*Vigna unguiculata*) are a good choice to increase the nutritional plane due to its drought tolerance, competiveness, attractiveness, and relatively low monetary input compared to other legume choices. The prolific weed seedbank present in Louisiana soils requires active management to ensure cowpeas do not suffer a major yield reduction. Three cowpea seeding rates (30, 60, and 90 lb/acre), three herbicide intensity levels [no herbicide, pre-emergence (PRE) herbicide only, and PRE followed by a post emergence (POST) herbicide], and two planting dates (optimum and late) were evaluated for their effect on weed control and cowpea biomass production. Herbicides evaluated included s-metolachlor (1.33 pt/acre) plus imazethapyr (4 fl. oz/acre) applied PRE and bentazon plus acifluoren (1.5 pt/acre) applied POST. The project will determine the herbicide input level required to maximize cowpea biomass, whether higher seeding rates can offset herbicide input level, and how planting date will interact to affect these factors. Budgets often constrain land managers, limiting resources applied to food plots and questions often arise concerning weed control and seeding rates that should be utilized in food plots. These issues will be addressed with this research project. All data has been collected and analysis is underway.

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Notes

Using Herbicide and Prescribed Fire to Increase Deer Forage in Gulf Coastal Plain Hardwood Stands

Authors

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Abstract

Research investigating forage availability for white-tailed deer (*Odocoileus virginianus*) in the Southeast has been concentrated in pine forests. Hardwoods are typically retained in drainages and areas of better site quality, but the effects of fire and herbicide application on forage availability in these systems has not been documented. Although some have expressed concern that fire cannot be used in hardwood systems without damaging timber resources, previous research has documented fire enhances deer forage in Mid-South and Central Hardwood stands. However, this approach has not been evaluated in the Gulf Coastal Plain. We selected 4, 10-acre hardwood stands in separate creek drainages on Barbour Wildlife Management Area, located within the Upper Coastal Plain of Alabama in 2017. We will reduce the basal area in each stand from approximately 100 ft^2/acre to 55 ft^2/acre in early 2018 by removing trees with relatively low wildlife value by girdling and spraying. We will use triclopyr (Garlon® 3A) to kill trees in one half of each stand, and a mixture of triclopyr and imazapyr (Arsenal® AC) in the other. We will document mortality of treated trees in summer 2018, as well as any injury to adjacent non-target trees. We will implement low-intensity prescribed fire late in the growing season of 2018 and during the dormant season of 2019 to begin a comparison of season of burning that will continue into the future. We will measure the effect of treatments on the plant community, including availability of deer forage plants.

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Spatial Cognition and Acuity of the White-tailed Deer Visual System

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Abstract

Object localization and the ability to discern visual detail are two components of the sensory system that allow animals to visualize their environment. Many aspects of white-tailed deer (*Odocoileus virginianus*) visual ability have been previously studied. However, the spatial cognition and visual acuity of deer remain relatively unexplored. Understanding the visual abilities of deer provides a foundation for how visual cues influence deer behavior and ecology. However, obtaining measures of visual performance of nonhumans precludes the use of techniques such as Snellen Eye Charts. We developed a series of Gabor Patches for application in a series of automated forced choice discrimination tests to obtain behavioral measures of relative contrast sensitivity by comparing acuity thresholds and average deer performance. In this approach, deer are trained to approach a feed source paired with a black and white grated stimulus and simultaneously avoid an accompanying grey screen of the same light intensity as the grated stimulus presented. Deer performance is automatically recorded over a series of contrast intensities and across a range of visual acuity gratings until response rates do not differ between the black and white grating and the grey screen. We report our preliminary findings and compare visual acuity of white-tailed deer and humans.

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Notes

TENNESSEE BUCKS EXHIBIT

The Tennessee Wildlife Resources Agency would like to acknowledge all of the hunters that allowed us to display their deer mounts during this event. Over 60 mounts were loaned to the agency by hunters all over the state. Listed below are the top 5 net scoring bucks that were loaned to us by typical and non-typical categories.

TOP FIVE NET NON-TYPICAL CATEGORY

State Rank	*Hunter*	*Score*	*Weapon*	*County*	*Year*
1	Stephen Tucker[1]	312 0/8	Muzzleloader	Sumner	2016
2	David Wachtel	244 3/8	Muzzleloader	Sumner	2000
3	Justin Samples	232 7/8	Rifle	Haywood	2001
4	Nelson Cannon	227 2/8	Rifle	Haywood	2007
9	Todd James	207 3/8	Rifle	Montgomery	1997

TOP FIVE NET TYPICAL CATEGORY

State Rank	*Hunter*	*Score*	*Weapon*	*County*	*Year*
1	William (Sonny) Foster	186 1/8	Rifle	Cumberland	1959
2	Benny Johnson	184 4/8	Rifle	Fayette	1979
3	Mike Fisher	180 5/8	Rifle	Williamson	2012
6	Anthony Bledsoe[2]	177 2/8	Archery	Williamson	2015
15	Andrew Friel[3]	173 4/8	Muzzleloader	Montgomery	2012

[1] Pending B&C world record non-typical taken by a hunter
[2] Number 1 typical taken with a bow
[3] Number 1 typical taken with a muzzleloader

Table 1. Southeastern state deer harvest summaries for the 2016-2017 or most recent available season.

