FEBRUARY 9-12, 1997
SHERATON CHARLESTON
CHARLESTON, SOUTH CAROLINA

HOSTED BY:
THE SOUTH CAROLINA DEPARTMENT
OF NATURAL RESOURCES

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THE SCDNR AND THE SOUTHEAST DEER STUDY GROUP THANK THE FOLLOWING COMPANIES AND ORGANIZATIONS FOR THEIR GRACIOUS CONTRIBUTIONS TO THIS MEETING.

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THE SOUTHEAST DEER STUDY GROUP

The Southeast Deer 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 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

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

Name	State	Employer
David K. Nelson	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	Department of Defense
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
Larry Castle	Mississippi	Mississippi Department of Wildlife, Fisheries and Parks
Lonnie P. Hansen	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
Greg Wathen	Tennessee	Tennessee Wildlife Resources Agency
Steve Demarais	Texas	Texas Tech University
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 9, 1997

1-6pm **Registration - Hotel Lobby**

3:00pm **Southeast Deer Committee Meeting (Citadel Room A)**

5:30pm **Buses Depart for Social (Side of Hotel)**

6-10pm **Social/Dinner-Charleston Visitors Center**

MONDAY, FEBRUARY 10, 1997

7-5pm **Registration - Hotel Lobby**

8:00am **Welcome - Paul Sandifer, Director Designee, SCDNR**

Welcome - W. Brock Conrad, Jr., Deputy Director, Wildlife & Freshwater Fisheries Division, SCDNR

Keynote Address - R. Larry Marchinton, Univ. of Ga.

Announcements and Instructions - Derrell Shipes

The Paper Selection Process - Greg Yarrow

Technical Session I - Moderator: *Robert L. Downing*, Retired, USF&WS

9:00am **Public Opinion: Obstacle or Aid to Sound Deer Management?**
Deborah Green, College of William and Mary; *Glen R. Askins* and *Phillip D. West*, Va. Dept. of Game and Inland Fisheries.

9:20am **The Mt. Holly Project: An Example of Successfully Navigating the Obstacles of Deer Management.**
Grant R. Woods, Woods and Associates, Inc.

***9:40am** **Challenges of Managing Deer for Diverse Interests: Current Attitudes Towards Resource Utilization in the Southeast.**
Deborah T. Yarrow and *David C. Guynn, Jr.*, Clemson Univ.

10:00am **Break**

Technical Session II - Moderator: *Luke Lewis*, Willamette Corp.

10:30am **The Dooly County Experiment: A Final Report.**
Micah S. Goldstein, Georgia-Pacific Corp.; *R. L. Marchinton* and *K. V. Miller*, Univ. of Ga.; *W.L. Cooper* and *T.L. Kile*, Ga. Dept. of Natural Resources.

10:50am **Evaluation of the Deer Management Assistance Program for Managing Private Lands in Alabama.**
Neil A. Waer, H. Lee Stribling and *M. Keith Causey*, Auburn Univ.

11:10am **Before and After Analysis of Quality Deer Management on Six Public Areas in Georgia.**
Kent E. Kammermeyer, Todd Holbrook and *Scott McDonald*, Ga. Dept. of Natural Resources.

11:30am **An Alternative Managed Deer Hunt Design.**
Bradley W. Howard and *Frederick A. Busch*, Va. Dept. of Game and Inland Fisheries.

11:50am **Anderson-Tully Company: A Case Study in Quality Deer Management.**
Timothy L. Evans, Mike Staten and *Stanley R. Priest*, Anderson-Tully Co.

12:10pm **Lunch (Provided at hotel as part of registration fee)**

Technical Session III - Moderator: *William M. Knox*, Va. Dept. of Game and Inland Fisheries

1:30pm **Comparative Antler Characteristics of Spike- and Fork-Antlered Yearling White-tailed Deer in Texas at Age 4.5 Years.**
James R. Ott, Scott W. Roberts and *John T. Baccus*, Southwest Texas State Univ.; *Donnie E. Harmel, Eugene Fuchs* and *William E. Armstrong*, Tex. Parks and Wildlife.

*1:50pm **The Role of Tarsal Bacteria in Scent Communication of White-tailed Deer.**
Jonathan W. Gassett, Karen A. Dasher, Scott M. Russell, David A. Osborn and *Karl V. Miller*, Univ. of Ga.

*2:10pm **Factors Affecting Occurrence of Broken Tines in Mature White-tailed Deer.**
Tyler A. Campbell, Stephen Demarais, Herbert F. Janssen and *Darren L. Peterson*, Texas Tech Univ.

2:30pm **Impact of Deer on Corn and Soybean Yields & Profitability of Chesapeake Farms, MD.**
Mark C. Conner and *D. Raymond Forney*, DuPont Agricultural Products.

*2:50pm **Feasibility of Controlling Soybean Depredation by White-tailed Deer Using a Quality Deer Management Approach.**
Eric G. Darracq, and *Greg K. Yarrow*, Clemson Univ.; *Derrell Shipes*, S. C. Dept. of Natural Resources.

3:10pm **Break**

<u>Technical Session IV - Moderator: *Sarah Schweitzer*, Univ. of Ga.</u>

*3:40pm **Deer Research in a Coastal South Carolina Residential/Resort Community.**
David W. Henderson, Robert J. Warren and Jennifer A. Schwartz, Univ. of Ga.; *Robert J. Hamilton*, S. C. Dept. of Natural Resources.

4:00pm **White-tailed Deer Management in a Coastal Georgia Residential Community.**
Joseph W. Butfiloski and *Douglas I. Hall*, USDA/APHIS/ADC-Wildlife Services; *Douglas M. Hoffman*, Univ. of Ga.; *Daniel L. Forster*, Ga. Dept. of Natural Resources.

4:20pm **Reduction of an Insular Suburban Deer Herd Using Sharpshooters.**
Anthony J. DeNicola, White Buffalo, Inc.; *Steve Weber*, New Hampshire Fish and Game.

4:40pm **Developing, Implementing and Evaluating Urban Deer Management Programs.**
Jay B. McAninch, Minn. Dept. of Natural Resources.

5:00pm **Dinner (On your own)**

7:30pm **SHOOTING FROM THE HIP: URBAN DEER AND ANIMAL RIGHTS ACTIVISTS**
Panelists: Robert J. Hamilton, S.C. Dept. of Natural Resources; Robert J. Warren, Univ. of Ga.; Jay B. McAninch, Minn. Dept. of Natural Resources.

TUESDAY, FEBRUARY 11, 1997

Technical Session V - Moderator: *Jim Crum*, West Va. Division of Natural Resopurces

***8:10am** **Captive and Field Tests of a Method for Immobilization and Euthanasia of Urban Deer.**
Jennifer A. Schwartz, Robert J. Warren, David W. Henderson and *David A. Osborn*, Univ. of Ga.; *Darrel J. Kesler*, Univ. of Ill.

8:30am **Censusing Deer with Infrared-Triggered Cameras.**
Robert E. Vanderhoof, Fla. Game and Freshwater Fish Commission; *Steven Shea*, Dept. of Defense.

8:50am **Preliminary Results of a Critical Evaluation of the Tooth Replacement/Wear Aging Technique for White-tailed Deer.**
Kenneth L. Gee and *John H. Holman*, Samuel Roberts Noble Foundation; *M. Keith Causey*, Auburn Univ.

9:10am **A Comparison of White-tailed Deer Fetal Aging Models.**
James C. Kroll and *Ben Koerth*, Stephen F. Austin State Univ.

***9:30am** **Prediction of Dietary Crude Protein of White-tailed Deer via NIRS Technology.**
Scott Showers and *Jerry Stuth*, Texas A&M Univ.; *Ben Koerth* and *James C. Kroll*, Stephen F. Austin State Univ.

***9:50am** **Deer Populations and Management Opportunities on Small Private Land Holdings in Cherokee County, Texas: A Case Study.**
Victor Donahey, James C. Kroll and *Ben Koerth*, Stephen F. Austin State Univ.

10:10am **Break**

Technical Session VI - Moderator: *David Ledford*, Stone Container Corp.

10:30am **Survivorship and Mortality Causes of Adult Bucks in Mississippi.**
Harry A. Jacobson, Daniel Coggin, Susan Bothum, James Heffelfinger and *Zack Morgan*, Miss. State Univ.

*10:50am **Observations of Mortality and Emigration in a Coastal South Carolina Population of White-tailed Deer.**
Tamara J. McCoy, James H. Dozier III, Elizabeth J. Turner, Keith Morgan and *Tim Fendley*, Clemson Univ.; *Derrell Shipes*, S.C. Dept. of Natural Resources; *Wallace Roberts*, Westvaco.

*11:10am **Fate of Bucks in a Coastal South Carolina Deer Herd.**
James H. Dozier III, Tim Fendley, Keith Morgan and *Elizabeth J. Turner*, Clemson Univ.; *Derrell Shipes*, S.C. Dept. of Natural Resources.

11:30am **Tag Returns from Deer Captured in Mississippi.**
Harry A. Jacobson, Susan Bothum, Daniel Coggin and *Jacob Bowman*, Miss. State Univ.; *Daniel Cotton* and *Donnie Lewis*, Miss. Dept. of Wildlife, Fisheries and Parks; *David C.Guynn*, Jr., Clemson Univ.

*11:50am **Yearling Buck Dispersal at Chesapeake Farms, Maryland: Managing a Disappearing Resource.**
Christopher S. Rosenberry and *Richard A. Lancia*, N.C. State Univ.; *Mark C. Conner*, Dupont Agricultural Products.

12:10pm **Lunch (Provided at hotel as part of registration fee)**

Technical Session VII - Moderator: *Mac Baughman*, Westvaco

1:30pm **Effects of Three Site Preparation Treatments on White-tailed Deer Forage Availability.**
William F. Moore, Karl V. Miller and Brian R. Chapman, Univ. of Ga.; *Jeffrey J. Brooks*, Ft. Benning Military Reservation; *Jane Rodrigue*, Univ. of Ga.

1:50pm **Plant Community Characteristics within an 18-Year-Old Deer Exclosure in South Mississippi.**
Jeanne C. Jones, Harry A. Jacobson and *Dale H. Arner*, Miss. State Univ.

2:10pm **Effect of Dormant Season vs. Growing Season Fire on White-tailed Deer Browse in Stands Managed for Red-cockaded Woodpeckers.**
William E. O'Connell, M. D. Yates and *M. B. Edwards*, USFS; *K. V. Miller* and *B.R. Chapman*, Univ. of Ga.

2:30pm **Impact of Forest Herbicides on White-tailed Deer Forage Abundance.**
George Hurst, Miss. State Univ.

2:50pm **Response of Selected Deer Browse Species to Thinning of a Natural Loblolly Pine-Hardwood Stand.**
David G. Peitz and *Philip A. Tappe*, Univ. of Ark.; *Michael G. Shelton*, USFS; *Michael G. Sams*, Okla. Dept. of Wildlife Conservation.

3:10pm **Break**

Technical Session VIII - Moderator: *Jimmy Bullock*, Union Camp Corp.

***3:40pm** **Forage Abundance in Group Selection Cuts in a Bottomland Forest in South Carolina.**
Steven B. Castleberry, Univ. of Ga.; *W.M. Ford*, Westvaco; *K.V. Miller*, Univ. of Ga.; *W.P. Smith*, USFS.

