22nd Annual Meeting

SOUTHEAST DEER STUDY GROUP

February 14-17, 1999 □ Fayetteville, AR

THE WILDLIFE SOCIETY

Arkansas Game & Fish Commission

UNIVERSITY of ARKANSAS
1871

FINANCIAL SPONSORS AND CONTRIBUTORS

THE ARKANSAS GAME AND FISH COMMISSION, ARKANSAS CHAPTER OF THE WILDLIFE SOCIETY, THE UNIVERSITY OF ARKANSAS - CONTINUING EDUCATION CENTER, AND THE SOUTHEAST DEER STUDY GROUP THANK THE FOLLOWING COMPANIES AND ORGANIZATIONS FOR THEIR GENEROUS DONATIONS AND/OR CONTRIBUTIONS OF MERCHANDISE OR SERVICES TO THE 22nd ANNUAL CONFERENCE

Sunday evening social provided by the Quality Deer Management Association in partnership with: American Cyanamid Company, Haas Outdoors Incorporated, International Paper Company and The Scotts Company.

Conference Sponsors

International Paper Company, Quality Deer Management Association, The Timber Company (Georgia Pacific), Wal-Mart

Conference Supporters

Buckmasters, University of Arkansas Cooperative Extension Service, Sightron, Inc.

Conference Contributors

Arkansas Game and Fish Foundation, Columbia Sewing Company, The Pickle Barrel Fudge Factory, Weyerhaeuser, Whitetail World

Conference Partners

Arkansas Big Buck Classic, Deer and Deer Hunting Magazine, Greenbay Packaging, Southwest Coon Hunters Association, Willamette Industries

Conference Boosters

API Outdoors, Arkansas Industrial Development Commission, Bass Pro Shops, Bill Lazenby, Buck Forage Food Plot Seed, Burris' Inc., Bushnell Sports Optics, Cabelas, Fayetteville Chamber of Commerece, Kent Starr, Knight Rifles, McKenzie Sports Products, Oneida Eagle Bows, Proline Archery Systems, Ranger Boats, Riceland Rice, Richard Ferrell, Ross Foundation, Smith and Wesson, Trailmaster, Inc., War Eagle Mill, Wellington, Tinks Hunting Products, Westvaco Corporation

THE SOUTHEAST DEER STUDY GROUP

The Southeast Deer Study Group was formed as a subcommittee of the Forest Game Committee of the Southeastern Section of The Wildlife Society. The first meeting was held as a joint Northeast-Southeast Meeting at Fort Pickett, Virginia, on September 6-8, 1977. Appreciating the economic, aesthetic, and biological values of the white-tailed deer (*Odocoileus virginianus*) 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. 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 in our region. The Deer Subcommittee was given full committee status in November, 1985, at the Southeastern Section of The Wildlife Society's annual business meeting.

SOUTHEAST DEER STUDY GROUP MEETINGS

Year	Location	Meeting Theme
1977	Fort Pickett, VA	-
1979	Mississippi State, MS	-
1980	Nacogdoches, TX	-
1981	Panama City, FL	Antlerless Deer Harvest Strategies
1982	Charleston, SC	-
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 'Um, What Are We Going To Do With ' Um?
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?

MEMBERS OF THE DEER COMMITTEE OF THE SOUTHEASTERN SECTION OF THE WILDLIFE SOCIETY

Name	State	Employer
Chris Cook	Alabama	Alabama Department of Conservation and Natural Resources
Michael E. Cartwright	Arkansas	Arkansas Game and Fish Commission
Robert E. Vanderhoof	Florida	Florida Game and Fresh Water Fish Commission
Stephen M. Shea	Florida	St. Joe Timberlands
Kent E. Kammermeyer	Georgia	Georgia Department of Natural Resources
John H. Phillips	Kentucky	Kentucky Department of Fish and Wildlife
David W. Moreland	Louisiana	Louisiana Department of Wildlife and Fisheries
L. Douglas Hotton	Maryland	Maryland Department of Natural Resources
Stephen Demarais	Mississippi	Mississippi State University
Larry Castle	Mississippi	Mississippi Department of Wildlife, Fisheries and Parks
Jeff Beringer	Missouri	Missouri Department of Conservation
J. Scott Osborne	North Carolina	North Carolina Wildlife Resources Commission
Kenneth L. Gee	Oklahoma	Samuel Roberts Noble Foundation

Michael G. Shaw	Oklahoma	Oklahoma Department of Wildlife Conservation
David C. Guynn, Jr.	South Carolina	Clemson University
Derrell A. Shipes	South Carolina	South Carolina Department of Natural Resources
Ben Layton	Tennessee	Tennessee Wildlife Resources Agency
E. L. "Butch" Young	Texas	Texas Parks and Wildlife Department
W. Matt Knox	Virginia	Virginia Department of Game and Inland Fisheries
Michael A. Coffey	Washington, D.C.	National Park Service
Jim Crum	West Virginia	West Virginia Department of Commerce, Labor and Environmental Resources

Program Agenda

SUNDAY, FEBRUARY 14, 1999

8am-4:30pm - Bass Pro Shop Outdoor World Field Trip (depart front entrance of Hilton Hotel)

1:00-6:00pm Registration - Hotel Lobby

3:00pm Southeast Deer Committee Meeting

Special Forum - Technical Session I - Human Dimensions and Deer Management
Moderator: ***Jeff Beringer***, MO Dept. of Conservation

4:00pm **Quality Deer Management - Ethical and Social Issues.**
Deborah Green, College of William and Mary and *Johnny Stowe*, SC Dept. of Natural Resources.

4:20pm **Balancing Public Values and Professional Expertise in Developing a Deer Management Plan for Virginia.**
Steve L. McMullin, VA Polytech. Inst. and State Univ.; *W. Matt Knox*, and *David E. Steffen*, VA. Dept. of Game and Inland Fisheries.

4:40pm **Costs of Evaluating Local Support for QDM in Shenandoah County, Virginia.**
David M. Kocka and *W. Matt Knox*, VA Dept. of Game and Inland Fisheries.

5:00pm **Arkansas Hunters' Opinions and Attitudes Toward Quality Deer Management.**
Michael E. Cartwright and *David F. Urbston*, AR Game & Fish Comm.; and *Mark D. Duda*, Responsive Management.

6pm-10pm Social/Arkansas-Style Barbecue

MONDAY, FEBRUARY 15, 1999

7am-5:00pm Registration - Hotel Lobby

8:00am **Welcome - *Donny Harris*,** Chief, Wildlife Management Division, AR Game & Fish Comm.

Keynote Address - *Larry Marchinton*, retired, Univ. of GA. "QDM: Philosophy, Prescription or Dogma?"

Announcements - *Don McKenzie*, Assistant Chief, Wildlife Management Division, AR Game & Fish Comm.

The Paper Selection Process - *Larry Hedrick*, U S D A, Forest Service.

Technical Session II - Moderator: *Marc Bara*, SC Dept. of Natural Resources

9:00am **Two Decades of Quality Deer Management by Anderson Tully Company - Where, Why, How and What.**
Mike Staten, *Tim Evans* and *Stan Priest*, Anderson Tully Company.

9:20am **QDM in Georgia is Most Successful on Private Clubs with Food Plots.**
Kent E. Kammermeyer, GA Dept. of Natural Resources.

9:40am **Saline River Association: Patience and Long-Term Data Collection Keys for Success.**
Doug R. Powell and *Morgan Richardson*, International Paper Company.

10:00am **Arkansas' Largest Deer Management Association: History, Results, Pros and Cons.**
Craig L. Viscardis and *Ronnie Ritter*, International Paper Company.

10:20am **Break**

Technical Session III - Moderator: *Micah Goldstein*, Georgia-Pacific Corporation, GA

10:40am **Can Quality Deer Management Succeed on Public Lands?**
Stephen S. Ditchkoff, Edgar R. Welch, Jr., Robert L. Lochmiller and *Ronald E. Masters*, OK State Univ.; and *William R. Starry*, McAlester Army Ammunition Plant; and *William C. Dinkines*, OK Dept. of Wildlife Conservation.

***11:00am** **Quality Deer Management in a Partial Enclosure: Insight from Seven Years of Research.**
Clayton K. Nielson, Southern Il. Univ.; *William F. Porter*, SUNY College; and *Steven Nelson*, Meriden, IA.

11:20am **Mandatory QDM Regulations - A Parade to Mediocrity.**
David W. Moreland, Anthony Vidrine and *Larry Savage*, LA Dept. of Wildlife and Fisheries.

11:40am **Evaluation of a Five-inch Regulation for Increasing Antler Size of Harvested Deer in Northwest Florida.**
Stephen M. Shea, St. Joe Timberlands and *Robert E. Vanderhoof*, FL Game and Fresh Water Fish Comm.

12:00pm **Lunch (On Your Own)**

Technical Session IV - Moderator: *Stephen M. Shea*, St. Joe Timberlands, FL

1:00pm **Biological Value of Oak Mast Proteins for White-tailed Deer.**
David G. Peitz and *Philip A. Tappe*, Univ. of AR at Monticello.

***1:20pm** **White-tailed Deer Forage Responses to Understory Hardwood Control in Mature Pine Stands.**
James R. Welch and *Karl V. Miller*, Univ. of GA; and *William E. Palmer*, Tall Timbers Rsh. Sta.

1:40pm **Testing the Diversity-Stability Hypothesis of White-tailed Deer Nutrition.**
Billy C. Lambert, Jr. and *Tim E. Fulbright*, Texas A&M Univ.

2:00pm **The Forestry Revolution - Intensive Forest Management Practices and Their Impacts on White-tailed Deer.**
Mark W. Thomas and *Pat Minogue*, American Cyanamid Company.

2:20pm **Age and Regional Differences in Antler and Body Characteristics of White-tailed Deer in Mississippi.**
Bronson K. Strickland and *Stephen Demarais*, MS State Univ.; and *Jim Lipe, Larry Castle*, and *Bill Lunceford*, MS Dept. of Wildlife, Fisheries and Parks.

2:40pm **Break**

Technical Session V - Moderator: *Morgan Richardson*, International Paper Company, AR

***3:00pm** **Preliminary Antler Performance of Translocated Northern White-tailed Deer in Southeastern Louisiana.**
Jonathan W. Day, Brian Zielinski and *Mark K. Johnson*, LA State Univ.

3:20pm **The Kerr Wildlife Management Area Penned Deer Research Studies - Application for Quality Management.**
William E. Armstrong and *Eugene Fuchs*, Texas Parks and Wildlife Dept.; and *John Williams*, Texas A&M Univ.

3:40pm **Presence or Absence of Brow Tines as a Predictor for Future Antler Characteristics in a Quality Deer Management Program.**
Kathy McGinty and *Eugene Fuchs*, Texas Parks and Wildlife Dept.; and *John Williams*, Texas A&M Univ.

4:00pm **The Effects of Genetic Selection During Nutritional Stress on Antler Production.**
John Williams, Texas A&M Univ.; and *Eugene Fuchs*, *Bill Armstrong* and *Donnie Frels*, Texas Parks and Wildlife Dept.

4:20pm **Predicting Gross Boone and Crockett Scores and Live Body Mass at Ages 2.5, 3.5, and 4.5 years in White-tailed Deer on the Basis of the Previous Year's Antler Characteristics and Body Mass.**
James R. Ott, *John Baccus*, *Scott Roberts*, *Paul Hendrix*, *Ronnie Kirchof* and *Lin Poor*, SW Texas State Univ.; and *Donnie Harmel*, *Eugene Fuchs* and *William Armstrong*, Texas Parks and Wildlife Dept.

4:40pm **Dinner (On Your Own)**

7:00 pm **Special Presentation:**
Michigan Tuberculosis Update: *James C. Kroll*, Stephen F. Austin State Univ.

7:30pm **Shoot From The Hip Session: Methods For The Protection Of Young Bucks: Short And Long Term Effects.**
Moderator: *Stephen Demarais*, MS State Univ.

TUESDAY, FEBRUARY 16, 1999

Technical Session VI - Moderator: *Bob McAnally*, AR Game & Fish Comm.

8:00am **The Lost Generation: Assessing the Impact of the 1993 Mississippi River Flood on Fawn Survival.**
Timothy L. Evans, *Mike Staten* and *Stan Priest*, Anderson Tully Company; and *Larry Savage*, LA Dept. of Wildlife and Fisheries.

***8:20am** **Mortality and Home Range of White-tailed Deer on Fort Chaffee Military Reservation, Arkansas.**
Gregory G. Humphreys, Deltic Timber Corp. and *Thomas A. Nelson*, Eastern Illinois Univ.

8:40am **Cyclic Patterns of Hemorrhagic Disease in Georgia White-tailed Deer.**
David E. Stallknecht, Univ. of GA.

9:00am **Answering Questions About Guns, Ammo, and Man's Best Friend.**
Charles R. Ruth, SC Dept. of Natural Resources and *Hayward Simmons, Jr.*, Cedar Knoll Club, SC.

***9:20am** **Effects of Hurricane Georges on Florida Key Deer.**
Roel R. Lopez, *Jason D. Sebesta* and *Nova J. Silvy*, Texas A&M Univ.

9:40am **Break**

Technical Session VII - Moderator: *Joe Hamilton*, Ducks Unlimited, SC

10:00am **Evaluation of Different Capture Techniques for White-tailed Deer.**
Daniel S. Coggin, FL Game and Fresh Water Fish Comm. and *Harry A. Jacobson*, Consultant.

10:20am **A Manpower-efficient Drop-net System for Capturing White-tailed Deer.**
Kenneth L. Gee and *John Holman*, Noble Foundation; and *Stephen Demarais*, MS State Univ.

10:40am **Pregnancy Diagnosis in White-tailed Deer: A Comparison of Four Blood-based Tests.**
David A. Osborn, Jonathan W. Gassett, Karen A. Dasher and *Karl V. Miller*, Univ. of GA; and *Jose Sulon* and *Jean-Francois Beckers*, Univ. of Liege, Belgium.

11:00am **Can We Reliably Estimate Deer Age Distribution From Jawbones? The Debate Continues.**
James C. Kroll, Ben H. Koerth and *P.R. Blackwell*, Stephen F. Austin State Univ.

***11:20am** **A Portable Drop Net for Capturing Urban Deer.**
Jason D. Sebesta, Roel R. Lopez and *Nova J. Silvy*, Texas A&M Univ.

11:40am **Lunch (On Your Own)**

Technical Session VIII - Moderator: *Ben Layton*, Tennessee Wildlife Resources Agency

***1:00pm** **Do Deer Detect Estrus by Visual or Olfactory Cues?**
Jonathan W. Gassett, Karen A. Dasher, David A. Osborn and *Karl V. Miller*, Univ of GA.

***1:20pm** **Variations in Bacterial Fauna May be Responsible for Individual-specific Tarsal Odors.**
Karen A. Dasher, Jonathan W. Gassett, Scott M. Russell, David A. Osborn and *Karl V. Miller*, Univ. of GA.

***1:40pm** **Use of Agricultural Lands by White-tailed Deer: Use Areas and Habitat Selection.**
Jeannine A. Tardiff, and *Richard A. Lancia*, NC State Univ.; and *Mark C. Conner*, Chesapeake Farms.

2:00pm **Evaluation of Deer Damage to Soybean Production Using Field Observations and Remote Sensing.**
Lisa I. Muller, DE State Univ.; *Christopher S. Rosenberry*, Kent Conservation; *Mark C. Conner*, Chesapeake Farms; *Jeannine Tardiff*, NC State Univ.; and *Gyasi A. Quince*, VA Polytech. Inst. and State Univ.

2:20pm **The Role of a Late-winter Deer Health Study in a 34,000-acre Quality Deer Management Program in Calhoun County, Arkansas.**
Charles A. Self, International Paper; *David F. Urbston,* AR Game and Fish Comm.; and Philip Tappe, Univ. of AR at Monticello.

2:40pm **Break**

Technical Session IX - Moderator: *Mark Clark*, AR Game & Fish Comm.

***3:00pm** **Movement Patterns and Habitat Use of Female White-tailed Deer Associated with an Urban Park.**
Marrett D. Grund, Southern IL Univ.; *Ernie P. Wiggers*, Univ. of MO; and *Jay B. McAninch*, Congressional Sportsmen's Foundation.

3:20pm **Single Strand Fences to Control Deer Damage to Soybeans in Tennessee.**
Charles E. Dixon, Univ. of TN.

3:40pm **An Assessment of an Urban Deer Management Program (1992-1998) in Lynchburg, Virginia.**
Jay C. Jeffreys, W. Matt Knox and *J. A. Bowman*, VA Dept. Game and Inland Fisheries; and *C. T. Carter*, Lynchburg Police Dept.

4:00pm **Urban Deer Research in Sea Pines, Hilton Head Island, South Carolina: Public, Political, and Legal Hurdles.**
David W. Henderson and *Robert J. Warren*, Univ. of GA; and *Charles R. Ruth*, SC Dept. of Natural Resources.

4:20pm **Movements of White-tailed Deer in an Urban Landscape: A Management Perspective.**
Howard J. Kilpatrick and *Shelley M. Spohr*, CT Wildlife Div.

