SOUTHEAST DEER STUDY GROUP

FEBRUARY 22-24, 2021

44TH ANNUAL MEETING

Hosted virtually by NATIONAL DEER ASSOCIATION

PANDEMIC or PROSPECT:

Managing Deer and Recruiting Hunters in 2021

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MANAGING DEER AND RECRUITING HUNTERS IN 2021

44TH ANNUAL MEETING
OF THE SOUTHEAST DEER STUDY GROUP

FEBRUARY 23-24, 2021

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SOUTHEAST
DEER STUDY GROUP
#SEDSG2021

WELCOME / ACKNOWLEDGMENTS

The National Deer Association welcomes you to the 44th Annual Meeting of the Southeast Deer Study Group.

We thank the Alabama Division of Wildlife and Freshwater Fisheries who hosted last year's meeting, the Plenary Speakers, and all of the sponsors for their generous contributions to this year's meeting. We also thank Delaney Meeting & Event Management staff for assisting with the virtual elements to this year's meeting as well. A complete list of sponsors is listed inside the front cover.

COMMITTEES

MEETING ORGANIZERS
Matt Ross (Chair)
Kip Adams
Cheyne Matzenbacher
Torin Miller

PAPER / POSTER SELECTION
Kip Adams (Chair)
Matt Ross
Lindsay Thomas Jr.
Ben Westfall

SPONSOR / EXHIBITOR / DOOR PRIZES
Hank Forester (Chair)
Lindsay Thomas Jr.
Cindy Compton
Mike Edwards
Josh Hillyard
Matt Ross

REGISTRATION
April Robertson (Chair)
Linda Walls
Chelsy Giles
Genice Foster

MEDIA / TECHNOLOGY
Ben Westfall (Chair)
Josh Hillyard
Brian Grossman

ENTERTAINMENT / GENERAL SESSIONS
Matt Ross (Chair)
Lindsay Thomas Jr.
Brian Grossman
Mike Edwards

PROMOTIONS
Lindsay Thomas Jr. (Chair)
Brian Grossman
Laura Colquitt
Cindy Compton

THE SOUTHEAST DEER STUDY GROUP

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 Annual Southeast Deer Study Group Meeting is hosted with the support of the directors of the Southeastern Association of Fish and Wildlife Agencies and also the directors 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 to 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.

Professional Development

The Wildlife Society (TWS) will allow a maximum of 15 Continuing Education Units (CEUs) in Category I of the Certified Wildlife Biologist® Renewal/Professional Development Certificate Program and the Society of American Foresters (SAF) will allow a maximum of 11.5 Continuing Forestry Education (CFEs) credits in Category I for participation in the 44th Annual Southeast Deer Study Group meeting. Participants will need to list these CEUs and/or CFEs on their Renewal or Professional Development Certificate application to either organization. For more information about professional development, visit TWS's website, www.wildlife.org, or SAFs website, www.eforester.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 Annual Meeting of the Southeast Deer Study Group 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 Annual Meeting of the Southeast Deer Study Group does not constitute nor imply any endorsement by the Southeast Deer Study Group, the Southeast Section of The Wildlife Society Deer Committee, the meeting host, or meeting participants.

SOUTHEAST DEER STUDY GROUP MEETINGS

YEAR	LOCATION	MEETING THEME
1977	Fort Picket, 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 and 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

SOUTHEAST DEER STUDY GROUP MEETINGS

YEAR	LOCATION	MEETING THEME
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	Concord, NC	The Challenges of Meeting Hunter Expectations
2017	St. Louis, MO	Disease: Science, Politics, and Management
2018	Nashville, TN	Stakeholder-focused, Science-based, and Data-driven: The Gold Standard for the State Deer Management System?
2019	Louisville, KY	Deer, It's What's for Dinner
2020	Auburn, AL	Deer Management in a Rapidly Changing World: Bridging a Generational Disconnect
2021	Virtual	Pandemic or Prospect: Managing Deer and Recruiting Hunters in 2021

COMMITTEE MEMBERS

SOUTHEAST DEER STUDY GROUP, THE WILDLIFE SOCIETY, SOUTHEAST SECTION

STATE	NAME	AFFILIATION
Alabama	Chris Cook	Alabama Division of Wildlife and Freshwater Fisheries
	Kevin McKinstry	The Westervelt Company
Arkansas	Ralph Meeker	Arkansas Game and Fish Commission
	Jeremy Brown	Arkansas Game and Fish Commission
Delaware	Eric Ness	Delaware Division of Fish and Wildlife
Florida	Cory R. Morea	Florida Fish and Wildlife Conservation Commission
	Becky Peters	Florida Fish and Wildlife Conservation Commission
	Steve Shea (Chair)	Shea Wildlife & Environmental Services, Inc.
Georgia	Charlie Killmaster	Georgia Department of Natural Resources
	Tina Johannsen	Georgia Department of Natural Resources
	Karl Miller	University of Georgia
Kentucky	Gabe Jenkins	Kentucky Department of Fish and Wildlife Resources
	Kyle Sams	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
Mississippi	William McKinley	Mississippi Wildlife, Fisheries, and Parks
	Steve Demarais	Mississippi State University
Missouri	Jason Isabelle	Missouri Department of Conservation
	Kevyn Wiskirchen	Missouri Department of Conservation
North Carolina	Jonathan Shaw	North Carolina Wildlife Resources Commission
	Ryan Meyers	North Carolina Wildlife Resources Commission
Oklahoma	Jerry Shaw	Oklahoma Department of Wildlife Conservation
	Dallas Barber	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	Matt Knox	Virginia Department of Game and Inland Fisheries
	Katie Martin	Virginia Department of Game and Inland Fisheries
West Virginia	Jim Crum	West Virginia Division of Natural Resources
	Brett Skelly	West Virginia Division of Natural Resources
NDA	Kip Adams	National Deer Association
USFWS	Larry Williams	United States Fish & Wildlife Service

SOUTHEAST DEER STUDY GROUP AWARDS

CAREER ACHIEVEMENT AWARD

1996	Richard F. Harlow
1997	Larry Marchington
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
2009	David E. Samuel
2010	Bob K. Carroll
2011	QDMA
2012	Robert E. Zaiglin
2014	Mark O. Bara
2015	Larry E. Castle
2016	J. Scott Osborne
2017	Karl V. Miller
2018	Steve Demarais
2019	W. Matt Knox
2020	Charles Ruth

OUTSTANDING STUDENT POSTER PRESENTATION AWARD

2010	Emily Flinn	Mississippi State
2011	Melissa Miller	University of Delaware
2012	Brandi Crider	Texas A&M
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 University - Kingsville
2017	Daniel Morina	Mississippi State University
2018	Onalise R. Hill	Texas A&M University - Kingsville
2019	Adam C. Edge Zachary Wesner	University of Georgia University of Georgia
2020	Lindsey M. Phillips	University of Tennessee

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	Brad Cohen	University of Georgia
2015	Eric Michel	Mississippi State University
2016	Rebecca Shuman	University of Georgia
2017	Jared Beaver	Texas A&M University
2018	Dan Morina	Mississippi State University
2019	C. Moriah Boggess	Mississippi State University
2020	Jordan R. Dyal	University of Georgia

ORAL PRESENTATION SCHEDULE

TUESDAY, FEBRUARY 23, 2021

9:00 AM – 10:55 AM | PLENARY SESSION

Moderator: Kip Adams – National Deer Association

Welcome (9:00-9:10 AM)
Matt Ross

Introduction (9:10-9:25 AM)
Nick Pinizzotto

A New Dialogue for Science in America: Lessons from COVID-19 (9:25-9:55 AM)
Dr. Michael Osterholm

Changing Demographics in the Outdoors and How Hunting Can Evolve to Meet the Demand (9:55-10:25 AM)
Lindsey Browne Davis

Federal Conservation Policy: Challenges and Opportunities for Deer and Deer Hunters in 2021 (10:25-10:55 AM)
Whit Fosburgh

11:10 AM – 11:55 AM | TECHNICAL SESSION I

COVID-19's IMPACTS TO DEER MANAGEMENT AND R3 – PART I

Moderator: Hank Forester – National Deer Association

COVID-19's Impacts to Deer Management and R3 in Pennsylvania (11:10-11:30 AM)
Bryan J. Burhans 16

COVID-19's Effects on R3 (11:30-11:50 AM)
Jenifer Wisniewski 17

[POSTER] **Environmental Stress Factors Influencing Antler Fluctuation Asymmetry in White-tailed Deer in Arkansas** (11:50-11:55 AM)
**Tristan Bulice* 18

1:00 PM – 1:45 PM | TECHNICAL SESSION I

COVID-19's IMPACTS TO DEER MANAGEMENT AND R3 – PART II

Moderator: Hank Forester – National Deer Association

COVID-19's Impacts on Hunting Seasons, Deer Processor Availability and Agency Programs (1:00-1:20 PM)
Kip Adams 19

The Susceptibility of White-tailed Deer to Experimental Infection with SARS-COV-2 (1:20-1:40 PM)
Dr. Mitchell Palmer 20

[POSTER] **Spatial Genetic Structure of Urban White-tailed Deer in West Michigan** (1:40-1:45 PM)
Jacob Brand 21

*Student Presentation

ORAL PRESENTATION SCHEDULE

1:45 PM – 3:35 PM | TECHNICAL SESSION II

POPULATION ESTIMATION & SIZE

Moderator: Ben Westfall – National Deer Association

Do Pellet Counts Count? Efficacy of Pellet Count Surveys for Estimating White-tailed Deer Density (1:45-2:05 PM)
**Sarah Cain* 22

Estimating White-tailed Deer Population Sizes Using Unmanned Aerial Vehicles (UAVS) (2:05-2:25 PM)
**Jesse Exum* 23

[POSTER] **Determining Rut Timing and Behavior of White-tailed Deer Using Passive Cameras** (2:25-2:30 PM)
**Cody Scarborough* 24

Modeling How to Achieve Localized Areas of Reduced White-tailed Deer Density (2:30-2:50 PM)
**Amanda Van Buskirk* 25

"Knowing Where You've Been:" Genetic Signatures of Historical Translocation in Contemporary White-tailed Deer Populations (2:50-3:10 PM)
**Tyler Chafin* 26

Estimating Unmarked White-tailed Deer and Elk Abundance Using Camera Traps (3:10-3:30 PM)
Colter Chitwood 27

[POSTER] **Young Bucks Stay Home? Age-Specific Distance Between White-tailed Deer Cast Antler Match Sets and Subsequent Sides** (3:30-3:35 PM)
Brian Peterson 28

3:45 PM – 5:10 PM | TECHNICAL SESSION III

DEER ECOLOGY, SURVIVAL & RESOURCE SELECTION

Moderator: Cheyne Matzenbacher – National Deer Association

Ecology of White-tailed Deer in Western Kansas (3:45-4:05 PM)
**Talesha Karish* 29

Resource Selection of White-tailed Deer Relative to Cattle Management (4:05-4:25 PM)
**Jordan Dyal* 30

Geographic and Seasonal Patterns in Coyote Diet (4:25-4:45 PM)
**Alex Jensen* 31

Fawn Survival Patterns: Looking Beyond Predators (4:45-5:05 PM)
Tess Gingery 32

[POSTER] **Apparent Annual Variation in Causes of White-tailed Deer Fawn Mortality in South Carolina** (5:05-5:10 PM)
**Michael Muthersbaugh* 33

*Student Presentation

ORAL PRESENTATION SCHEDULE

6:00 PM – 6:45 PM | STORYTELLING EVENT

Brought to you by:

Moderator: Kip Adams – National Deer Association
Panelists: Joe Hamilton, Matt Knox, Dr. Larry Marchinton and Dr. Karl V. Miller

WEDNESDAY, FEBRUARY 24, 2021

9:00 AM – 11:00 AM | TECHNICAL SESSION IV

HABITAT MANAGEMENT

Moderator: Matt Ross – National Deer Association

Management Influences Available Forage in Early Successional Communities (9:10-9:30 AM)
**Bonner Powell* 34

Energy Content of Browse: A Regional Driver of White-tailed Deer Size (9:30-9:50 AM)
**Seth Rankins* 35