4:00pm **Spatial Structuring of White-tailed Deer Populations.**
Michael H. Smith, Univ. of Ga;. *James R. Purdue*, Ill. State Univ.; *James M. Novak* and *Paul E. Johns*, Univ. of Ga.

4:20pm **Directional Long-Distance Movements by White-tailed Deer in Florida.**
John C. Kilgo, Ronald F. Labisky and *Duane E. Fritzen*, Univ. of Fla.

4:40pm **Keeping Deer Data "On the Ground".**
William H. Lunceford and *Jimmie W. Lipe*, Miss. Dept. of Wildlife, Fisheries and Parks.

5:00pm **Business Meeting**

6:00pm **Social Hour**

7:00pm **Banquet**

WEDNESDAY, FEBRUARY 12, 1997

8:00am **ACE Basin Field Trip (Buses will depart the hotel from the side entrance).**

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

***Indicates Student Papers**

ABSTRACTS

Monday, February 10, 1997

Technical Session I - Moderator: *Robert L. Downing*, Retired, USF&WS

9:00 AM

Public Opinion: Obstacle or Aid to Sound Deer Management?
Deborah Green, College of William and Mary; *Glenn R. Askins* and *Phillip D. West*, Virginia Department of Game and Inland Fisheries.

Public opinion is often perceived as an obstacle to deer management when concerns about issues such as hunter behavior and human safety increasingly result in ordinances against firearms discharge, and other restrictions, which may have long-term negative consequences for herd health. In the present study, the public was surveyed in conjunction with development of a deer management plan for a southeastern town. Approximately 3% of the population (N = 102) were contacted using a random digit dial telephone survey; 87 (85%) completed an interview concerning their experience with deer and deer problems, their attitudes about specific management techniques, whether or not they believe deer require management, etc. Despite reports of widespread deer problems (vehicular accidents, garden damage and Lyme disease), media coverage of the local deer management issue indicated that lethal controls would sharply divide the community.

Results of the survey revealed that residents do see deer (95.5%), are aware of deer problems (70%), favor management (70%), and believe trapping and relocating, birth control, repellents, controlled hunts, and fencing are acceptable management techniques (all > 55%). Discussion will focus on removing public opinion as an obstacle to deer management by using survey data to: (a) diffuse controversy generated by media reports, (b) develop management plans incorporating techniques already acceptable to the community, and (c) provide a specific focus for public education efforts.

9:20 AM

The Mt. Holly Project: An Example of Successfully Navigating the Obstacles of Deer Management

Grant R. Woods, Woods and Associates, Inc.

Since 1990, the Mt. Holly project has been designed to address questions about deer management frequently asked by sportsmen. These questions can be grouped into three categories: (1) what behavior and physiological changes can be expected to occur in a deer herd when its sex ratio and age structure change?, (2) how much of an effect can small inholdings or neighboring properties with differing deer management goals have?, and (3) if bucks are passed, will they survive and are they harvestable?

This project was designed so it could be replicated by sportsmen on a single or adjoining properties. The 6,000 acre Mt. Holly Plantation has been an excellent location for this study because it has several characteristics that allow for these questions to be addressed. For example, there is a 10 acre inholding that is home to several deer hunters and a 90 acre inholding peninsula where baiting on the border is practiced. Trespassing and poaching occur annually and several arrests have been made.

Following the South Carolina Department of Natural Resources' harvest regulations and fair chase guidelines, a team of researchers has harvested 171 bucks and 465 does from 1990 to 1995. The observed adult buck:doe ratio changed from 0.72:1 in 1990 to 1.83:1 in 1995. The quantity of quality mature bucks (3 1/2+ years old) observed and harvested increased throughout the project even though buck harvest by the neighbors was unrestricted -- 30+ bucks annually on one neighboring 60 acre property. Observation and physiological data were collected during this project and will be discussed. The results of this project indicate the frequent goal of sportsmen to improve deer herd quality, including the opportunity to observe and harvest mature bucks, can be achieved in less than ideal situations.

*9:40 AM

Challenges of Managing Deer for Diverse Interests: Current Attitudes Towards Resource Utilization in the Southeast

Deborah T. Yarrow and *David C. Guynn, Jr.*, Clemson University.

Understanding current attitudes towards natural resource use and management requires information regarding preferences and underlying values of landowners, deer managers and biologists, and others who influence public policy. To gather such data, a survey addressing interests and perceptions regarding ecosystem management and forest attitudes was pre-tested and mailed during 1994 to 1500 people in nine Southeastern states. Recipient groups, with response rate in parentheses, included forest stewardship landowners (74%), members of the state's House or Senate with natural resource committee appointments (30%), members of The

Wildlife Society (84%) or the Society of American Foresters (77%), and *Urban Forests* magazine readers (64%). Demographics revealed respondents who were better educated (64% attaining a college or master's degree), wealthier (58% reporting incomes of $50,000. or greater), and who held more land (46% owning 100-999 acres) than the general population; yet their background was reflective of opinion leaders in natural resource policy decisions and implementations.

Principle Components Analysis (internal reliability of .94) identified five primary forest attitudes, listed in priority order of variance explained (in parentheses): utilitarian (5.9%), anti-scientistic (5.4%), cathedralistic (4.9%), negativistic (3.0%), and aesthetic management (1.9%). These five classifications revealed clear areas of focus for deer managers in the Southeast. By understanding and disseminating the implications of these results, natural resource professionals can better meet human dimensions challenges of deer herd management in the Southeast.

Technical Session II-Moderator: *Luke Lewis*, Williamette Corp.

10:30 AM

The Dooly County Experiment: A Final Report
Micah S. Goldstein, Georgia Pacific Corporation; *R. L. Marchinton* and *K. V. Miller*, Univ. of Georgia; W. L. Cooper and *T. L. Kile*, Georgia Department of Natural Resources.

Between 1992 and 1995, The University of Georgia and The Georgia Department of Natural Resources (DNR) tested the feasibility of using state harvest regulations to initiate Quality Deer Management (QDM) on a county-wide basis. Dooly County was selected based on various biological and sociological parameters. Data collected in 1992 indicated that a 15-inch outside spread regulation would protect all 1.5 year-old bucks from harvest. The antler regulation was implemented for three seasons beginning in 1993. Doe harvest was liberalized to achieve an even sex ratio and herd stabilization. County landowners and hunters were surveyed prior to the experiment and again at its conclusion. Herd parameter changes were monitored with harvest data collected at voluntary check-stations. Excluding 1.5 year-old bucks from harvest significantly increased the age structure of bucks harvested throughout the experiment. After year one, total antlered bucks harvested was similar to pre-regulation levels, while yearlings checked declined from 41% in 1992 to 6% in 1995. Illegal harvest of yearling bucks appeared insignificant. Age structure of the female harvest did not change significantly. Condition indicators, including live and eviscerated weight, kidney fat, and antler characteristics were unchanged for all age classes of both sexes. Mail surveys indicated a significant shift in public perception. Support increased from 66% prior to the experiment to 89% after the third year. A decision has been made by DNR to continue selective harvest of bucks in Dooly County, and a process is being formulated to allow other counties to adopt similar regulations.

10:50 AM

Evaluation of the Deer Management Assistance Program for Managing Private Lands in Alabama

Neil A. Waer, H. Lee Stribling, M. Keith Causey, Auburn University.

The Alabama Cooperative Deer Management Assistance Program (DMP) of the Alabama Division of Game and Fish was initiated in 1984 to assist individuals interested in white-tailed deer management on private lands. As of the 1995-1996 hunting season, the DMP had over 1,700 cooperators encompassing approximately 1.4 million hectares. The program allows landowners and hunters a liberalized antlerless harvest (harvest quotas are established by an appointed biologist based on evaluating each cooperator's harvest data) to decrease deer populations and help balance sex ratios. We used regression analyses to evaluate changes in body weight across hunting seasons for deer harvested by 55 cooperators who had participated in the DMP for a minimum of 5 years. Most (71%) cooperators experienced no change in deer body weights after a minimum of 5 years of harvest management. We only found 5 (9%) of the 55 cooperators with ≥3 age by sex classes with an increase in body weight. Conversely, we found 11 cooperators (20%) with ≥3 age by sex classes experiencing a decrease in body weight. Even though most cooperators have not experienced the expected improvements in herd performance, herd reduction through antlerless harvest and reduction in harvest of young bucks have resulted in increased overall harvests and improvements in herd sex ratios and buck age ratios. However, managing deer herds by solely reducing standing crop biomass to improve deer performance may be unsuccessful in many areas of Alabama because sufficient antlerless harvest must be coupled with provision of a high-quality diet to improve herd quality.

11:10 AM

Before and After Analysis of Quality Deer Management on Six Public Areas in Georgia

Kent E. Kammermeyer, Todd Holbrook and *Scott McDonald*, Georgia Department of Natural Resources.

In recent years, quality deer management has been widely promoted and is extremely popular among hunters. However, there is a serious lack of data on how to monitor the program and gauge the success of this management. Through the 1995 hunting season, 5 Georgia Wildlife Management Areas (WMAs) have been under some form of quality deer management (QDM) for at least 5 years and another for 20 years. We monitored selected harvest data and ran paired t-tests to determine any significant differences in means the last 3 years before and the last 3 years of QDM for individual WMAs and the 5 areas combined. For 5 combined areas, number of hunters was not significantly different, deer kill per sq. mi. was lower ($P \leq .08$) and hunter success was lower ($P \leq .004$) under QDM. Quality buck harvest (defined as any buck 2 1/2 years or older) was lower ($p \leq .01$) (1.3 versus 1.7 per sq. mi.) after QDM. Doe kill and button buck harvest was significantly higher ($P \leq .07$ and $P \leq .04$) after QDM. Of

the 5 condition indicators tested for the 5 combined areas, button buck weights ($P \leq .10$) and yearling doe weights ($P \leq .004$) were significantly higher for the two 3-year periods. After QDM, percent 3 1/2 and older bucks in the harvest was higher ($P \leq .007$). If success is based mostly on increased harvest of quality bucks, 4 of the 5 areas are not considered successful after 5 years. Only the 20 year WMA and one 7 year WMA which showed striking improvements in the 5th year are considered successful. One conclusion is that QDM may not work on many large public areas for a variety of reasons including heavy hunting pressure around their boundaries, buck dispersal, and high button buck harvest. If an area is successful, there is a lengthy delay before the benefits of QDM are realized and become evident in the data.

11:30 AM

An Alternative Managed Deer Hunt Design

Bradley W. Howard and *Frederick A. Busch*, Virginia Department of Game and Inland Fisheries.

In an effort to minimize on-site supervision, maximize hunting opportunity, and control hunter density, an innovative managed hunt design was implemented on a 2500 acre parcel of state owned land in Henrico County, Virginia. The design provided 8 weeks of hunting divided into two 1-week muzzleloading and three 2-week general firearm hunts. The parcel of land was divided into nine sections, approximately 200 acres each. Hunters were selected by a random drawing and assigned a hunt unit. Hunters were allowed no more than 3 guests per day, creating a maximum of 36 hunters per day. All hunters were surveyed to obtain information on deer harvested, days hunted, guests taken, and subjective comments regarding hunt design. Comments indicated all hunters favored hunt design and many actually requested future managed hunts be designed in a like manner. Thirty deer were harvested and hunters spent an average of 4 ± 2.09 days in the field. Survey results indicated an average of 2.5 ± 1.39 guests for the season. No significant ($p \geq 0.05$) difference was detected in number of days hunted between 1 week ($\bar{x}=4$) and 2 week ($\bar{x}=3.8$) segments suggesting that allocating a greater number of days to hunters did not necessarily increase days afield. Managers faced with a need to control deer populations in areas where managed access is desired can use this design to provide a popular alternative to the labor intensive one or two day managed hunt.