4:45pm **Business Meeting**

6:00pm **Social Hour - Garland Room**

7:00pm **Banquet - Sequoyah Ballroom**

WEDNESDAY, FEBRUARY 17, 1999

8:00am **White Rock Bear Den Field Trip (depart front entrance of Hilton Hotel).**

8:00am **Buffalo River Elk Field Trip (depart front entrance of Hilton Hotel).**

4:00pm **Return to Hotel.**

Indicates Student Paper

ABSTRACTS

SUNDAY, FEBRUARY 14, 1999

Special Forum - Technical Session I - Human Dimensions and Deer Management. Moderator: *Jeff Beringer*, Missouri Department of Conservation.

4:00pm

QUALITY DEER MANAGEMENT - ETHICAL AND SOCIAL ISSUES.
Deborah Green, College of William and Mary and *Johnny Stowe*, South Carolina Department of Natural Resources

Quality Deer Management (QDM) is emerging as a new paradigm for managing white-tailed deer populations. Examining ethical and social issues is an integral part of evaluating QDM theory and practice. Hunters' perceptions of QDM often differ from wildlife managers', especially with respect to the role of trophy deer, yet hunters' full cooperation is essential to successful QDM. Implementing increasing antlerless harvest while restricting buck harvest requires changes in hunters' attitudes and behaviors. We address these human dimensions by analyzing both professional research (from journals, conference abstracts, and technical reports) and popular articles (in magazines, newspapers, and Internet sites) about QDM for explicit and implicit ethical and social themes. Issues include the significance of trophy deer in hunter motivation and public perceptions of hunting, concerns about increasing privatization and elitism, enforcing QDM principles through regulation, and economic consequences of QDM. We discuss implications of these issues for wildlife managers, including suggestions for further research and for educating hunters and the public.

4:20pm

BALANCING PUBLIC VALUES AND PROFESSIONAL EXPERTISE IN DEVELOPING A DEER MANAGEMENT PLAN FOR VIRGINIA.
Steve L. McMullin, Virginia Polytechnic Institute and State University; *W. Matt Knox* and *David E. Steffen*, Virginia Department of Game and Inland Fisheries

Public attention to white-tailed deer is arguably greater than the interest exhibited for any other species of wildlife in Virginia. Implications of management of Virginia's most popular game species range from welcome public viewing opportunities to serious damage and public safety concerns. In February 1996, the Virginia Department of Game and Inland Fisheries

(VDGIF) initiated development of a statewide deer management plan using a process that emphasized stakeholder participation in making value choices (defining goals) and involvement of wildlife professionals in developing management strategies. A 19-member independent advisory Committee, representing a cross section of Virginia stakeholders and VDGIF staff, drafted the plan. Deer population objectives based on local cultural carrying capacities were developed at six regional meetings. Distribution of 50,000 summaries of the draft plan in tabloid newspaper format ensured broader public involvement. The VDGIF policy-making Board, which was treated as an important stakeholder group, endorsed the updated plan in July 1998 without significant change or controversy. Although the final plan does not differ significantly from what VDGIF biologists would have developed by themselves, the alternative planning approach amplified the role of stakeholders in development of the plan and resulted in increased acceptance by the public and the Board. Deer program priorities are now agreed to by stakeholders, the public, and the VDGIF. Incorporating diverse interests into the planning process in Virginia produced a long-range plan that VDGIF staff can implement with greater confidence of public support.

4:40pm

COSTS OF EVALUATING LOCAL SUPPORT FOR QDM IN SHENANDOAH COUNTY, VIRGINIA.

David M. Kocka and *W. Matt Knox*, Virginia Department of Game and Inland Fisheries

Increasing interest throughout the southeast in quality deer management (QDM) is resulting in more states evaluating support for implementation of QDM on a county-wide basis. Little or no data exist on the costs associated with these evaluations. Shenandoah is the first county in Virginia where support for a county-wide QDM initiative on private lands is being evaluated. In January 1998, the Wildlife Division created a draft Department protocol for evaluating county-wide QDM requests by the public. Based on this protocol, Department work in Shenandoah County included: the preparation of articles on QDM for local newspapers, educational seminars for landowners and sportsmen, and administration of landowner and hunter surveys to evaluate support for the initiative. Three educational seminars were conducted prior to administering the surveys and cost $104, not including staff time. More than 400 interested persons attended these seminars. From County tax records, all resident landowners owning > 50 (non-industrial) acres were mailed a survey (n=755). Landowner survey material costs (e.g. copying, mailing labels, mail-out and business-reply postage) were $1.38 per survey unit. County tax records could not be obtained electronically so an additional $.28 per survey unit was spent to manually create the address database. A 79% landowner response rate was achieved. Of the 3,124 resident hunters living in the County during 1997, a random sample was drawn of 1,400 persons to receive a hunter survey. A response rate of > 60% was achieved. Materials costs for the hunter survey was $1.36 per survey unit. To reduce demands on staff time, an hourly

employee was hired through a temporary employment service to prepare mailings and to database the returned surveys. This hourly employee increased survey costs by an additional $.48 per survey unit. Despite the use of hourly personnel, over 364 hours of Agency staff time were devoted to this evaluation. The total cost of evaluating interest in Shenandoah County for QDM to the Department, including personnel time, was greater than $13,000. Results of the evaluation and cost breakdown will be discussed.

5:00pm

ARKANSAS HUNTERS' OPINIONS AND ATTITUDES TOWARD QUALITY DEER MANAGEMENT.

Michael E. Cartwright and *David F. Urbston*, Arkansas Game and Fish Commission; and *Mark D. Duda*, Responsive Management

Resident licensed hunters were surveyed in February 1997 and January 1998 to obtain information on hunter opinions and attitudes toward deer management, with some emphasis on quality deer management (QDM) strategies. The survey instrument was a post season telephone interview of randomly selected resident hunting license holders. In 1997, over 67 % of the respondents supported QDM strategies for selected wildlife management areas even if it meant fewer hunters allowed, fewer hunting days, fewer deer legal for harvest, an increased antlerless harvest, and antler restrictions for bucks. In 1998, 85 % of respondents defined a quality buck as one with ≥ 8 points or ≥ 16 inch inside spread. Most (71%) were willing to give up the opportunity to shoot small antlered bucks in order to have larger antlered bucks in later years. Greatest support (≥ 62%) was for the following buck harvest strategies: (1) hunter's choice for first buck with a minimum of 4 points on one antler for the second buck and (2) one buck with a modern firearm. Strategies most opposed (≥ 54%) included: (1) quota buck permits, (2) reducing hunting days and (3) reducing the buck limit. Antlerless harvest strategies that had the greatest support (≥70%) included: (1) zone quota antlerless bonus permits and (2) limited either-sex days with modern firearms. Strategies opposed the most (≥ 52%) included: (1) unlimited antlerless bonus permits, (2) either-sex days for the entire modern firearms season and (3) increased bag limits. Information from the 1998 survey indicated support for QDM.

MONDAY, FEBRUARY 15, 1999

Technical Session II - Moderator: *Marc Bara*, South Carolina Department of Natural Resources.

9:00am

TWO DECADES OF QUALITY DEER MANAGEMENT BY ANDERSON TULLY COMPANY - WHERE, WHY, HOW AND WHAT.

Mike Staten, *Timothy L. Evans* and *Stan Priest*, Anderson Tully Company

Anderson-Tully Company (ATCO) records show that the first deer management programs were tried in the late 1960s, but were discontinued. By the late 1970s, with the help of state biologists, some larger clubs and at least one large association of clubs began deer management programs with the goal of increasing quality. Trophies were downplayed, but increasing the number of 2.5 year old bucks was encouraged.

Forests owned and managed by ATCO are dependent upon natural regeneration of hardwoods to be sustainable, but deer can negatively alter the desirable species composition of a managed forest. In 1987, ATCO made the decision that deer should be managed on all company lands. Quality Deer Management was chosen to maintain the balance between the deer herd and its habitat.

By summarizing the data from 1987 to 1997, we find that almost 63,000 deer data sets have been collected and processed. Deer harvest numbers remain constant with an average of one deer per 54 acres harvested. Buck harvest numbers have decreased from a buck per 93 acres in 1987 to a buck per 111 acres in 1997. Doe harvest has increased from a doe per 115 acres in 1987 to a doe per 100 acres in 1997. The percentage of bucks aged 2.5 years and older has increased from 40% in 1987 to 81% in 1997. From 1987 to 1997, average age has increased from 2.1 years to 2.8 years, average live weights have increased from 136 pounds to 163 pounds, and average antler quality has increased by 55%. Forest regeneration now includes a more diverse composition of desirable tree species

9:20am

QDM IN GEORGIA IS MOST SUCCESSFUL ON PRIVATE CLUBS WITH FOOD PLOTS.

Kent E. Kammermeyer, Georgia Department of Natural Resources

Quality deer management (QDM) programs were compared among 13 public and private areas. Data sets include 6 piedmont and upper coastal plain state operated wildlife management areas (WMAs) with < 0.5% (low) in food plots, 4 private QDM clubs with >1.5% in food plots (high) and 3 with < 0.5% in food plots (low), all in the piedmont. Criteria for selection included participation in a bona fide QDM program for a minimum of 5 years and complete kill data records including age of deer. The following parameters were compared per mi^2: quality buck kill (quality buck defined as 2 ½ years or older), doe kill, button kill, and total kill. Ratio of does per quality buck was also tested. Quality buck kill on private clubs (3.7 per mi^2) with high food plots was significantly greater ($P \leq 0.05$) than that of WMAs (1.4/mi^2), or private clubs with low food plots (1.0/ mi^2). Doe kill per mi^2 was significantly greater ($P \leq 0.05$) on both private lands groups (11.1 and 6.7) than on WMAs (2.6). Total deer kill was greatest ($P \leq 0.05$) on private lands with food plots (17.3/ mi^2) versus 8.9/ mi^2 on clubs with low plots and 4.8/ mi^2 on QDM WMAs with low plots. There was no difference ($P > 0.05$) in button buck kill among the 3 groups. The doe kill/quality buck kill ratio was greatest ($P \leq 0.05$) on private clubs with low plots (11.2) versus clubs with high plots (2.9) and QDM WMAs (1.8). Regression equations revealed no significant relationship ($P > 0.05$) between total size of properties and quality buck kill per mi^2, despite a range of 1.2 /mi^2 to 31.3 / mi^2 public or private. Anecdotal comparison indicated a voluntarily reported 1997 quality buck kill in Dooly County of 0.2/ mi^2, which was lower than all other properties compared. A WMA which was returned from QDM to traditional management produced 2.9 quality bucks per mi^2 in 1997 – higher than all QDM WMAs and 3.6 times its harvest total (0.8/ mi^2) in 1996 – its last year of QDM. This indicates large numbers of quality bucks were in the population from past QDM efforts and were killed by increased hunting pressure. In general, the data indicates that relatively small private clubs with a committed membership, agricultural food plots, and voluntary antler restrictions produced more quality bucks per mi^2 than larger, heavily wooded public WMAs with regulated minimum antler sizes of 4 points on a side.

9:40am

SALINE RIVER ASSOCIATION: PATIENCE AND LONG - TERM DATA COLLECTION KEYS FOR SUCCESS.

Doug R. Powell and *Morgan Richardson*, International Paper Company

A voluntary quality deer management (QDM) program was implemented on 9 clubs in 1991 on a contiguous 20,000-acre block of the Saline River bottoms in Arkansas. Objectives included improving hunter satisfaction and the quality of the deer herd, specifically buck quality. Initial data suggested an abundant deer herd near carrying capacity with few mature bucks. Management recommendations designed to protect young bucks and improve herd health were made (doe harvest 100 to 200, protect bucks with less than 6 points and a 12-inch beam). Overall, harvest increased more than 50% primarily from increased doe

harvest. Doe harvest increased from 1 doe to 3 bucks to a harvest ratio of about 1 to 1. Buck harvest has remained relatively stable, while average antler size more than doubled (3-point, 7-inch beam, and Kroll Index 43 to a 7-point, 14-inch beam, and Kroll Index 90). Four of the five largest bucks harvested in Grant County (N=1531) in 1997 were taken from this area. An Epizootic Hemorrhagic Disease (EHD) outbreak in 1994 appears to have depressed lactation rates and body weights. These parameters dropped in 1994 with recovery seen in 1995 and 1996. Without a long term data set this program would have appeared to be a failure in terms of herd health. A long term data set and commitment to QDM were keys to success for this area. A mail survey in 1996 showed 88% of club members had a satisfying hunting experience and 77% supporting QDM.

10:00am

ARKANSAS' LARGEST DEER MANAGEMENT ASSOCIATION: HISTORY, RESULTS, PROS AND CONS.

Craig L. Viscardis and *Ronnie Ritter*, International Paper Company

Arkansas' largest privately owned and operated deer management association was formed by International Paper (IP) in 1990. Together, IP and 22 hunting clubs leasing a fairly contiguous block of IP land formed the Graysonia Deer Management Association (GDMA). Hunters began to learn the fundamentals of quality deer management: habitat, protection, and intelligent harvest. Through a continuing education process, over sixty gates were constructed and paid for by the clubs at a cost of over $43,000. Harvest data collection has increased from 11 clubs providing 156 records on 26,000 acres in 1990 to 37 clubs providing over 500 records on almost 70,000 acres in 1997. The percentage of 2.5+ year old bucks has increased over 20%, and adult doe lactation has increased to over 72%. Buck harvest guidelines have evolved from a buck of choice to only bucks meeting a 6-12 guideline. With thirty-seven hunting clubs collecting data on almost 70,000 acres for eight years, this is one of the most complete and comprehensive ongoing data sets available in Arkansas. The deer management is the easy part; coordinating 800 hunters with various management philosophies is the difficult part. Although other barriers exist, the largest barrier in the last eight years has been overcome since the statewide three points on one side regulation. After the announcement of the new buck harvest regulation, deer management acceptance has already increased from 50% to over 73%. The GDMA is a true case study in hunter perceptions and the state's progression toward quality deer management.

Technical Session III - Moderator: *Micah Goldstein*, Georgia-Pacific Corporation.

10:40am

CAN QUALITY DEER MANAGEMENT SUCCEED ON PUBLIC LANDS?
Stephen S. Ditchkoff, Edgar R. Welch, Jr., Robert L. Lochmiller and *Ronald E. Masters,* Oklahoma State University; and *William R. Starry*, McAlester Army Ammunition Plant; and *William C. Dinkines*, Oklahoma Department of Wildlife Conservation

Quality deer management programs have become prevalent across the southeastern United States in recent years, but the vast majority of these programs are located on private lands (hunting clubs, ranches, etc.). As a result, the question of whether quality deer management programs can be successfully implemented on public lands needs further assessment. We describe the quality deer management program at the McAlester Army Ammunition Plant in southeastern Oklahoma, a public hunting area, and compare harvest data collected before and after quality deer management began in 1989. The McAlester Army Ammunition Plant is an 18,212 ha facility that is open to public hunting by lottery. Its quality deer management program is unique because it does not impose harvest restrictions or significantly limit the number of hunters to achieve harvest goals. Rather, hunters are limited to traditional archery equipment (recurve or longbow) to control hunter success but provide maximum hunter opportunity. A centrally located 4,500 ha refuge and an antlerless harvest system that encourages, not requires, hunters to harvest does are also important aspects of the program. Hunter success at McAlester has been about 10% since limiting hunters to traditional archery equipment. However, improvement in herd quality is exemplified by increases in male body mass (16.3%), female body mass (10.9%), basal circumference (12.7%), antler points (9.0%), beam length (5.6%), and male age (11.5%). As a result, hunter support for the program is strong, suggesting that quality deer management on public lands is feasible, but creative strategies may be required to ensure success.

*11:00am

QUALITY DEER MANAGEMENT IN A PARTIAL ENCLOSURE: INSIGHT FROM SEVEN YEARS OF RESEARCH.
Clayton K. Nielson, Southern Ilinois University; *William F. Porter*, State University of New York; and *Steven Nelson*, Meriden, Iowa

Quality deer management (QDM) is often initiated by private landowners wishing to manage deer populations on their lands separately from the surrounding landscape. Deer-proof fences allow for strict management and control over deer movements; however, many private landholdings can not be completely enclosed because of public streams or roadways. We

focused on population dynamics, nutritional condition, and movements of deer relative to the partial enclosure. Population density was 86 deer/km^2. Despite the high level of nutritional supplementation on the study area, harvested males weighed >5 kg less than other western New York deer. Emigration of 37 radio-marked yearlings was low relative to unfenced populations (23%); however, emigration increased to 64% at 30 months of age. Research during Phase II (1995-98) consisted of implementing harvest management to reduce population density and balance the adult sex ratio. We also monitored condition of deer as nutritional supplementation ceased. Revised estimates of carrying capacity (K) on the study area (50-70 deer/km^2) indicate nutritional supplementation biased original estimates of K >3-fold. During 1995-96, population density decreased 5-fold due to increased mortality via harvest and severe winter conditions. Improvements in antler characteristics and natality during 1997-98 suggest that current deer density may be desirable for QDM. We conclude with a discussion of the efficacy of the partial enclosure to facilitate QDM.