[POSTER] **Preferences of Captive White-tailed Deer for Species of Oak Acorns Found in Georgia** (9:50-9:55 AM)
**Zachary Wesner* 36

Fire Season and Intensity Impacts Hardwood Invasion and Deer Forage in Thinned Pine Stands (9:55-10:15 AM)
**Luke Resop* 37

White-tailed Deer Selection for Burned Pine, Hardwoods, and Food Plots During the Hunting Season (10:15 -10:35 AM)
**Dylan Stewart* 38

[POSTER] **Antler Casting Phenology and Occurrence of Late-Breeding in Nebraska White-tailed Deer** (10:35-10:40 AM)
Brian Peterson 39

Regular Mowing Does Not Improve Perennial Forage Plots (10:40-11:00 AM)
**Mark Turner* 40

11:15 AM – 12:00 PM | TECHNICAL SESSION V

WATER & FEEDING

Moderator: Josh Hillyard – National Deer Association

Effects of Water Salinity on Intake of Food and Water by White-tailed Deer (11:15-11:35 AM)
**Austin Killam* 41

What Are We Feeding Wildlife? Aflatoxin Prevalence in Supplemental Feeding (11:35-11:55 AM)
**Miranda Huang* 42

[POSTER] **Regional Copper Deficiencies of White-tailed Deer and Other Mineral Abnormalities** (11:55 AM-12:00 PM)
**Seth Rankins* 43

*Student Presentation

ORAL PRESENTATION SCHEDULE

1:00 PM – 2:05 PM | TECHNICAL SESSION VI

DEER MOVEMENTS

Moderator: Mike Edwards – National Deer Association

Movements of Hunters and Female Deer: Balancing Population Stability and Recreation (1:00-1:20 PM)
**Jacalyn Rosenburger* 44

Using Animal Space-Use and Movement to Infer Behavioral States: A Cautionary Tale (1:20-1:40 PM)
Franny Buderman 45

Effects of Public Hunts on Movements and Behavior of Mature White-tailed Deer (1:40-2:00 PM)
Jason McCoy 46

[POSTER] Effects of Human Hunter Movement and Site Selection on Observation Rate of White-tailed Deer (2:00-2:05 PM)
**Alyssa Meier* 47

2:05 PM – 3:10 PM | TECHNICAL SESSION VII

CHRONIC WASTING DISEASE – PART I

Moderator: Torin Miller – National Deer Association

Estimating the Economic Impacts of Chronic Wasting Disease in the U.S. (2:05-2:25 PM)
Scott Chiavacci 48

A County Risk Assessment Tool: An Innovative and Science-Based Process for Determining CWD Management Zone Counties in Arkansas (2:25-2:45 PM)
Jeremy Brown 49

Tracking Chronic Wasting Disease Surveillance with an Interactive Visualization Dashboard (2:45-3:05 PM)
Erick Gagne 50

[POSTER] Green Lung Syndrome: Pneumonia due to Fungal-like Organisms in White-tailed Deer (3:05-3:10 PM)
Alisia Weyna 51

3:25 PM – 4:25 PM | TECHNICAL SESSION VII

CHRONIC WASTING DISEASE – PART II

Moderator: Torin Miller – National Deer Association

CWD Show and Tell: Gauging Hunters' Willingness to Adopt Management Practices (3:25-3:45 PM)
Sonja A. Christensen 52

How [Your State Name Here] Might Avoid Losing Its Deer Herd to CWD Like Wisconsin (3:45-4:05 PM)
Michael Foy 53

Comparison of CWD Detection Methods and Tissue Types: Implications for Free-Ranging White-tailed Deer Management (4:05-4:25 PM)
Marc Schwabenlander 54

*Student Presentation

ORAL PRESENTATION SCHEDULE

4:25 PM – 5:05 PM | TECHNICAL SESSION VIII

DOGS & HOGS

Moderator: Karlin Dawson – National Deer Association

Is There a Future for Dog-deer Hunting in the United States? (4:25-4:45 PM)
Gino D'Angelo 55

Effects of Wild Pigs on Space Use by White-Tailed Deer (4:45-5:05 PM)
James Garabedian 56

6:00 PM – 6:45 PM | AWARDS CEREMONY

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SOUTHEAST DEER STUDY GROUP
FEBRUARY 22-24, 2021
44TH ANNUAL MEETING

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POSTER PRESENTATION LIST

(List and Abstracts follow in Order of Appearance)

Environmental Stress Factors Influencing Antler Fluctuating Asymmetry in White-tailed Deer in Arkansas
**Tristan Bulice*

Spatial Genetic Structure of Urban White-tailed Deer in West Michigan
Jacob Brand

Determining Rut Timing and Behavior of White-tailed Deer Using Passive Cameras
**Cody Scarborough*

Young Bucks Stay Home? Age-Specific Distance Between White-tailed Deer Cast Antler Match Sets and Subsequent Sides
Brian Peterson

Apparent Annual Variation in Causes of White-tailed Deer Fawn Mortality in South Carolina
**Michael Muthersbaugh*

Preferences of Captive White-tailed Deer for Species of Oak Acorns Found in Georgia
**Zachary Wesner*

Antler Casting Phenology and Occurrence of Late Breeding in Nebraska White-tailed Deer
Brian Peterson

Regional Copper Deficiencies of White-tailed Deer and Other Mineral Abnormalities
**Seth Rankins*

Effects of Human Hunter Movement and Site Selection on Observation Rate of White-tailed Deer
**Alyssa Meier*

Green Lung Syndrome: Pneumonia Due to Fungal-like Organisms in White-tailed Deer
Alisia Weyna

SPECIAL PRESENTATION LIST

Tuesday, February 23
Uncle Sam Needs Deer Hunters .... (12:55-1:00 PM)
Larry Williams

Wednesday, February 24
An Executive Summary of the Southeast Deer Partnership (SDP) .... (12:55-1:00 PM)
Kip Adams

*Denotes abstracts given by students.

PLENARY SESSION

A NEW DIALOGUE FOR SCIENCE IN AMERICA: LESSONS FROM COVID-19

Dr. Michael Osterholm

Center of Infectious Disease Research and Policy, University of Minnesota

CHANGING DEMOGRAPHICS IN THE OUTDOORS AND HOW HUNTING CAN EVOLVE TO MEET THE DEMAND

Lindsey Browne Davis

Outdoor Recreation Roundtable

FEDERAL CONSERVATION POLICY: CHALLENGES AND OPPORTUNITIES FOR DEER AND DEER HUNTERS IN 2021

Whit Fosburgh

Theodore Roosevelt Conservation Partnership

Notes:

COVID-19'S IMPACTS TO DEER MANAGEMENT AND R3 IN PENNSYLVANIA

Authors: Bryan J. Burhans, Coren Jagnow

Pennsylvania Game Commission

Abstract:
The Pennsylvania Game Commission experienced an increase in hunting license sales during 2020. One plausible explanation for this increase was the potential increase in free time and lack of other recreational opportunities due to COVID-19. Compared to 2019, Pennsylvania had a general hunting license sales increase of nearly 3%. This increase is mostly attributable to licenses sold in the early months of the license year (July through September) than those sold later. Looking specifically at deer hunting opportunities, there was over a 5% increase of antlerless deer licenses purchased and a 9% increase in archery licenses purchased compared to the same time frame in 2019.

It is also important to look at how travel restrictions may have negatively affected sales, particularly of non-resident licenses. Non-resident adult licenses increased by only 1.2% compared to last year. Days before the start of the rifle deer season in Pennsylvania, which is typically one of the most popular hunting seasons for non-residents, Pennsylvania's governor issued new restrictions on out-of-state travel. In addition to the societal changes that occurred in 2020 because of COVID-19, Pennsylvania also made several important changes to deer hunting season dates and regulations and implemented a more robust marketing program. Although it's difficult to separate the role that COVID-19, regulations, and marketing played in these increased license sales, research is currently being conducted of reactivated hunters to determine what role each of these changes had in explaining the increased license sales.

Contact:
bburhans@pa.gov

Notes:

COVID-19'S EFFECTS ON R3

Author: Jenifer Wisniewski

Tennessee Wildlife Resource Agency

Abstract:
The pandemic has a silver lining. People are discovering or rediscovering hunting and fishing at high rates. R3 (recruitment, retention, and reactivation of hunters/anglers/shooters) has been a challenge for our community at large, and this COVID-19 cohort is an opportunity to make real strides in the decline in hunters. We will cover trends, retention tactics, survey results from first timers, and more.

Contact:
Jenifer.Wisniewski@tn.gov

Notes:

[POSTER] ENVIRONMENTAL STRESS FACTORS INFLUENCING ANTLER FLUCTUATING ASYMMETRY IN WHITE-TAILED DEER IN ARKANSAS

Authors: Tristan M. Bulice, Lori Neuman-Lee, Virginie Rolland

Arkansas State University

Abstract:
Symmetry in White-tailed Deer antlers serves an important role in mate selection, wildlife management, and big game competitions. However, asymmetry in antlers is common and may be caused by various stressors that vary with age and environmental factors. Additionally, the most common way of scoring antlers, the Boone and Crockett scoring (BCS) system, does not account for all visual asymmetry (e.g., angles). Therefore, our goals were to create a more accurate scoring system and determine factors that influence antler asymmetry. From September to early December 2020, we collected 50 antler pictures, a hair sample, age, weight, main beam length, basal circumference, and inside spread on >150 hunter-harvested bucks across 12 deer zones in Arkansas. We converted the pictures into 3D models using the program Agisoft Metashape to measure angles, lengths, widths, and circumferences. We are using logistic regressions to compare the BCS system and our model-based scoring system and to test for the effect of age, ecoregions, temperature, precipitation, food supplementation, natural food abundance, dominant habitat, and population density. We discuss the preliminary results of our logistic regressions comparing the BCS to the new scoring system and quantifying the effect of environmental stress factors on antler asymmetry. Our results will help refine management decisions that boost herd health and hunting experience.

Contact:
tristan.bulice@smail.astate.edu

Notes:

*Student Presentation

COVID-19'S IMPACTS ON HUNTING SEASONS, DEER PROCESSOR AVAILABILITY AND AGENCY PROGRAMS

Authors: Kip Adams, Matt Ross

National Deer Association

Abstract:
The COVID-19 pandemic changed normal operating procedures for most businesses in 2020, and that included state wildlife agencies. To determine the pandemic's impacts on hunting seasons, deer processor availability, and agency programs we surveyed state wildlife agencies in the contiguous United States and collected data on license sales restrictions, season closures, tag allocations, deer processor availability, agency staff work locations, and new deer program opportunities. We received data from 47 of 48 states (98%). Five states (11%) placed restrictions on, temporarily stopped selling nonresident hunting licenses, or closed or altered spring bear or turkey seasons. These were all in the Midwest (Kansas, Kentucky, Nebraska) and West (Idaho, Montana). Forty-two states (89%) moved staff to remote work locations, and one of these (Indiana) expected the move to be permanent. Fourteen states (30%) expected deer processing to be a problem for hunters in fall 2020 due to the spring shutdown and summer/fall backlog of beef and pork at commercial meat processors. This concern was mostly in the Midwest (8 of 13 states), and was nonexistent in the West. Twenty-eight states (60%) used the crisis to create positive opportunities for their deer management programs. Some examples included venison exchange programs, online hunter education, video series on venison processing and cooking, podcasts, webinars, and expanded online reporting. The United States and the World are still feeling COVID-19's impacts. Fortunately, state wildlife agencies are adapting and meeting the needs of wildlife populations and hunters in a new era of social distancing.

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Notes:

THE SUSCEPTIBILITY OF WHITE-TAILED DEER TO EXPERIMENTAL INFECTION WITH SARS-COV-2

Author: Dr. Mitchell Palmer

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Abstract:
Given the presumed zoonotic origin of SARS-CoV-2, the human-animal-environment interface of COVID-19 pandemic is an area of great scientific and public- and animal- health interest. Identification of animal species that are susceptible to infection by SARS-CoV-2 may help to elucidate the potential origin of the virus, identify potential reservoirs or intermediate hosts, and define the mechanisms underlying cross-species transmission to humans. Additionally, it may also provide information and help to prevent potential reverse zoonosis that could lead to the establishment of a new wildlife hosts. Our data show that upon intranasal inoculation, white-tailed deer became subclinically infected and shed infectious SARS-CoV-2 in nasal secretions and feces. Importantly, indirect contact animals were infected and shed infectious virus, indicating efficient SARS-CoV-2 transmission from inoculated animals. These findings support the inclusion of wild deer species in investigations conducted to assess potential reservoirs or sources of SARS-CoV-2 of infection.