11:50 AM

Anderson-Tully Company: A Case Study in Quality Deer Management
Timothy L. Evans, Mike Staten, and *Stanley R. Priest*, Anderson-Tully Company.

Since 1980, Anderson-Tully Company (ATCO) has been actively implementing deer management programs of various types on lands leased or licensed to hunting clubs. Cooperation in this effort has grown from 26 clubs in 1978 to over 250 clubs today. Early management efforts were aimed primarily at data collection (age, lactation, antler characteristics, etc.), and grew into the present system that utilizes that same data to determine allowable harvest levels, desired harvest sex ratios, and herd age structure. With the development of the Quality Deer Management Association (QDMA) in 1988 ATCO had a name for the program it had been working towards, and became a corporate sponsor of the organization. Early acceptance of the program was fair at best but as the results became evident opposition has steadily declined,with only a few diehard opponents still holding out. At present, data from approximately 95% of the deer harvested on ATCO owned lands are examined by ATCO biologists; and 90% of ATCO hunting clubs are involved in QDM at some level. Overall herd quality has improved with yearling bucks averaging 131 lbs, 4.4 points and 8.25 inches of beam length; while 2.5 year old bucks average 161 lbs, 7 points, and 14.5 inches of beam length. Percentage of yearling bucks in the harvest has declined from approximately 70% in 1984-85 to 32% in 1995-96, while the percentage of 2.5 year and older bucks has increased from approximately 20% to 66% over the same period. Buck to doe harvest ratios have likewise shown marked changes over the same period, going from approximately 2.3:1.0 to 1.0:1.03. In short, Quality deer management can work on industrial forestlands given enough time and commitment from the biologists and hunters alike.

Technical Session III-Moderator: *William M. Knox*, Virginia Game and Inland Fisheries

1:30 PM

Comparative Antler Characteristics of Spike- and Fork-Antlered Yearling White-tailed Deer in Texas at Age 4.5 Years
James R. Ott, Scott W. Roberts and *John T. Baccus*, Southwest Texas State University; *Donnie E. Harmel, Eugene Fuchs* and *William E. Armstrong*, Kerr Wildlife Management Area, Hunt Texas

Understanding the antler development of yearling (1.5 year old) spike-antlered white-tailed deer in later age classes is critical to resolving the controversial issue of whether to protect or remove spike-antlered bucks in managed white-tailed deer populations. We collected data on antler characteristics of 144 white-tailed bucks from the Kerr Wildlife Management Area (Texas) study herd that, as yearlings, were spike-antlered (N = 44) or fork-antlered (N = 100). All deer were maintained on a 16% crude protein diet ad libitum, and antler

characteristics were measured at age 4.5 years. The Boone & Crockett scoring system was used to summarize overall antler quality. Gross Boone & Crockett (GBC) score was defined as: $\sum MB + \sum G_N + \sum H_N + SP$; where $\sum MB$ = sum right + left main beam lengths; $\sum G_N$ = sum tine lengths G_1 to G_N; $\sum H_N$ = sum beam circumferences H_1 to H_4; and SP = maximum inside spread. The average GBC score at age 4.5 years for spike-antlered yearlings was 90.5 $\pm$ 2.77 (SE), significantly less than that of fork-antlered yearlings (127.5 $\pm$ 2.08) ($F_{1,143}$ = 101.6; P ‹ 0.0001). Sixty-two percent of fork-antlered yearlings had GBC scores in excess of 120 at age 4.5, whereas only 2.3% of spike-antlered yearling had similar scores. MANOVA showed that all four components of GBC score at 4.5 years differed significantly ($P < 0.001$) between the classes of yearling bucks. Percent increases in component scores of fork-antlered bucks were respectively MB + 18%; $\sum G_N$ + 48%; $\sum H_N$ + 20%, and SP+12%; indicating that the 36-inch average difference in GBC scores between the two classes of deer arises from differences in every component of antler quality. These results show that classifying yearlings as either spike- or fork-antlered is useful for predicting antler characteristics at maturity and that spike-antlered bucks continue to produce inferior quality antlers at maturity.

*1:50 PM

The Role of Tarsal Bacteria in Scent Communication of White-tailed Deer
Jonathan W. Gassett, Karen A. Dasher, Scott M. Russell, David A. Osborn, and *Karl V. Miller*, University of Georgia.

During the breeding season, dominant male white-tailed deer often develop a characteristic rutting odor. Previously, we suggested that this odor results from the microbial decomposition of urinary components on the tarsal gland. Bacteria residing on the tarsal gland may produce compounds important for conspecific communication by transforming the mammal's secretions or by excretions of their own metabolic activity. The tarsal glands are composed of lipid-retaining hairs which provide a substrate for bacteria, have a high surface temperature to expedite microbial growth, and catch urine during rub-urination. We investigated microbial species from the tarsal glands of 27 male and female white-tailed deer of various ages. We cultured 29 species of bacteria, 18 of which were specific to the tarsal region. Older males had a higher diversity of microbial flora than females. Variations in microbial flora among males was pronounced and likely contributes to the production of an odor specific to each individual. Additionally, increased bacterial diversity combined with an increase in rub-urination among dominant males during the breeding season likely produces a rutting odor that is specific to dominant males. Tarsal bacteria break the conjugated bonds of excreted compounds into their volatile constituents, thus providing the microbe with an energy source, and the deer with an olfactory signal. Because dominant bucks typically excrete higher concentrations of conjugated androgens during the breeding season, the microbial conversion of these and other compounds likely plays a role in the social behavior of white-tailed deer.

*2:10 PM

Factors Affecting Occurrence of Broken Tines in Mature White-tailed Deer
Tyler A. Campbell, Stephen Demarais, Herbert F. Janssen and *Darren L. Peterson*, Texas Tech University.

Many white-tailed deer management programs emphasize production and harvest of quality antlers on mature bucks. The occurrence of broken tines can affect the desirability of mature animals as a "trophy". Mature bucks not harvested due to antler damage negatively impact the cost-effectiveness of a management program. These animals may be lost to non-hunting mortality or consume additional forage resources during the subsequent year. High rates of antler breakage traditionally have been related to excessive numbers of mature bucks. Understanding if other factors affect breakage rates may lead to corrective management efforts to minimize this problem. To determine if mineral or morphological characteristics of the antlers predisposed them to breakage, we studied the density of the entire antler and for a 1-cm cross-section of the base (cross-cut) (as measured by mass per unit volume and x-ray penetration), and break strength and mineral composition of the cross-cut of 90 antlers shed by mature bucks during 1989-1995 near San Angelo, Texas. Antlers were assigned to one of three categories: no antler breakage; one tine broken; and, two or more tines broken. Antler density (g/cc) of the cross-cut was affected by antler breakage category ($P < 0.001$) and was highest ($P < 0.05$) in the unbroken antler category. Break strength of the cross-cut and total antler density were not affected by antler breakage category ($P > 0.23$). X-ray penetration and mineral composition data will be included in an updated abstract. Lower antler density at the base appeared to predispose antlers to breakage. Management implications will be discussed.

2:30 PM

Impact of Deer on Corn and Soybean Yields and Profitability of Chesapeake Farms, Maryland
Mark C. Conner and *D. Raymond Forney*, DuPont Agricultural Products.

Agriculture and wildlife are economically important on Maryland's eastern shore. For example, in Kent County, where 73% of the land area is devoted to cropland, annual revenues generated by agriculture and deer hunting are $50 million and $2.2 million, respectively. Deer density in the county is relatively high and deer negatively impact crop yields and profits in some areas of the county. To quantify the impact of a high-density deer herd on agriculture, we compared corn and soybean yield and profitability in areas protected from deer damage with those in unprotected areas. As part of a Sustainable Agriculture Project at Chesapeake Farms (formerly known as Remington Farms), productivity and profitability of four cash-grain cropping systems are measured. Each system is replicated once in a field-scale watershed and four times in 1/2-acre plots in a Latin squares design. Replicated plots were protected from deer using a single-strand electric fence since the project began in 1993. Watersheds were protected from deer in 1995 and 1996. During years of protection, average

corn and soybean yields in watershed fields were 80% and 92%, respectively, of yields in replicated plots. These values were used to predict potential yields in watersheds during 1993 and 1994, when they were not protected from deer. Average percent yield loss to deer in watershed fields was estimated [((predicted yield actual yield)/predicted yield)*100] to be 33% in corn and 37% in soybeans. On average, deer reduced agricultural profits by $115/acre.

*2:50 PM

Feasibility of Controlling Soybean Depredation by White-tailed Deer Using a Quality Deer Management Approach

Eric G. Darracq and *Greg K. Yarrow*, Clemson University; *Derrell Shipes*, South Carolina Department of Natural Resources.

The greatest challenge deer management will continue to have is influencing perceptions and attitudes based on sound biological data in order to eventually benefit stakeholders and natural resources. We worked with many stakeholders and examined the effectiveness of an increased doe harvest under a Quality Deer Management (QDM) approach to reduce soybean (*Glycine max*) damage by white-tailed deer (*Odocoileus virginianus*) on a 12,011 ha study area in the lower Coastal Plain of South Carolina. Since 1989, hunt club members have voluntarily restricted buck harvest to deer with outside antler spreads of 16 inches or greater. Field-by-field deer damage control methods applied within a mosaic of habitat types and landownerships have not provided long-term or widespread reduction of crop damage in many agricultural regions. Specific objectives were to: 1) determine the relationship of deer density to soybean depredation; 2) examine deer herd condition indices as deer densities were decreased; and 3) examine the influence of extrinsic factors, such as weather, natural food availability, and changing land-use patterns on the amount and timing of soybean crop damage. Pre-hunting season deer densities were annually estimated to recommend a 30%, 40%, and 50% harvest during the 1993-94, 1994-95, and 1995-96 hunting seasons, respectively.

Results indicate that short-term deer depredation control techniques, in conjunction with a long-term deer density control program, would be most effective during: 1) the vegetative growth period (only if deer depredation is severe) so soybean plants can compete with weeds by establishing canopy closure first, and 2) the reproductive growth period of soybeans when precipitation is below normal. Of all significant ($\alpha=0.05$) and numerical differences in soybean yield found among years on the entire study area during the soybean growing season, 81% and 76%, respectively, indicated that increased antlerless deer harvest under QDM did reduce the number of soybean plants browsed by deer. During years when precipitation is at or above normal and deer densities are controlled, we found that soybean plants are more susceptible to deer browse during the second month (July) of the growing season. The percent volume of soybean plant matter found in rumens collected during the 1993-94 and 1994-95 hunting seasons was 17.8 (n=28) and 7.8 (n=36), respectively. Soybean plant matter in rumens occurred in 54%, 25%, and 100% of deer killed during the 1993-94 hunting season, 1994-95 hunting season, and a July 6, 1994 crop depredation collection period, respectively.