11:20am

MANDATORY QDM REGULATIONS - A PARADE TO MEDIOCRITY.

David W. Moreland, Anthony Vidrine and *Larry Savage*, Louisiana Department of Wildlife and Fisheries

Louisiana lies in a precarious position concerning quality deer management. The Bayou State is bordered on the west by Texas, a longtime leader in trophy deer management. On the east is Mississippi, with a mandatory four-point antler restriction. To the north is Arkansas, a recent entry into mandatory QDM with its three-point rule. Will Louisiana follow the trend toward mandatory QDM? Many clubs and landowners in the state presently practice QDM on a voluntary basis and their efforts are producing positive results. Of the seventy-one deer listed in the Louisiana Big Game Records in the Gun Division, Typical Antlers Category, 38% have been killed during the 1990's. Mandatory buck regulations, especially ones that are based on antler points, remove management options available to the biologist. In Louisiana, deer herds are dependent upon the native habitat for body growth and antler development. Very few clubs or landowners feed or plant year-round for deer. DMAP data indicate that branched-antler yearling bucks weigh more than yearling bucks with spikes. Yearling bucks in the upper end of this age class *i.e.*, those with good antler development and body weights, would be subject to harvest under four-point or three-point regulations. Yearlings on the lower end of the scale would be protected by these regulations and would be allowed to move up into the older age classes. Harvest data from Louisiana clubs, however, suggest that these small yearling bucks do not *catch up* and develop into the quality bucks that hunters really desire. Voluntary programs are still necessary to protect these better yearling bucks. With the present success being achieved, Louisiana biologists are very hesitant to adopt mandatory QDM regulations.

11:40am

EVALUATION OF A FIVE-INCH REGULATION FOR INCREASING ANTLER SIZE OF HARVESTED DEER IN NORTHWEST FLORIDA.

Stephen M. Shea, St. Joe Timberlands and *Robert E. Vanderhoof*, Florida Game and Fresh Water Fish Commission

The Florida Game and Fresh Water Fish Commission implemented a five-inch antler restriction on the harvest of male white-tailed deer (Odocoileus virginianus) beginning in 1994. Prior to this regulation change, legal bucks were required to have a minimum of one-inch of visible antler above the hairline. We evaluated this regulation change for its efficacy to increase the mean antler size of harvested deer in northwest Florida. Antler beam lengths, circumferences, and points of 2,868 deer harvested on 13 wildlife management areas (WMAs) in northwest Florida were collected between 1985 and 1997. Additionally, antler beam lengths, circumferences, and points of 26 known-aged Florida deer in Tyndall Air Force Base's Deer Research Facility were measured at 1.5 years and 2.5 years of age between 1993 and 1998. Antler beam length, circumference, and points of deer harvested on WMAs increased significantly ($P < 0.001$) after implementation of the five-inch harvest restriction. Mean beam length, circumference, and points increased from 20.1 cm to 23.5 cm, 5.7 cm to 6.2 cm, and 4.0 to 4.4, respectively. Some increase in antler dimensions was expected because the five-inch restriction allowed a greater number of deer to reach the 2.5-year age class. The mean age of bucks increased significantly ($P < 0.001$) from 2.24 years to 2.41 years after the five-inch restriction was implemented. Although, the mean antler dimensions of harvested deer increased as a result of age structure improvement, the antler dimensions of 2.5 year-old bucks decreased significantly ($P < 0.05$). Mean antler beam length, circumference, and points of 2.5 year-old bucks decreased from 27.1 cm to 26.2 cm, 6.5 cm to 6.3 cm, and 4.9 to 4.5, respectively. Analyses of penned deer antler data revealed that 86% of the variation in beam lengths and 66% of the variation in beam circumferences of 2.5-year-old deer could be explained by the size of these antler parameters at 1.5 years of age.

These data suggest that deer, which produce comparatively large antlers at 1.5 years of age, are likely to produce comparatively larger antlers at 2.5 years of age. The lower antler measurements observed in 2.5-year-old deer after implementation of the five-inch antler restriction most likely resulted from high-grading the 1.5-year-old age class (i.e., selective harvest of yearlings with the largest antlers leaving only the smallest antlered yearlings to recruit to the older age classes). Analyses of penned deer data revealed significant relationships ($P < 0.001$) between birth date and antler beam length, circumference, and points of 1.5 and 2.5-year-old deer. Comparisons of birth dates and mean antler dimensions indicate that antler mass is greater for earlier born deer at both 1.5 and 2.5 years of age. Therefore, the five-inch antler restriction protects a greater percentage of late-born deer having less than 5-inch antlers as yearlings. These deer subsequently have smaller antler

dimensions when 2.5 years old. Our data suggest that the five-inch antler restriction places disproportionate harvest pressure on early-born deer, which has caused a reduction in the mean antler mass of 2.5-year-old bucks in northwest Florida. Evaluation of other minimum antler size harvest restrictions may be necessary to prevent high-grading within the yearling age class. Minimum antler size harvest restrictions implemented to increase antler size should be evaluated to ensure that they protect at least most of the yearling age class.

Technical Session IV - Moderator: *Stephen M. Shea*, St. Joe Timberlands.

1:00pm

BIOLOGICAL VALUE OF OAK MAST PROTEINS FOR WHITE-TAILED DEER.
David G. Peitz and *Philip A. Tappe*, University of Arkansas at Monticello

Many studies have analyzed various nutritional components of oak (*Quercus* spp.) mast, including protein concentrations, and the influence of forest stand condition on overall mast production. However, none have assessed the critical factor of protein quality (essential amino acid concentrations) of oak mast available to white-tailed deer (*Odocoileus virginianus*). Therefore, we evaluated protein quality of cherrybark *(Q. pagoda*) and white oak (*Q. alba*) mast at two different basal area levels. In addition, percent crude protein, crude fat, crude fiber, dry matter, moisture, and mineral contents were analyzed. Oak mast was collected from a minimum of 15 cherrybark and 15 white oak trees on forested stands of high (21.4 - 22 m2/ha) and low (11.5 - 15.3 m2/ha) basal area. Fat and mineral content of cherrybark oak mast, and crude protein and moisture content of white oak mast varied between stands. Protein quality differed by basal area for white oak mast, but not for cherrybark oak mast. Biological values of oak mast protein for deer calculated from essential amino acid concentrations were similar between cherrybark and white oak species and same species oaks growing on stands of varied basal areas. Therefore, thinning a cherrybark or white oak stand may increase mast production but has little effect on the biological value of oak mast produced.

*1:20pm

WHITE-TAILED DEER FORAGE RESPONSES TO UNDERSTORY HARDWOOD CONTROL IN MATURE PINE STANDS.

James R. Welch and *Karl V. Miller*, University of Georgia; and *William E. Palmer*, Tall Timbers Research Station

We assessed potential use of imazapyr (Arsenal®), mowing, chopping, and burning alone and in combination to control hardwood understory in "open" pine stands in the Red Hills region of south Georgia and north Florida. Two independent sites and study designs were used to evaluate treatment response. On Tall Timbers Research Station, we used a blocked design with 3 blocks and each of 7 possible treatment plots (0.75ha/plot) replicated once per block (burn, herbicide, herbicide+burn, mow, mow+burn, chop, and chop+burn). On Foshalee Plantation, 14 plots, varying in size from 2 - 8ha, were selected at random, treated with imazapyr during October 1997, and burned the spring of 1998. Plots at both locations were sampled systematically pre- and post- treatment during the summers of 1997 and 1998. Plant species were ranked according to deer preference based on previously published rankings. At 1 year post-treatment, herbaceous, vine and woody vegetation considered to be preferred by deer was lowest on herbicide and herbicide+burn plots. Ragweed, a highly preferred deer forage, was most abundant on herbicide and herbicide+burn plots but did not differ in abundance on other treatment plots. Overall, preferred deer forage was less abundant on herbicide treated plots than on other treatment plots. Although herbicide treatments had lower amounts of deer forage at 1 year post-treatment, the dramatic reduction of hardwood sprouts on these plots likely will result in higher forage abundance in subsequent years.

1:40pm

TESTING THE DIVERSITY-STABILITY HYPOTHESIS OF WHITE-TAILED DEER NUTRITION.

Billy C. Lambert, Jr. and *Tim E. Fulbright*, Texas A&M University - Kingsville

A widely accepted concept in habitat management is that plant diversity plays a key role in white-tailed deer nutrition. An alternative hypothesis is that white-tailed deer maintain high nutritional quality and seasonally stable diets through selective foraging. We selected seven 1,850-acre study sites on the Galvan ranch in Webb County, Texas. Vegetation species richness and beta diversity (changes in diversity between points in the landscape) were determined by vegetation sampling during spring, summer, and fall 1997. White-tailed deer fecal piles were also collected from each area during each season. Fecal nitrogen (N) and fecal diaminopimelic acid (DAPA) were used to index dietary quality, and microhistological analysis was used to determine diet composition. Based on microhistological analysis results, diets were reconstructed and nutritional analyses on diets were performed.

Regression analysis was used to determine the relationships between habitat diversity (total species richness, browse species richness, and beta diversity) and dietary quality (fecal N, DAPA, dietary N, diet digestibility), habitat diversity and diet diversity, and diet diversity and diet quality. Preliminary data indicate weak and inconsistent relationships between diversity variables and diet quality. White-tailed deer may be able to maintain similar diet nutritional quality across habitats varying in levels of diversity through selective foraging.

2:00pm

THE FORESTRY REVOLUTION - INTENSIVE FOREST MANAGEMENT PRACTICES AND THEIR IMPACTS ON WHITE-TAILED DEER.

Mark W. Thomas and *Pat Minogue*, American Cyanamid Company

During the last decade, forest management in the southeastern United States has undergone a revolution. Modern, environmentally friendly and highly selective herbicides were developed that caused a virtual displacement of the bulldozer with the helicopter for site preparation. New silvicultural treatments like herbaceous weed control, conifer release, mid-rotation release and late-rotation release were invented. Wildlife habitat enhancement treatments that increase white-tailed deer preferred food plants by over 30-fold were perfected. This research examines a 3,350 acre Treasure Forest located near Brent, Alabama, in Bibb County. The area came under professional white-tailed deer management in 1985 through the Alabama Cooperative Deer Management Assistance Program (ACDMAP), with the adoption of the Quality Deer Management Association (QDMA) philosophy occurring in 1991. A total of 1,076 deer were harvested during the 12-year period, including 894 does and 182 bucks, with an average of 90 deer per year. An average of 75 does and 15 bucks were harvested annually. During the six year period under the ACDMAP regime, a total of 124 bucks were harvested, or an average of 21 per year. Most of these bucks were spike or fork-horns. During the six year period under the QDMA management regime, a total of 58 bucks were harvested, or an average of 10 per year. Although approximately half as many bucks were harvested under the QDMA regime, they all had at least 8 points or more. Average body weight of harvested deer overall has declined over the years, however. In 1988, average body weight for all deer harvested was 118 pounds. By 1995, average body weights had been found to have declined by 30 pounds, to only 88 pounds. An ever-increasing deer population and the difficulty in regulating the doe population has led to habitat depletion, even with increased carrying capacity due to intensive forest management activities. Annual adjustments to the doe harvest must be considered in order to reduce the total deer population and positively impact the buck to doe ratio. Control of low quality understory hardwoods with herbicides that enhance native plants, cool dormant-season prescribed fire, broadcast fertilization of native plants that increase the protein content and the installation of supplemental agricultural food plots all need to be considered to enhance the habitat preferred by white-tailed deer.

2:20pm

AGE AND REGIONAL DIFFERENCES IN ANTLER AND BODY CHARACTERISTICS OF WHITE-TAILED DEER IN MISSISSIPPI.
Bronson K. Strickland and *Stephen Demarais*, Mississippi State University; and *Jim Lipe*, *Larry Castle*, and *Bill Lunceford*, Mississippi Department of Wildlife, Fisheries and Parks

Inherent soil fertility differences among physiographic regions could differentially impact the application of harvest restrictions based on antler characteristics. A better understanding of how physiographic regions affect age-related physical development could aid in selecting harvest restrictions. We analyzed 1993-1997 harvest data from Mississippi's Deer Management Assistance Program consisting of over 40,000 bucks $\geq$ 1.5 years from 11 physiographic regions in Mississippi. We used a 2-way, unbalanced, ANOVA to test the effects age and physiographic region have on body mass and an antler quality index (sum of inside spread, number of points, main beam lengths, and basal circumferences for each deer). Significant interactions indicated these variables develop differently among physiographic regions. We describe the age effects within regions ($P < 0.001$) and region effects within age classes ($P < 0.001$). We also estimated the percentage of bucks protected in 1.5, 2.5, and 3.5+ age classes for each region if increments of inside spread, main beam length, or number of points were used as harvest-regulation criteria. We discuss potential differences in age composition resulting from selective harvest restrictions based on antler characteristics.

Technical Session V - Moderator: *Morgan Richardson*, International Paper Company.

*3:00pm

PRELIMINARY ANTLER PERFORMANCE OF TRANSLOCATED NORTHERN WHITE-TAILED DEER IN SOUTHEASTERN LOUISIANA.
Jonathan W. Day, *Brian Zielinski* and *Mark K. Johnson*, Louisiana State University

White-tailed deer antlers are valuable as trophies of the hunt, opportunities for financial gain, and as insight into the biological realm of a deer. Quality deer management is a growing movement intended to increase the age structure and antler size of harvested bucks. Many people, however, are interested in shortcuts to quality deer production. Translocation has been proposed as a method to increase antler size along with body size and genetic variability of a population. We translocated 24 male white-tailed deer from Wisconsin to the Golden Ranch Plantation in southeastern Louisiana from January 1996 to February 1997 to assess the feasibility of augmenting a deer population with translocated individuals. Antler point

development was monitored through visual observations for two years. Point data for translocated deer were compared to native, hunter killed deer on the study site and to pen-raised Louisiana and Wisconsin bucks in order to compare actual versus potential performance. Results from the overall analysis of variance determined significant age, and status (wild vs. pen-raised) effects ($P > 0.05$). There was no significant difference between Louisiana and Wisconsin bucks' antler points in the overall model ($P = 0.31$). Within the 2.5-year-old age class, translocated Wisconsin bucks had significantly fewer points than pen-reared Louisiana and Wisconsin bucks and wild deer at Golden Ranch. Within the 1.5-year-old age class, translocated Wisconsin bucks were not significantly different from wild deer at Golden Ranch, but had significantly fewer points than pen-raised deer from both states. Two years post-release, translocated Wisconsin deer did not develop the superior antlers they were genetically capable of. Limiting factors could include nutrition, climate, translocation stress, or an environment x genetics interaction. Implications for future translocation projects are discussed.

3:20pm

THE KERR WILDLIFE MANAGEMENT AREA PENNED DEER RESEARCH STUDIES - APPLICATION FOR QUALITY MANAGEMENT.

William E. Armstrong and *Eugene Fuchs*, Texas Parks and Wildlife Department; and *John Williams*, Texas A&M University

Since 1974, the Texas Parks and Wildlife Department's Kerr Wildlife Management Area has been involved in a series of studies designed to determine the role of nutrition and/or genetics in antler development. There have been seven major studies involving 1,016 male and 889 female deer. It is the intent of this paper to place these studies in context as related to management decisions. Major studies include: Effects of Nutrition on Antler Development, Genetics Role in Antler Development, Spike vs. Fork Antlered Yearlings Antler Status in Later Years, Heritability Estimates, Effects of Genetics Vs. Environment on Antler Development, Spike Line Selection Study, and Effects of Early Weaning on Fawn Survival. Other factors suspected of influencing antler growth such as effects of age of doe and time of birth have also been examined. While data from all studies have been independently analyzed, when all studies are viewed as a whole, it becomes evident that antler development in white-tailed deer is genetically based, heritable, and environmentally influenced. Studies also indicate that, within cohorts, yearling antler status is a reliable predictor of future antler production. Implications of selective spike harvest vs. spike protection as a quality management tool is discussed.

3:40pm

PRESENCE OR ABSENCE OF BROW TINES AS A PREDICTOR FOR FUTURE ANTLER CHARACTERISTICS IN A QUALITY DEER MANAGEMENT PROGRAM.

Kathy McGinty and *Eugene Fuchs*, Texas Parks and Wildlife Department; and *John Williams*, Texas A&M University

Many landowners and sportsmen have often questioned why some mature bucks (4.5+ years old) do not have "brow tines". Since 1974, the Texas Parks and Wildlife Department's Kerr Wildlife Management Area has been involved in a series of studies designed to determine the role of nutrition and/or genetics in antler development. We compared antler development based on presence of brow tines at 1, 2, 3 and 4 years of age. Antlers were collected from 1974-1997 from various penned deer studies. Antlers were categorized as to number of points on the "basic frame", if no brow tines were present, if only one brow tine was present, or if both brow tines were present. Data was analyzed based on the absence or presence of one or both "brow tines" and compared to antler weight (mass), body weight, antler points, antler basal circumference, antler spread, main beam length and gross Boone and Crockett score at 1.5, 2.5, 3.5 and 4.5 years of age. We examined antlers from 217 deer (N=651 sets) for which at least the first three sets of antlers were available and 168 deer (N=672 sets) for which at least the first four sets of antlers were available. In a related analysis, antler production, also based on the presence or absence of brow tines within cohorts, was compared. This paper discusses the analysis of this data in relation to management implications and selection criteria used in managing white-tailed deer.