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Notes:

[POSTER] SPATIAL GENETIC STRUCTURE OF URBAN WHITE-TAILED DEER IN WEST MICHIGAN

Authors: Jacob Brand, Alexandra Locher, Georgette Sass

Grand Valley State University

Abstract:

In urban areas, green spaces are used by humans and wildlife. The proximity between the two groups can lead to both positive and negative interactions. Managers have difficulty managing urban wildlife due to conflicts between population sizes that can be naturally supported and sizes that are socially tolerable. White-tailed deer *(Odocoileus virginianus)* thrive in urban environments because their life requisites are met within green spaces and backyard vegetation. Matrilineal groups of urban white-tailed deer live and travel within the same areas, at times forming high densities that can lead to the spread of disease or invasive species. Technological advancements in spatial analyses and genetics have allowed researchers to investigate wildlife populations and identify areas that may require management for conservation or disease mitigation. The objective of this study is to understand the spatial genetic structure of urban deer to facilitate discussions and management decisions based on urban deer movement patterns and relationships. Using DNA extracted from fecal samples and 10 microsatellites we were able to determine the proportion of shared alleles in our population. Using the spatial genetic package ResistanceGA, our preliminary results show that roads with high traffic volume, water, and shopping centers with large parking lots limit genetic spread in Grand Haven, Michigan. The results from this study can be used by managers to make informed decisions related to urban deer issues in Grand Haven.

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Notes:

DO PELLET COUNTS COUNT?
EFFICACY OF PELLET COUNT SURVEYS FOR ESTIMATING WHITE-TAILED DEER DENSITY

Author: Sarah Cain

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Abstract:
Reliable estimates of white-tailed deer population density can provide information on population responses to various processes (e.g., disease, harvest) and help managers achieve population objectives. Numerous techniques for estimating deer density have been developed and tested, but there is considerable debate regarding their accuracy and precision. Pellet count surveys, for example, are generally regarded as ineffective because of the multiple assumptions (e.g., defecation rate, detectability) that managers cannot account for without significant additional work. However, pellet count surveys have rarely been applied to known populations, which limits understanding of the accuracy of this technique. Therefore, during fall-winter of 2020-2021, we systematically established ~600 plots within the Auburn University Deer Lab research facility, where all adult deer had uniquely numbered ear tags, to evaluate the accuracy and precision of pellet count surveys for determining white-tailed deer density. We compared resulting estimates to those generated using mark-recapture camera surveys of the marked deer, which we assumed provided accurate estimates of density. Population estimates were 85 (95% CI = 79–91) deer for the camera survey, and 32 (95% CI = 24.36–39.64) deer for 4-week pellet count survey. These data suggest that, possibly due to disappearance and non-visibility of pellet groups, 4-week pellet count surveys are not accurate and are less precise than camera surveys of marked individuals, likely making them unsuitable for research or management applications. Based on ongoing work, we will examine whether 8- and 12-week surveys improve our estimates.

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*Student Presentation

ESTIMATING WHITE-TAILED DEER POPULATION SIZES USING UNMANNED AERIAL VEHICLES (UAVS)

Authors: Jesse Exum[1], Aaron M. Foley[1], Randy W. DeYoung[1], David G. Hewitt[1], Jeremy Baumgardt[1], Mickey W. Hellickson[2]

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Abstract:
Helicopters are commonly used to survey wildlife in South Texas; however, they are expensive, risky, and sometimes impractical for small ranches. Unmanned aerial vehicles (UAVs) are an emerging technology that has not been fully evaluated for white-tailed deer *(Odocoileus virginianus)* surveys. We conducted UAV surveys at 5 sites with varying deer densities from February – April 2020. One site contained 8 deer fitted with satellite radio-collars programmed to record locations every 5 minutes. We repeated surveys ≥2 times at each site to evaluate consistency across counts. The UAV, equipped with a dual thermal-optical video camera, was flown at 120 ft above ground level, 15 mph, and downward camera angle of 20°. Heat signatures were detected on thermal imagery, then species identification was confirmed via optical imagery. Mark-resight and distance sampling analyses were used to estimate population sizes. We compared our UAV survey results with an estimate derived from a 100% coverage helicopter survey conducted during September 2019; the raw deer count was multiplied by 2 to account for missed deer. Our pooled thermal estimates from 5 repeated surveys at 1 site from mark-resight (12.90 acres/deer, 95% CI = 13.49 – 12.38) and distance sampling (10.11 acres/deer, 95% CI = 16.61 – 6.13) were comparable with the helicopter survey estimate (13.32 acres/deer). However, optical mark-resight and distance sampling estimates were 33% (19.82 acres/deer, 95% CI= 21.13 – 18.66) and 26% (18.04 acres/deer, 95% CI = 32.15 – 10.13) lower, respectively. Remaining analysis is in progress and additional results will be discussed.

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Notes:

*Student Presentation

[POSTER] DETERMINING RUT TIMING AND BEHAVIOR OF WHITE-TAILED DEER USING PASSIVE CAMERAS

Authors: Cody B. Scarborough[1], Richard B. Chandler[1], James T. Johnson[1], Charlie H Killmaster[2], James H. Stickles[3], Karl V. Miller[1]

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Abstract:
Deer-vehicle collision (DVC) data has been used to determine the period of peak breeding behavior of white-tailed deer. However, this only provides county level information about the chronology of reproduction. To assess the effectiveness of using passive cameras to determine the timing of the rut at smaller spatial scales, we deployed 30 passive IR cameras (1 camera/60 acres) within five wildlife management areas (WMA) in different regions of Georgia, USA. Weekly activity patterns were assessed using count data to determine peak activity periods of male whitetails, which were then compared to DVC data obtained from a previous study estimating the timing of the rut. Changes in diurnal and nocturnal behavior were also compared using data from before, during, and after the period of peak movement. We collected 21,352 images of deer across the five study sites between October 2019 and January 2020. We found a significant relationship between DVCs and camera detections at two study areas, while the association was weaker at the other three sites. However, our estimates of the "rut week" based on camera detections were consistently in agreement with the breeding period identified using county-level DVC data. At three of the five study sites, males exhibited heightened daytime activity during the rut, with a significant decline in daytime movement following the rut period. Our findings provide additional evidence that passive cameras can be used to evaluate deer activity patterns, and managers could use passive cameras at the local scale to identify the timing of the rut.

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*Student Presentation

MODELING HOW TO ACHIEVE LOCALIZED AREAS OF WHITE-TAILED DEER DENSITY

Authors: Amanda N. Van Buskirk[1], Christopher S. Rosenberry[2], Bret D. Wallingford[2], Emily Domoto[3], Marc E. McDill[4], Patrick Drohan[4], Duane R. Diefenbach[5]

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Abstract:
Localized management of white-tailed deer *(Odocoileus virginianus)* involves the removal of matriarchal family units with the intent to create areas of reduced deer density. However, application of this approach using hunter harvest has not always been successful possibly because of female dispersal and high deer densities. We developed a spatially explicit, agent-based model to investigate the intensity of deer removal required to locally reduce deer density depending on surrounding deer density, dispersal behavior, and size and shape of the removal area. Our model, based on completely forested landscapes similar to northern Pennsylvania, indicated that a localized reduction was successful for scenarios in which the surrounding deer density was ≤30 deer/mi², antlerless harvest rates were ≥30% and the removal area was ≥5 mi². Situations in which deer density was higher (40 and 50 deer/mi²) required antlerless harvest rates >30% to considerably reduce deer density in the removal area regardless of its size. In addition, success in reducing and maintaining reduced deer densities was unlikely in small removal areas (≤ 1 mi²). Therefore, localized management using hunter harvest may be an effective strategy for lower density herds only in large removal areas. Our model identifies the conditions under which localized deer density reductions are likely to be achieved. It will allow managers to evaluate whether deer reduction programs will be effective in areas with deer-human conflicts, where increased advanced tree regeneration and plant species diversity is desired, or where chronic wasting disease is detected.

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*Student Presentation

"KNOWING WHERE YOU'VE BEEN:" GENETIC SIGNATURES OF HISTORIC TRANSLOCATION IN CONTEMPORARY WHITE-TAILED DEER POPULATIONS

Authors: Tyler K. Chafin[1], Zachery D. Zbinden[1], Marlis R. Douglas[1], Bradley T. Martin[1], Christopher M. Middaugh[2], M. Cory Gray[2], Jennifer R. Ballard[2], Michael E. Douglas[1]

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Abstract:
Quantifying movements of white-tailed deer (WTD) across the landscape is a fundamental component for proactive CWD management, and can be gauged over space and time using landscape genetics. However, a major stumbling block for genetic studies is the extensive stock-replenishment/translocation by state and federal management agencies in response to collapse of WTD in eastern North America ~100 years ago. Natural patterns of gene flow were essentially obscured by the mixing of stocks and subsequent intermingling of individuals and populations. A major issue has been to tease apart genetic patterns shaped by natural dispersal versus those due to anthropogenic translocations. We do so herein by evaluating 1,143 WTD sampled from across the state of Arkansas, using a population genomic approach coupled with novel analytical techniques. In doing so, we: 1) Characterize patterns of genetic structure across the state; 2) Assign individual ancestry to separate historical stocking sources; and 3) Identify natural landscape barriers that separate populations. Our approach demonstrates how modern genetic data can be used not only to 'trace' historical movements where records are lacking, but also overcome genetic 'noise' caused by historic restocking efforts. This in turn allows the application of genetic data for management-oriented tasks such as: Geolocating individuals within counties, and testing for environmental features that restrict movement.

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*Student Presentation

ESTIMATING UNMARKED WHITE-TAILED DEER AND ELK ABUNDANCE USING CAMERA TRAPS

Authors: Colter M. Chitwood[1], Ellen M. Pero[2], Anna K. Moeller[1,2], Aaron M. Hildreth[3], Barbara J. Keller[4], Joshua J. Hillspaugh[2], Paul M. Lukacs[2]

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Abstract:
Estimating abundance is important for numerous wildlife management contexts, from threatened and endangered species conservation to establishing harvest goals among common species like white-tailed deer *(Odocoileus virginianus)* and elk *(Cervus canadensis)*. Unfortunately, many methods for estimating abundance require expensive radiotags or dangerous fieldwork (e.g., flights), and some rely on flawed or biased sampling design (e.g., use of bait). Recently, advances in unmarked abundance methods have created opportunities for using camera trap images to derive abundance. We randomly deployed 36 camera traps in the elk restoration zone of southeastern Missouri from August 1 – October 31 of 2017 and 2018, and we used an unmarked abundance estimator, the space-to-event (STE) model, to estimate abundance of elk and white-tailed deer. Because the elk population restoration began only a few years before (2011-2013), Missouri Department of Conservation (MDC) had a high proportion of radiotagged elk, meaning MDC had near-perfect knowledge of population size. We compared STE abundance estimates to known population size for each year to demonstrate the effectiveness of unmarked estimates from camera data. We then applied the model to white-tailed deer in the elk restoration zone, demonstrating that well-designed unmarked methods like STE could provide abundance estimates for multiple species under one sampling design. Because the STE method is grounded in sampling theory, it avoids biases associated with bait and trails/roads. Unmarked methods like the STE model represent a promising step forward in abundance estimation, particularly when management agencies need to strike a balance between field effort, cost, and information gained.