State	Land Area (sq. mi)	Deer Habitat		Percent For-ested	% Land Area Public Hunting	Harvest		
		(sq. mile)	(% Total)			Male	Female	Total
AL	51,628	46,981	91	69	5	115,000	180,000	295,000
AR	52,609	44,718	85	53	12	108,684	93,386	202,070
DE	1,954	1,592	36	15	10	7,192	7,601	14,793
FL	53,632	27,573	51	48	17	57,403	32,024	89,427
GA	57,800	38,674	67	67	6	134,465	181,998	316,463
KY	40,395	39,654	97	59	9	78,910	60,540	139,450
LA	41,406	26,562	64	52	9.5	78,824	59,476	138,300
MD	9,837	8,766	89	39	4	36,749	45,611	82,360
MO	69,561	63,910	92	31	4	156,145	110,099	266,244
MS	47,296	31,250	66	66	6	99,716	144,622	244,338
NC	48,511	37,149	77	57	6	101,036	103,338	204,374
OK	69,919	37,425	54	19	3	62,385	36,638	99,023
SC	30,207	21,920	73	63	7.5	99,678	72,637	172,315
TN	42,246	25,770	61	49	9	85,656	70,941	156,597
TX	261,914	152,730	58	40	<2	399,487	322,557	722,044
VA	39,589	35,642	90	59	8	102,360	78.301	180.661
WV	24,064	22,972	95	79	9	68,047	44,330	112,384[1]
Avg or Total	942,568	663,288	73.29	50.88	7.8	1,791,737	1,565,786	4,266,820

Table 1. Continued. Page 2

State	Harvest/sq. mi. Deer Habitat	Method of Data Collection[2]	Estimated Pre-season Population	Length of Season (Days)[3] Archery	Black Powder	Firearms	Method of Setting Seasons[4]	% Land Area Open to Dog Hunting
AL	6.2	A,B,C,E,F	1,300,000	120 (C)	5 (A)	89 (A,C)	A,B	67
AR	4.7	A,C, F, G	1,000,000	175 (C)	12 (C)	50 (C)	A,B	70
DE	9.3	B, F, G	36,000	131 (C)	15 (A,B)	39 (A,B)	A,B,C	0
FL	3.1	E		35-38	14	74-79	A,B	20
GA	8.2	A,C,D,E, F, G	1,000,000	128-145 (C)	92 (A,C)	85 (C)	A,B,C	23
KY	3.9	D,F,G	825,000	136 (C)	3(A), 9(B)	10-16 (C) + 4 Jr	A,B,C	0
LA	5.3	A.B.C	500.000	123(C)	14(A.B)	65	A.B.C	80
MD	9.4	B,C,D,F,G	216,000	101 (C)	3+9 (A), 13 (B)	13 (A), 2 (B),	A,B,C	0
MO	4.0	B,C,D,F,G	1,200,000	112	11	11-14 + 5 Jr	A,B	0
MS	8.1	C, E	1,575,000	123 (C)	12 (A)	74	B,C	90
NC	5.5	A,B,C,D,F,G	1.000.000	21-83	14	18-81	A,B,C	50
OK	2.4	A,C, E, online	500,000	107 (C)	9	16	A,B	0
SC	8.2	A,B,C	730,000	16 (A)	10 (A)	70-140	C	60
TN	6.4	A, mobile /online		105 (C)	65 (C)	51 (C)	A,B	0
TX	3.8	B,C	3.8-4.8 million [5]	35	14	65-93 (B, C)	A,B	0
VA	5.1	A.B.C.D.F	888.000	42-77	14-36	15-50	A.B	55
WV	4.9	F	551,000	85 (C)	6 (C)	23 (C)	A,B,C	0
Avg. or Total	5.79		15.121 to 16.121 million					30.29