4:00pm

THE EFFECTS OF GENETIC SELECTION DURING NUTRITIONAL STRESS ON ANTLER PRODUCTION.

John Williams, Texas A&M University; and *Eugene Fuchs*, *Bill Armstrong* and *Donnie Frels*, Texas Parks and Wildlife Department

Research at the Kerr Wildlife Management Area indicates that antler characteristics are highly heritable and, therefore, selection pressure for/against would be successful in changing the incidence of a trait such as antler points, antler weight, etc. Other research has shown that selection for spike antlers can produce 100% spike antlered yearlings in only 5 generations. Field observations indicate that, in periods of good nutrition, there are fewer spike antlered deer than in periods of poor nutrition. This has caused many landowners to restrict hunting pressure during these periods of poor conditions. In Texas, there are always some spikes in periods of good nutrition and some fork antlered deer in periods of poor nutrition. We believe there are 3 genetic classes of deer: one group which will produce forks regardless of the available nutrition, one group which will produce spikes regardless of the

nutrition available, and a third group which produces spike or fork antlers according to the nutrition available.

To test this hypothesis, all male deer produced their first set of antlers when fed a restricted diet with less than 8% protein during the entire antler-growing period. Based on antler characteristics, four to six sires were selected from this yearling group of deer and placed in single sire breeding pens. Females for each breeding pen were chosen based on the performance of their related yearling males. All selected females, including yearlings, were randomly assigned to the breeding pens. To date, this procedure has produced 4 generations of yearlings. We observed a dramatic decrease in the incidence of spike yearlings. The incidence of spike yearlings changed from 28%(7) to 3%(1) spike yearlings in 3 generations of selection while the incidence of 8-point yearlings changed from 4%(1) to 29%(9) during the same period. Data from the 4th generation, 1998, will be reported during the presentation.

4:20pm

PREDICTING GROSS BOONE AND CROCKETT SCORES AND LIVE BODY MASS AT AGES 2.5, 3.5, AND 4.5 YEARS IN WHITE-TAILED DEER ON THE BASIS OF THE PREVIOUS YEARS' ANTLER CHARACTERISTICS AND BODY MASS.

James R. Ott, *John Baccus*, *Scott Roberts*, *Paul Hendrix*, *Ronnie Kirchof* and *Lin Poor*, SW Texas State University; and *Donnie Harmel*, *Eugene Fuchs* and *William Armstrong*, Texas Parks and Wildlife Department

The relationship between antler characteristics of yearling white-tailed deer and bucks in later age classes is poorly understood for free-ranging white-tailed deer. Nevertheless, a number of state wildlife agencies are now "experimenting" with management schemes that entail selective harvest of yearling white-tailed bucks based on variation in antler characteristics. Management schemes such as that recently imposed in Arkansas protect yearlings with relatively poor antler growth and are predicated on the assumption of no relationship between yearling antler characteristics and the antler characteristics of bucks in later age classes. This assumption requires that yearlings with relatively poor antler growth exhibit compensatory growth in subsequent age classes and thus "catch up" with those yearling males (unprotected) that exhibited superior antler growth. Here we examine the role of (a) yearling gross Boone & Crockett scores (GBC) and (b) yearling body weights on GBC scores, GBC components, and body weights at ages 2.5, 3.5, and 4.5 years. This analysis reveals that, for our study population, (a captive herd reared on a high protein diet), GBC scores, GBC components, and body weights are highly correlated within and among years. On this basis we developed simple linear models to predict GBC scores, GBC components, and weights at ages 2.5, 3.5, and 4.5 based on yearling GBC scores, weight, or both. Our results show that GBC scores and weights at every subsequent age class are accurately predicted by yearling GBC score and provide no evidence for compensatory antler growth in yearlings with low GBC scores.

TUESDAY, FEBRUARY 16, 1999

Technical Session VI - Moderator: *Bob McAnally*, Arkansas Game & Fish Commission.

8:00am

THE LOST GENERATION: ASSESSING THE IMPACT OF THE 1993 MISSISSIPPI RIVER FLOOD ON FAWN SURVIVAL.

Timothy L. Evans, *Mike Staten* and *Stan Priest*, Anderson Tully Company; and *Larry Savage*, Louisiana Department of Wildlife and Fisheries

Throughout the decade of the 90's the lower Mississippi River has assumed a sigmoid pattern of abnormally high water in late winter and spring then low water in late summer and fall. While this pattern has wrought havoc with turkey reproduction in the Delta, it has generally been seen as having little or no impact on the deer population. However in 1993, following heavy rains and unprecedented flooding in the Midwest, the river abandoned this pattern; remaining 15 to 20 feet above normal at Vicksburg from late July until early November. Based on data collected from Anderson-Tully (ATCO) and other privately owned delta and batture lands in Arkansas, Louisiana, and Mississippi; lactation rates in the1993 deer season fell to 48% on average, down from 65% (1990-97). Immediate suspicions arose regarding the accuracy of the data, and the possibility that the 1993-fawn crop may have been lost due to the flood. Over the next three years the age distribution of harvested bucks cycled through a series of peaks and troughs as the loss of the 1993 fawn crop evidenced itself in each successive year's harvest, resulting in increased harvest pressure being exerted upon the remaining age classes of bucks. Amazingly, total buck harvest never wavered, even in the wake of Mississippi's four-point law (enacted in 1995).

While convinced of the 1993 flood's impact, the harvest data were still only anecdotal evidence. It was only through cohort analysis that the real impacts became clear. Cohort tables based on buck, doe and total harvest for the period of 1990-1997 showed that hunters had already harvested more deer, both bucks and does, from the 1994 (and in some cases the 1995) cohort than from the 1993 cohort in spite of having one to two less years to harvest from it; confirming suspicions of extremely high fawn mortality as indicated by the low lactation rates of 1993. The basic take home lesson from all of this was that while normal spring floods appear to be relatively benign from a deer survival standpoint; late summer flooding, even at moderate depths, can be highly detrimental to fawn survival. Further, total buck harvest (especially in herds managed under the principles of quality deer management) is a poor indicator of fawn survival. Hunters tend to maintain harvest levels by shifting their pressure to other age classes; those other age classes are not always available for harvest

under traditional management where yearlings bear the brunt of each years harvest pressure, and while age class distribution of harvested bucks and the cohort tables based on that distribution are indicators of poor fawn survival, they are only available one to three years in the future when those deer are harvested. The best early indicator of fawn survival is adult doe lactation rates if they are accurately and reliably, or at least consistently, collected.

*8:20am

MORTALITY AND HOME RANGE OF WHITE-TAILED DEER ON FORT CHAFFEE MILITARY RESERVATION, ARKANSAS.

Gregory G. Humphreys, Deltic Timber Corporation and *Thomas A. Nelson*, Eastern Illinois University

Adult nonhunting mortality rates are often unknown and can be a significant factor in population dynamics. It is necessary to ascertain these rates in order to insure hunter participation and satisfaction remain at acceptable levels. Therefore, adult white-tailed deer mortality was studied on the Fort Chaffee Military Reservation in western Arkansas. Recent spotlight counts and declining harvests suggested the Fort Chaffee population was declining at a rate greater than that which could be accounted for by harvest levels and normal rates of nonhunting mortality. Twenty-seven (27) adult deer (>1.5 years old) were captured by rocket net or helicopter and net gun, equipped with radio-collars, and monitored from February 1995 until January 1996 in order to estimate annual adult nonhunting mortality rates. MICROMORT analysis revealed annual survival rates for all deer to be 74.1%. Contrary to other studies from military installations, no mortalities were observed due to military training-related activities. As expected, male survival rates were lower than female rates and appear to indicate that males on Fort Chaffee are more susceptible to various mortality agents than females. The primary adult mortality agents appear to be poaching, wounding loss, and predation. Annual home range estimates were also calculated for deer inhabiting the installation. Harmonic mean analysis of home range data estimated annual male and female home ranges to be 482.7 ha and 180.7 ha, respectively. Hopefully, these results can be used to benefit the installation managers and the whitetail resource by increasing the quality of the Fort Chaffee hunts.

8:40am

CYCLIC PATTERNS OF HEMORRHAGIC DISEASE IN GEORGIA WHITE-TAILED DEER.

David E. Stallknecht, University of Georgia

Hemorrhagic disease (HD), which is caused by viruses in both the epizootic hemorrhagic disease virus (EHDV) and bluetongue virus (BTV) serogroups, is the most important viral disease affecting white-tailed deer in the Southeast. Although HD has been reported to occur on a 2 to-3 year cycle in this region, the reasons behind these cycles are unknown. In this study, we examined clinical and serological data collected from white-tailed deer in Georgia from 1981 to 1997. Peaks in clinical reports, as determined by the number of counties from which HD was reported, and antibody prevalence occurred during the same years, and occurred at 2 and 3-year intervals. The observed cycles could be attributed to infection with several virus serotypes including EHDV-1, EHDV-2, BTV-10, BTV-11, and BTV-13, but only EHDV-2 was represented on every outbreak year. To better understand these cycles, we constructed a simple model based on concurrent 3 and 8-year HD cycles. Predicted changes in antibody prevalence based on this model matched observed changes in antibody prevalence and may explain why outbreaks can occur on 2 as well as 3-year intervals. This model may be useful in predicting the risk of a HD outbreak at the state level, but has limited application to specific management units such as wildlife management areas.

9:00am

ANSWERING QUESTIONS ABOUT GUNS, AMMO, AND MAN'S BEST FRIEND.

Charles R. Ruth, South Carolina Department of Natural Resources and *Hayward Simmons, Jr.*, Cedar Knoll Club, South Carolina

Harvest of white-tailed deer (Odocoileus virginianus) through regulated hunting is the most important tool available to deer resource managers. As wildlife professionals, we are often looked upon as outlets for information concerning not only biological concepts, but also hunting in general. The hunting community can pose unique questions and, in some instances, hunting related information is not supported by data. The purpose of this study was to attempt to answer questions most often posed by sportsmen. We attempted to determine the importance of a trained dog in locating dead and wounded deer, the distance deer traveled when shot, the effects of shot placement, and differences in the effectiveness of various firearms and ammunition. Statistical significance was based on a probability level of $P = 0.05$.

We determined that on this study site, the mean distance of shots taken at deer was 132 yards and that there was a significant difference between shots that resulted in a deer (127 yds) and those resulting in a miss (150 yds). Overall, it required 603 shots to harvest 493, deer resulting in 81.7 percent shooting success. There was no difference in shooting success with respect to antlered (81%) or antlerless deer (83%). Approximately 50 percent of the 493 deer ran when shot and the mean distance traveled was 62 yards. Antlered and antlerless deer traveled the same distances. Of the 221 deer that ran when shot and were located dead, 61 left no discernable sign in the vicinity of the shot. An additional 19 deer were wounded by the shot. Using a trained dog expedited the process of recovering these 240 deer. Deer were assigned to 3 groups depending on how difficult they were to recover. There were significant differences in the distances deer ran depending on whether they would be recovered; (a) easily (46 yds), (b) with some difficulty (85 yds), or (c) not recovered without the aid of a dog (147 yds). Overall, a trained dog increased the harvest approximately 20 percent at this site because it almost totally eliminated unrecovered dead deer and crippling loss. We determined that deer shot in the shoulder ran significantly shorted distances (3 yds) than those shot in the heart (39 yds), lungs (50 yds), and abdomen (69 yds). There were no significant differences in the efficiency of weapons when grouped by caliber. However, deer ran significantly less frequently (42%), less distance (27 yds) and left sign more often (88%) when struck with soft type bullets than when struck with hard style bullets (60%, 43 yds, and 81%). Management implications will be discussed.

*9:20am

EFFECTS OF HURRICANE GEORGES ON FLORIDA KEY DEER.

Roel R. Lopez, *Jason D. Sebesta* and *Nova J. Silvy*, Texas A&M University

The endangered Florida Key deer (Odocoileus virginianus clavium) are endemic to the Lower Florida Keys, ranging from Big Pine to Sugarloaf Keys. It has been hypothesized that a hurricane or other significant storm might have a negative impact on the Key deer population (i.e., survival, fresh water availability). On 26 September 1998, the primary Key deer range took a direct hit by Hurricane Georges. This storm offered some insight into Key deer survival during a hurricane. Prior to the hurricane, 52 deer (adults-32, yearlings-15, fawns-5) were fitted with battery-powered radio transmitters. We found approximately 98% survival (51/52 deer, 1 adult male drowned) following the storm, despite areas occupied by radio-collared animals being completely submerged by the storm surge. Salinity levels of 43 water holes used by Key deer also were measured following the storm. Seventy-nine percent were found to be suitable (<10 ppt) for Key deer while 21% were unsuitable due to the storm surge. Many habitats important for Key deer were altered by uprooted trees and loss of branches; however, we suggest the storm was probably beneficial for Key deer by opening the overstory canopy. Overall, we found Hurricane Georges not to have a negative effect on the Key deer population.

Technical Session VII - Moderator: *Joe Hamilton*, Ducks Unlimited.

10:00am

EVALUATION OF DIFFERENT CAPTURE TECHNIQUES FOR WHITE-TAILED DEER.

Daniel S. Coggin, Florida Game and Fresh Water Fish Commission and *Harry A. Jacobson*, Consultant

Male white-tailed deer (Odocoileus virginianus) were captured with dropnets (n=136), stand sitting with dartguns (n=26), spotlighting with dartguns (n=27), and helicopters (n=49) from February 1990 to January 1997 over selected areas in Mississippi to examine nonhunting related mortality causes. Capture attempts with dropnets (n=102) resulted in 1.33 bucks captured / attempt at 9.46 man-hours expended / buck. Attempts with dartguns sitting on stands (n=180) resulted in 0.14 bucks captured / attempt at 40.56 man-hours expended / buck. Attempts spotlighting with dartguns (n=53) resulted in 0.51 bucks captured / attempt at 14.69 man-hours expended / buck. Helicopter capture attempts (n=15) resulted in 3.27 bucks captured / attempt at 5.63 man-hours expended / buck. Preliminary results show that even though the helicopter proved to be the most efficient, the dropnet proved to be the most cost efficient at capturing large numbers of deer. Capture mortality causes (capture myopathy and injuries) resulted in 14 deaths (6% of captures). Attempts with the dropnet had the least number of mortalities, <4% (5 of 136). Eleven percent (6 of 53) of males captured with the dartguns (stand sitting and spotlighting) succumbed to mortality, while 6% (3 of 49) of captures with the helicopter resulted in death. Males in the 1.5 year old class had the highest number of mortalities (n=10) followed by the 2.5 year old class (n=2). The 3.5 and 5.5+ year old classes each had one mortality, while the 4.5 year old class did not have any capture related mortalities.

10:20am

A MANPOWER-EFFICIENT DROP-NET SYSTEM FOR CAPTURING WHITE-TAILED DEER.

Kenneth L. Gee and *John Holman*, Noble Foundation; and *Stephen Demarais*, Mississippi State University

Efficiency of drop-net capture systems is limited because net sites must be visually monitored. Use of night vision technology allows nocturnal monitoring, but ability to identify sex and age of animals is limited. Our deer capturing system consists of a traditional drop-net with a remote, non-explosive release mechanism, an infrared monitoring unit that signals when animals are present, and a remotely operated infrared spotlight that allows long range night vision observations. The release mechanism costs $340 to build, and incorporates battery-operated solenoids that are activated from up to 250 yds. The onetime construction cost compares favorably with the repeated cost and danger associated with blasting caps. The release mechanism is safe, reliable, and quiet. The monitoring/signaling unit consists of a Trailmaster infrared monitoring unit connected to a radio transmitter, and costs $670. This unit allows continuous monitoring of several trap sites from a single remote location. Night vision binoculars and a remotely operated infrared spotlight (cost $348) allow identification of sex and age at distances up to 250 yds, which allows personnel to sneak into trap sites undetected. One hundred thirteen successful drops have been made using the remote drop-net release mechanism since January 1993. Several failures to release have been associated with operator error (e.g., low batteries or poor signal pathway). Two failures were the result of defective components in the release mechanism. A faulty receiver on the release mechanism resulted in one errant drop. The infrared spotlight unit has been used since 1997 on 32 drops and numerous other observations. No mechanical failures have occurred while using this deer capture system.

10:40am

PREGNANCY DIAGNOSIS IN WHITE-TAILED DEER: A COMPARISON OF FOUR BLOOD-BASED TESTS.