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Notes:

[POSTER] YOUNG BUCKS STAY HOME? AGE-SPECIFIC DISTANCE BETWEEN WHITE-TAILED DEER CAST ANTLER MATCH SETS AND SUBSEQUENT SIDES

Authors: Brian Peterson[1], Casey Shoenebeck[2]

[1]University of Nebraska at Kearney
[2]Minnesota Department of Natural Resources

Abstract:
White-tailed deer antlers are grown and cast annually, triggered by photoperiod and subsequent decrease in testosterone. Timing of complete casting and therefore the distance an individual deer's antlers are cast can vary. To our knowledge, this is the first study to evaluate the age-specific distance an individual's antlers are cast in a free-ranging white-tailed deer population. Our objectives were to 1) determine the age-specific distance antlers from a match set were cast from each other and 2) determine late-winter home range fidelity by evaluating the distance individual deer cast their antlers in subsequent years. We hypothesized 1.5-year-olds would have a greater distance between cast antlers compared to ≥2.5-year-olds due a larger home range. Cast antlers were collected from the central Nebraska Platte River valley (2009-2020) as part of a long-term monitoring program. Cast antler match sets and subsequent sides were assumed based on reasonable physical proximity and antler similarities and are currently undergoing genetic confirmation. The mean distance between ≥2.5-year-old match sets were significantly greater (W=383, P=0.03) and found twice as far apart as 1.5-year-olds. However, fewer yearling match sets were collected compared to the older age group, and less than 25% of yearling match sets were found at distances greater than 5 yards (compared to 49% of ≥2.5-year-olds), which may suggest a potential bias in finding the smallest antler sets due to a longer timeframe for yearlings to complete casting resulting in unavailable casts either in time or space (e.g., off study site). Cast antlers from the same individual (primarily 2.5-5.5-year-olds) were found on average 517±146 yards or ~0.3 miles apart in subsequent years suggesting late-winter home range fidelity for older individuals.

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Notes:

ECOLOGY OF WHITE-TAILED DEER IN WESTERN KANSAS

Authors: Talesha Karish[1], Maureen Kinlan[1], Mitchell Kern[1], David Haukos[2], Drew Ricketts[1], Levi Jaster[3]

[1]Kansas State University

[2]Cooperative Fish and Wildlife Research Unit

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Abstract:
White-tailed deer *(Odocoileus virginianus)* have only recently become common in the Great Plains. Kansas established a modern deer hunting season in 1965 due to the low population until that point. White-tailed deer are now expanding westward and establishing populations in landscapes that were historically populated by mule deer *(Odocoileus hemionus)*. Increasing numbers of white-tailed deer in Kansas are associated with declining mule deer numbers, increasing deer-human conflicts, and facilitation of the spread of chronic wasting disease. The lack of information on white-tailed deer ecology is hindering development of informed management strategies. Our objective was to investigate the ecology of white-tailed deer in study sites representative of the western Great Plains. Over three years, 90 pregnant females were captured and collared to determine survival, movements, home range, and habitat selection. Deer were tracked and monitored using GPS locations for 60 weeks from date of capture. Survival of adult females was high with only a 14% annual mortality rate. Only 2% were legally harvested the entire study. Resource selection varied among seasons and spatial scales, with deer selecting for canopy cover when it was available. The average home range area varied by season from 0.36 mi2 to 3.97 mi2. The average core home range areas varied by season from 0.05 mi2 to 0.41 mi2. The average hourly movement was 146 m but varied throughout the diel period. These results are contributing to a larger assessment of how the white-tailed deer adaptability to different landscapes may contribute to their westward expansion.

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Notes:

*Student Presentation

RESOURCE SELECTION OF WHITE-TAILED DEER RELATIVE TO CATTLE MANAGEMENT

Authors: Jordan R. Dyal[1], Micahel T. Kohl[1], Michael J. Cherry[2], Karl V. Miller[1], Gino J. D'Angelo[1]

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Abstract:
White-tailed deer *(Odocoileus virginianus)* are found throughout 47 states that collectively produce approximately 93% of the cattle in the United States. Understanding resource use of deer relative to livestock management practices is essential to successfully managing ranching operations for multiple revenue sources. In 2018–2020 we used global positioning system data from 42 male white-tailed deer to evaluate resource selection relative to livestock management practices (e.g., grazing, herbicide, fertilizer, biosolids), supplemental feeders, and vegetative communities during the growing (Apr–Sept) and dormant (Oct–Mar) seasons in central Florida. We used mixed conditional logistic regression (i.e., step selection function) with a random intercept for stratum and random coefficients for covariates to estimate resource selection. Resource selection of bucks varied between seasons with bucks selecting areas closer to pastures that were grazed approximately 140–220 days prior during the dormant season. During the growing season, deer selected pastures recently grazed with lighter stocking rates. In both seasons, bucks selected areas closer to supplemental feeders and non-forested wetlands. During the growing season, deer selected pastures that were applied with herbicide less recently. We documented no significant relationship between fertilizer or biosolids and relative probability of deer use. Rotational grazing of cattle can provide deer with a multitude of pastures at different stages of herbaceous regeneration, allowing them to balance the tradeoff between forage quality and quantity. When designing pastures, managers should strive to create a mosaic of habitats across properties to maximize resources available to deer within active cattle management systems.

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*Student Presentation

GEOGRAPHIC AND SEASONAL PATTERNS IN COYOTE DIET

Authors: Alex J. Jenson[1], Courtney J. Marneweck[1], John C. Kilgo[2], David S. Jachowski[1]

[1]Department of Forestry and Environmental Conservation, Clemson University
[2]USDA Forest Service, Southern Research Station

Abstract:
Coyotes are a relatively recent arrival to the eastern US, having expanded their range from the western 2/3 of the continent in the last 100 years. Since this expansion, much research has been devoted to understanding their ecology, with a focus on when and where they eat deer. Hundreds of coyote diet studies have been published from across their range, yet we know little about how their diet varies at the geographic scale, or what factors influence that variation. We conducted the first range-wide meta-analysis of coyote diet by using linear regression to evaluate support for various hypotheses (season, ecoregion, snow cover, human footprint, environmental productivity, coyote mass, time since arrival, presence of large carnivores, and consumption of alternative food items) regarding why cervid use might vary. Ninety-three studies met our criteria for inclusion, and we found that season and ecoregion were the best predictors of range-wide cervid use. Overall, coyotes had the highest proportion of cervids in their diet during winter (27% of scats), followed by spring (21%), then summer (20%) and fall (18%). Cervid use was 3-4 times higher in temperate forests (29 – 42%) relative to other ecoregions (4 – 12%). Cervid consumption in eastern temperate forests (37%) was second only to northern forests (42%), confirming that coyote use of cervids is relatively high in the eastern US. Moving forward, we plan to investigate the proportion of cervids in coyote diets that can be attributed to fawns and carrion.

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*Student Presentation

FAWN SURVIVAL PATTERNS: LOOKING BEYOND PREDATORS

Authors: Tess M. Gingery[1], Duane R. Diefenbach[2]

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[2]U.S. Geological Survey

Abstract:
White-tailed deer fawn mortality causes, and their frequency, are often used to identify limiting factors to recruitment. Although predation may simply mask ultimate causes of mortality, concerns regarding predation dominate neonate survival literature because it is the primary type of observed mortality. Using published data from 20 populations with reported fawn survival to 3–6 months of age, we found no relationship between the number of predator species (0–5) and survival rates ($P = 0.932$) or predation rates ($P = 0.223$). Furthermore, studies that manipulated predator densities report limited or no effect on fawn survival and recruitment. We suggest that a mortality-focused approach in the literature has propagated a biased belief in what influences neonate survival. A new paradigm is needed to explain patterns in fawn survival, and factors that influence physiological condition of fawns may better explain why fawns exposed to no predators experience mortality risk similar to those exposed to ≥3 predator species. Research in Pennsylvania found greater risk of mortality in fawns with higher levels of stress-related hormones. We believe research that focuses on direct and indirect effects from stress factors (e.g., habitat quality, predation risk, anthropogenic disturbance) on female body condition and its effects on recruitment and neonate survival could provide important insights into the population dynamics of white-tailed deer. Additional observational studies of fawn survival will provide region-specific demographic information but are unlikely to provide novel insights into the population dynamics and management of white-tailed deer.

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*Student Presentation

[POSTER] APPARENT ANNUAL VARIATION IN CAUSES OF WHITE-TAILED DEER FAWN MORTALITY IN SOUTH CAROLINA

Authors: Mike S. Muthersbaugh[1], Alex J. Jensen[1], Charles Ruth[2], Jay Cantrell[2], John C. Kilgo[3], David S. Jachowski[1]

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Abstract:
Populations of white-tailed deer *(Odocoileus virginianus)* in South Carolina have declined since the late 1990's, likely due to a variety of factors including liberal hunter harvest, habitat changes, and an increase in predation pressure. Because the declines in deer populations were concurrent with an increasing prevalence in coyotes *(Canis latrans)*, many hunters believe coyote predation on fawns is the primary limiting factor for deer populations. However, coyote predation on fawns vary among regions, perhaps locally, and possibly through time. Variation in predation rates may be attributed to a multitude of biological, anthropogenic, and climatic factors. Our ultimate research objectives are to determine white-tailed deer behavioral and population-level responses to coyote predation and coyote predation risk in the Piedmont region of South Carolina. We fit 29 and 27 does with GPS collars and vaginal implant transmitters and 39 and 32 fawns with GPS/VHF collars in 2019 and 2020, respectively. Naïve fawn survival estimates were 30.8% in 2019 and 31.3% in 2020. Here we compare the preliminary causes of fawn mortality between years and present observations on birth site fidelity. Although fawning season phenology and fawn survival rates were similar between the two years, causes of fawn mortality appeared to vary considerably. These data will be used in additional research on the factors influencing fawn mortality and the potential indirect effects of adult doe behavior and space-use on fawn survivorship. Results from our study will inform the investigation of coyote-related impacts on deer populations and could help managers mitigate fawn mortality where desired.

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*Student Presentation

MANAGEMENT INFLUENCES AVAILABLE FORAGE IN EARLY SUCCESSIONAL COMMUNITIES

Authors: Bonner L. Powell[1], David A. Buehler[1], Christopher E. Moorman[2], Craig A. Harper[1]

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Abstract:
Early successional plant communities, such as old-fields, can provide forage and cover for white-tailed deer. Managers can use various disturbance techniques to maintain old-fields, but the type of disturbance may influence forage and structure available for deer. We evaluated the influence of 3 management techniques following restoration of native plant communities using 2 techniques (planting and natural revegetation) in 11 fields in TN and AL previously dominated by tall fescue *(Schedonorus arundinaceus)*. We compared deer forage and cover in 6 establishment/management treatments (natural revegetation burned (NRB), natural revegetation disked (NRD), natural revegetation mowed (NRM), planted burned (PLB), planted disked (PLD), planted mowed (PLM)), and tall fescue control (CNTRL). Available selected forage (lbs/ac) was similar in units that were burned (NRB=664, PLB=534) and mowed (NRM=539, PLM=489). Available selected forage was greater in all treatment units compared to control (NRB=664, NRD=284, NRM=539, PLB=534, PLD=283, PLM=489, CNTRL=91). On average, >94% of available selected forage in planted treatments was from the seedbank, not planted species. Visual obstruction for fawns was greater in PLB and PLM than CNTRL, NRD, and PLD. Visual obstruction for adult deer was greater in NRB and PLB than CNTRL, NRD, and PLD. Our results distinguish how managers may use different disturbance techniques to influence available forage and cover for deer.

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*Student Presentation

ENERGY CONTENT OF BROWSE: A REGIONAL DRIVER OF WHITE-TAILED DEER SIZE

Authors: Seth T. Rankins[1], Randy W. DeYoung[1], Aaron M. Foley[1], J. Alfonso Ortega-S[1], Timothy E. Fulbright[1], David G. Hewitt[1], Landon R. Schofield[2], Tyler A Campbell[2]

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Abstract:
There is increasing evidence that regional differences in ungulate morphology are nutritionally, rather than genetically, driven. However, it is unclear if these size differences are influenced more by the quantity of high-quality forage or nutritional quality of the same plant species between regions. We quantified differences in white-tailed deer *(Odocoileus virginianus)* body mass and antler size from 3,128 deer captured at 4 sites on East Foundation ranches spanning from the Gulf of Mexico to the western border of the Coastal Sand Plain ecoregion of South Texas from 2011–2019. Body mass of female and male deer were 9 and 20% smaller, respectively, on the eastern edge of the Coastal Sand Plain ecoregion as opposed to the western border. Similarly, gross Boone and Crockett antler scores were 11 inches, or 8% smaller, for males from the eastern coastal region. Biomass of preferred forbs varied annually as a function of rainfall, with no clear trend among sites. The amount of digestible energy in browse and mast species was ~60 kcal/kg lower at sites with smaller deer ($\chi 32 = 7.40$, $P = 0.06$). Diversity indices for forbs and brush were slightly higher at the sites with larger deer. Our research suggests that regional differences in nutritive value of forage drives regional size differences in body mass and antler size of deer. We recommend wildlife managers interested in increasing body mass and antler size of deer in South Texas focus their efforts on increasing the quality and diversity, rather than the quantity, of forage.