Live-weights of yearling does were significantly greater ($\alpha=0.05$) in the 1995-96 hunting season relative to any previous year since the 1989-90 season when records were first kept. Percent lactation of yearling does was 0 from 1990-91 through 1992-93 and increased to 30% in 1994-95 following an estimated 31% deer harvest in 1993-94. We found evidence that deer density control can be achieved during legal hunting seasons by intensifying antlerless deer harvest under a QDM regime, resulting in improved herd health and benefitting community stakeholders. Ultimately, successful deer management depends upon whether or not landowners carefully prioritize and effectively communicate their interests to sportsmen as well as other stakeholders.

Technical Session IV-Moderator: *Sarah Schweitzer*, University of Georgia

*3:40 PM

Deer Research in a Coastal South Carolina Residential/Resort Community
David W. Henderson, Robert J. Warren, and *Jennifer A. Schwartz*, University of Georgia; *Robert J. Hamilton*, South Carolina Department of Natural Resources.

We are evaluating the ecology and management of white-tailed deer (*Odocoileus virginianus*) on the residential/resort community of Sea Pines on Hilton Head Island, SC. Damage to landscape plantings by deer is a concern on this 2,137-ha area. Deer hunting on this area is prohibited by local ordinances. Evaluations of 63 deer (31 road-killed deer and 32 project-related collections) indicated that ectoparasite burdens were extremely low, mean abomasal parasite counts were relatively low, and body fat indices and reproductive performance were relatively high. Thus, these deer appeared to be healthy and not significantly malnourished. During Fall 1995, we captured 79 deer, of which 55 were fitted with radio-transmitter collars. As of Fall 1996, 4 of these 55 deer are missing, 5 were road-kills, and 1 was killed by another deer. We conducted 3 formal public meetings to answer questions and receive input from residents. Comments received have resulted in modifications to our study, such as inclusion of a small-scale, intra-island deer relocation experiment that ultimately demonstrated the infeasibility of this management technique. Additionally, we added an experiment to determine the responses of deer and residents to a temporary 50% reduction in deer density; uniquely so, deer in this experiment could not be removed lethally and had to be temporarily confined in a large pen on the island. Our research demonstrates the challenges, unique opportunities, and peculiar problems that deer biologists will face more routinely in the future as urban and suburban development continues throughout the southeastern U.S.

4:00 PM

White-tailed Deer Management in a Coastal Georgia Residential Community
Joseph W. Butfiloski, Douglas I. Hall, and *Douglas M. Hoffman*; University of Georgia and *Daniel L. Forster*, Georgia Department of Natural Resources.

An overpopulation of white-tailed deer (*Odocoileus virginianus*) was creating problems involving landscape and property damage, auto collisions, Lyme disease, reduced herd health and browsing impacts on native flora and fauna for The Landings, a 1,903 ha residential community located on Skidaway Island, near Savannah, Georgia. The Landings Association contracted with USDA/APHIS/ADC-Wildlife Services (WS) and the Georgia Department of Natural Resources (DNR) to jointly develop a plan to reduce human-wildlife conflicts and strike a balance between residents' interests and the needs of wildlife. Due to the public volatility of this issue, a Stakeholders Committee was formed to discuss management options and to get input from interested parties. An environmental assessment was prepared following National Environmental Policy Act (NEPA) guidelines, and field assistance began in the Summer of 1994. As of October 1996, 1080 deer have been safely and humanely removed by professional biologists primarily through spotlight shooting, stand hunting, and trapping. Spotlight surveys indicated 36 deer/square km (92/sq. mi.) prior to operational control in July 1994 and 3.5 deer/sq. km (9/sq. mi.) in September of 1996. Reimbursement to the ADC-Wildlife Services program totaled $137 per deer removed. As an added benefit, nearly 20 metric tons of edible venison was donated to the needy. This project represents the first time the Federal Wildlife Services program has implemented an integrated, operational, residential management program for white-tailed deer in the nation.

4:20 PM

Reduction of an Insular Suburban Deer Herd Using Sharpshooters
Anthony J. DeNicola, White Buffalo, Inc.; *Steve Weber*, New Hampshire Fish and Game.

Nontraditional deer management techniques are being used with increasing frequency as deer populations continue to grow in the eastern United States. One approach, sharpshooting, has been used in several locations over the last decade with considerable success. This is the first documented account of an independent contractor harvesting white-tailed deer under special state permit in a suburban community. Task-force members selected sharpshooting to reduce deer starvation and detrimental impacts to the environment caused by excessive numbers of deer on the island. Ninety deer were harvested over 3 days using customized suppressed firearms from both treestands and a vehicle. Biological data collected included eviscerated body weight, age, chest girth, total length, and antler beam diameter. A total of 152 person-hours were required for organizational aspects (i.e., obtaining landowner permission, selecting bait sites, determining safe shooting areas, meetings with New Hampshire Fish and Game) and 112 person-hours were expended during deer removal and carcass processing. Harvest data supported the State's claim that deer were under nutritional stress and were significantly

smaller than nonisland deer. Animal rights activists used typical tactics to prevent the population reduction. Their efforts were circumvented through press releases and public education, which generated the local support needed to implement the herd reduction. This project further demonstrates the utility of sharpshooting in select circumstances where hunting is not considered an option.

4:40 PM

Developing, Implementing and Evaluating Urban Deer Management Programs
Jay B. McAninch, Minnesota Department of Natural Resources.

Urban deer populations in the Twin Cities of Minnesota have been increasing for the past 10 year. In 1994-95, at least 10 cities received special permits from the Department of Natural Resources (DNR) to conduct deer control programs. These programs included archery and firearms hunts, various forms of sharpshooting, and live trap and kill. These control efforts were implemented as part of deer population management programs adopted by each city that, in addition to controlling deer numbers, were designed to reduce deer impacts on human health and safety and property while increasing citizen tolerance and acceptance of deer through education and outreach. These management programs have included monitoring of deer population trends, establishing goals in deer density per square mile, and monitoring of deer damage, vehicle collisions and other impacts of deer in urban areas.

In each city, a public process was used in developing, implementing and evaluating each deer management program. Depending on the degree of controversy involved in each situation, we have overcome obstacles by working as members of facilitated task forces and deer management committees, as consultants to city decision-making bodies, or as defendants in court cases. In this presentation I will describe the range of methods we have used to over come a variety of obstacles, will detail the essential elements of 2 recent court cases, and will outline professional concerns that have arisen as a result of our management efforts.

Tuesday, February 11, 1997

Technical Session V-Moderator: *Jim Crum*, West Va. Div. of Natural Resources

*8:10 AM

Captive and Field Tests of a Method for Immobilization and Euthanasia of Urban Deer
Jennifer A. Schwartz, Robert J. Warren, David W. Henderson, and *David A. Osborn*, University of Georgia; *Darrel J. Kesler*, University of Illinois.

While the demand for white-tailed deer (*Odocoileus virginianus*) control in urban/suburban areas increases, wildlife managers' options for lethally removing deer often are limited by public acceptance or local firearms ordinances. We evaluated a method for lethal removal of deer involving immobilization with succinylcholine chloride (SC) followed by immediate euthanasia with a penetrating bolt gun. In a captive study with 13 deer, we compared 3 methods of chemical immobilization prior to euthanasia (125mg-SC biobullets, 125mg-SC syringe-darts, and xylazine/ketamine [XK; 300mg/150mg] syringe-darts) to determine physiological stress and elapsed time from drug delivery to collapse and subsequent euthanasia. Stress, as measured by blood cortisol levels, did not differ among the methods. Mean ($\pm$SE) times (seconds) from drug delivery to deer collapse were longer ($P=0.0001$) for the XK group (594.3 ± 77.8) than for the SC-biobullet (64.0 ± 6.3) or SC syringe-dart groups (46.4 ± 12.2); euthanasia occurred an average of ≤ 20 seconds after collapse for each group. Subsequently, we conducted a field trial with SC biobullets and the bolt gun on the residential/resort community of Sea Pines on Hilton Head Island, SC. We evaluated 2 methods of biobullet delivery: 4 deer were shot during daylight from a tree stand, and 7 deer were spotlighted at night and shot from a truck. All deer shot from the tree stand were recovered and euthanized an average of 113 seconds after biobullet delivery. Three of the 7 deer treated at night were not recovered soon enough for humane euthanasia.

8:30 AM

Censusing Deer with Infrared-Triggered Cameras
Robert E. Vanderhoof, Florida Game and Fresh Water Fish Commission; *Stephen Shea*, Department of Defense.

Trailmaster^{R} TM1500 infrared-triggered wildlife monitors were used in conjunction with 35mm cameras to estimate population size, sex ratio, and recruitment of white-tailed deer (*Odocoileus virginianus*) on Tyndall Air Force Base, Florida from 1993-1995. Five sites were

prebaited with corn annually for 2 weeks and then equipped with an infrared-triggered camera. The precise location of each site was determined by using a portable Global Positioning Satellite (GPS) receiver. Distances between camera sites ranged from 765-4166 yds. Cameras were active for 3 weeks during October and November each year. The number of unique bucks photographed (*B*) was determined by comparing antler pattern. Distances (D_{site}) between all possible station pairs were recorded as well as the proportion of bucks photographed at the first site that were also photographed at the second site ($P_{overlap}$). The relationship between $P_{overlap}$ and D_{site} was determined using regression analysis. This relationship represents the probability of photographing an individual at a known distance from a bait site. Therefore we determined buck density (*BD*) using the following equation:

$$BD = \frac{\frac{B}{P_{overlap}}}{D_{site}^2} \cdot \pi$$

Sex ratio was determined by comparing the total number of buck photographs to the total number of doe photographs. Recruitment was determined by dividing the number of fawn photographs by the number of doe photographs.

The distance between bait sites accounted for 65% of the variation in the proportion of deer photographed at both sites ($r = 0.804$, $P < 0.001$, $n = 25$). Therefore, distance between bait sites was shown to be a strong predictor of the proportion of deer photographed at one site that can be expected to be photographed at a second site. Bonferoni Confidence Limits for the regression line revealed that the equation produced the lowest CI at a distance of 1,914 yds. At this distance the estimate of $P_{overlap}$ of 0.27. Buck density was estimated to be 8.2 ± 0.17 deer/mi.^{2} (95% CI). Buck:doe ratio estimate was 0.777 (n = 1,369 photographs) and fawn:doe ratio was 0.41 (n = 1,090 photographs).

This technique assumes that all sex and age classes of deer are equally vulnerable to being photographed. Differential home range size between sexes would theoretically violate this assumption. We attempted to minimize differential vulnerability by deploying cameras well before rut at Tyndall AFB. This assumption, however, has yet to be verified.

Unlike methods involving mark recapture, this method not only estimates the number of animals present, but also explicitly estimates how much of the habitat is being censused. Our data show that an extensive area is capable of being censused by a single camera ($\tilde{=}$ 1-4 mi^2), and that a high proportion of the population is photographed ($\tilde{=}$27-40%). We believe, therefore, that this technique has the potential to provide managers with an accurate and cost-effective method for estimating densities of free-ranging deer in forested habitats.

8:50 AM

Preliminary Results of a Critical Evaluation of the Tooth Replacement/Wear Aging Technique for White-tailed Deer

Kenneth L. Gee and *John H. Holman*, Samuel Roberts Noble Foundation; *M. Keith Causey*, Auburn University.