David A. Osborn, *Jonathan W. Gassett*, *Karen A. Dasher* and *Karl V. Miller*, University of Georgia; and *Jose Sulon* and *Jean-Francois Beckers*, University of Liege, Belgium

Progesterone assays are the most commonly used blood-based pregnancy tests for deer. In 1996, we validated blood tests for bovine and ovine pregnancy-associated glycoproteins (PAG) as alternatives to progesterone assays. We presented results based on 191 blood samples collected before, during, and after the pregnancies of 6 captive white-tailed deer. The ovine-derived test was 100% accurate after day 32 of gestation. In the present study, we tested duplicates of these blood samples using a traditional progesterone assay and a new caprine-PAG assay. Our progesterone assay was 100% accurate after day 8 of gestation.

However, this assay cannot differentiate between progesterone from corporalutea of pregnancy and progesterone from the ovarian cycling of non-pregnant does. Additionally, this assay may yield false positive results because of stress-related adrenal gland production of progesterone. Therefore, results based on single blood samples are tenuous. As with our previous assay, caprine-PAG can be used to detect pregnancy after day 32 of gestation with 100% accuracy. Ovine- and caprine-PAG are pregnancy-specific, eliminating concerns about false positives due to questionable luteal status or extraovarian production of progesterone. Because these assays provide definitive diagnosis of deer reproductive status, researchers and managers should use tests for ovine-PAG or caprine-PAG in preference to progesterone assays.

11:00am

CAN WE RELIABLY ESTIMATE DEER AGE DISTRIBUTION FROM JAWBONES? THE DEBATE CONTINUES.

James C. Kroll, *Ben H. Koerth* and *P.R. Blackwell*, Stephen F. Austin State University

Studies conducted in Mississippi and Oklahoma on the reliability of using the tooth wear and replacement method of Severinghaus suggested considerable error in this method. Popular press coverage following these studies has caused many private managers to abandon aging as a diagnostic tool in deer management. Furthermore, biologists often discount the ability of laymen to age deer using the Severinghaus technique. Yet, rigorous statistical analyses or modeling to determine efficacy of this method have not been conducted. Our study asked two basic questions. First, can the layman age harvested animals with statistically reliable results? Second, can error distributions be used to correct inconsistencies in aging due to observer error? In order to test these two hypotheses, we examined 1,485 jawbones collected over a 6-year period from hunting clubs in 14 east Texas counties. Each club annually (1992-97) submitted a harvest record book, along with a jawbone removed from each deer. After receiving training in the form of actual instruction, a written pamphlet and/or a commercial videotape, each hunter recorded his/her estimate of the deer's age. Later, one experienced biologist was designated to age all jawbones according to the Severinghaus technique. This age was designated as a "known" age. These data then were used to make comparisons between ages estimated by hunters versus the biologist. Mean (±S.D.) hunter-estimated ages for six age classes (fawn, yearling, 2.5, 3.5, 4.5, 5.5 and 6.5 years) were: 0.63±0.37, 1.89±0.69, 2.72±0.59, 3.19±0.75, 3.83±0.95, 4.27±1.24 and 4.86±1.52 years, respectively. As expected, the older age classes (4.5 years or more) had the greatest variability. However, although differences did occur, Chi-square tests indicated no significant differences between biologist and hunter-estimated age data sets. Next, we produced error distributions about each "known" age using the hunter-estimated ages. The resulting distributions were very similar to those reported in previous studies for known aged animals. We then conducted over 500,000 Monte Carlo simulations using the error distributions. Random samples of 10, 25, 50 and 100 deer were drawn repeatedly from the

data set and assigned ages according to the error distribution (1 and 2 standard deviations). For samples greater than 1% of the total population (1485) hunter-determined age distributions did not differ significantly from "known" distributions. In fact, sample size had a much greater impact on the estimated age distribution than observer error. Sample sizes smaller than 25 produced age distributions with older (5.5+years) age classes under-represented or absent. Although this study was conducted on hunter harvested, rather than known aged animals, it does provide insight toward and methodologies for assessing the utility of the Severinghaus technique. We suggest similar tests and modeling be conducted on previously published data before discounting the Severinghaus technique altogether.

*11:20am

A PORTABLE DROP NET FOR CAPTURING URBAN DEER.
Jason D. Sebesta, *Roel R. Lopez* and *Nova J. Silvy*, Texas A&M University

A free-standing, portable drop net was developed and used in the capture of 82 Florida Key deer (Odocoileus virginianus clavium). The net was efficient, easy to set, inexpensive, and non-invasive (e.g., no blasting caps, no destruction of private property) in capturing white-tailed deer. The net could be used to trap deer and other animals in most urban areas and should be effective in other areas where wildlife are susceptible to being baited.

Technical Session VIII - Moderator: *Ben Layton*, Tennessee Wildlife Resources Agency.

*1:00pm

DO DEER DETECT ESTRUS BY VISUAL OR OLFACTORY CUES?
Jonathan W. Gassett, *Karen A. Dasher*, *David A. Osborn* and *Karl V. Miller*, University of Georgia

Controlled studies have failed to adequately demonstrate the presence of a sexually-attractive odor or to confirm the role of the vomeronasal organ in estrous detection by male cervids. In addition, behavioral cues may be an important role in the determination of estrous status. We performed a series of experiments to determine the factors controlling estrous detection in white-tailed deer (*Odocoileus virginianus*). We first manipulated the vomeronasal and olfactory system of males by cauterizing the incisive duct to the vomeronasal organ and/or anesthetizing the olfactory epithelium in the nose. We then exposed the treated males to a group of 4 females, 1 of which was in estrus. The ability to detect estrus did not differ ($P>0.05$) among treatment groups, suggesting that behavioral cues may override olfactory cues and that olfactory cues are not critical for estrous detection. Our second study used an

odor preference experiment to evaluate the male's ability to detect estrus in the absence of visual cues. When we placed olfactory-intact male deer in a 20-meter y-maze and provided a choice between an estrous and non-estrous female, they spent more time ($P=0.0001$) with the estrous female, although visual and behavioral cues were removed. We suggest that olfaction may be important to initiate contact between animals, but behavioral cues become more important once visual contact is established.

*1:20pm

VARIATIONS IN BACTERIAL FAUNA MAY BE RESPONSIBLE FOR INDIVIDUAL-SPECIFIC TARSAL ODORS.

Karen A. Dasher, Jonathan W. Gassett, Scott M. Russell, David A. Osborn and *Karl V. Miller*, University of Georgia

Scent marking is an integral part of the reproductive ecology of white-tailed deer. In particular, the tarsal gland likely is the source of both priming and behavioral cues. Odor production and the dark staining of the tarsal gland likely result from bacterial decomposition of urinary products deposited on the gland during rub-urination. Scent production may be related to variations in the bacterial fauna among individuals, age classes or sexes, as well as to variations in urinary constituents. We conducted a study to identify variations in bacterial abundance and species composition among ages and between males and females. We collected 120 tarsal glands from hunter-harvested deer on wildlife management areas in northern Georgia. Thirty samples were collected from each age class of bucks (1.5 year-old, 2.5 year-old, and 3.5+), and 30 samples were collected from does of varying age classes. We identified the predominate species and determined the relative abundance of bacteria for each animal. We also compared relationships of staining to buck age and bacterial composition. Abundance of bacteria was higher on male tarsals than on female glands. Also, male glands tended to be more darkly stained. We found no difference in abundance among age classes of bucks; however, there were differences in species composition among age classes, and degree of staining tended to increase with age. Our results concur with previous suggestions that socially-significant tarsal odors result, at least in part, from variations symbiotic bacterial communities.

*1:40pm

USE OF AGRICULTURAL LANDS BY WHITE-TAILED DEER: USE AREAS AND HABITAT SELECTION.

Jeannine A. Tardiff and *Richard A. Lancia*, North Carolina State University; and *Mark C. Conner*, Chesapeake Farms

Managing an animal population requires balance. Balancing the benefits provided by the population itself (direct and indirect) and the potential conflicts that may arise is a difficult task. This management dilemma is clearly exemplified by white-tailed deer populations in agricultural habitats. To effectively manage a population in this setting, information regarding habitat use and selection is key in order to aid in reducing crop damage. This information may be gathered by targeting the more stable, philopatric female portion of the population. Chesapeake Farms is a 3,300 acre agricultural development and wildlife management demonstration area located in Kent County, Maryland. Current deer density is approximately 50 deer/km^2. Female white-tailed deer were used in this study to monitor use patterns and movements in an agricultural setting. In 1997 and 1998, yearling (n=20 and n=10) and adult (n=13 and n=2) does were captured, fitted with radio transmitters, and were followed throughout the year to determine use area and habitat selection. Data from 1997 show an average annual use area of 530.11 (SE=67.76) and 379.54 (SE=75.99) acres for yearling and adult does, respectively. Spring, summer, and fall use areas in 1997 for yearlings were 530.08 (SE=74.39), 155.49 (SE=30.06), and 193.47 (SE=51.87), respectively. For adult does, spring, summer and fall use areas in 1997 were 414.01 (SE=96.46), 125.99 (SE=58.32), and 139.46 (SE=44.63), respectively. Preliminary results indicate a much smaller range in the summer months suggesting that females rely on agricultural crops.

2:00pm

EVALUATION OF DEER DAMAGE TO SOYBEAN PRODUCTION USING FIELD OBSERVATIONS AND REMOTE SENSING.

Lisa I. Muller, Delaware State University; *Christopher S. Rosenberry*, Kent Conservation; *Mark C. Conner,* Chesapeake Farms; *Jeannine Tardiff*, North Carolina State University; and *Gyasi A. Quince*, Virginia Polytechnic Institute and State University

There are growing concerns about deer-caused damage to agricultural production. To measure the effect of deer browsing on soybean yield, we evaluated 4 full-season soybean fields in Sussex Co., Delaware and 2 fields in Kent Co., Maryland. Mean field size was 15.5 ha. During the 1998-growing season, we built fences around 6x6 m plots (exclosures) that were paired with 6x6 m unprotected plots. Paired plots were 12 m apart. Two to 6 paired plots were placed in every field. The exclosures were constructed of PVC pipe and extra strength deer-proof fencing and were designed to allow quick removal and replacement

following field spraying. All plots were mapped using global positioning system (GPS). Exclosures were built within 3 days after planting for plots in Maryland. Due to dry conditions and late emergence of plants, exclosures were placed 3-4 weeks after planting in Delaware. Soybean growth and development were measured weekly on 3 random rows (1-m lengths) from weeks 4-13 on all plots. Soybean damage from wildlife was also recorded.

The exclosures were effective in eliminating deer damage, but did not exclude other small mammalian herbivores. After soybean harvest and processing (to be finished in early November 1998), we will estimate yield from the center 3x3 m of each plot. We will compare yield to percentage of plants damaged by deer. At least 2 remotely sensed hyperspectral images were taken of all fields during the growing season. Images will be analyzed to determine if deer damage can be identified remotely.

2:20pm

THE ROLE OF A LATE-WINTER DEER HEALTH STUDY IN A 34,000-ACRE QUALITY DEER MANAGEMENT PROGRAM IN CALHOUN COUNTY, ARKANSAS.

Charles A. Self, International Paper; *David F. Urbston*, Arkansas Game and Fish Commission; and *Philip Tappe*, University of Arkansas at Monticello

International Paper's 34,000 acre Four Lakes Association in Calhoun County, Arkansas has been managed for quality deer since 1989. Although doe harvest was increased from 2.9 to 3.6 does per square mile, weights did not appear to increase. A health study was initiated during the late-winter periods of 1994 and 1995 to identify factors which may have been interacting with this population. Thirty-eight females (33 adults and five fawns) were collected and examined during the study. Additionally, 14 males (seven adults and seven fawns) were taken and examined also. Mean conception date was November 23. Eighty-one percent of all conceptions were in November. Mean fawning date was June 9. No fetuses were found in fawns. Of adults, 17 (52 %) had twins, 14 (42 %) had single fetuses, one (3 %) had triplets and one had no fetuses. Dressed weights followed seasonal trends, but were lighter than expected. Kidney fat index for adult does dropped greatly after mid March (69.2 in late-February and 11.4 in late March). Abomasal parasite counts (APCs) for nine fawns showed one (25 %) with more than 1,500 helminthes in 1994, but 80 % of the five fawns checked in 1995 had counts over 1,500. One lung worm and no liver flukes were found.

Low dressed weights, low kidney fat indices and high APCs in fawns encouraged continued doe harvests of 1.5 - 2 does per buck through 1997. Weights still have not increased, so additional management options, including additional timber harvests, have been implemented.

Technical Session IX - Moderator: *Mark Clark*, Arkansas Game and Fish Commission.

*3:00pm

MOVEMENT PATTERNS AND HABITAT USE OF FEMALE WHITE-TAILED DEER ASSOCIATED WITH AN URBAN PARK.
Marrett D. Grund, Southern Illinois University; *Ernie P. Wiggers*, University of Missouri; and *Jay B. McAninch,* Congressional Sportsmen's Foundation

Management of white-tailed deer *(Odocoileus virginianus*) in urban areas is a growing national concern due to public safety issues as well as depredation on ornamental plants. While many communities have implemented deer management programs for controlling overabundant populations, there is a paucity of basic ecological information for deer in this unique landscape. We studied the seasonal home range size, seasonal movement patterns, and habitat use of female white-tailed deer associated with a large urban park in Bloomington, Minnesota during 1997. Home range sizes varied seasonally and were smaller than those reported for deer in many rural studies. The largest home ranges occurred in the spring (mean = 137 ha) and smallest in the summer (mean = 45 ha). Females shifted their spring home range approximately 1.5 km away from the winter home range, and remained in this home range through the fall. Does selected habitats containing woody cover in all seasons and occupied the relatively undeveloped public parks and conservation areas during the spring, summer, and fall. However, our does avoided these public sites in the winter and instead selected residential sites, presumably because the residential sites provided superior foraging and thermal regulation opportunities. Current deer population management programs do not consider the seasonal shifts in home ranges and seasonal habitat selections we observed on our study area, and consequently the effectiveness of these management programs may be reduced. Additional investigations into seasonal habitat use and movements of urban deer are needed to enhance the effectiveness of urban deer management programs

3:20pm

SINGLE STRAND FENCES TO CONTROL DEER DAMAGE TO SOYBEANS IN TENNESSEE.
Charles E. Dixon, University of Tennessee

Deer depredation has been identified as the top wildlife damage problem in Tennessee. Soybeans represent the most widely grown field crop in Tennessee that is fed upon extensively by deer. Farmers in certain areas report soybeans no longer can be grown in small fields totally or partially surrounded by woods. In the spring of 1998, fields were

identified at three locations where deer depredation had prevented successful soybean production and fencing demonstrations to control deer depredation were implemented. The first treatment was an electric fence with aluminum foil tabs (coated with peanut butter) attached to insure nose-to-fence contact, enhancing the fence's effectiveness. The second and third treatments were olfactory repellents (Deer Away ® and Deer Stopper ®) applied to a single strand fence. Control areas were not fenced. Browsing was less within all treated areas than the unfenced control areas. In addition, weeds were more abundant in control areas although herbicide applications were consistent across all treatments. Yields averaged 6.3 bushels per acres in control areas and 41, 41 and 36 bushels per acre behind electric, Deer Away, and Deer Stopper fences, respectively. The results suggest these low-cost fences can be effective in deterring deer damage to soybeans and possibly other crops preferred by deer, allowing these crops to be grown where deer feeding currently limits their growth.

3:40pm

AN ASSESSMENT OF AN URBAN DEER MANAGEMENT PROGRAM (1992-1998) IN LYNCHBURG, VIRGINIA.

Jay C. Jeffreys, *W. Matt Knox* and *J. A. Bowman*, Virginia Department of Game and Inland Fisheries; and *C. T. Carter*, Lynchburg Police Department

Lynchburg is a city of approximately 66,000 citizens encompassing 50 square miles in the southwest piedmont of Virginia. In response to public complaints of deer depredation, including property damage and deer-vehicle collisions, the Lynchburg City Council formed the Lynchburg Wildlife Study Commission in 1991. Following a public meeting and survey, the Commission recommended that Lynchburg initiate an urban deer management program employing the use of sharpshooters. In 1992, the council approved the hiring of a wildlife management specialist and began a management program. This program consists primarily of killing deer under authority of permits issued by the Lynchburg Police Department, pursuant to a Memorandum of Understanding with the Virginia Department of Game and Inland Fisheries. During the period March 1992 through July 1998, 1,317 deer were killed. Annual kills have ranged from 174 to 294 (μ =205). Hours and labor cost per deer killed have ranged from 3.8 to 12.7 hours annually at \$31.54 to \$124.33 (μ = 7.9 hours and \$71.50), respectively. Over 700 deer have been donated to a Hunters for the Hungry Program. Deer-vehicle collisions, which had exhibited an increasing trend (p=0.13) prior to herd reduction, have declined significantly (p=0.06) since program implementation. Results from the Lynchburg program demonstrate that sharpshooting is an effective urban deer management tool. Program costs fall within cost ranges of other urban deer management programs found in the literature. In conclusion, this program has been well received by the general public and has been successful in reducing deer-vehicle collisions.

4:00pm

URBAN DEER RESEARCH IN SEA PINES, HILTON HEAD ISLAND, SOUTH CAROLINA: PUBLIC, POLITICAL, AND LEGAL HURDLES.