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Notes:

*Student Presentation

[POSTER] PREFERENCES OF CAPTIVE WHITE-TAILED DEER FOR SPECIES OF OAK ACORNS FOUND IN GEORGIA

Authors: Zachary G. Wesner, Gino J. D'Angelo, David A. Osborn

Daniel B. Warnell School of Forestry and Natural Resources, University of Georgia

Abstract:
Over 100 species of birds and mammals are known to consume oak (*Quercus* spp.) acorns in the United States. Acorn production directly influences the movement, behavior, habitat use, physiology, and population size of white-tailed deer *(Odocoileus virginianus)*. Establishing preferences of white-tailed deer for oak acorn species found in Georgia could help managers anticipate effects deer may have on oak regeneration through selective consumption and provide for a better understanding of deer movements, behavior, and habitat use. During 2019, we conducted cafeteria-style food preference trials (10 trials per acorn group) using 6 captive deer for 4 oak acorn species found on the coastal barrier islands of Georgia (laurel oak [Q. laurifolia], live oak [*Q. virginiana*], sand live oak [*Q. geminata*], and water oak [*Q. nigra*]) and 4 oak acorn species found in the mountains of northern Georgia (chestnut oak [*Q. montana*], northern red oak [*Q. rubra*], water oak, and white oak [*Q. alba*]). We calculated preference indices ranging from 0 (avoided) to 1 (preferred) for each oak acorn species. During coastal and mountain trials, respectively, we established the following rankings of mean (± SE) preference indices: coastal species–sand live oak ($\bar{x}$ = 0.67 ± 0.8), live oak ($\bar{x}$ = 0.575 ± 0.8), water oak ($\bar{x}$ = 0.49 ± 0.07), and laurel oak ($\bar{x}$ = 0.41 ± 0.07); mountain species–white oak ($\bar{x}$ = 0.85 ± 0.05), chestnut oak ($\bar{x}$ = 0.68 ± 0.06), water oak ($\bar{x}$ = 0.35 ± 0.06), and red oak ($\bar{x}$ = 0.19 ± 0.04).

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*Student Presentation

FIRE SEASON AND INTENSITY IMPACTS HARDWOOD INVASION AND DEER FORAGE IN THINNED PINE STANDS

Authors: Luke M. Resop, Steve Demarais, Bronson K. Strickland, Rainer Nichols, and Marcus Lashley

Department of Wildlife, Fisheries, and Aquaculture, Mississippi State University

Abstract:
Southeastern forests are commonly limited in terms of forage production for white-tailed deer. Within thinned loblolly pine *(Pinus taeda)* stands, undesirable hardwoods often shade out forbs and compete with loblolly trees for resources. We evaluated the influence of prescribed fire season and fire intensity on hardwood stem density during the third growing season post-fire in nine thinned loblolly stands (basal area ~70 sq ft/acre) in east-central Mississippi. Growing season (June) fires reduced density of hardwood stems ≤6 inches by 47% compared to dormant season (March) fires (mean = 2378 stems/acre) and control (mean = 2375 stems/acre) treatments. Mean fire intensity was 118°F greater in growing than dormant season treatments, but fire intensity within season was not found to influence hardwood stem density. Although March fires have been shown to produce more forage biomass year of fire than June fires, they do not effectively suppress hardwood invasion. Land management objectives that include forage production for white-tailed deer in pine forests can incorporate growing season fire to reduce hardwood competition with more desirable forages and crop trees.

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*Student Presentation

WHITE-TAILED DEER SELECTION FOR BURNED PINE, HARDWOODS, AND FOOD PLOTS DURING THE HUNTING SEASON

Authors: Dylan G. Stewart[1], William D. Gulsby[1], Stephen S. Ditchkoff[1], Bret A. Collier[2]

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Abstract:
White-tailed deer *(Odocoileus virginianus)* balance resource acquisition (e.g., forage and mating opportunities) with predation risk by avoiding risky areas, or using those areas during periods of lower risk. Others have provided some evidence of these behaviors, but direct evidence from movement data is limited in the Southeast, especially for females. We captured 54 adult (≥1.5 years old) male and 57 adult female deer over an 8-year period on a study area in Dorchester County, South Carolina, and fitted them with GPS collars programmed to record a position every 30 min. We quantified cover type (i.e., hardwood drains, food plots, natural and planted pine) selection, by sex and time of day, during the pre-rut (August 16–September 18), rut (September 19–October 28), and post-rut (October 29–December 1) using a resource selection function. Both sexes selected for hardwood drains during the day and food plots at night, and males were >4 times more likely to use hardwood drains than food plots during the day when hunting risk was greatest (rut). When hunting risk subsided post-rut, daytime use of food plots by males increased. Female use of food plots was greater than for males during the day. Natural pine (i.e., frequently burned pine woodlands) was used by both sexes approximately equal to its availability, but there was selection for planted pine, which offered denser vegetative cover. Our data provide direct evidence that deer balance resource acquisition with predation risk, and can quickly detect and respond to spatiotemporal shifts in that risk.

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*Student Presentation

[POSTER] ANTLER CASTING PHENOLOGY AND OCCURRENCE OF LATE-BREEDING IN NEBRASKA WHITE-TAILED DEER

Authors: Brian C. Peterson[1], Dave Fehlhafer[2], Patrick D. Farrell[3],
Miranda C. Reinson[1], Dustin H. Ranglack[1]

[1]University of Nebraska at Kearney

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Abstract:
Reproductive phenology of white-tailed deer *(Odocoileus virginianus)*, including the timing of breeding and antler casting, can be highly variable and influences by a variety of factors, including geography, sex ratios, hormone levels, and body condition. White-tailed deer in Nebraska primarily breed in November, but this season extends into December and January for unfertilized females and healthy fawns reaching the appropriate breeding weight by winter. During April of 2019, we observed late season breeding by a male white-tailed deer in the central Platte River valley and documented late antler casting for this same late-copulating male. An additional male was observed in late April of 2020 still retaining antlers within the region. To understand how irregular these observations were in the central Platte River valley, we documented historical observations of early and late antler casting utilizing long-term cast antler collection and camera trap data. We were able to establish a baseline for antler casting phenology within this region to denote a shift in average casting timeframe (more than one month later than previously recorded) and document the latest know antler casting within the literature in this region. We detail the variation in antler casting phenology for white-tailed deer in this region and the latest known occurrence of natural breeding in the state. Our findings help us better understand the life history of the Nebraska white-tailed deer population which can assist state wildlife biologists and property managers as they assess harvest regulations, strategies and adaptively manage the changing resource.

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Notes:

REGULAR MOWING DOES NOT IMPROVE PERENNIAL FORAGE PLOTS

Authors: Mark A. Turner, Bonner L. Powell, Craig A. Harper

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Abstract:
Perennial food plots, such as white clover, red clover, and alfalfa, are commonly planted white-tailed deer forages, and regular mowing of these forages during the growing season is widely recommended to maintain food plots and to increase nutritional quality and attractiveness. Previous work demonstrated that mowing does not increase crude protein, calcium, and phosphorus content in perennial forages, but data on deer attraction and weed control following mowing is lacking. We conducted a case study on a 4-acre food plot in east TN that we split into 2 treatments (mowed and unmowed) with 3 replicates each. We measured biomass production (lbs/ac), deer use, and weed coverage June-August 2020 to determine effects of monthly mowing on perennial forages. Mowing reduced forage production by 25%, and deer consumed 608 lbs/ac more forage in unmowed plots over the sampling season. We used cameras to measure deer visitation to each treatment and recorded 53% more deer detections per day in treatment units that were not mowed. Additionally, mowing failed to decrease coverage of either broadleaf or grass weeds. Total weed coverage over the sampling season averaged 8% in unmowed treatment units, and 14% in mowed treatment units. Based on these results, managers should refrain from regularly mowing perennial food plots and instead use a selective herbicide application (imazethapyr and clethodim) early in the growing season and a single mowing at the end of the growing season to more efficiently manage perennial food plots for increased forage production and deer use.

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*Student Presentation

EFFECTS OF WATER SALINITY ON INTAKE OF FOOD AND WATER BY WHITE-TAILED DEER

Authors: Austin K. Killam, Clayton D. Hilton, David G. Hewitt, Aaron M. Foley, Natasha L. Bell

Texas A&M University-Kingsville

Abstract:
Surface water in the southwestern United States is often limited due to frequent droughts. Large mammals in this environment are forced to rely on pumped ground water or rapidly evaporating pools of poor-quality water that may contain high (≥7,000ppm) levels of salt and dissolved solids. Our objectives were to identify for white-tailed deer *(Odocoileus virginianus)* 1) the upper threshold of salinity that deer will drink, 2) if water salinity affects daily water intake across seasons, and 3) if increasing salinity causes a decrease in dry matter intake (DMI). We offered deer water ad libitum at varying (1,000-control, 2,500-low, 4,000-moderate, 6,000-high, and 7,500ppm-extra high) salinity in autumn 2019, spring 2020, and summer 2020. Our results showed no difference in DMI across treatments or seasons throughout the study. Water intake increased with water salinity in the spring and summer seasons ($P<0.0001$), and had a weak interaction in the fall season ($P=0.064$). In our study, daily water consumption was between 6.5-12.5% body weight (4-12 liters) across seasons and treatments. Toxic levels of salts in water occur at ≥7,000 and 10,000 ppm for livestock (Embry et al., 1959). We observed no negative health impacts by treatments on any deer. Our study indicates that white-tailed deer can tolerate salinity up to 7,500 ppm without a decline in dry matter consumption. This information will be valuable to wildlife managers giving them a range specific to wildlife instead of livestock as they evaluate water sources to improve habitat for white-tailed deer.

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WHAT ARE WE FEEDING WILDLIFE? AFLATOXIN PREVALENCE IN SUPPLEMENTAL FEEDING

Authors: Miranda Huang, Steve Demarais, Bronson Strickland, Cooper Brookshire

Mississippi State University

Abstract:
Aflatoxins, common contaminants of crops and feed, are a health risk to wildlife. Supplemental feed for deer, but consumed by a variety of wildlife species, has been shown to contain aflatoxins in bags and feeders (e.g., 51% prevalence and levels ≤750 ppb). Aflatoxin levels of 200 and 800 ppb negatively affect turkey poult and deer fawn health, respectively. The goals of this study were to determine the current extent of aflatoxin contamination in feed bags and feeders, compare contamination by feeder type (spin, gravity, and trough), examine how quickly corn piles with ground contact become contaminated with aflatoxins, and determine the rate of wildlife visitation with feeding. In the summer and fall of 2019 and 2020, we tested 42 bags of feed from four states, sampled 88 Mississippi feeders, tested 20 corn piles over 10-day periods, and monitored wildlife visitation at 65 feeders. We found low prevalence of aflatoxins in feeders during the summer (4.3%) and fall (11.8%) and no detectable aflatoxin in feed bags. However after 8 days of summer exposure, all piles of corn were contaminated with high levels of aflatoxins (483-3,575 ppb). No aflatoxins were detected in samples from trough feeders. Finally, a variety of wildlife species visit feeders and appear to ingest feed including white-tailed deer, raccoon, feral hogs, turkeys, mourning doves, and songbirds. In conclusion, supplemental feeding does not always present risk of aflatoxicosis, but aflatoxin-producing fungi present in the environment can contaminate feed with ground contact, putting the health of visiting wildlife at risk.