Table 1. Continued, Page 3

State	No. of Hunters	5-Year Trend	Hunting License Fees (Full Season)		Tagging System		
			Resident	Non-Resident	Physical Tag? License Tag? None?	Mandatory? Volunteer? None?	Bonus Tags Available?
AL	191,257	Stable	$26.60	$133.55-$306.25	Hunter Log	Mandatory	DMAP
AR	243,064	Down	$10.50 – 25	$55 – 350	License Tag	Mandatory if not checked immedi-ately upon harvest	DMAP
DE	21,200	Stable	$39.52	$199.50	Physical Tag	Mandatory	2 Antlered, Unlim-ited Antlerless
FL	98,577	Down	$22	$156.50	None	None	Yes
GA	353,620	Up	$49	$325	License Tag	Mandatory	WMAs
KY	307,743	Stable	$55	$260	License Tag/ Hunter Log	Mandatory	Yes
LA	184,400	Stable	$29-50	$300-352	Physical Tag	Mandatory	DMAP
MD	59,000	Stable	$36.50	$130	Physical Tag	Mandatory	Antlered only
MO	501,576	Stable	$17	$225	License Tag	Mandatory	Antlerless only
MS	142,330	Stable	$25-$45	$300-$375	None	None	DMAP & FMAP
NC	253,067	Stable	$36	$160	License Tag	Mandatory	Yes & DMAP
OK	186,173	Stable	$25	$280	License Tag	Mandatory	DMAP
SC	138,997	Stable	$25	$235-375	Physical Tag	Mandatory	Yes & DMAP
TN	198,795	Stable	$166	$306	None	Mandatory	Select WMAs
TX	738,713	Stable	$25	$315	License Tag	Mandatory	MLDP tags
VA	200,000	Down	$46-82	$197-259	License Tag	Mandatory	Unlimited on private lands, antlerless only
WV	222,219	Down	$35	$196	Physical Tag	Mandatory	Yes

Table 1. Continued. Page 4

State	Mandatory Orange	Crossbows Permitted	Deer Related Accidents						Highway Kill[7]
			Firearms		Stands		Other		
			Injuries	Fatalities	Inj.	Fat.	Inj.	Fat.	
AL	Yes	Yes	4	1	8	2	0	0	29,830 (C)
AR	Yes	Yes	3	2	15	1	1	0	21,922 (C)
DE	Yes	Yes	0	0	0	0	0	0	5,644 (C)
FL	WMAs only	Yes	4	2	0	1	0	0	16,845 (C)
GA	Yes	Yes	NA	NA	NA	NA	NA	NA	50,000 (C)
KY	Yes	Season & Handicap	3	3	0	1	2	3	3,283 (A)
LA	Yes	Yes	2	1	4	0	0	0	10,098 (C)
MD	Yes	Yes	0	0	9	1	0	0	32,913 (C)
MO	Yes	Yes	5	0	?	0	0	0	37,667 (C)
MS	Yes	Yes	9	0	13	2	0	0	22,733 (C)
NC	Yes	Yes	1	0	8	1	1	0	61,047 (C)
OK	Yes	Yes	3	0	3	0	0	0	12,605 (C)
SC	WMAs only	Yes	8	2	7	0	0	0	2,460 (A)
TN	Yes	Yes	0	0	0	1	0	0	31,408 (C)
TX	WMAs only	Yes	3	1	0	2	0	0	54,408 (C)
VA	Yes	Yes	11	1	8	1	0	0	60,600 (C)
WV	Yes	Yes	9	0	9	0	7	2	13,224 (A)
Total									466,687

Table 1. Continued, Page 5

State	Limits [8]			Antler Restrictions [9]	% Hunting Success[10]			Avg. Leasing Fees/Acre
	Season	Antlerless	Antlered		Archery	Muzzleloader	Firearms	
AL	3/None[8]	1 per day	3	A (one buck must have 4-points on 1 side), B (one county all bucks must have 3-points on 1 side), C (20 WMAs)	~15	~20	~45	$6-18+
AR	6	3-6	2	A,C No antler restrictions in Deer Zones 1 or 2 (as part of CWD Management Zone)	?	?	?	$6-10
DE	None	4+	2	One buck must have a spread ≥15"	?	?	?	?
FL	2/day [8]	1 or 2/day[8]	2/day [8]	A	----------	42% Combined	----------	$10-12
GA	12	10	2	A (One buck must be 4-points on 1 side) B (9 counties are more restricted)	9	1	48	$5-25
KY	None	Varies	1	C	----------	34% Combined	----------	$5-40
LA	6 statewide	3, 1either-sex	2, 1 either-sex	No	15	19	38	$5-40
MD	Varies	3 with 1 bonus in Region B	3 with 1 bonus in Region B	Yes, on part of buck bag limit	34	31 (C)	42	$5-35
MO	Varies	Varies	2; 1 with firearm	Yes, 43 counties	19	-	37	?
MS	6/5	3/2	3	C	39	36	59	?