Beginning in March 1983, free-ranging white-tailed deer (*Odocoileus virginianus texanus*) were trapped, aged, tagged, released and subsequently harvested and/or recaptured in an attempt to evaluate tooth eruption and wear as an accurate aging technique. Initial emphasis was placed on capturing, tagging and releasing fawns in order to establish a sizable known-age population. In 1992, we began constructing dental casts of all captured, tagged, and released deer. To date, 299 individual deer have been tagged and released. Approximately 120 jawbones or dental casts have been obtained from harvest or recapture that are useful in evaluating the technique. On the Noble Foundation Wildlife Unit in south-central Oklahoma, the Severinghaus (1949) tooth replacement and wear aging technique allowed us to confidently place deer into 3 age-classes only, i.e. fawn, yearling, and adult. Attempts to place adult deer into specific year-classes using traditional methods were very inaccurate. It appears that management or research programs requiring accurate and precise age determination of adult white-tailed deer should carefully review and critique the method currently being employed by most wildlife biologists.

9:10 AM

A Comparison of White-tailed Deer Fetal Aging Models

James C. Kroll and *Ben Koerth*, Stephen F. Austin State University.

At the 1995 meeting of the SEDSG, a question arose concerning validity of using a northern (Short's 1970 equation) model for southern deer. Using a data set obtained from 128 does collected in east Texas whitetails over the period 1991-96, we examined breeding chronologies calculated with four models. These included Hamilton, et al. (1985) for South Carolina (n=64), Short (1970) for Michigan (n=21), Cheatum and Morton (1946) for New York (n=15) and Armstrong (1950) for New York (n=76). Rut chronology curves were produced by pooling data into 3-day and 7-day categories. The Hamilton, et al. (1985) model developed for southern deer did not differ substantially from those of Cheatum and Morton (1946) and Armstrong (1950), but did deviate substantially from the Short (1970) equation. The Short equation uniformly produced a rut chronology approximately one week later than the other three models. All four models were based on regression analysis and each carried with them high r^2 values greater than 0.95. Given our study shows a high level of agreement between three of the models (Hamilton et al.; Armstrong; Cheatum-Morton) and lack of agreement with the Short model, we suggest use of the Hamilton, et al. equation for southern deer is more appropriate.

*9:30 AM

Prediction of Dietary Crude Protein of White-tailed Deer via NIRS Technology
Scott Showers and *Jerry Stuth,* Texas A&M University; *Ben Koerth* and *James C. Kroll,* Stephen F. Austin State University.

Research was conducted to determine the feasibility of predicting percent dietary crude protein (CP) of white-tailed deer through the analysis of feces with near infrared reflectance spectroscopy (NIRS). Feeding trials were conducted with stall-fed white-tailed deer. Seventy six rations were formulated with combinations of over fifty species representing a broad range of values and composition. Fecal samples were collected on days six and seven after feeding the rations. Micro-Kjeldahl procedure was used to determine CP of each ration. Fecal NIRS scans were paired with dietary CP values to establish a reference data set and resulting equation. A 5-wavelength equation allowed good predictions of the data set: R^2=0.95, SEC=0.67, n=108. Given the high degree of success with cattle and goats, it is not surprising diet quality can be predicted for deer using NIRS technology. Work will be completed to predict dietary digestible organic matter (DOM), dietary phosphorus, fecal nitrogen and fecal phosphorus. Thus, critical nutritional deficiencies throughout the year and across the range can be assessed and strategic decisions made for nutrition and habitat management for deer populations using NIRS derived models.

*9:50 AM

Deer Populations and Management Opportunities on Small Private Land Holdings in Cherokee County, Texas: A Case Study
Victor Donahey, James C. Kroll and *Ben Koerth,* Stephen F. Austin State University.

The study was conducted on a block of privately-owned properties, with many cooperating individuals, to determine: (1) status of deer herds; and, (2) demographics, attitudes and perceptions of landowners towards deer and management. We tested the hypothesis: given time and factual information, small private landowners (SPLs) will reach sound conclusions regarding proper management. No attempt was made to influence participants in management. No attempt was made to influence participants in making decisions; only data were provided. Infrared-triggered cameras, browse surveys, detailed habitat analyses and harvest information were used to provide information to SPLs. Focus groups were used to identify management issues and to involve SPLs in the decision-making process. Although common "wisdom" among biologists of the region was that overall habitat quality is low, primarily due to land use (improved pastures, overgrazing), results were contradictory. Stocking level and recruitment was indeed low, but habitat quality was good. Participants concluded buck harvest was excessive and voluntarily agreed to reduce harvest as part of a cooperative management program (CMP). Indeed empirical evidence suggested an overharvest of bucks may be a causal factor to low populations rather than habitat quality. A documented breeding date of 25 February, 1995, was recorded; and only one buck was "captured" older than 1-1 1/2 years. It

appears SPLs realized on their own that deer crossed property lines and came to an independent conclusion a management association would be the only effective means of managing small holdings for deer. Recommendations for deer management on small, private land holdings involving CMPs are discussed.

Technical Session VI-Moderator: *David Ledford*, Stone Container Corporation

10:30 AM

Survivorship and Mortality Causes of Adult Bucks in Mississippi
Harry A. Jacobson and *Daniel Coggin*, Mississippi State University; *Susan Bothum*, Madison, Wisconsin; *James Heffelfinger*, Arizona Game and Fish Department; *Zack Morgan*, Lake Wells, Florida.

To examine non-hunting related mortality of adult bucks in Mississippi, between February, 1990 and 1996 we captured and radio collared a total of 238 >1.5 year bucks on 19 areas. All landowners and hunting clubs on selected study areas agreed to attempt to protect radio collared deer from hunting mortality within study area boundaries. Study areas were 1,500-30,000 (x = 8,500) acres. Despite these precautions, 120 of 146 (82%) documented mortalities were hunting related. Fifty-four percent of know hunting mortality kill locations were within the boundaries of study areas. For survivorship estimates, bucks were broken into the following age groups 1.5-2.5 years (n=77), 2.5-3.5 years (n=160), 3.5-4.5 years (n=136), 4.5-5.5 years (n=72), and >5.5 years (n=57). Overall annual survivorship within these age classes was 84%, 78%, 65%, 57%, and 65%, respectively. With hunting mortality excluded, and only natural and unknown mortality causes considered, survivorship was 98%, 97%, 94%, 87% and 80% for 1.5-2.5 year, 2.5-3.5 year, 3.5-4.5 year, 4.5-5.5 year, and >5.5 year bucks, respectively. Our study will continue through June of 1997, but preliminary results indicate, in Mississippi, bucks could be protected from harvest until >4.5 years of age with little loss of opportunity for hunter harvest because of natural mortality causes.

*10:50 AM

Observations of Mortality and Emigration in a Coastal South Carolina Population of White-tailed Deer
Tamara J. McCoy, James H. Dozier III, Elizabeth J. Turner, Keith Morgan and *Tim Fendley*, Clemson University; *Derrell Shipes*, South Carolina Department of Natural Resources; *Wallace Roberts*, Westvaco.

White-tailed deer (*Odocoileus virginianus*) in coastal South Carolina equipped with radio-transmitters were monitored daily to detect mortality and emigration. Forty-four deer were monitored the first year. First year annual mortality was 36% (16 of 44). Fifty-six percent (9 of 16) were non-harvest mortalities, and 46% (7 of 16) were harvest mortalities.

Six (86%) harvest mortalities occurred off-site. Eleven percent (5 of 44) of the monitored deer established stable off-site home ranges. During the second year, 71 deer were monitored. Second year annual mortality was 18% (13 of 71). Forty-six percent (6 of 13) were non-harvest mortalities, and 54% (7 of 13) were harvest mortalities. Three (43%) of the harvest mortalities occurred off-site. Nine percent (6 of 71) of the monitored deer established stable off-site home ranges. During the third, 52 deer were monitored. Third year annual mortality was 25% (15 of 52). Twenty-seven percent (4 of 15) were non-harvest mortalities and 73% (11 of 15) were harvest mortalities. Two (15%) harvest mortalities occurred off-site. Eight percent (4 of 52) established stable off-site home ranges. During the fourth year, 26 deer were monitored. Fourth year annual mortality was 46% (12 of 26). Eight percent (1 of 12) were non-harvest mortalities and 92% (11 of 12) were harvest mortalities. Two (18%) of the harvest mortalities occurred off-site. No deer left the study area and established off-site home ranges during the fourth year.

*11:10 AM

Fate of Bucks in a Coastal South Carolina Deer Herd

James H. Dozier III, Tim Fendley, Keith Morgan and *Elizabeth J. Turner*, Clemson University; *Derrell Shipes*, South Carolina Department of Natural Resources.

The rate of loss of male white-tailed deer is of great importance to resource managers where buck harvest is an important goal of hunters. Loss rates depend on the two factors of mortality and emigration from a population. During a three year study from January 1, 1993 to January 1, 1996 on the 7760 acre North Whitener Tract in South Carolina, sixty-one bucks were monitored using radio-telemetry for mortality and emigration. Fourteen of these individuals were censored from the analysis due to transmitter malfunction or loss. Seventeen individuals survived to the end of the study period. This left forty-seven bucks at risk for mortality, thirty of which suffered mortalities during the three years. Mortalities were broken into three categories: non-harvest, on-site harvest, and off-site harvest. Non-harvest factors accounted for 12 (14.7%) of the mortalities. Mortalities due to harvest on the study area made up 7 (14.9%) of the mortalities. Off-site harvest of bucks accounted for 11 (23.4%) of the mortalities. If non-harvest and harvest factors are combined, then 63.8% (30) of the males in the analysis suffered mortalities. By combining the non-harvest and off-site harvest mortalities, we see 37.8% (23) of the buck mortalities were due to other reasons than on-site hunting activity. Of the seventeen individuals that survived to the end of the study period, eight had emigrated off of the study area and established off-site home ranges. If non-harvest mortalities, off-site harvest mortalities and emigrated individuals are combined, we see that 66% (31) of the bucks collared on North Whitener were not available to the hunt club members for harvest after three years.

11:30 AM

Tag Returns from Deer Captured in Mississippi

Harry A. Jacobson, Mississippi State University; *Susan Bothum*, Madison, Wisconsin; *Daniel Coggin* and *Jacob Bowman*, Mississippi State University; *Daniel Cotton* and *Daniel Lewis*, Mississippi Department of Wildlife, Fisheries, and Parks; *David C. Guynn, Jr.*, Clemson University.

Between 1979 and 1995 we captured, tagged and released 495 male and 441 female deer in Mississippi. Tag returns, at death, were obtained for 57% of the males and 31% of the females. We recorded both capture and death locations for 159 males and 58 females. For analysis, distance from capture to recovery site was related to age at capture, regardless of age at death. Males died (X+- 2 S.E.) 6.3 +-1.6 km, 2.7 +-1.0 km, and 1.9 +-0.2 km, from their capture site, when tagged as fawns, yearlings or >2 years at capture, respectively.Females, when tagged as fawns, yearlings, or >2 years, respectively, died 3.0+-1.9 km, 0.5+-0.3 km, and 1.5+-1.1 km from capture sites. No male that was >2 years (n=52), at capture, and only one female that was >2 year (n=34), at capture, died >6 km from their capture site. Ten percent of males (n=50), but no females (n=6), captured as yearlings, died >6 km from their capture location. In contrast, 42% of males (n=52) and 28% of females (n=18), captured as fawns, died >6 km distance from their capture site. Further, 60% of all males and 82% of all females, that were >2 years at capture, died within 2 km of their capture site. Fifty-six percent of males and 100% of females captured as yearlings, died within 2 km distance of capture sites, and 35% of males and 50% of females captured as fawns died within 2 km of their capture site. These data indicate dispersal in male and female deer occurred primarily between 6-18 months of age and that once deer reach >2 years of age they have strong home range affinity.