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Notes:

*Student Presentation

[POSTER] REGIONAL COPPER DEFICIENCIES OF WHITE-TAILED DEER AND OTHER MINERAL ABNORMALITIES

Authors: Seth T. Rankins[1], Randy W. DeYoung[1], Aaron M. Foley[1], J. Alfonso Ortega-S[1], Timothy E. Fulbright[1], David G. Hewitt[1], Landon R. Schofield[2], Tyler A. Campbell[2]

1Cesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville

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Abstract:
Regional differences in white-tailed deer *(Odocoileus virginianus)* body mass and antler size are nutritionally mediated, but the nutrient(s) driving these size differences are largely undocumented. Much research on regional differences in deer body and antler size focuses on macronutrients, such as crude protein and digestible energy. However, a common symptom of mineral deficiencies is stunted growth. We sampled the concentrations of 10 minerals (calcium, copper, iron, potassium, magnesium, manganese, phosphorous, sodium, sulfur, and zinc) in blood serum from 28 deer sampled at 2 ranches of the East Foundation with contrasting body mass and antler size differences. Our research was conducted on unmanaged deer populations (i.e., no feeding or hunting) on native rangelands in South Texas. On average, each sampled deer had 6.3 serum mineral concentrations that deviated from published norms. The proportion of deer with deficient levels of serum copper was greater at the site with smaller deer sizes (100% versus 21%, $P < 0.001$, Fisher's exact test). We also found the proportion of lactating (100%) females ≥1.5 yrs. of age with deficient levels of serum copper was greater than non-lactating (43%) females ≥1.5 yrs. of age ($P = 0.08$, Fisher's exact test). Our research suggests regional sub-clinical mineral deficiencies in deer might limit antler and body development. In regions with naturally occurring mineral deficiencies in deer, providing adequate mineral supplementation can potentially increase body mass and antler size. Our research also highlights our imperfect knowledge of normal serum mineral ranges and lack of knowledge regarding mineral nutrition for deer.

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*Student Presentation

MOVEMENTS OF HUNTERS AND FEMALE DEER: BALANCING POPULATION STABILITY AND RECREATION

Authors: Jacalyn P. Rosenberger[1], Adam C. Edge[1], Cheyenne J. Yates[1], Nathan P. Nibbelink[1], Karl V. Miller[1], David A. Osborn[1], Charlie H. Killmaster[2], Kristina L. Johannsen[2], Gino J. D'Angelo[1]

[1]Daniel B. Warnell School of Forestry and Natural Resources, University of Georgia

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Abstract:
Hunting can impact game directly through harvest or indirectly by inducing behavioral responses. Indirect effects may be especially pertinent for managing white-tailed deer *(Odocoileus virginianus)* populations in decline. Within the Chattahoochee National Forest in the mountains of northern Georgia, deer populations have decreased drastically over several decades. This study was designed to help managers minimize the effects of hunting on deer while providing recreational opportunities for hunters on the national forest. We analyzed movements of 58 GPS-instrumented hunters relative to roads, slope, and wildlife openings during firearms hunts on 2 Wildlife Management Areas (WMAs) during the 2018–2020 hunting seasons. We projected that 50% of hunting pressure occurred on 3% of the area, 75% of hunting pressure occurred on 18% of the area, and 90% of hunting pressure occurred on 51% of the area. Over the same period, we studied the effects of firearms hunts on the movements of 26 female deer relative to pre-, hunt, and post-hunt periods. We detected no differences among periods for core area locations of deer, movement rates, or home range size and composition, including proportions of land cover, public land, and areas of suitability for hunters. Overall, hunting pressure on our study area did not produce significant changes in movements and space use of female deer. Therefore, regulatory adjustments likely are not necessary to minimize hunting-related disturbance of deer. Although our results suggest increasing open road access would increase hunter utilization of WMAs, this would most likely decrease the availability of refuges for deer.

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*Student Presentation

USING ANIMAL SPACE-USE AND MOVEMENT TO INFER BEHAVIORAL STATES: A CAUTIONARY TALE

Authors: Frances E. Buderman[1], Tess M. Gingery[1], Duane R. Diefenbach[2], Laura C. Gigliotti[3], Danielle Begley-Miller[4], Bret D Wallingford[5], Christopher S. Rosenberry[5]

[1]Pennsylvania State University

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Abstract:
Successfully mating is one of the primary components of an individuals' lifetime reproductive success and fitness, but the movements that characterize ungulate mating strategies are poorly understood. However, advances in telemetry technology and statistical methodologies are allowing researchers to identify space-use and movement behavior without directly observing the animal. Two methods that have been used for inferring behavior from white-tailed deer location data are utilization distributions (UDs) and hidden Markov models (HMMs). UDs can be used to identify high and low areas of use by an individual, whereas HMMs can be used to identify behavioral states that vary by step-length quantities. However, little work has been done to determine if the inferred behavior corresponds to the true behavior. We used male and female white-tailed deer location data to identify potential breeding events based on proximity of locations. We then tested the ability of UDs and HMMs rendered with single sex data to identify these events. We found no evidence that a probability density threshold applied to an individual's UD could identify potential breeding events. Likewise, HMMs were unable to identify the breeding events, inconsistently assigning events to states and splitting a single breeding event into multiple states. Therefore, caution is warranted when interpreting behavioral insights rendered from statistical models applied to location data, particularly when there is no form of validation data. Unvalidated assumptions about variation in space-use and movement can lead to incorrect inference about behavioral strategies.

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Notes:

EFFECTS OF PUBLIC HUNTS ON MOVEMENTS AND BEHAVIOR OF MATURE WHITE-TAILED DEER

Authors: Jason E. McCoy, Justin F. Foster, Cristy G. Burch, Don B. Frels Jr., Ryan Reitz

Texas Parks and Wildlife Department

Abstract:
We examined movement patterns and home range of adult deer on the Kerr Wildlife Management Area (KWMA) during public hunts from 2013-2016. Thirty mature (> 3.5 years old) deer (16 male,14 female) were captured and fitted with GPS collars with a one-hour fix rate. The KWMA was divided into two units and hunting was restricted to one unit each season to allow us to compare behavior of hunted and un-hunted deer. Each year we conducted 4 hunts centered around the estimated peak of the breeding season (November 24th). Utilization distributions (UD 50%, 95%) and motion variance (MV) were calculated using the Dynamic Brownian Bridge Movement Model (DBBMM). We examined MV (index of activity) and UD for the 2-day periods both prior to and during each two-day hunt. Overall, we found no evidence that hunting pressure effected home range or activity rates. We found no significant differences in average UD size between hunted and un-hunted deer in all years. Activity levels were highly variable between individuals and between years. Males showed higher activity levels than females. Hunted males had a trend of higher activity in each year, but was only significant in one year. Females showed a significant difference in 3 of 4 years, however there was no consistent trend from one year to the next. Data from this study on timing of peak activity for white-tailed deer and insight on the resultant behavior of deer when exposed to hunting pressure is informative to hunters pursuing mature male deer.

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Notes:

[POSTER] EFFECTS OF HUMAN HUNTER MOVEMENT AND SITE SELECTION ON OBSERVATION RATE OF WHITE-TAILED DEER

Authors: Alyssa N. Meier[1], Andrew R. Little[2], Stephen L. Webb[3], Kenneth L. Gee[4], Steve Demarais[5], Dustin H. Ranglack[1]

[1]University of Nebraska at Kearney

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Abstract:
Hunting is the primary tool for population control for many ungulate species across the United States, including white-tailed deer *(Odocoileus virginianus)*. Previous research has focused primarily on the effects of hunting on prey behavior while neglecting the potential effects hunter behavior has on the probability of harvest success. Hunters make numerous active decisions while hunting that affect their probability of success, such as where to hunt on the landscape and hunting method (i.e. ground-blind, tree-stand, still hunting). Because wildlife managers rely on hunting for population control, it is important to understand and quantify hunter behavior to more confidently meet management goals. In this study, I examine hunter movement patterns and site selection and assess how these parameters affect hunter observation rate of white-tailed deer. The information provided by my research will help educate hunters on becoming more effective and efficient, and inform wildlife managers on methods to more reliably meet harvest quotas.

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*Student Presentation

ESTIMATING THE ECONOMIC IMPACTS OF CHRONIC WASTING DISEASE IN THE U.S.

Author: Scott J. Chiavacci

United States Geological Survey

Abstract:
Cervid hunting, cervid farming, and cervid-related tourism financially support a range of industries and economic sectors in the U.S., with cervid hunting also underpinning the budgets of natural resources agencies throughout the country. The economic impacts of chronic wasting disease (CWD) on these industries, sectors, and agencies are currently unknown. We used expert elicitation to gather data and information about CWD's financial effects on state agencies, captive cervid operators, private landowners, cervid-related tourism, and organizations and companies tied to cervid hunting. To date we have spoken with 97 professionals representing 67 government agencies and non-governmental organizations. State agencies overseeing cervid hunting or captive cervids collectively spent over $24 million on CWD-related work in 2020. We are currently gathering data on CWD's effects on the captive cervid industry, land leasing for hunting, and companies and organizations representing the cervid hunting industry. This talk will also describe our plans to develop models for predicting the future economic impacts of CWD under different prevalence and spread scenarios. Importantly, our work will establish a baseline estimate of the realized costs of this disease nationwide, demonstrating the degree of CWD's current economic impacts and serving as a foundation for future economic assessments.

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Notes:

A COUNTY RISK ASSESSMENT TOOL: AN INNOVATIVE AND SCIENCE-BASED PROCESS FOR DETERMINING CWD MANAGEMENT ZONE COUNTIES IN ARKANSAS

Authors: Jeremy Brown, Christopher R. Middaugh, Ralph Meeker, Jennifer R. Ballard, A.J. Riggs, Cory Gray

Arkansas Game and Fish Commission

Abstract:
Since the discovery of chronic wasting disease (CWD) in Arkansas in 2016, the Arkansas Game and Fish Commission (AGFC) has adaptively responded to the disease with special regulations and enhanced statewide surveillance. As part of these efforts, the AGFC created a CWD management zone with CWD regulations in counties within the zone. A county is currently included in the CWD management zone if a CWD positive sample is discovered inside the county or within 10 miles of the county perimeter. However, the AGFC has determined that a more scientific approach to including counties within the CWD zone, as well as a strategy for removing "low risk" counties from the CWD zone is needed. Therefore, we have developed a risk assessment tool that allows for assigning a level of risk to each county in the state for the purpose of determining whether a county should be in the CWD zone or removed from the CWD zone. This risk assessment is based on a combination of two county-level risk factors (sampling history and percent of county line contacting CWD management zone counties) and five CWD positive sample-related risk factors, three that apply to free ranging CWD positive samples and two that apply additionally to captive CWD positive samples (infection proximity and intensity, geographic movement restrictions, special circumstances, captive fencing integrity, and captive population percent positive). This tool presents an innovative, science-based, and quantitative approach to adding and removing counties from a CWD management zone.

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Notes:

TRACKING CHRONIC WASTING DISEASE SURVEILLANCE WITH AN INTERACTIVE VISUALIZATION DASHBOARD

Authors: Erick Gagne[1], Andre Di Salvo[2], Andrea Korman[2], Amber Nodler[2], Lisa A. Murphy[1], Julie Carol Ellis[1], E. Scott Weber III[1], Lowell Ballard[3]

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Abstract:
In Pennsylvania, the first case of CWD was detected in 2012 in white-tailed deer *(Odocoileus virginianus)*. To determine the extent to which CWD has spread in free-ranging wild cervid populations, the Pennsylvania Game Commission performs year-round CWD surveillance. Samples for testing come from a variety of sources including, but not limited to, roadkill, hunter-harvested, and clinical suspect cervids. In 2019, the Pennsylvania Game Commission and the University of Pennsylvania's School of Veterinary Medicine established the Wildlife Futures Program to better understand, investigate, and survey wildlife health issues throughout the Commonwealth. In an effort to provide up to date CWD surveillance information to hunters, wildlife managers, and other stakeholders, the Pennsylvania Game Commission and Wildlife Futures Program created a visualization dashboard that tracks CWD sampling and test results. This dashboard came to fruition with expertise by Timmons Group to utilize surveillance data in an easy-to-navigate interactive format. The dashboard demonstrates Pennsylvania's commitment to managing CWD in both a proactive and a transparent way by showing ongoing sampling efforts and the sample prevalence of CWD throughout the state. Data for the dashboard ranges from 2013 to present for free-ranging wild deer and 2016 to present for free-ranging wild elk. The dashboard displays data across three tabs: Samples Over Time, Sample Prevalence and Sample Statistics. First launched in early December 2020, data for the dashboard is refreshed on a weekly basis. During this presentation, the functionality of the dashboard will be demonstrated to illustrate how CWD submissions and sample prevalence in Pennsylvania's free-ranging wild cervid populations has changed over time and location. Sharing this tool and incorporating data from regional partners outside of Pennsylvania will facilitate more comprehensive monitoring of CWD surveillance efforts and encourage management of the disease at a regional or perhaps even a national level.