David W. Henderson and *Robert J. Warren*, University of Georgia; and *Charles R. Ruth*, South Carolina Department of Natural Resources

Sea Pines (SP) is a 5,300-acre residential/resort community located on the southern portion of Hilton Head Island, SC. White-tailed deer *(Odocoileus virginianus)* have recently become overabundant in some areas of SP. In May 1998, the University of Georgia (UGA) and the South Carolina Department of Natural Resources (SCDNR) concluded a 3-year research project on the SP deer herd and recommended a follow-up project to evaluate 3 deer herd control techniques (2 different experimental fertility control methods and sharpshooting). After approval of the project by SP authorities, local animal activists responded by initiating a campaign designed to bring public pressure against the program. Specific methods used included bumper stickers, threats to protest the 2 nationally televised sporting tournaments in SP, a web site on the Internet, letters to local newspapers, and chain letters to local and state politicians, including even the Governor of SC. When this campaign failed to stop the program, a coalition of 5 local, state, and national animal rights organizations filed a lawsuit against UGA, SCDNR, and SP. A temporary restraining order was granted in August 1998 to prevent SCDNR from issuing scientific collecting permits to kill deer in SP. The SP deer controversy attracted national and international attention, as evidenced by coverage from NBC News, Fox News, National Public Radio, The Atlanta Journal and Constitution, The Economist, and many others. In the future, as human populations in the Southeast increase and wildlife habitats decrease, the frequency of similar human-wildlife conflicts will increase. Updates on the legal battle, the status of the SP deer research project, and possible implications to other state agencies will be presented.

4:20pm

MOVEMENTS OF WHITE-TAILED DEER IN AN URBAN LANDSCAPE: A MANAGEMENT PERSPECTIVE.

Howard J. Kilpatrick and *Shelley M. Spohr*, Connecticut Wildlife Division

Knowledge of temporal and spatial use of a residential community by deer is important in assessing the potential effectiveness of different deer management options in urban areas. We collected radio telemetry data from 25 female deer over a 2-year period (Apr 1995 - Mar 1997) to determine home range and core area size and use of the community for 3 management periods - fall archery season (1 Oct - 31 Dec), late archery season (15 Jan - 15 Feb), and sharpshooting period (16 Feb - 18 Mar). Home range ($\underline{P} = 0.413$) and core area size ($\underline{P} = 0.486$) did not differ among periods. The mean number of houses within deer home

ranges ($\underline{P} = 0.818$) and use of the community during the day ($\underline{P} = 0.725$) did not differ among periods. The community comprised 20 - 25% of deer home ranges and 13 - 15% of core areas during the day for all periods. The mean number of houses in deer home ranges during the fall archery season was 44, but only 19 houses were in day home ranges. This indicates that hunting during the fall archery season to remove deer in the community during legal shooting hours may be effective for 43% of the homeowners. During the late archery season, deer shifted closer to the community ($\underline{P} = 0.024$) and removal of deer in the community during legal shooting hours may be effective for 69% of the homeowners. During the sharpshooting period, core areas were closer to the community at night ($\underline{P} < 0.001$) and deer use of the community doubled in home ranges ($\underline{P} < 0.001$) and tripled in core areas ($\underline{P} < 0.001$). Our results suggest that increased access to deer in the community during the late archery season may increase bowhunting success and homeowner satisfaction and that sharpshooting in the community would be most effective at night. Small home ranges of urban deer suggest that local management can be effective.

APPENDIX I
STATE NARRATIVES

ALABAMA

Few areas of comparable size rival Alabama when one considers the diversity of plant and animal species found within the state. From the Gulf Coast to the Cumberland Plateau, numerous physiographic regions divide the state. The Fall Line extends as an arc from the northwestern corner, southeastward across Alabama, separating the Coastal Plain to the south from the older upland provinces of the north and northeast. Elevation ranges from sea level to 2,407 feet above sea level. Several major rivers and tributaries dissect the state, further adding to the diversity of habitats within Alabama.

The Coastal Plain provinces include the Lower Coastal Plain, Red Hills, Black Belt Prairie and Fall Line Hills. The soils of the Coastal Plain vary from sands and sandy loams to heavy calcareous alkaline types. Streams are sluggish with broad, low floodplains and numerous sloughs and oxbows. Land use is intensive agriculture, pasture, and forest land with pine, pine-hardwood and bottom land hardwood timber types. Much of the land suitable for pines has been converted to even-aged pine plantations. The upland regions above the Fall Line include the Piedmont, Blue Ridge, Ridge and Valley, Appalachian Plateau, Tennessee Valley and Chert Belt. The soils of the upland regions are mostly well drained and vary from clays to sand with gravelly and rocky phases common. Rock formations vary from sandstone in the northeast to shale, limestone and chert in the south. The ecology of the upland regions favors pines on ridge tops and hardwood along lower slopes and bottomlands. Intensive agriculture/conversion of forests to loblolly pine, strip-mining, increasing industry, and the expanding human population have all negatively altered habitats for many species of wildlife over much of the upland region.

Historically, deer were abundant in Alabama until unrestricted hunting and changes in land use reduced their numbers to only a few thousand animals in a couple of isolated locations by the early 1900's. The Game and Fish Department began cooperative restocking of suitable habitat as early as 1925, and with growing public support, the Department accelerated restocking efforts though the 1960's. Today, all 67 counties have huntable deer populations and an open deer season. The current statewide preseason population estimate is 1.75 million. South and south central Alabama support the highest concentrations of deer and currently command the highest deer hunting lease fees. All counties have a 71-day gun deer season, allowing the harvest of one antlered buck per day. Age structure of harvested bucks is very young, with the majority of bucks taken being 1 1/2 years old. The total deer harvest is typically comprised of 65-70% bucks and 30-35% does.

Over 2,100 cooperators covering more than 4 million acres are currently enrolled in Alabama's Deer Management Assistance Program (DMP). By allowing the use of antlerless tags to meet harvest quotas, the DMP has given many landowners and hunting clubs the

opportunity to manage their properties for better quality deer that the normal hunting seasons and bag limits did not offer. The DMP has been very successful in Alabama, but the need still exists for other options for managing deer herds on properties not enrolled in the program. For the 1998-99 hunting season, either-sex hunting opportunities are being increased in most counties. This increase should provide the framework many landowners, hunting clubs, etc. need to manage their properties as they wish, without having to enroll in the DMP. It is also hoped this increase in either-sex hunting opportunities will help stabilize expanding deer herds found in many parts of the state.

ARKANSAS

Arkansas is a very diverse state in terms of physical and biotic characteristics. In terms of topography, geological substrate and dominant vegetation, the state is divided into two primary regions -- the Interior-Highlands (Ozark and Ouachita Mountain Natural Divisions) and the Lowlands (West Coast Gulf Coastal Plain, Mississippi Alluvial Plain and Crowley's Ridge Natural Divisions). General vegetation in the Ozarks, Ouachitas, West Gulf Coastal Plain and Mississippi Alluvial Plain divisions is upland hardwood, shortleaf pine-upland hardwood, loblolly pine-bottomland hardwood and bottomland hardwood, respectively. Crowley's Ridge is forested with upland and bottomland hardwood types. The state is still classed as rural with a total human population of less than 2.5 million. Eighty-nine percent of the total land base is privately owned.

Arkansas' deer herd declined drastically around the turn of the century, reaching a low of approximately 500 deer statewide in 1930. The Arkansas Game and Fish Commission began an aggressive deer restoration program in the 1920s, 1930s, and 1940s, which included refuge establishment, trapping and restocking, strict enforcement of laws and regulations, and conservative bucks only hunting seasons. These efforts resulted in a rapidly expanding deer herd in the 1950's, with a large number of record book bucks harvested in several areas of the state. In 1950, the estimated deer herd was about 40,000. By 1972, the herd had grown to an estimated population of approximately 300,000 and today approaches 1,000,000. Legal harvest increased from 540 deer taken in 1939 to a record harvest of 167,305 in 1997.

Today, the herd is somewhat stable in some areas with slow growth continuing in other areas. The highest populations of deer and heaviest hunting pressure occur in the West Gulf Coastal Plain division. The herd in this region is characterized by high numbers of antlerless deer and poor antler development. The largest deer and best quality deer occur in portions of the Mississippi Alluvial Plain division. Population levels in the Ozark and Ouachita Mountain divisions are classed as low to moderate with high densities in localized, highly protected areas. Age-class distribution, especially for bucks, and herd-quality indices are superior to those in the West Gulf Coastal Plain division.

Deer management zones are used for statewide herd management. Antlerless harvest is accomplished with the use of either-sex primitive weapons and modern firearms hunting seasons. Management efforts are directed toward increasing the antlerless harvest and reducing the antlered harvest. A more conservative antlerless harvest strategy is being taken in portions of the state where lower deer populations occur. For the 1998 deer season, Arkansas implemented a three-point rule statewide except for some wildlife management areas and federal refuges. Legal bucks must have at least three points (one inch or longer)

on at least one antler. This regulation was implemented to reduce the harvest of young bucks and improve the antlered to antlerless ratios in the state.

FLORIDA

Florida's topography, with the exception of coastal dunes and bluffs, is flat for a considerable distance inland from both the Atlantic and Gulf coasts. Hilly, rolling topography extends from the northwestern part of the state ranging southerly through the center of the peninsula and gradually diminishes in Highlands County near Avon Park.

Florida has 15 general vegetation types of which 13 are important to deer because of the amount and variety of deer food plants present. These types are grouped into major categories of vegetation considered important to deer: flatwoods (39.6%), pine-oak uplands (29.3%), swamps (8.6%), hammocks (6.7%), fresh water marshes (5.6%), prairies (5.2%), sand pine-scrub oak ridges (1.5%), and various mixtures or other types including tidal marsh (3.5%).

In the 1800's and early 1900's, hunting was a way of life to the pioneers as well as the Indians. The sale of hides made up much of their income. Fire hunting (with torches) was a common practice of taking animals in the early days. From the 1920's to 1930's, ranchers were losing large amounts of money due to the loss of cattle as a result of "Texas Cattle Fever." Pressure was placed on the legislature for a cattle fever tick eradication program, which included the slaughtering of deer because they were believed to be reservoirs for the disease. Between 1939 and 1941, an estimated 10,000 deer were killed. However, in some areas of the Southeast and on the Seminole Indian Reservation in south Florida, the cattle fever tick was eradicated without the slaughtering of deer. This raised serious doubts that the slaughter of deer was necessary. Possibly the most serious problem facing the white-tailed deer during this time in Florida history was the screw-worm. An acute increase in deer numbers was evident immediately following the eradication of the screw-worm fly by the U.S. Department of Agriculture in 1958.

Since the 1930's, Florida's white-tailed deer herd has increased dramatically as a direct result of enforcement of harvest restrictions and the screw-worm eradication. White-tailed deer harvest in Florida currently exceed 100,000 animals annually, which is higher than estimates of the entire population during the early 1960's. Today, the Florida Game and Fresh Water Fish Commission allows either-sex archery hunting, has a lottery drawing for antlerless deer permits on most wildlife management areas, and issues antlerless deer permits to private lands in addition to two days of antlerless deer hunting during the gun season.

GEORGIA

Georgia's deer population (as estimated by computer models) has declined from 1.5 million in 1991-92 to 1.3 million in 1997-98. This decline has been by design due to steadily increasing opportunities for either-sex harvesting since the 1990-91 hunting season. The reduction of either-sex hunting opportunities during the early and mid 1980's resulted in a herd expansion that pushed the population from approximately 500,000 in 1981-82 to almost over million in 1986-87. This expansion continued though 1991-92, even though either-sex hunting opportunities were increased annually. The increased removal of does began to decrease the population in 1992-93 through the present.

Georgia's Piedmont physiographic province is the predominant physiographic province of the northern deer zone as well as the more productive habitat. Prior to the 1987-88 hunting season, the Piedmont province supported approximately 600,000 deer. This province also supports the most intense hunting pressure due to its proximity to the highest hunter populations. It was apparent that if the statewide population was to be reduced, the Piedmont was the appropriate starting place. To affect this reduction, the number of either-sex hunting days was increased and now stands at 28 in most counties. In addition, prior to the 1991-92 hunting season, the statewide bag limit was increased from three to five deer with no more than two antlered bucks. Either-sex days began increasing in the Coastal Plain province in the 1990-91 season and now stands at 53 in most counties. Due to the lower hunter numbers, a reduction in the Coastal Plain deer populations has not been easily accomplished.

As one might expect, this increase in either-sex hunting days and bag limit resulted in a steady increase in the harvest of does. Statewide, the percentage of does in the harvest has increased from an average of 27.4% annually during the 1980's to over 54% in 1997. As a result, the population has been reduced somewhat, but the 1990 goal of 1 million has not yet been reached.

These efforts to reduce the population are continuing; however, they have presented a new challenge not previously faced by wildlife agencies in the southeast - managing a declining deer population. The preferred method for the future would be to provide the same either-sex hunting opportunities and educate the hunters to use this framework to manage the deer populations on their respective hunting lands as needed. To accomplish such a goal will require some innovative educational programs, since most of the hunters are accustomed to harvesting deer from high deer populations.

KENTUCKY

The forest regions of Kentucky include the Mixed Mesophytic Forest, Western Mesophytic Forest and Southeastern Evergreen Forest. Divisions within the Mixed Mesophytic Forest include the Cumberland Mountains and the Cumberland and Allegheny plateaus. The Western Mesophytic Region divisions include the Bluegrass section, Hill section, Mississippian Plateau section, and the Mississippian Embayment. The Southeastern Evergreen Region includes the Mississippi Alluvial Plain on the western most tip of Kentucky.

Ninety-five percent of Kentucky is in private ownership. The average farm size is 185 acres and there are about 210,000 farm owners in the state. The best deer habitat is in the Western Mesophytic Forest, which comprises the western two thirds of the state.

Kentucky's deer restoration program began in 1948, but most stocking occurred during the 1960 to 1970 period. The deer population has risen from an estimated 2,000 in 1945 to a current prepartum number of 410,000. Deer harvests have reached new records for each of the past 14 years. The deer herd is managed on a doe day system and female deer make up 36 percent of the total harvest. Almost all antlerless harvest come from the Western Mesophytic Region of the state. Harvests declined in 1992 and 1993, primarily due to herds being reduced by heavy doe hunting. Deer herds are continuing to be allowed to grow in the Mixed Mesophytic Region and have yet to reach carrying capacity of the habitat.

The largest problem in managing Kentucky's deer herd is conflict with agricultural interests. Deer herds in the western two-thirds of the state are currently being held at levels well below carrying capacity of the habitat. Herds in this region cannot be increased because of landowner intolerance of deer damage. This will remain the case unless attitudes change or leasing makes deer more valuable to landowners.

LOUISIANA

Mention Louisiana and most non-residents conjure up thoughts of swamps, bayous and alligators. While Louisiana has its share of these, the Bayou State's environment is a little more diverse than what some people imagine. In his book Louisiana's Wildlife Inventory, Dr. Lyle St. Amant lists seven ecological divisions of the state. These areas include: the Lower Mississippi-Atchafalaya Alluvial Plain; Upper Mississippi, Tensas, and Ouachita, and Red River Alluvial Plains; Northwest Louisiana Uplands; Southeast Louisiana Terrace Lands; Southwest Louisiana Terrace Lands; and Coastal Marshes. Deer can be found in all of these divisions today, and the present population is approaching one million animals.

The Louisiana deer story is similar to that of most other states. A once thriving deer population was reduced by a combination of habitat loss and unregulated hunting. Deer could only be found in remote swamp and bottomland areas and on a few protected refuges. This occurred between 1880 and 1925.

The Louisiana Department of Wildlife and Fisheries began a deer trapping and relocation program in the fifties. The program began slowly but, by 1970 deer had become established throughout the state. The restoration program was a success, and during the 1970s, deer herds continued to increase, resulting in a need for sound deer management programs. In the late 70s, LDWF began to assist hunting clubs and landowners with their deer management problems and needs.

The Wildlife Division of LDWF is divided into seven game districts. The wildlife biologists in each district are responsible for management of the herds on public and private lands within their district. The Department's wildlife management areas provide excellent deer hunting opportunities due to sound herd and habitat management. During the 1993 either-sex gun season on these WMAs, there were 38,335 hunter efforts, resulting in a harvest of 3,016 deer (1 deer per 12 hunter efforts). These areas are also open for additional days of deer hunting with bow and arrow, black powder, and bucks-only hunting with modern firearms. The Deer Management Assistance Program (DMAP) is available to hunting clubs and private landowners who desire a higher level of deer management. In 1993, nine hundred ninety-four cooperators enrolled 1,942,777 acres of land in this program. This generated $123,079 for the Department from enrollment fees.

While the success of the wildlife management programs and DMAP have demonstrated that proper deer management is effective, there is still more work to be accomplished. An example of this is the need for further development of either-sex hunting opportunities. Progress is being made along these lines because, in 1994, a regulation was passed that

allows hunters to harvest one antlerless deer and one antlered buck per day on doe days. The daily limit had been one deer per day. It is hoped that this regulation will encourage hunters to shoot a doe since they would often pass them up in hope of seeing and shooting a buck.