*11:50 AM

Yearling Buck Dispersal at Chesapeake Farms, Maryland: Managing a Disappearing Resource

Christopher S. Rosenberry and *Richard Lancia*, N. C. State University, *Mark C. Conner*, DuPont Agricultural Products.

Despite high fawn recruitment, estimates of the prehunt antlered population at the 3300 acre Chesapeake Farms (formerly Remington Farms) suggested a loss of yearling males from 6 to 18 months of age. We hypothesized that dispersal and mortality could account for this apparent loss of males from the population. To test this hypothesis, the movements and survival of yearling males were monitored from 1994 through 1996. Deer were captured in drop-nets in late winter and equipped with solar powered ear-tag transmitters. During the first two years of the three-year study, two-thirds (29 of 43) of the yearling bucks dispersed off of Chesapeake Farms, with 27% and 73% of all dispersers leaving during the spring fawning season and fall breeding season, respectively. Direction of dispersal was nonrandom, with

westward movements being most common. Average dispersal distance was 8 km. Survival through the end of the hunting seasons for dispersed deer was 26.5%, with most mortality from hunting. Dispersal of yearling bucks from Chesapeake Farms and the lack of compensatory immigration likely account for the low pre-hunt antlered population estimates. Results indicate that protection of male fawns is not an effective means of increasing the antlered portion of the deer herd in a relatively small area.

Technical Session VII-Moderator: Mac *Baughman*, Westvaco Corporation

1:30 PM

Effects of Three Site Preparation Treatments on White-tailed Deer Forage Availability
William F. Moore, Karl V. Miller and *Brian R. Chapman*, University of Georgia; *Jeffrey J. Brooks*, Ft. Benning Military Reservation; *Jane Rodrigue*, Rupert, West Virginia.

We assessed the effects of imazapyr (Arsenal™), picloram+triclopyr (Tordon 101™+Garlon 4™), and hexazinone (Pronone 10G™) site preparation treatments on white-tailed deer (*Odocoileus virginianus*) food plant availability at 1-6 years post-treatment in the Georgia Sandhills. Treatment plots were replicated 3 times and ranged in size from 12-20 ha. Vegetation was sampled in permanently marked, systematically located quadrants during August, 1991-1996. Plant species were evaluated based on previously published preference ratings. Herbaceous vegetation highly preferred by deer was more abundant on imazapyr and hexazinone-treated sites than on picloram+triclopyr treatments at 4 and 5 years post-treatment. Vines highly preferred by deer were most abundant on imazapyr sites at 6 years post-treatment but did not differ among treatments during the first 5 years. Hexazinone and picloram+triclopyr sites contained greater abundances of highly preferred woody forage at 1 year post-treatment and less preferred woody forage at 2 years post-treatment. Sassafras, a highly preferred browse species, was most abundant on hexazinone treatments at 1-5 years post-treatment. Overall, white-tailed deer forage availability varied little among the site preparation treatments.

1:50 PM

Plant Community Characteristics within an 18-year-old Deer Exclosure in South Mississippi
Jeanne C. Jones, Harry A. Jacobson and *Dale H. Arner*, Mississippi State University.

Vegetative inventories were conducted in a 1 acre white-tailed deer exclosure that was constructed in 1977 in upland forest habitat in Perry County, Mississippi. Surveys in 1977 revealed similar plant community characteristics inside and outside the exclosure. In 1996, 125-foot transects (4 within and 4 outside the exclosure) were established to determine the effects of browsing on plant diversity and community structure. Percent coverage and forest

canopy were measured by line-intercept, Nudd's board, and densiometer, respectively. Forest canopy was dominated by pine (*Pinus taeda)* and did not differ between exclosure (76.3%) and control (78.3%) sites. Comparisons of flora diversity revealed 59 plant species within the exclosure and 43 species on control sites. Plants, such as state-protected orchids (*Cliestes* spp.) and palatable browse species, were restricted to exclosure habitat. Structure and coverage of midstory plants differed between exclosure and control transects with midstory development being greater along exclosure transects ($P < 0.01$). Deer food plants, such as blueberries (*Vaccinium* spp.) and yellow jessamine (*Gelsemium sempervirens*) exhibited > 25% higher midstory and ground coverage along exclosure transects than along control transects ($P < 0.05$). These data revealed long-term browsing effects by deer on flora diversity and shrub composition. Reductions of soft mast-producing shrubs can have deleterious effects on passerines and other nongame and game species. This information will be utilized to develop justification and protocol for long-term exclosure studies in Mississippi.

2:10 PM

Effects of Dormant Season vs. Growing Season Fire on White-tailed Deer Browse in Stands Managed for Red-cockaded Woodpeckers

William E. O'Connell, M. D. Yates and *M. B. Edwards*, USFS; *K. V. Miller* and *B. R. Chapman*, University of Georgia.

Many forests are managed for multiple objectives and forest managers must incorporate legal mandates, public demands, and wildlife needs into management plans. On federal lands the mandates concerning endangered species require management for specific habitat objectives. We examined how management techniques for maintenance of red-cockaded woodpecker habitat impact the quantity and quality of available deer browse. Study sites were on Fort Benning Military Reservation in the Upper Coastal Plain of Georgia. Stands consisted of a mature overstory of loblolly and longleaf pine while the midstory was reduced by periodic fire and contained oak, sweetgum, and other hardwoods. The understory included broomsedge, numerous forbs, and patches of gallberry. Stands were grouped by dormant season or growing season burns. We defined fires of the dormant season occurring from January 1 to March 31, and those in the growing season from April 1 to August 30 of the year previous to sampling. Ten dormant season and nine growing season stands were selected based on appropriate size and location as foraging areas for red-cockaded woodpecker colonies. All stands had a history of an approximate three-year burn rotation. Within each of these sites, nine 400-ft. transects were established and plants along them identified and enumerated at one year post-burn. Herbaceous species were tallied along the transect line and woody species in a belt 10 ft. wide. Plants were ranked in importance as deer browse and comparisons made between treatment means. We compared the effects of the season of burn on the resulting available deer browse both by plant species and in the groupings of grasses, forbes, legumes, vines, and woody plants of importance to deer.

2:30 PM

Impact of Forest Herbicides on White-tailed Deer Forage Abundance
George Hurst, Mississippi State University.

Pine (*Pinus* spp.) plantations (PP) are a major white-tailed deer (*Odocoileus virginianus*) habitat type in the Southeast, with 25.9 million acres in 1990 and a projected 44 million acres in 2030. To meet world demand for wood products, PP are intensively managed, including use of herbicides during site preparation and pine release to reduce competition. Any practice that affects plants is a concern for wildlife managers. We studied the impact of herbicides on deer forage abundance in central Mississippi using the ranked-set sampling method. Parts of plants usually eaten by deer were hand-picked, oven-dried and weighed.

In June, 1985, Arsenal (imazapyr) was applied at rates up to 1 lb a.i./ac to a 3-year-old PP for pine release. In August, 1986, total deer forage averaged 742 lbs/ac on treated plots and 710 lbs/ac on control plots. Forage in the vine and forb categories increased; legumes and blackberry and dewberry (*Rubus* spp.) were not killed by Arsenal.

Forage in the woody browse category significantly declined. Following intensive mechanical site preparation and planting, a PP received a broadcast application of Pronone 5G (hexazinone) granules at 1 lb a.i./ac in March, 1984. In September, deer forage averaged 393 lbs/ac on treated plots and 1,481 lbs/ac on control plots, and in February (1985) deer forage averaged 38 lbs/ac on treated and 132 lbs/ac on control plots. However, after the second growing season, there were no significant differences in amount of deer forage. Short- and long-term implications of the impact of herbicides must be placed in the total context of PP management. Other uses of herbicides (e.g., roadsides, preharvest) on deer forage will be discussed.

2:50 PM

Response of Selected Deer Browse Species to Thinning of a Natural Loblolly Pine-Hardwood Stand
David G. Peitz and *Philip A. Tappe*, University of Arkansas; *Michael G. Shelton*, USFS; *Michael G. Sams*, Oklahoma Department of Wildlife Conservation.

Current trends in public land management emphasize hardwood retention in pine stands to increases habitat diversity and aesthetic quality. Browse production for white-tailed deer (*Odocoileus virginianus*) in naturally regenerated pine stands with retained hardwoods is largely determined by successional progress and silvicultural practices. Without intensive control of the overstory basal area, shading from trees can substantially limit carrying capacity of an area for deer. Although several studies have addressed habitat quality in pine-hardwood stands, few have examined browse production across varying pine and hardwood basal areas. Understanding the relationship between stand density and browse production provides a gauge

in which land managers can prescribe thinning to encourage both deer and timber production. In our study browse biomass was determined before thinning and two and four growing seasons after thinning a 35-year-old loblolly pine-hardwood stand (initially 27 m^2/ha of pine and 8 m^2/ha of hardwood basal area). A combination of three loblolly pine (15, 18 and 21 m^2/ha) and three hardwood basal areas (0, 3.5 and 7 m^2/ha) were replicated three times, resulting in a total of 27 net plots for study. Understory biomass was determined for 14 browse species on 25 plots systematically located within each net plot. Browse production following thinning was dominated by grape (*Vitis* spp.), blackberry (*Rubus* spp.), Japanese honeysuckle (*Lonicera japonica*), and smilax (*Smilax* spp.). Biomass for most browse species was negatively correlated with residual pine and hardwood basal areas, with the hardwood basal area being the more important factor. Stand thinning improved browse biomass availability for white-tailed deer, but the response was time dependent.

Technical Session VIII-Moderator: *Jimmy Bullock*, Union Camp Corp.

*3:40 PM

Forage Abundance in Group Selection Cuts in a Bottomland Forest in South Carolina
Steven B. Castleberry, University of Georgia; *W. M. Ford*, Westvaco; *K. V. Miller*, University of Georgia; *W. P. Smith*, USFS.

We examined the influence of canopy opening (gap) size on white-tailed deer (*Odocoileus virginianus*) forage in group selection cuts in a bottomland hardwood forest at the Savannah River Site, South Carolina. Forty-eight 0.5 m^2 vegetation sample plots were installed within 6 replicates of 6 gap sizes ranging from 0.015 to 0.504 ha. We sampled 8 plots per gap each month from April to September in 1995 and 1996. We tallied the number of available woody twigs in each plot and scored each as browsed or unbrowsed. Percent cover and percent browsed of herbaceous species also was recorded in each plot. We rated each taxa as preferred or non-preferred according to Hurst and Warren (1981). Abundance of preferred herbaceous taxa was significantly different ($p=0.0024$) among gap sizes only in 1995, but was approaching significance in 1996. Abundance of preferred woody taxa did not differ among gap sizes in 1995 or 1996. Rates of deer herbivory did not differ among gap sizes for woody or herbaceous taxa in either year and were less than 1% for all woody and herbaceous taxa combined. Gap size did affect the abundance of preferred herbaceous deer forages in the first year after harvest but did not affect rates of herbivory in either year. Fecal pellet group counts indicated that deer use of the study area was relatively low during spring and summer. Low herbivory rates were probably a result of low deer densities on the study site during the growing season.