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Notes:

[POSTER] GREEN LUNG SYNDROME: PNEUMONIA DUE TO FUNGAL-LIKE ORGANISMS IN WHITE-TAILED DEER

Authors: Alisia A.W. Weyna[1], Melanie R. Kunkel[1], Kevin D. Niedringhaus[2], Mark G. Ruder[1], Nicole M. Nemeth[1]

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Abstract:
Green lung syndrome (GLS) in white-tailed deer manifests as prominent, green-hued nodules in the lungs. Increased numbers of cases recently have been diagnosed at the Southeastern Cooperative Wildlife Disease Study (SCWDS), prompting further study. Our goals are to characterize manifestations of disease, determine potential cause(s), assess for seasonal, geographic, and demographic trends, and identify potential risk factors. From 2003-2019, 27 deer from 10 states (Arkansas, Florida, Georgia, Louisiana, Maryland, North Carolina, Pennsylvania, South Carolina, Virginia, West Virginia) were diagnosed with GLS, with 30.8% (8/26) from Florida. Full carcasses or select samples collected at field necropsy were assessed grossly and microscopically. Polymerase chain reaction (PCR) testing for oomycetes (i.e., fungal-like organisms, including Pythium spp. in a subset) and fungal culture of lung also were performed. Over half of cases were diagnosed in fall (September-November; 15/26; 57.7%), 26.9% (7/26) in June-August, and 15.4% (4/26) in December-February. The majority of affected deer were female (16/25; 64%) and (14/21; 67%) <3.5 years (range: 0.5-5.5 years). Grossly, lesions were often limited to one lung lobe, although large portions of the damaged lobe sometimes were affected. Microscopically, lesions included severe, chronic inflammation and tissue death with intralesional fungal-like elements. In a subset of cases, forestomachs were also affected, emphasizing the importance of complete postmortem examination in affected deer. Among 13 deer for which lung was tested for Pythium spp., five (38.5%) were positive. Further characterization of GLS is ongoing and SCWDS is soliciting additional samples to help assess the significance of this condition in wild deer.

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Notes:

CWD SHOW AND TELL: GAUGING HUNTERS' WILLINGNESS TO ADOPT MANAGEMENT PRACTICES

Author: Sonja A. Christensen

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Abstract:
Chronic wasting disease (CWD) threatens wild cervid populations and the funds available to manage and conserve wildlife. Despite the increasingly widespread apparent prevalence of this disease, few options to control or manage it have been successful. Many of the disease management options available to state wildlife agencies rely on deer hunters complying with new regulations or voluntarily changing behavior following suggested best management practices for harvesting and handling potentially infected animals. Research in behavioral psychology has shown improved success with changing human behavior when subjects are provided with visual demonstrations of the desired action. We created short (< 2 min) videos for deer hunters that demonstrate a series of best management practices for reducing the spread of CWD. We assessed the impact of these videos on hunter intent to accept management actions via a survey before deer season and actual behavior via a follow-up survey taken during the fall 2020 deer season. To assess each information treatment against a control, we randomly selected hunters from our total sample to participate in each survey group, including a group that received no information treatment. Further, we used methods based in behavioral economics, such as continued valuation for willingness-to-pay and best-worst choice experiments, to inform CWD mitigation strategies. Our survey results and an information impact assessment provide critical insight into CWD management acceptance. Understanding if informational videos resulted in differences in hunter behavior will be vital for evaluating and targeting successful CWD management options.

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Notes:

HOW [YOUR STATE NAME HERE] MIGHT AVOID LOSING ITS DEER HERD TO CWD LIKE WISCONSIN

Authors: Michael K. Foy, Thomas M. Hauge

Wisconsin's Green Fire

Abstract:
Wisconsin ranks among the top states and provinces in North America for deer harvest and licensed deer hunters, with an annual deer harvest exceeding 325,000 and over 500,000 licensed deer hunters. The Wisconsin DNR receives $22M annually from deer license sales – over 75% of its wildlife program budget. Deer and deer hunting contribute over $230M in local, state and federal taxes to Wisconsin, on nearly $900M in annual retail sales. The annual economic output of deer and deer hunting exceeds $370M, supporting over 15K Wisconsin jobs, with a total economic multiplier effect of over $1.3B. These figures don't begin to fully account for the value of deer for outdoor recreation & local food resources, tribal & ecosystem benefits, R3 progress, and a huge contribution to rural real estate values. Yet if current CWD prevalence and distribution increases in Wisconsin continue – and there is no indication that they won't – sooner or later these golden fawns will quit dropping. When that happens, a cherished part of the Wisconsin culture and fall traditions will be lost. We want to repeat that – Wisconsin, one of this continent's premier deer hunting states, is on track to effectively lose its deer herd to CWD in the coming decades. Without development and practicable implementation of miracle treatments, implausible genetic solutions, or elusive vaccines, your state will likely follow Wisconsin's tragic lead someday. We propose how states might turn this gloomy situation around, by investing in their hunters, landowners, and small businesses to counter relentless CWD growth.

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Notes:

COMPARISON OF CWD DETECTION METHODS AND TISSUE TYPES: IMPLICATIONS FOR FREE-RANGING WHITE-TAILED DEER MANAGEMENT

Authors: Marc D. Schwabenlander[1], Peter A. Larsen[1], Gage R. Rowden[1], Manci Li[1], Kelsie LaSharr[2], Erik C. Hildebrand[2], Suzanne Stone[1], Davis M. Seelig[3], Chris S. Jennelle[2], Tiffany M. Wolf[4], Michelle Carstensen[2]

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Abstract:
Wildlife disease managers tasked with chronic wasting disease (CWD) management in free-ranging cervids utilize current “gold standard” diagnostic approaches of immunohistochemistry (IHC) and enzyme-linked immunosorbent assay (ELISA) on medial retropharyngeal lymph node (RPLN) samples from hunter harvested, targeted, and/or opportunistic sources. Prion amplification assays, such as real-time quaking-induced conversion (RT-QuIC), have brought forth the possibility of improved detection methods and surveillance strategies. We used a combination of ELISA, IHC, and RT-QuIC with a goal of understanding the detection capabilities of RT-QuIC in comparison to current methods within a free-ranging white-tailed deer (WTD) population. The Minnesota DNR conducted targeted agency culling from known CWD hot spots during the winter of 2019. The RPLNs of over 500 culled deer were tested by CWD ELISA, resulting in 12 putative positives that were subsequently confirmed using IHC. Additional biological samples (parotid lymph nodes, submandibular lymph nodes, palatine tonsils, muscle, whole blood, and feces) were collected from the ~500 deer and provided to the Minnesota Center for Prion Research and Outreach as a blinded sample set for independent RT-QuIC analyses. Our RT-QuIC results, in combination with ELISA and IHC, indicate CWD prion protein detection is dependent upon tissue type and sampling technique. We reinforce previous research that recommends bilateral sampling of paired tissues for CWD diagnostic testing. Moreover, our results indicate that screening an optimal tissue set (i.e., multiple, bilateral lymphoid tissues) for CWD surveillance might result in a more fine-scale resolution of the CWD landscape, better informing CWD management in free-ranging WTD.

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Notes:

*Student Presentation

IS THERE A FUTURE FOR DOG-DEER HUNTING IN THE UNITED STATES?

Authors: Gino D'Angelo, Thomas Prebyl, David Osborn, Jacalyn Rosenberger

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Abstract:
Hunting white-tailed deer *(Odocoileus virginianus)* with dogs has long been steeped in tradition and controversy. Today in the United States, dog-deer hunting only occurs in 9 states of the Southeast. We reviewed hunting regulations and primary literature, interviewed biologists, and simulated deer movements on national forests in Mississippi to investigate the current status of dog-deer hunting and to develop recommendations for best practices. Our study revealed many inconsistencies regarding how states regulate dog-deer hunting. Dog trespass onto unauthorized properties was the most common complaint to state wildlife agencies. Hunter permitting and registration requirements have made hunters more accountable and were beneficial based on the perceptions of state agencies of fewer public complaints. The results of our simulations indicated that hunts would need to be limited to areas >1.2 miles from property boundaries to ensure 50% of hunts would be contained on a property, >1.4 miles to ensure 70% containment, or >1.7 miles to ensure 90% containment. When excursions by deer were eliminated from simulated hunts (e.g., dogs stopped via correction collars), expected distances required to contain 50, 70, and 90% of hunts were reduced ≥52% to 0.5 miles, 0.7 miles, 0.8 miles respectively. We recommend: 1) consistent plans for communication among agencies and stakeholders; 2) allowing dog-deer hunting where the practice is accepted culturally; 3) developing and enforcing permit systems to ensure hunter accountability; and 4) encouraging or requiring tracking and correction collars on dogs to reduce trespass.

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Notes:

EFFECTS OF WILD PIGS ON SPACE USE BY WHITE-TAILED DEER

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Abstract:
Wild pigs *(Sus scrofa)* pose a significant challenge in conservation of native wildlife, particularly culturally and economically important game species like white-tailed deer *(Odocoileus virginianus)*. Anecdotal observations suggest deer respond negatively to pig presence, but no research has examined whether deer adjust space-use in response to spatial variation in pig density. Here, we examined whether deer avoid areas of their home ranges where pig density is high on the Savannah River Site, SC. We used quantile regression to model effects of pig density on intensity of space use by deer within areas of deer home ranges representing relatively low-, moderate-, and high-use by deer. Overall, deer responses to pig density were strongest in high-use areas of their home ranges, but negligible in low-use areas. Deer use declined sharply with pig density in high-use areas of home ranges during March and October, but use increased with pig density in high-use areas during February and June. We also detected contrasting sex-specific responses to pig density during certain months. Bucks and does responded negatively and positively, respectively, to pig density in April and July, whereas bucks and does responded negatively and positively, respectively, to pig density in December, suggesting sex-specific physiological requirements drive responses of deer to pig density. Our results provide novel insight on deer response to pig presence, highlighting greater complexity in these responses than previously recognized, and they further elucidate the effects of this invasive species on native wildlife.

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Notes:

Table 1. Southeastern state deer harvest summaries for the 2019-2020 or most recent available season.