MARYLAND

Maryland, often referred to as "America in Miniature", has four physiographic regions, the Coastal Plain, Piedmont, Ridge & Valley, and the Appalachian Plateau. The land uses vary from northern hardwood timber production in the extreme western portion of the state, to extensive farming in the central and eastern regions, and the pine forest in the Chesapeake Bay region and coastal region. Maryland has one of the largest percentages of urban dwellers in the country. This large urban population lives on 15% of the land. The presence of this large human population places stress on the remaining 85% of Maryland for agriculture and recreational activities. These land use pressures have resulted in a loss of deer habitat (88,000 acres of woodland loss from 1985-1990) and will continue to affect how the Maryland deer herd will be managed in the future.

Despite our large human population of 4.9 million people, the Maryland deer herd continues to expand. This expansion began in the early 1900's when deer from the Aberdeen Proving Grounds were introduced throughout the state. Western Maryland experienced its first deer season in the 1920's. Mandatory check stations were instituted in 1931. That year, 31 deer were checked in the western Maryland counties of Allegany and Garrett. By 1960, deer hunting was state-wide, except for Montgomery County.

During 1994, the state-wide deer kill should total about 50,000 plus deer. Maryland had its first antlerless deer season in 1957. At present, both sexes are legal during our three seasons: archery - 9/15 to 1/31, firearm - 12 days, and muzzleloader - a 3-day early segment in October and a 2-week segment in the regular muzzleloader season. Antlerless permits are required only in the 3 western counties. Three of these counties have deer zones in which antlerless permits are issued accordingly. Antlerless permits are issued in these counties due to high hunting pressure and the possibility of an extremely high harvest.

The deer density is greatest in the western panhandle counties, where 31% of the statewide harvest occurs. The metropolitan and suburban areas, Maryland's most developed section, have the fastest growing deer population. This has created an urban deer population with the associated problems that other eastern states are experiencing. We are beginning to initiate an urban deer management program to reduce the complaints from municipal watershed managers, farmers, suburban landowners, etc. In the future, managing our urban deer population is going to be the Maryland Wildlife Division's greatest challenge.

MISSISSIPPI

Mississippi contains 8 major soil regions that vary greatly in fertility and use. Predominate land uses are forestry and agriculture. Forests, which occupy 55% of the state, include natural stands of hardwoods, pines, mixed pine-hardwoods, and plantations of primarily pine. The majority (69%) of the forestlands are owned by private non-industrial landowners and about 10% is in public ownership. Primary agricultural crops are soybeans, cotton, sorghum and rice.

The history of the white-tailed deer in Mississippi has been very similar to that in many other southeastern states. Despite some sporadic attempts at protection in the late 1800's and early 1900's, the white-tailed deer was almost completely eliminated from the state. In 1929, Aldo Leopold reported that only small herds remained in limited parts of the Mississippi Delta and in the Pearl and Pascagoula River swamps. The Mississippi Game and Fish Commission was established by the state Legislature in 1932 and by 1940 a deer restoration project, funded principally by Pittman-Robertson moneys, was well underway. Deer were translocated from North Carolina, Texas and other states as well as Mexico to refuges in Mississippi. Due to these restoration efforts coupled with strict law enforcement, the state's deer herd has experienced tremendous growth and is now estimated at 1,750,000 animals. There are currently 139,000 resident deer hunters who harvested approximately 262,000 deer during the 1993 season.

With the success of Mississippi's deer restoration program came complex resource and people management problems. Through a cooperative research program with Mississippi State University, initiated in 1976, the Mississippi Department of Wildlife, Fisheries and Parks has gained information useful for both public and private needs in deer herd management.

Even though antlerless harvest was first allowed on private clubs as early as 1960, many hunters in Mississippi are resistant to following currently accepted, scientifically based harvest recommendations of biologists. Therefore, deer management in the state ranges from intensive "quality deer" strategies to bucks-only harvest on some areas. Much of the antlerless harvest and management objectives are currently being accomplished through the very successful Deer Management Assistance Program (DMAP). In 1990 there were about 900 cooperators in the program, encompassing 2.3 million acres. The harvest ratio of antlered to antlerless on DMAP landis about 1:1, while on a statewide basis antlerless deer make up only about 29% of the total harvest.

MISSOURI

Missouri has five distinct physiographic provinces. The Glaciated Plains, characterized by rolling hills and deep glacial till and loess soils, lies north of the Missouri River. Extant vegetation includes some native prairie and deciduous forest; however, much of the region has been altered by farming. The Ozark Plateau, located in southern Missouri, has thin soils and rocky terrain. Most of the area is forested with an oak-hickory cover type dominating and shortleaf pine common in the southeastern portions. Between these 2 largest provinces lie the Ozark Border and Osage Plain transition provinces. The Ozark Border is similar to the Ozark Plateau, however, it's soils are richer and more productive. The Osage Plains is chiefly prairie in nature; however, most native prairie has been converted to cool season pastures. The Mississippi Lowland province, located in southeastern Missouri, is best described as a broad flat alluvial plain under intensive agriculture, with a small amount of bottomland hardwood forest.

Ninety-three percent of Missouri is in private ownership. Average farm size ranges from 183 acres in the Ozark Border to 484 acres in the Mississippi Lowland. The amount of land in crops varies from a low of 8% in the Ozark Plateau to 83% in the Mississippi Lowland. Leasing for hunting rights is uncommon but increasing throughout Missouri. Generally the better deer habitat occurs north of the Missouri River, although portions of the Ozark Border and Glaciated Plains offer excellent habitat. Deer densities, growth potential and reproductive rates are highest in these 3 regions. Deer abundance in the Ozark Plateau varies with habitat and hunter densities. Deer numbers are typically lower in the southeast Ozarks where productivity is lower and illegal harvest is high.

The history of deer in Missouri is similar to that in most Midwestern states. Prior to settlement, deer were abundant but populations declined rapidly from habitat loss and unrestricted harvest. In 1925 it is estimated there were only 395 deer left in the state. An aggressive program of public education, enforcement, reintroductions and land acquisitions was successful in restoring the deer and in 1944 the first modern day deer season was held. It was a bucks-only season in a limited number of Ozark counties and 535 deer were taken. In 1951, the first any-deer season was held. Other major changes include the implementation of deer management units in 1970, an any deer quota system in 1975, and a bonus antlerless-only permit system in 1987.

Deer herd management in Missouri is accomplished on a unit basis. Quotas of permits that allow the harvest of antlerless deer are established annually for each of 57 management units. Antlered-only permits are unlimited. Quotas are based on population modeling, harvest statistics from mandatory check-ins, conservation agents' perceptions of

populations and crop damage reports. Stabilization of deer populations in most parts of Missouri is desirable and emphasis in recent years has been on increasing doe harvests through liberal quotas.

NORTH CAROLINA

North Carolina has a diversity of habitat types ranging from the sounds and marshes of the Outer Banks coastal region to the highest mountains in the eastern United States. Regional habitat diversity also is evident in the state's 3 physiographic provinces. The lower Atlantic Coastal Plain region is comprised of marsh, flatwoods, and both lowland and upland swamps (pocosins). Many of the wetlands in this area have been drained and converted to pine forests and farms. The upper Coastal Plain is one of the major agricultural areas of the state. Primary forest types of the Coastal Plain are loblolly pine, oak-gum cypress, oak-hickory, oak-pine, pond pine, and longleaf pine. The Piedmont region is characterized by rolling hills and smaller farms and woodlots. Major forest types include oak-hickory, loblolly pine, oak-pine, Virginia pine, and shortleaf pine. The Appalachian Mountain region consists primarily of rugged mountains with shallow rocky soils in the highest areas to some fertile bottomlands and valleys in the lower elevations. Principal forest types of this region include oak-hickory, oak-pine, chestnut oak, white pine-hemlock, maple-beech-birch, and Virginia pine.

The history of deer in North Carolina is similar to the other southeastern states. In the early 1900's it was estimated that only 10,000 deer were in the state. A buck law was established in 1927. The period from 1930 to 1960 was characterized by the restoration and recovery of deer herds. During this "buck management" phase, deer herds responded dramatically to the restoration efforts and protection they were afforded. By 1960, the statewide population was 250,000 animals and almost 30,000 were harvested. Either-sex seasons were established in 1959. The period of 1960 to 1980 was characterized by the "doe management" phase. Most management strategies involved the concept of trying to get more does in the harvest. Very little concern was given to the buck segment of the herds. The period since 1980 has been characterized by the "herd" management phase. Herd and habitat management schemes were established which attempted to make better utilization of both sexes and at the same time improve the quality of the deer harvested and the condition of the habitats. A Deer Management Assistance Program was initiated in 1981 to offer the concept of quality deer management to landowners and hunting clubs.

The 1994 pre-season population estimate was 800,000 deer. In the Coastal Plain, densities and buck harvests have stabilized somewhat and there have been accompanying increases in doe harvests (almost 40% of the total). Piedmont herds are being affected by urbanization and conflicts between deer and people are becoming more evident. Work is ongoing to evaluate techniques for increasing antlerless harvests without adding to existing conflicts between hunters and landowners. Herds are continuing to increase in the good habitat of the foothills area of the upper Piedmont and lower Mountain regions. Mountain populations

are relatively stable and either-sex hunting is being incorporated gradually into those areas where herds are sensitive to severe environmental conditions and fluctuations in high energy foods like acorns occur.

OKLAHOMA

Oklahoma's deer range provides sportsmen with varying topography, several different habitat types, and two species of deer to hunt. White-tailed deer occur throughout the entire state, while mule deer inhabit the panhandle and northwest counties.

Oklahoma slopes southeastward from an elevation of 1518 m at Black Mesa in the panhandle to 99 m on the Red River in the southeastern corner. Topography is generally flat or rolling, exceptions being the Wichita Mountains in the southwest, the Arbuckle Mountains in the south-central section, and the .Ouachita, Boston, and Ozark Mountains along the eastern border. Average annual precipitation ranges from a low of 38 cm in the panhandle to 115 cm in the southeast part of the state.

Four major forest types cover approximately 20% of the state. The most extensive forest type is the post oak-blackjack oak type which occurs throughout the central region. Oak-hickory and oak-pine forests cover much of the eastern portion of the state. The pinon-juniper type is found only in the Black Mesa area of the panhandle, and represents an eastern extension of the Rocky Mountain flora. The remainder of the state is dominated by grasslands with tallgrass, mixed grass and shortgrass prairies occurring east to west. Sand sage and shinnery oak grasslands are common along the western border and in the panhandle.

A highly successful restocking program helped Oklahoma's deer herd rebound from a low of 500 animals in 1916, to an estimated 325,000 animals today. Antlerless deer harvests were implemented in the mid-1970's under a zoned permit system. In 1982, this system was dropped in favor of a system which offers varying numbers of antlerless days depending on the harvest zone. Initially, sportsmen had difficulty accepting the idea of harvesting does, but harvest results clearly show that antlerless hunting has benefitted Oklahoma deer hunters. The deer harvest trend during the past decade has seen a remarkable increase of 146%, including a 121% increase in the antlered buck harvest.

Perhaps the greatest challenge in managing Oklahoma's deer herd is that over 95% of the land is privately owned. Coupled with this is the fact that much of this land is used for an agriculture-based economy which is not always compatible with deer production. Deer habitat is especially scarce in the southwest portion of the state and in many areas of eastern Oklahoma, where forest succession has advanced to the point of greatly reduced carrying capacity. A short nine-day gun season can also pose management problems if poor weather discourages participation of gun hunters, who typically account for 75% of the total harvest. Despite these obstacles, deer hunters have enjoyed record harvests four of the past five years.

SOUTH CAROLINA

The statewide deer harvest of 148,123 deer represents an actual count of the number of deer killed. These data were provided by hunters at Department operated check stations and from cooperating club data. It appears to contrast some other states' information, which is derived from postal surveys or hunter reports. However, it should be pointed out that South Carolina's reported harvest represents an absolute minimum number.

Deer hunting in South Carolina is characterized by two distinct season frameworks. The Upper and Lower Coastal Plain encompasses 28 counties where the deer season begins on August 15, September 1, or September 15 and continues until January 1. In this area, dog hunting is allowed; however, this activity is declining significantly. The antlerless deer harvest in the 28 county region is controlled by an antlerless deer quota program, whereby tags are issued to tracts of land based upon the biological needs of each area. It is important to note that the deer season and method of antlerless harvest in the Coastal Plain is controlled by the State General Assembly through statutory control.

In the Piedmont and Foothills of South Carolina (18 counties), the season framework is controlled by Department regulatory authority. In this area, the deer season begins on October 1 for primitive weapons and October 11 for modern firearms, and continues until January 1. Antlerless deer harvest is facilitated in this area using either-sex days and an antlerless tag program.

South Carolina's deer herd reached an extremely low point at the turn of the century and disappeared completely from the Piedmont and Foothills. Restoration efforts began in the early 50's and deer were restored to all of the Piedmont and Foothills. All restocking efforts utilized deer from the coastal plain of South Carolina. Huntable populations currently exist in all 46 counties.

Current Department objectives include stabilizing or reducing the deer population in most areas of the state. Changes will include efforts to increase the antlerless harvest while offsetting some of the harvest of antlered bucks.

TENNESSEE

Tennessee is composed of 8 distinct physiographic regions, ranging from mountains in the east to wide swampy river bottoms in the west. Elevations range from 200 feet above sea level along the Mississippi River in the west to 6,642 feet at Clingman's Dome in the Great Smoky Mountains. The wide range in elevations, topography and soil classifications has resulted in a complex diversity of forest types, vegetation, and productivity. Deer habitat quality consequently is very diverse across the state. Tennessee's most abundant deer herds are found in the highly interspersed forested and agricultural areas of the middle and western portions of the state, from which approximately 75% of the harvest is taken. The deer herds of the Cumberland Plateau and eastward are less abundant, although they are increasing rapidly. The habitat in the mountainous eastern portion of the state is less productive than the rest of the state, and deer herds in these areas will probably not reach the densities that have been achieved in middle and western Tennessee.

Tennessee is blessed with abundant public hunting opportunity. Over 2,000,000 acres of land is available for hunting by the general public. About 1.3 million of these acres are managed by state and federal agencies, and provide a variety of hunting opportunities. Another 700,000 acres are privately owned timberlands that are part of the state's Public Hunting Area program, which provides public hunting access to large acreages for a small fee ($12-$25).

The history of Tennessee's deer herd is similar to that of other states. The low point in numbers of deer occurred at the turn of the century, when it is estimated that the herd numbered less than 2,000 deer. Restoration of the state's deer herd was begun in the 1930's and 40's and continued until 1985. During the initial years of restoration activities, most deer were obtained from out of state, with the states of North Carolina, Texas, and Wisconsin providing the bulk of the deer that later served as in-state sources for subsequent stocking. From 1940 to 1985, over 9,000 deer were stocked in 72 of Tennessee's 95 counties. Since the 1940's, herd growth has been substantial and consistent, with the herd now estimated to be approximately 829,000. The deer harvest has grown accordingly, from 113 in 1949 to over 150,341 in 1997.

Deer management in Tennessee is conducted on a unit basis, with 2 major units. Unit A comprises the middle and western counties of the state and has the longest seasons and the most liberal bag limits. Unit B comprises the eastern counties and has shorter seasons and more conservative bag limits. Within each unit, county deer herds are managed separately. Population models as well as other biological parameters (age/sex structure, weights, antler dimensions) are used to assess the status of each herd, and desired doe harvests are

determined. Doe harvests are accomplished through the issuance of quota permits allocated by drawing. Since 1975, the antlerless harvest in Tennessee has increased from 23% to over 41% of the total harvest in 1997.

Future deer management in Tennessee will continue to focus on the challenge of maintaining adequate doe harvests in the face of a stabilized or reduced hunter base. Also, the demand for quality/trophy deer opportunities is increasing in the state, and will have to be addressed in the near future.

TEXAS

Texas is composed of 10 ecological areas. The Edwards Plateau is the limestone and granite "Hill Country" of west central Texas. The South Texas Plains, also known as the "Brush Country", is a level to rolling plain extending south and west from about San Antonio to the Gulf of Mexico and the Rio Grande. The Cross Timbers and Prairies range from oak and mesquite savannah to dense brush. The Gulf Prairies and Marshes region, a slowly drained level area, is located along the Texas coast. The Post Oak Savannah is a gently rolling area with elevations of 300 to 800 feet dominated by post oak and blackjack oak. The arid and mountainous Trans Pecos region is in the extreme western part of the state. The Blackland Prairies region is gently rolling to moderately rough and has agricultural and urban areas. The Rolling Plains and High Plains regions are located in the Panhandle where livestock grazing and irrigated farming dominate. The Piney Woods contains pines and bottomland hardwoods, much of which is in commercial forestry.

Early settlers found white-tailed deer in all areas of the state except the western and northwestern portions. Excessive harvest of deer for hides and meat to feed the settlers and early city-dwellers caused the species to decline by the late 1800's. Public concern prompted a series of protective measures. A five-month closed season was enacted in 1881, and the first bag limit was six bucks in 1903. Six game wardens were hired in 1919 to patrol the entire state. Deer increased dramatically by the 1930's thanks to protective regulations, law enforcement, invasion of woody plants into prairies, and restocking efforts.