4:00 PM

Spatial Structuring of White-tailed Deer Populations
Michael H. Smith, Savannah River Ecology Laboratory; *James R. Purdue*, Illinois State University; *James M. Novak* and *Paul E. Johns*, Savannah River Ecology Laboratory.

Genetic characteristics of white-tailed deer populations were studied in South Carolina and Georgia. Spatial heterogeneity in allele and haplotype frequencies were observed for both allozymes and mitochondrial DNA. In the latter case, populations only 50 km apart usually do not share any haplotypes, and some adjacent populations, especially those living in coastal marshes and on barrier islands, have completely unique haplotypes. Spatial differentiation was also observed for protein polymorphisms. White-tailed deer exist on the coastal plain as a series of relatively distinct populations. Most genetic dispersal among populations is due to males (87%), and females account for only 13% of total dispersal. Similar values from a study conducted across several southeastern states agreed closely with these dispersal estimates from this more limited area (males 78% and females 22%). Thus, females are philopatric, while males are mobile. Under these conditions, matriarchal lines likely become established and form genetic clusters of similar individuals within relatively small areas. Studies on the Savannah River Site confirm the existence of spatial-genetic clusters often separated by only a few kilometers. Males that stay within the genetic cluster in which they were born are likely to inbreed even when choosing mates at random, while those that move to another cluster outbreed. Breeding structure and consequent inbreeding effects are one possible cause of differences in individual heterozygosity, and maybe responsible for correlations of various traits (e.g., Boone and Crockett scores, number of offspring, and body size) with genetic heterozygosity.

4:20 PM

Directional Long-Distance Movements by White-tailed Deer in Florida
John C. Kilgo, Ronald F. Labisky and *Duane E. Fritzen*, University of Florida.

Knowledge of directional tendencies among long-distance movements by animals can be important in planning conservation and management strategies for wildlife at the landscape scale. Distance, timing, and rates of dispersal and migration have been well-documented for white-tailed deer. However, direction of dispersal by deer, which may be as important in some situations as distance and timing of dispersal, has received less attention. During a population ecology study of deer on the Osceola National Forest, Florida, we observed 23 long-distance movements (≥2 km), both dispersal and excursional,by radio-instrumented deer. Of 14 radio-monitored fawns, all 7 (100%) males dispersed at 1.5 years of age, and 3 of 7 (43%) females dispersed as yearlings, 1 in June and 1 in February. Direction of dispersal by the 10 yearlings was non-uniform in distribution and averaged 95°. Direction of 13 excursions by 12 adults (2 males, 10 females) also was non-uniform but was bimodally (east-west) distributed. Mean directions of the 2 distributions were 83 and 261°. Thus, both excursions

and dispersals of radio-instrumented deer were on an east-west axis. Influences on deer behavior such as availability of food, water, and refugia are discussed but seem inadequate to explain the observed movements. Likewise, no prominent landscape features that would direct deer movement were apparent. However, the fact that deer movements followed a consistent directional trend, even in a relatively homogeneous landscape, may have important implications for management of gene flow among small populations.

4:40 PM

Keeping Deer Data "On the Ground"
William H. Lunceford and *Jimmie W. Lipe*, Mississippi Department of Wildlife, Fisheries and Parks.

The Mississippi Deer Management Assistance Program (DMAP) has allowed managers to base harvest recommendations and bag limit needs on data collected by participating cooperators. Recently it has become possible to quickly interpret cooperator data into a dynamic presentation "on site." The biologist starts in mid-afternoon to age jawbones and enter this and other data into a portable laptop computer and print a 2-page synopsis. From this synopsis selected parameters are entered into a multi-graphic presentation for visual trend analysis. Video imagery can be incorporated into the presentation providing data on habitat and herd health.

Having portable computer and printer equipment, a custom deer data analysis program, DEERTRAX*, SNAPPY* image capture equipment, computer interface projector to "show on the wall what is on the computer screen" allows an after supper presentation of hard data that is difficult to refute. Presentations with graphed biological indicators have convinced many a hunter, young and old, of the need for increased doe harvest and restricting harvest of younger bucks.

In the case of each club, members know before the biologist leaves how they are progressing, and have the option to change objective parameters. Later, the club will receive a publication that includes all DMAP club analyses so they may compare their program to others in the state. The goal of each deer club, whether quantity, quality or trophy, is reached by setting measurable objectives. This follows the same comprehensive planning, documenting, measuring and reporting procedure that is used for the entire DMAP program.

ALTERNATE PAPERS

RCWs and WTDs: A Conflict of Interest?
David W. Moreland, Louisiana Department of Wildlife and Fisheries.

Almost one-half of the Kisatchie National Forest in Louisiana will be designated as Habitat Management Areas (HMAs) for red-cockaded woodpeckers. This restoration of the longleaf forest system will have an impact on the deer herds occupying these areas of the National Forest. A 120 year rotation system along with increased growing season burns does not create desirable deer habitat. Hunting seasons have been reduced on the Kisatchie National Forest and other restrictions may be necessary as deer habitat declines. Managers of the KNF need to be aware that stockpiling deer on low quality habitat is not conducive to sound deer management. Deer hunters need to be aware that management for other species is important and understand the problems this presents to deer managers. One possible trade-off is the potential improvement of quail and turkey habitat on these HMAs.

Effect of TrophX™ Treatment on Nutritional Quality of Browse
Ben H. Koerth and *James C. Kroll*, Stephen F. Austin State University.

TrophX™ is a commercially produced product designed as a plant growth stimulator. Advertisement claims up to 30% increase in production and nutrient content following treatment. To test the effects of TrophX™ on nutrient content and digestibility of native browse, we selected 3 replicates of Japanese honeysuckle, greenbriar and sweetgum in a paired plot design. One of each pair was randomly selected and treated with a foliar application of TrophX™ mixed at a rate of 2 oz TrophX™/3 gal water. Initial treatment was on 2 May 1996. Two follow-up treatments were applied to the same plots at 6 week intervals. The remaining paired plots received no treatment. Samples of new growth forage were hand-clipped from all plots immediately prior to the first application, before each follow-up treatment and 6 weeks after the last treatment for a total of 4 samples. Forages were analyzed for crude protein, acid detergent fiber (ADF), percent phosphorus, potassium, calcium, magnesium and sulfur, and parts per million of sodium,iron, manganese, zinc and copper. TrophX™ application had no significant effect on crude protein, ADF or mineral content of any of the forages at any sampling date. Use of TrophX™ does not appear warranted in improving nutritional quality of forages for wildlife.

*** INDICATES STUDENT PAPERS**

APPENDIX I
STATE NARRATIVES

ALABAMA

Alabama is rivaled by few other areas of comparable size when one considers the diversity of plant and animal life. 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 Pain to the south from the older upland provinces of the north and northeast. Elevation ranges from sea level to 2,407 feet. Several major rivers and tributaries dissect the state, further adding to the diversity of the habitat.

The Coastal Plain provinces include the Lower Coastal Plain, Red Hill, Black Belt 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. Swampy habitats are fairly common. Land use is intensive agriculture, pasture and forest land with pine, pine hardwood and bottom land hardwood timber types. Much of the suitable forested pine growing land has been converted to even age pine stands. 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, reforestation with loblolly pine, strip-mining, industry and the increasing population has negatively altered habitats for all wildlife in a significant part of the upland regions.

Historically, deer were abundant until unrestricted hunting and land use changes reduced their numbers to only a few thousand in a few isolated localities around 1900. The Game and Fish Department began cooperative restocking of suitable habitat as early as 1925; and with growing public support, the Department accelerated restocking effort though the 1960's. Today, all counties have a deer population and a deer season. The current statewide preseason population estimate is 1.5 million. South and south central Alabama support the greatest abundance of deer and command the highest lease fees paid for deer hunting. Most counties have a 75-day gun season with a one-antlered buck per day limit. Since nearly all lands in Alabama are privately owned, the long season and liberal bag limit extend the deer hunting opportunity. Age structure on harvested bucks is rather low except on the more intensively managed lands. Approximately 70% of the state has a limited hunter choice season, usually not exceeding 10 days.

In 1984, Alabama initiated a Deer Management Assistance Program (DMAP) to assist the private sector with management of their deer herd. Interest gradually grew to include 1500 participants and 3 million acres by 1991. In 1992, a fee will be charged for participation in the DMAP. Through the DMAP and dissemination of other information, hunters are increasingly more aware of management requirements for improving deer quality. Alabama is continuing to lose public hunting land and open permit land to private lease. In November of 1992, Alabama voters will have an opportunity to approve and amendment to the Constitution allowing a Forever Wild Trust to acquire land for public recreation and state operated WMA's.

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 2 primary regions; the Interior-Highlands (Ozark and Ouachita Mountain 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. The state is still classed as rural with a total human population 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 about 500 deer statewide in 1930. The Arkansas Game and Fish Commission began an aggressive deer restoration program in the 1920's, 30's, and 40's, 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 and estimated population size of about 300,000. Legal harvest increased from 540 deer taken in 1939 to a record harvest of 122,063 taken in 1993.

Today, the herd is somewhat stable with an estimated pre-hunt population of 800,000. 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, poor antler development, and poor age and sex distribution. A high percentage of young bucks occur in the antlered segment of the population. 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. 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 hunting seasons, either-sex hunting days during the modern firearm season (primarily antlered only season) and quota antlerless permits. Management efforts are directed toward increasing the antlerless harvest and reducing the antlered harvest in high deer population areas such as the West Gulf Coastal Plain division. A more conservative antlerless harvest strategy is being taken in the remainder of the state where lower deer populations occur. Many of the state-owned or controlled wildlife management areas operate under a quota either-sex or antlerless permit program which allows for controlled harvest and proper herd management.

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, and 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 model) has declined 1.26 million in 1990-91 to 985,190 in 1994-95. This decline has been by design by 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 1 million in 1986-87. This expansion continued though 1990-91, even though either-sex hunting opportunities were increased annually. The increased removal of does began to decrease the population in 1991-92 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. In addition, prior to the 1991-92 hunting season, the statewide bag limit was increased from three - with no more than two antlered bucks. Either-sex days began increasing in the Coastal Plain province in the 1990-91 season. 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 have increased from 32.2% in 1987-88 to 51.2% in1993-94. As a result, the population has been reduced slightly below the goal established in 1990 of 1 million.

These efforts to reduce the population have been successful; 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. This is where the challenge lies. 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. As the old saying goes - time will tell.

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 agriculture 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 can not 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, Quachita, 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 Wildlife and Fisheries Commission 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 seventies, deer herds continued to increase, resulting in a need for sound deer management programs. In the late seventies, 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 WMA's, 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, thirty-one 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 and 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-hardwood, 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 an 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 other states including North Carolina, Texas and 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 on the program encompassing 2.3 million acres. The harvest ratio of antlered to antlerless on DMAP is 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 and 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, and 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 herd 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.

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 Quachita, 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 typed is the postoak-blackjack 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 to 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 animal 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 benefited 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, 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 harvest four of the past five years.

SOUTH CAROLINA

The statewide deer harvest of 148,123 deer represents and 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 the 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 January1. 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 and 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 stabilization 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 acreage for a small fee ($15-$20).

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 700,000. The deer harvest has grown accordingly, from 113 in 1949 to over 113,000 in 1990.