State	Land Area (sq. mi)	Deer Habitat (sq. mile)	Deer Habitat (% Total)	Percent Forested	% Land Area Public Hunting	Harvest Male	Harvest Female	Harvest Total
AL	51,628	46,981	91	69	5	94,112	124,246	218,358
AR	52,068	38.607	74	56	12	100,603	87,548	188,131
DE	1,954	1,592	81	15	10	7,546	9,423	16,969
FL	53,632	27,573	51	48	17	48,724	23,513	72,237
GA	57,800	38,674	67	67	6	129,329	132,713	262,042
KY	40,395	39,654	97	59	9	78,633	69,762	148,395
LA	41,406	26,562	64	52	9.5	94,050	76,950	171,000
MD	9,837	8,766	89	39	6	35,202	40,808	76,010
MO	69,561	63,910	92	31	4	162,062	123,811	285,873
MS	47,296	31,250	66	66	6	90,697	106,200	197,157
NC	52,660	36,154	67	57	6	95,507	90,180	185,687
OK	69,919	37,425	54	19	3	66,993	39,344	106,337
SC	30,207	21,920	73	63	7.5	105,201	87,872	193,073
TN	42,246	25,770	61	49	9	79,104	56,029	135,133
TX	261,914	177,272	58	40	<2	460,242	386,088	846,330
VA	39,589	37,939	96	61	11	115,035	93,032	208,067
WV	24,064	22,972	95	79	11	61,420	37,993	99,437[1]
Avg or Total	946,176	683,021	72.18	51.18	7.88	1,824,460	1,585502	3,410,236

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	4.6	A,B,C,E,F	1,250,000	119 (C)	5 (A)	86 (A,C)	A,B	67
AR	4.9	A,C, F, G	1,000,000	160 (C)	12 (C)	50 (C)	A,B	70
DE	10.7	B, F, G	46,000	155 (C)	17 (A,B)	43 (A,B)	A,B,C	0
FL	3.1	E, F		35-38	14	74-79	A,B	20
GA	7.2	A,C,D,E, F, G	1,000,000	128-145 (C)	92 (A,C)	85 (C)	A,B,C	23
KY	3.7	D,F,G	931,000	136 (C)	2(A), 9(B)	16 (C) + 4 Jr	A,B,C	0
LA	6.5	A,B,C	500,000	123-138 (C)	14-19(A,B)	65-79	A,B,C	80
MD	8.7	B,C,D,F,G	240,000	111 (C)	3+9 (A), 13 (B)	13 (A), 2 (B),+ 2 Jr. day	A,B,C	0
MO	4.5	B,C,D,F,G	1,400,000	112	11	11-14 + 5 Jr	A,B	0
MS	8.1	C, E	1,475,000	123 (C)	12 (A)	76	B,C	90
NC	5.1	A,B,C,D,F,G	1,100,000	21-121	14	20-82	A,B,C	50
OK	2.4	A,C, E, online	750,000	107 (C)	9	16	A,B	0
SC	9.1	A,B,C	730,000	16 (A)	10 (A)	70-140	C	60
TN	5.7	A, mobile /online		40 (C)	14 (C)	60 (C)	A,B	0
TX	4.7	B	5.5 million [5]	35	14	72-86 (B, C)	A,B	0
VA	5.5	A,B,C,D,F	1.08 million	42-77	14-36	15-50	A,B	55
WV	4.3	F	472,000	99 (C)	11 (C)	25 (C)	A,B,C	0
Avg. or Total	5.8		17,474000					30.29

			Hunting License Fees (Full Season)		Tagging System		
State	No. of Hunters	5-Year Trend	Resident	Non-Resident	Physical Tag? License Tag? None?	Mandatory? Volunteer? None?	Bonus Tags Available?
AL	198,924	Stable	$28.20	$142.00-$325.90	Hunter Log	Mandatory	DMAP
AR	239,629	Down	$10.50 – 25	$55 – 350	License Tag	Mandatory if not checked immediately upon harvest	DMAP
DE	20,498	Stable	$39.50	$199.50	Physical Tag	Mandatory	2 Antlered, Unlimited Antlerless
FL	123,400	Down	$22	$156.50	Electronic Reporting	Mandatory	Private Lands Programs
GA	199,915	Stable	$40	$325	License Tag	Mandatory	WMAs
KY	268,506	Down	$62	$335	License Tag/ Hunter Log	Mandatory	Yes
LA	173,300	Down	$29-50	$300-352	Physical Tag	Mandatory	DMAP
MD	55,000	Down	$36.50	$130	Physical Tag or Electronic Proof of Registration	Mandatory	Antlered only
MO	483,522	Down	$17	$265	License Tag	Mandatory	DMAP
MS	137,983	Down	$25-$45	$300-$375	None	None	DMAP & FMAP
NC	231,800	Down	$39	$200	License Tag	Mandatory	DMAP & CDMAP
OK	203,245	Stable	$25	$300	License Tag	Mandatory	DMAP
SC	141,116	Stable	$25	$235-375	Physical Tag	Mandatory	Yes & DMAP
TN	198,795	Stable	$68-166	$306	Physical Tag or Electronic Proof of Registration	Mandatory	Select WMAs and Unit CWD
TX	791,619	Stable	$25	$315	License Tag	Mandatory	MLDP tags
VA	189,500	Down	$46-82	$197-259	License Tag	Mandatory	Unlimited on private lands, antlerless only
WV	173,730	Down	$35	$196	Physical Tag	Mandatory	Yes
Total	3,830,482						

			Deer Related Accidents						
			Firearms		Stands		Other		
State	Mandatory Orange	Crossbows Permitted	Injuries	Fatalities	Inj.	Fat.	Inj.	Fat.	Highway Kill[7]
AL	Yes	Yes	4	0	10	3	0	0	29,777 (C)
AR	Yes	Yes	3	0	9	1	0	1	22,000 (C)
DE	Yes	Yes	0	0	0	0	0	0	5,770 (C)
FL	WMAs only	Season & Handicap	2	0	5	0	0	0	38,858 (C)
GA	Yes	Yes	NA	NA	NA	NA	NA	NA	50,000 (C)
KY	Yes	Season & Handicap	NA	NA	NA	NA	NA	NA	NA (A)
LA	Yes	Yes	1	0	7	1	0	0	10,098 (C)
MD	Yes	Yes	0	1	8	2	1	0	32,600 (C)
MO	Yes	Yes	7	1	6	1	NA	NA	43,365 (C)
MS	Yes	Yes	7	1	11	2	2	0	26,594 (C)
NC	Yes	Yes	6	0	4	0	0	0	71,175 (C)
OK	Yes	Yes	3	0	3	0	0	0	12,605 (C)
SC	WMAs only	Yes	9	1	7	1	0	0	3,085 (A)
TN	Yes	Yes	0	1					35,974 (C)
TX	WMAs only	Yes	4	0	5	0	0	1	60,857 (C)
VA	Yes	Yes	10	1	9	0	NA	NA	~63,000 (C)
WV	Yes	Yes	3	0	5	0	5	2	24,398 (C)
Total									540,156

	Limits [8]				% Hunting Success [10]			
State	Season	Antlerless	Antlered	Antler Restrictions [9]	Archery	Muzzleloader	Firearms	Avg. Leasing Fees/Acre
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,B,C No antler restrictions within CWD Management Zone counties	?	?	?	$6-10
DE	None	4+	2	One buck must have a spread ≥15"	?	?	?	?
FL	5	Up to 2	Up to 5	A	-----------	33.8% Combined	--------------------	$10-12
GA	12	10	2	A (One buck must be 4-points on 1 side) B (9 counties are more restricted)	11	3	50	$5-25
KY	None	Varies	1	None	-----------	39% Combined	-------------	$5-40
LA	6 statewide/3 in 2 of 10 deer areas	3, 1either-sex	2, 1 either-sex	No	25	23	47	$5-40
MD	Varies	2 in Region A, 35 in Region B	2 with 1 bonus in Region B	3-pt restriction on two bucks	40	31	39	$5-35
MO	Varies	Varies	2; 1 with fire-arm	Yes, 52 counties	22	-	42	?
MS	8/5	5/2	3	C	41	34	57	?
NC	6[8]	4[8]	2	NA	----------	49% Combined	-----------------	?
OK	6	Up to 6	2	No	31	32	36	$10-20
SC	8+	3+	5	A (on 2 of buck bag limit) C (16 WMAs)	28	21	67	$8–20
TN	None	Varies	2 statewide	C (on select WMAs)	?	?	?	?
TX	5	Up to 5	Up to 3	Yes, 117 counties	-----------	60% Combined	------------------	$7-30
VA	6 (east) & 5 (west)	6	3 (east)& 2 (west)	On 2 WMAs + 5 counties	~30	~37	~51	UNK
WV	11	Up to 8	Up to 3	5 WMAs & 2 State Forests	36	15	46	$3-10
Avg.					27.9	29.22	48	

State	Type[11]	Private Lands Programs: Min. Acreage Requirements	Fee	No. of Cooperators	Trailing wounded deer with dogs legal?	Supplemental feeding legal?	Baiting legal?
AL	A	None	None	124	Yes	Yes	Yes [12]
AR	A	500	None	579	Yes	Yes (except in CWD Zone where bait may only be used from Sept. 1-Dec. 31)	Yes, Private
DE	3 levels DDAP	None	None	129, 339, 9	No	Yes	Yes, Private
FL	A, C	640; 5000	None	969; 28	Yes	Yes	Yes, Private
GA	DMAP	250-1500	$200-1,000	~70	Yes	Yes	Yes
KY	B	None	None	500	Yes	Yes (except March – May)	Yes, Private
LA	A	40/500/1,000	$100-$1500	698	Yes	Yes	Yes, Private
MD	None				Yes	Yes	Yes, Private Only.
MO	A,B	20 landowner tags; 500 DMAP (40 municipalities)	None	164,131	Yes	Yes (except CWD zone)	No
MS	A,D	Variable	None	415	Yes	Yes	Private land only
NC	A	Regional; 1,000/500	$50	50	Yes	Yes	Yes, Private
OK	A	1,000	$200-400	150	Yes	Yes	Yes, Private
SC	A	None	$50	1,439- 3.1 mil ac	Yes	Yes, Private	Yes, Private
TN	None				With officer approval	Yes	No
TX	A	None	None	7,271 properties under a wildlife management plan – 134 wildlife cooperatives (4,500 + members) 31.7 mil ac	Most of Texas	Yes	Yes
VA	DCAP DMAP DPOP	None	None	747 706 12	Yes (weapon allowed)	No (Sept 1 – first Sat in Jan)	No
WV	None				Yes	Yes[12]	Yes[12]

Table 1. Continued; footnotes. Page 7

[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 – In Region B: 10 antlerless deer limit in firearms, 10 antlerless deer limit in muzzleloader, 15 antlerless deer limit in archery. In Region A: 2 antlerless deer limit, no more than one per weapon season. Statewide Antlered Deer Limit: Two antlered deer, no more than one in a weapon season. One bonus antlered deer may be harvested in Region B during any weapon season.
MO – No daily or annual limit of antlerless deer but number that can be harvested in each county varies.
NC – Unlimited bonus antlerless tags are available during the Urban Archery Season in participating municipalities.
[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] Must possess Baiting Privilege License ($15.25 resident, $51.85 non-resident) to hunt deer with bait on private lands; hunting deer with bait illegal on public lands
Note: All states require hunter education, permit handguns for use on deer, and do not permit use of drugged arrows on deer.

NOTES

About the National Deer Association

On July 7, 2020, the Quality Deer Management Association and the National Deer Alliance announced they were embarking on a merger to combine the strengths, resources and core initiatives of their non-profit organizations to better serve deer and hunters more effectively at a time when the need is greatest. Leadership and staff proceeded with strategic planning to unify the two under one organizational structure, and a new Board of Directors was elected that comprises members from both organizations. The National Deer Association (NDA), re-forged on November 10, 2020, is united for deer with a mission of ensuring the future of wild deer, wildlife habitat and hunting. A new, ambitious strategic plan calls for a concentration of effort in four critical areas.

Education and Outreach
The National Deer Association will carry forward the reputation for reliable information for hunters, empowering them to be more informed, successful and engaged stewards of deer and wildlife. Teaching the non-hunting public about the keystone position of deer in the success of all wildlife conservation will be a new goal. Familiar programs, titles and multi-media channels will be strengthened and broadened through key partnerships in the hunting industry.

Recruitment, Retention, Reactivation
The highly successful and tested Field to Fork adult hunter recruitment program will be the cornerstone of the National Deer Association's R3 effort aimed at growing hunter numbers, instilling a desire among experienced hunters to serve as mentors, and increasing acceptance of hunting among the general public.

Policy and Advocacy
Protecting deer and hunting requires skill in the rooms where wildlife policy and legislation are formed. Though both parent organizations spent considerable time in this arena, NDA CEO Nick Pinizzotto in particular brings experience on Capitol Hill to the team. Uniting hunters behind wise deer policy is a primary goal.

Deer Diseases
A number of diseases, most notably the always-fatal chronic wasting disease (CWD), present serious threats to the future of all deer species and deer hunting traditions. The National Deer Association will build a coalition of hunters, wildlife agencies and scientific experts to answer these threats.

The National Deer Association has the resources and vision to ensure the future of wild deer, wildlife habitat and hunting for the next generation. Your membership and support enables our work. Our 4-star rating from Charity Navigator is proof we will spend your dollars wisely to achieve our mission. Become a member today at DeerAssociation.com.

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