Deer have expanded their range in Texas and over 82 million acres of the state are occupied by whitetails. There is a major problem with deer-human conflicts in subdivisions near cities. Texas allows private trapping and moving of deer under permit to help alleviate the problem. Bag limits and seasons have become more liberal to deal with the burgeoning deer population and to pique hunter interest.

Research and management experience in Texas continues to demonstrate the wisdom of selective harvest to produce bucks with superior antlers. Targeting deer with the smallest antlers as early as possible helps to ensure better bucks at maturity. Currently, some of the wildlife management areas emphasize harvest of bucks with 4 points or less through regulation. Many landowners under the technical guidance programs have programs that allow harvest of the low-end bucks and trophy bucks. Selective harvest seems to be a tool which will gain prominence in the state.

In 1998, Texas will implement a new program. managed lands deer permits are available to any landowner who is willing to follow guidelines provided by the local TPWD wildlife biologist or technician. If the landowner is willing to accept the number of buck and doe

permits that is biologically correct for the herd, then a special season and bag limit is designated for the property. That season is more than twice as long as the regular season to allow the landowner ample time to meet the objectives. The number of deer to be taken from the area is set by the number of permits issued, so the long season and increased bag will not mean an increased harvest. In fact, the number of bucks allowed to be killed through managed lands permits should be less than that which the landowner would have allowed under the regular county season.

Additionally, TPWD biologists may make recommendations on related issues as livestock management, vegetation management, watering devices, and the like. The biologist will approve a wildlife management plan that considers all aspects of management and considers the effects of the management on other wildlife species as well as deer. The effect of the deer herd on the native habitat is the prime consideration for deer harvest recommendations. If a landowner fails to make significant progress toward the herd and/or habitat objectives, that property will be dropped from the program in succeeding years until significant progress has been made.

While there is no minimum acreage required for the Managed Lands program, small land holdings are not expected to be enrolled because of the strict limitations on the number of bucks that may be harvested. Properties under deer-proof fence are eligible, but a high fence is not required. Small landowners are encouraged to join together in a "cooperative" to apply for managed lands permits. In that case, permits are issued to the cooperative's officers, who are then responsible for distributing them fairly to the participating landowners. Landowners are encouraged to practice good management, regardless of the size of the place or the amount of money they have to invest in expensive management tools such as fencing or supplemental feeds.

Participating landowners must report the deer harvest to the Texas Parks and Wildlife biologist or technician who approved the plan. Managers will be required to collect and submit data on the herd. Prior to the next season's issuance, biologists will review the biological data collected from deer (weights and measurements), survey data, and the habitat improvement progress. If the landowner has made significant effort toward achieving the objectives, then permits can again be issued.

A special hunting weekend for youth-only (under 17 years of age) was established and the Texas Youth Hunting Association was formed to encourage young people to enter the hunting fraternity. There were over 600,000 deer hunters of all ages in 1997 and they took over 371,000 deer from a herd estimated at 3,359,031.

VIRGINIA

The statewide deer harvest during the 1997 hunting season was 198,561 (93,601 antlered males, 22,385 male fawns, 80,546 females (41.0%), and 2,029 deer of unrecorded sex). The archery and muzzleloading harvests were 15,101 (7.6%) and 37,233 (18.7%), respectively . Harvest data in Virginia represent an actual known minimum count. Data are obtained through mandatory tagging and subsequent checking at one of about 1,400 check stations located statewide. The mandatory check station system has been in operation continuously since 1947 and is operated by volunteers.

Deer season in Virginia begins with a 7-week either-sex archery season that begins the first Saturday in October. Concurrent with the last two weeks of the archery season east of the Blue Ridge Mountains and the last week of the archery season west of the Blue Ridge Mountains is an early muzzleloading season. The early muzzleloading season is full season either-sex east and one-day either-sex west. In-line muzzleloaders with scopes are legal. Two distinct season frameworks characterize general firearms deer hunting, which begins the third Monday in November. East of the Blue Ridge Mountains, the firearms season runs through the first Saturday in January. West of the Blue Ridge and in the southwestern Piedmont, the firearms season is 12 days long. During the firearms season, either-sex deer can only be taken on prescribed either-sex days. West of the Blue Ridge the bag limit for all deer hunters (archers, muzzleloaders, and general firearms hunters) is 1 per day, 3 per season, 1 of which must be antlerless. Also, during the early muzzleloading season west of the Blue Ridge, hunters are limited to 1 antlered buck. East of the Blue Ridge the bag limit for all deer hunters (archers, muzzleloaders, and general firearms hunters) is 2 per day, 3 per season, 1 of which must be antlerless. Bonus permits (1 either-sex and 1 antlerless only) allow hunters to exceed the season bag limit statewide on private land(s) and designated public areas. No deer hunting is allowed on Sunday in Virginia.

In addition to the standard seasons and bag limits, Virginia has 2 site specific deer management programs, the Deer Management Assistance Program (DMAP) and the Damage Control Assistance Program (DCAP). Both programs were initiated during the 1988 season and continue to achieve wide acceptance. During the 1997 season, there were 499 DMAP cooperators encompassing 1,203,016 acres in 83 counties. These DMAP cooperators were issued a total of 13,160 antlerless tags and reported a total deer harvest of 17,318. Biological data are collected from all these animals. Also during the 1997 deer season, there were 651 DCAP cooperators comprising 136,278 acres. These DCAP cooperators were issued 5,611 antlerless tags and reported a harvest of 1,597 antlerless DCAP deer.

WEST VIRGINIA

West Virginia, known as the "Mountain State", lies within the Allegheny Mountain Range. It is comprised of 3 major physiographic regions. The Eastern Ridge and Valley Section found in the far eastern portion of West Virginia is made up of oak-pine forests and has a drier climate. The Allegheny Mountains and Uplands make up the central portion of the state, and are comprised of a northern forest type with twice the rainfall of the eastern region. The remaining area, which is the largest in size, is the Western Hills Section. This section contains the Monongahela-Upper Ohio Province to the north and the Cumberland Mountains to the south. The region is characterized by the central hardwood forest type which is predominantly oak-hickory.

The average elevation of the state is higher than any other state in the east. The highest point in the state is Spruce Knob (4,862 feet), while the lowest is where the Potomac River flows out of West Virginia at Harpers Ferry (247 feet). Most of West Virginia is characterized by a branched (dendritic) drainage pattern.

West Virginia, with 12.1 million acres of forest land, is 79% forested. Most of the state's economy is associated with timber and other forest products. The oak-hickory forests, which are vital to the welfare of deer in West Virginia, cover 77 % of the timberland.

Fertile soils are relatively uncommon in the state, so where they occur they are quickly adapted to farming. Bottomland soils are generally restricted to the floodplains of major streams. Terrace soils suited to farming are found along the Ohio River in the western portion of the state. Fertile upland soils containing limestone are found in eastern West Virginina.

West Virginia contains three national forests: the Monongahela, by far the largest, covering 901,678 acres; the George Washington, the second largest in the eastern portion of the state, covering 104,861 acres, and the Jefferson in southeastern West Virginia which covers 18,400 acres. In addition to this public land, the state owns or leases an additional 250,000 acres.

Deer in West Virginia reached their lowest level about 1910, following large scale logging operations and market hunting. Restocking programs were initiated in 1923 on a small scale, but as moneys were made available in 1939, restocking of deer escalated tremendously. Stocking of deer is no longer practiced in West Virginia with the exception of occasional releases of surplus animals from the Wildlife Center.

West Virginia sportsmen have experienced just about every type of season imaginable in the past, from bucks-only, to hunter's-choice, to permit hunting. It wasn't until 1968, when unregulated hunter-choice seasons were curtailed, that the deer herd began to rebound at a tremendous rate to its' present day population. Twenty years ago, West Virginia's deer harvest totaled 25,863 animals under archery and bucks-only regulations. In 1993, West Virginia sportsmen harvested 169,014 deer under lengthy archery, 12-day bucks-only, 3-day antlerless and 6-day muzzleloader seasons. In 1970, the bag limit was 2 deer. Today, resident hunters may take as many as 7 deer. West Virginia offers a wonderful opportunity for deer hunter recreation and, with a progressive program, deer hunting in the mountains should remain excellent in the future.

APPENDIX II
STATE DEER HARVEST SUMMARIES

Table 1. Southeastern deer harvest summaries, 1997-98.

State	Land Area (sq. mi.)	Deer Habitat (sq. mi.)	Deer Habitat (% Total)	Percent Forested	Deer Range Unoccupied	% Land Area Public Hunting	1997-98 Harvest Male	1997-98 Harvest Female	1997-98 Harvest Total
AL	51,628	48,014	93	66	0	3.0	266,742	156,658	423,400
AR	52,609	44,677	85	53	0	12.0	105,535	61,770	167,305
FL	51,628	29,280	**57**	45	0	16.0	51,346	10,246	61,592
GA	57,800	33,163	57	57	0	6.0	233,876	275,657	509,533
KY	40,395	39,654	97	59	0	8.5	87,826	54,126	141,952
LA	41,406	26,562	64	52	0	6.0	155,208	112,392	267,600
MD	9,837	8,766	89	43	0	4.0	39,380	26,133	65,513
MS	47,296	31,250	66	62	0	6.0	166,077	166,495	332,572
MO	69,561	21,396	31	31	0	4.3	122,366	94,192	216,558
NC	48,794	36,699	75	62	0	6.0	123,630	71,370	195,000
OK	69,919	34,960	50	19	0	2.0	46,459	24,748	71,207
SC	30,207	21,920	73	63	0	7.0	n/a	n/a	n/a
TN	42,246	25,770	61	49	0	8.5	98,222	52,119	150,341
TX	261,914	129,592	49	40	<10	<2	219,863	151,470	371,333
VA	39,682	31,782	80	63	0	9.8	115,986	80,546	198,561
WV	24,064	22,889	95	79	0	9.0	138,130	96,766	235,305

Table 1.(Continued)

State	Harvest/mi^2 Occupied Habitat	Method of Data Collection*	Estimated Pre-season Population	Length of Season (Days)			Method for Setting Seasons**	% Land Area Open to Dog Hunting
				Archery	Black Powder	Firearms		
AL	8.8	1,2,3	1,750,000	109	17	71	1,2	70
AR	3.7	1	1,000,000	151	21	36	1,2	81
FL	2.1	2	n/a	30	3	72	1,2	75
GA	15.4	1,2,3,4	1,388,000	35	51-79	51-79	1,2,3	10
KY	3.5	1,3,4,5	553,000	118	9	10	1,3	0
LA	10.0	1,2,3	1,000,000	123	14	60	1,2,3	80
MD	7.5	1,2,3,4	270,000	87	16	15	1,2	0
MS	10.6	1,2,3	1,500,000	62	14	47	1,2,3	99
MO	10.0	1,2,4	850,000	98	20	15	1,2	0
NC	5.3	1,2,3,4	900,000	24-60	6	18-70	1,2,3	53
OK	3.1	1,3	350,000	78	9	9	1,2	0
SC	n/a	1,2,3	1,000,000	12	10	70-140	1,2,3	60
TN	5.8	1,4	883,000	30-35	10-14	18-32	1,2,3	0
TX	3.5	2,3,4	3,359,031	30	9	58-121	1,2	0
VA	6.3	1,2,3,4	900,000	43-73	12-24	12-42	1,2	55
WV	10.3	1	900,000	64	6	18	1,2	0

*1-Check station; 2-Mail survey; 3-Jawbone collection; 4-Computer models; 5-Phone survey.

** 1-Harvest and biological; 2-Department-commission regulatory; 3-Legislative.

Table 1. (Continued)

State	No. Deer Hunters	5-Year Trend	License Fees		% Hunting Success		Typical Fine Illegal Deer	Average Leasing Fees/Acre
			Resident	Non-Resident	Archery	Firearms		
AL	217,300	Stable	$16.00	$202.00	25	50	$150-600	$2-11
AR	250,000	Stable	$10.50-25.00	$95-195	n/a	n/a	$150-1000	$2-4
FL	90,577	Down	$11.00	$150.00	n/a	n/a	$250-500	$3.50
GA	319,488	Stable	$19.00	$177.00	28	60	$500.00	$3-15
KY	217,000	Up	$33.00	$116.00	25	60	$350.00	n/a
LA	185,300	Stable	$21-42	$96-212	30	54	$500.00	$3-30
MD	90,000	Decline	$24.50	$120.50	40	50	$500.00	$5-35
MS	170,003	Stable	$17-32	$105-225	44	63	$150.00	$3-10
MO	400,000	Stable	$11.00	$110.00	15	75	$250.00	$2-3
NC	285,000	Stable	$25.00	$80.00	n/a	49	$200-500	$2-6
OK	175,874	Stable	$29.25	$201.00	13	23	$500-1000	$2-5
SC	184,000	Up	$18.00	$105-155	n/a	n/a	$200.00	$4-10
TN	172,297	Down	$39.00	$105.50-156.00	24	51	$50-500	$3.55
TX	613,279	Stable	$19.00	$250.00	15	54	$188-1000+	$5.00
VA	230,000	Down	$25-50	$122-174	29	51	$50-850	n/a
WV	343,000	Stable	$25.00	$100.00	21	60	$282-562	$1-5

Table 1. (Continued)

State	Mandatory Hunter Education	No. Fatal Hunting Accidents		Mandatory Blaze Orange	Handguns Permitted	Crossbows Permitted	Drugged Arrows Permitted	Highway Kill (Minimum)
		All	Deer					
AL	Yes	3	1	Yes	Yes	Handicap	No	5,000
AR	Yes	8	4	Yes	Yes	Yes	No	8,839
FL	Yes	n/a	n/a	Yes	Yes	Yes	No	n/a
GA	Yes	4	4	Yes	Yes	Handicap	No	9,000
KY	Yes	5	2	Yes	Yes	Yes	No	3,900
LA	Yes	1	0	Yes	Yes	Handicap & over 60	No	2,500
MD	Yes	3	3	Yes	Yes	Handicap	No	3,600
MS	Yes	6	6	Yes	Yes	Handicap & 65 & over	Yes	7,500
MO	Yes	4	2	Yes	Yes	Yes	No	9,000
NC	Yes	3	2	Yes	Yes	Handicap	No	6,000
OK	Yes	3	0	Yes	Yes	Handicap	No	n/a
SC	Yes	4	4	Yes (18 co.)	Yes	Yes	Yes (28 co.)	3,821
TN	Yes	5	3	Yes	Yes	Handicap	No	n/a
TX	Yes	7	1	No	Yes	Yes	No	n/a
VA	Yes	n/a	n/a	Yes	Yes	Handicap	No	n/a
WV	Yes	4	1	Yes	Yes	No	No	14,713

NOTES

NOTES

1999 DEER STUDY GROUP
COMMITTEE ASSIGNMENTS

CO-CHAIRPERSONS
MICHAEL CARTWRIGHT, DON McKENZIE, DAVE URBSTON

PROGRAM AND AGENDA
MICHAEL CARTWRIGHT (CHAIR), JOHN LANE, MIKE MITCHELL, DAVE URBSTON

REGISTRATION
CINDY COPELAND (CHAIR), WENDY ADDISON, SANDI FARR, JANET GREENWOOD, PAT MATTHEWS, MARY SEXTON, BEVERLY SUTTON

HOTEL ARRANGEMENTS
FRED WARD (CHAIR), RICK CHASTAIN, DAVID LONG, CHARLENE RISNER

FUNDRAISING
CHARLES SELF (CHAIR), LEVI DAVIS, GREGG MATHIS,
MYRON MEANS, RICHARD STICH

PAPER SELECTION
LARRY HEDRICK (CHAIR), MICHAEL CARTWRIGHT, MICHAEL HILL, TONY MELCHIORS, TOM NUPP, PHIL TAPPE, DAVE URBSTON

TECHNICAL SESSIONS (INCLUDING MODERATORS, AUDIO VISUAL & DOOR PRIZES)
DOYLE SHOOK (CHAIR), MARK CLARK, DAVID SETTLEMOIR

SOCIAL EVENTS AND ENTERTAINMENT
DON McKENZIE (CHAIR), MARTIN BLANEY, WANDA FOWLKES, DAVID GOAD,
NANCY LEGG, MIKE WIDNER

FIELD TRIPS
BOB McANALLY (CHAIR), MARK BARON, JOHN GALLAGHER, SAM LAIL

TRANSPORTATION
EDDIE LINEBARGER (CHAIR), RANDALL BULLINGTON, ALAN POGUE

STUDENT PAPER AWARD
DAVE URBSTON (CHAIR), JOHN LANE, MIKE STATEN, MIKE WIDNER

EXHIBITORS AND VENDORS
STEVE R. WILSON (CHAIR), BRUCE COOK, MARC KILBURN

SECURITY
LUTHER HUNGATE, (CHAIR)

MEETING LIAISON AND COORDINATOR
MIKE GIBSON