Deer management in Tennessee is conducted on a unit basis, with 3 major units. Unit A comprises the middle and western counties of the state and has the longest seasons and the most liberal bag limits. Units B and C comprise the eastern counties and have 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 40% of the total harvest in 1990.

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 are increasing in the state, and will have to be addressed in the near future.

TEXAS

Texas is divided into 10 distinct or vegetational areas. The Pineywoods contains gently rolling to hilly forested land in the eastern part of the state. Commercial forestry is practiced throughout the area. The Gulf Prairies and Marshes is located along the Texas coast and is a nearly level, slowly drained plain less than150 feet in elevation. Most of the area is grazed by cattle. The Post Oak Savannah is a gently rolling to hilly area with elevations of 300 to 800 feet. The overstory is primarily post oak and blackjack oak. Many brush and weedy species are common. The Blackland Prairies are gently rolling to nearly level and maintain rapid surface drainage with most of the area devoted to agricultural crops. The Cross Timbers an Prairies is a rolling to hilly region, deeply dissected and with rapid surface drainage. The East and West Cross Timbers range from open savannah to dense brush. The South Texas Plains area is level to rolling, and the land is dissected by streams flowing into the Gulf. Most of the area is dominated by dense brush. Land holdings predominantly are large cattle ranches. The Edwards Plateau or "Hill Country" is a hilly area in west-central Texas which is predominantly rangeland. The Rolling Plains area is gently rolling to moderately rough and 65% rangeland. The High Plains is a relatively level high plateau north of the "Hill Country". The Trans-Pecos area in the extreme western part of Texas consists of mountains and arid valleys. It is a region of diverse habitats and vegetation, varying from desert valleys and plateaus to wooded mountain slopes.

Indiscriminate slaughter by commercial meat and hide hunters and ignorance of the deer's habitat requirements caused the near extirpation of white-tailed deer in Texas near the end of the 19th century. Public concern prompted a series of protective measures by the legislature near the turn of the century. A five-month closed season during which deer could not be hunted was enacted in 1881. A bag limit of 6 bucks per season was established in 1903, but was reduced to 3 bucks in 1907. Hunting licenses were first issued in 1909, with 5,000 being sold that year. In 1919, 6 game wardens were hired to patrol the entire state. Whitetails increased in numbers and distribution during the 1930's and1940's. The increase resulted from several factors: protection from illegal and commercial exploitation; exclusion of fire; invasion of woody plant species into the grasslands; deer restocking; and interest and cooperation shown by hunters, landowners, and the general public. During the late 1950's and 1960's, deer populations reached very high levels and extended their ranges into almost all suitable habitat throughout the state.

The white-tailed deer occurs in all 10 ecological areas of Texas, occupying over 71 million acres of range. Current estimates place the total population at 3.4 million, with the species being most abundant in the Edwards Plateau (48% of statewide total), South Texas Plains (17%), and Pineywood (12%). In 1993, 593,000 hunters harvested a total of 453,000 white-tailed deer, expending 5.5 million days of hunting effort. In terms of hunting recreation furnished, the white-tailed deer ranks highest of all game species in the state. This species also generated the highest response among the non-hunting public for overall viewing interest as compared with other wildlife according to a recent public survey.

Since 97% of the land is privately owned, landowners are the key to healthy white-tailed deer populations in Texas. How they manage the vast amount of land they control for other uses, such as livestock production, will continue to determine the amount and quality of habitat for whitetails. Simultaneously, the extent to which they permit access to hunters will determine the number and condition of whitetails on given ranges.

VIRGINIA

The statewide deer harvest during the 1994-95 hunting season was 209,373 (120,360 males, 87,530 females (42.1%), and 1,483 deer of unrecorded sex). The archery and muzzleloading harvests were 18,700 (8.9%) and 31,090 (14.8%), respectively. Of the 209,373 deer harvested in Virginia, 185,568 (89%) were harvested on private land(s) and 20,186 (10.0%) were harvested on public land(s). 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. Check stations are operated by volunteer operators.

Deer season in Virginia begins with an approximately 7-week either-sex archery season that begins the first Saturday in October. Concurrent with the last two weeks of the archery season is a statewide two-week early muzzleloading season. The early muzzleloading season is full season either-sex east of the Blue Ridge Mountains and one-day either-sex west of the Blue Ridge. General firearms deer hunting, which begins the third Monday in November, is characterized by two distinct season frameworks. East of the Blue Ridge Mountains, the firearms season runs to the first Saturday in January. West of the Blue Ridge and in the southwestern Piedmont, the firearms season is 12 days in length. During the firearms season, either-sex deer can only be taken on prescribed either-sex days. There is a standard statewide bag limit for all deer hunters (archers, muzzleloaders, and general firearm hunters) of two deer per day, three per license year, one of which must be antlerless. Unlimited bonus deer permits (one either-sex and one antlerless only) allow hunters to exceed the season bag limit statewide on private land only.

Virginia's two private land deer management programs, the Deer management Assistance Program (DMAP) and the Damage Control Assistance Program (DCAP), initiated during the 1988-89 season, continue to achieve wide acceptance. During the 1993-94 hunting season, there were 323 DMAP cooperators encompassing 1,016,968 acres in 75 counties. These DMAP operators were issued a total of 13,160 antlerless tags and reported a harvest of 13,040 deer. Also during the 1993-94 hunting season, there were 679 DCAP cooperators comprising 329,426 acres. These DCAP cooperators were issued 16,947 antlerless permits and reported a harvest of 4,519 deer (637 of 679 reporting).

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 is 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 at 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 percent of the timberland..

Fertile soils are relatively uncommon in the state, so where they so 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 hunters-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 animal under archery and bucks-only regulations. In 1993, West Virginia sportsmen harvested

169,014 deer under a 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 Mountain should remain excellent in the future.

APPENDIX II
STATE DEER HARVEST SUMMARIES

Table 1. Southeasatern deer harvest summaries, 1995-96.

State	Land Area (sq. mi.)	Deer Habitat (sq. mi)	Deer Habitat (% Total)	Percent Forested	Deer Range Unoccupied	% Land Area Public Hunting	1995-96 Harvest Male	1995-96 Harvest Female	1995-96 Harvest Total*
AL	51,628	48,014	93	66	0	2.0	274,620	123,380	398,000
AR	52,609	44,677	85	53	0	12.0	109,925	5,399	163,924
FL	51,628	29,280	57	45	<1%	16.0	n/a	n/a	81,891
GA	57,800	33,163	57	57	0	6.0	195,040	189,924	391,595
KY	40,395	39,654	97	59	0	8.0	70,829	40,104	110,933
LA	41,406	26,562	64	52	0	0.0	130,570	106,830	237,400
MD	9,874	8,936	91	43	0	4.0	41,581	20,349	61,949
MS	47,296	31,250	66	55	0	6.0	164,466	170,629	335,095
MO	69,561	21,396	31	31	0	4.3	125,405	85,117	208,917
NC	48,794	36,699	75	62	0	6.0	132,700	83,400	216,100
OK	69,919	22,837	33	19	0	2.0	48,367	17,519	65,886
SC	30,207	21,920	73	63	0	7.0	76,334	66,243	148,123
TN	42,246	25,770	61	49	0	8.5	103,630	41,502	145,132
TX	265,625	n/a	n/a	40	0	<5	252,065	198,528	450,593
VA	39,682	31,782	80	63	0	7.9	131,258	86,101	218,476
WV	24,064	22,882	95	79	0	9.0	127,465	73,980	201,815

*Total includes deer of unknown sex.

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	8.3	2	1,500,000	109	7	75	2	70
AR	3.7	1,4	900,000	152	21	36	1,2	81
FL	2.9	2	n/a	30	3	72	1,2	75
GA		1,2,3,4		35	51-79	51-79	1,2,3	10
KY	2.8	1,3,4	423,000	109	9	10	1,2,	0
LA	8.9	1,2,3	900,000	123	7-28	14-69	1,2,3	80
MD	6.7	1,3	235,000	87	16	13	1,2	0
MS	10.7	1,2,3	1,750,000	62	14	47	1,2,3	99
MO	9.8	1	790,000	98	20	11	1,2	0
NC	5.9	1,2,3,4	900,000	24-54	6	18-67	1,2,3	53
OK	2.88	1,3	325,000	78	9	9	1,2	0
SC	6.8	1,2,3	750,000	10	10	60-140	1,2,3	60
TN	5.6	1,4	785,609	23-34	9-14	18-28	1,2,3	0
TX	4.0	n/a	n/a	32	9	65	252,065	0
VA	6.9	1,2,3,4	900,000	41-71	12-30	12-42	1,2	55
WV	8.8	1	950,000	67	6	15	1,2,3	0

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

** 1-Harvest and biological data; 2-Department-commission regulatory authority; 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	229,600	Stable	$16.00	$202.00	34	60	$150-600	$2-10
AR	250,000	Stable	$11.50-26.00	$95-185	n/a	n/a	$150-1000	$2-4
FL	117,567	Down	$11.00	$150.00	n/a	n/a	$250-500	$3.50
GA	308,342	Stable	$19.00	$177.00	37	27	$500	$2-10
KY	209,000	Stable	$33.50	$116.50	13	47	$300	$3
LA	181,200	Stable	$21-42	$96-212	21	45	$725	$3
MD	85,101	Down	$24.50	$120.50	50	60	$500	$5-25
MS	166,320	Down	$17-32	$105-225	44	65	$150	n/a
MO	400,000	Stable	$12-15	$75-100	20	40	$200-300	$1-2
NC	285,000	Up	$25.00	$80.00	n/a	49	$150	$2-5
OK	200,000	Stable	$29.50	$201.00	17	27	$500-1000	$2-5
SC	176,114	Up	$18.00	$105-155	n/a	n/a	n/a	$2-4
TN	186,342	Decreasing	$39.00	$156.00	23	47	$50-500	$2-5
TX	582,148	n/a	n/a	$250.00	15	252065	$25-500	$5
VA	290,000	Stable	$25-50	$122-174	30	50	$50-850	n/a
WV	300,000	Stable	$25.00	$80.00	22	58	n/a	n/a

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	5	5	Yes	Yes	Handicap	No	3,000
AR	Yes	1	1	Yes	Yes	Yes	No	7,214
FL	Yes	n/a	n/a	Yes	Yes	Yes	No	n/a
GA	Yes	6	5	Yes	Yes	Handicap	No	44,000
KY	Yes	3	0	Yes	Yes	Yes	No	4,600
LA	Yes	6	4	Yes	Yes	Handicap & over 60	No	2,000
MD	Yes	2	1	Yes	Yes	Handicap	No	2,987
MS	Yes	6	2	Yes	Yes	Handicap & over 65	Yes	5,000
MO	Yes	3	0	Yes	Yes	Yes	No	7,663
NC	Yes	6	3	Yes	Yes	Handicap	No	5,000
OK	Yes	0	0	Yes	Yes	Handicap	No	n/a
SC	Yes	4	3	Yes (18 co.)	Yes	Yes (28 co.)	Yes (28 co.)	5,546
TN	Yes	2	2	Yes	Yes	Handicap	No	n/a
TX	Yes	n/a	n/a	No	Yes	No	252,065	n/a
VA	Yes	3	3	Yes	Yes	Handicap	No	Unknown
WV	n/a	3	0	Yes	Yes	No	No	9,186

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