Table 1. Continued, Page 6

	Limits [8]			Antler Restrictions [9]	% Hunting Success[10]			Avg. Leasing Fees/Acre
State	**Season**	**Antlerless**	**Antlered**		**Archery**	**Muzzleloader**	**Firearms**	
NC	6[8]	6[8]	2/4 [8]	NA	----------	46% Combined	----------	?
OK	6	Up to 6	2	No	26.4	15.7	31.5	$5-10
SC	9+	4+	5	A (on part of buck bag limit) C (16 WMAs)	27	26	60	$8−20
TN		Varies	2 statewide	Certain WMA's	11	19	70	$5-$15
TX	5	Up to 5	Up to 3	Yes, 117 counties	----------	62% Combined	----------	$7-30
VA	6 (east) & 5 (west)	6	3 (east)& 2 (west)	On 2 WMAs + 7 Counties	~30	~37	~51	?
WV	10	Up to 8	Up to 3	6 WMAs	26	11	44	$3-10
Avg.					24.04	29.3	45.6	

Table 1. Continued. Page 7

State	Private Lands Programs: Type[11]	Min. Acreage Requirements	Fee	No. of Cooperators	Trailing wounded deer with dogs legal?	Supplemental feeding legal?	Baiting legal?
AL	A	None	None	95	Yes	Yes	No
AR	A	500	None	720	Yes	Yes (except n CWD Zone where bait may only be used from Sept. 1-Dec. 31)	Yes, Private
DE	DDAP SDDAP	None	None	111 274	No	Yes	Yes, Private
FL	A, C	640; 5000	None	1,370; 15	Yes	Yes	Yes, Private
GA	None				Yes	Yes	No-North Zone Yes-South Zone
KY	B	None	None	500	Yes	Yes (except March – May)	Yes, Private
LA	A	40	Yes	715	Yes	Yes	Yes, Private
MD	None				Yes	Yes	Yes, Private Only.
MO	B	5	None	150,000	Yes	Yes (except CWD zone)	No
MS	A,D	Variable	None	459	Yes	Yes	Feeder must be 100+_ yards from stand, Private land only
NC	A	Regional; 1,000/500	$50	49	Yes	Yes	Yes, Private
OK	A	1,000	$200-400	150	With officer approval	Yes	Yes, Private

Table 1. Continued. Page 8

State	Private Lands Program				Trailing wounded deer with dogs legal?	Supplemental feeding legal?	Baiting Legal?
	Type	Min. Acreage Requirements	Fee	No. of Cooperators			
SC	A	None	$50	1,575- 3.3 mil ac	Yes	Yes	Yes, Private
TN	None				With officer approval	Yes	No
TX	A,B,C	None	None	7,626 individual land-owners +144 wildlife cooperatives (3,000+ members) 32.5 mil ac.	Most of Texas	Yes	Yes
VA	DCAP DMAP DPOP	None	None	526 768 15	Yes (no weapon)	No (Sept 1 – first Sat in Jan)	No
WV	None				No	Yes[12]	Yes[12]

Table 1. Continued; footnotes. Page 9

[1] Total harvest includes deer of unknown gender.
[2] A−Check Station; B−Mail Survey; C−Jawbone Collection; D−Computer Models; E−Telephone Survey; F− Telecheck; G− Butchers/Processors, H – Harvest card submitted end of season, I – Voluntary Internet Reporting.
[3] A−Early Season; B−Late Season; C−Full Season.
[4] A−Harvest & Biological; B−Departmental/Commission Regulatory; C−Legislative.
[5] Texas population estimates should not be compared to estimates prior to 2005 due to changed methodology.
[6] Asterisk if estimate includes landowner exempted hunters.
[7] A−Actual number based on reports; B−Estimated road kill; C-State Farm estimate
[8] AL – 3 antlered bucks per season. No season limit on antlerless deer.
FL – A total of two deer may be harvested per day. Both may be antlerless deer during archery season and if taken with antlerless deer permits. Only one/day may be antlerless during firearms antlerless deer seasons.
MD – Unlimited antlerless archery bag limit in Region B. Statewide antlerless bag limit of 1 buck per weapon (bow, muzzleloader, firearm). One bonus buck can be taken in Region B after buying bonus stamp and harvesting two antlerless deer.
MO – No daily or annual limit of antlerless deer but number that can be harvested in each county varies.
NC – Up to 2 bucks in areas in the western, northwestern, and central deer seasons. Up to 4 bucks in areas in the eastern deer season. Unlimited bonus antlerless tags are available in northwestern, central and eastern seasons.
[9] A−Statewide Antler Restrictions; B−County Antler Restrictions; C−Region or Area Antler Restrictions.
[10] Averages do not include combined reports.
[11] A−DMAP; B−Landowner tags; C−Antlered buck tags; D−Fee MAP.
[12] Except for CWD area and public land from September 1 through December 31.
Note: All states require hunter education, permit handguns for use on deer, and do not permit use of drugged arrows on deer.

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