21st Annual Meeting

SOUTHEAST DEER STUDY GROUP

February 8-11, 1998 • Jekyll Island, Georgia

DEPT. OF NATURAL RESOURCES
WILDLIFE RESOURCES DIVISION
GEORGIA

The University of Georgia

Warnell School of Forest Resources

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THE GA DNR, THE UNIVERSITY OF GEORGIA, AND THE SOUTHEAST DEER 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
1998	Jekyll Island, GA	Factors Affecting the Future of Deer Hunting

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

Name	State	Employer
Chris Cook	Alabama	Alabama Department of Conservation and Natural Resources
Michael E. Cartwright	Arkansas	Arkansas Game and Fish Commission
Robert E. Vanderhoof	Florida	Florida Game and Fresh Water Fish Commission
Stephen M. Shea	Florida	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
Jeff Beringer	Missouri	Missouri Department of Conservation
J. Scott Osborne	North Carolina	North Carolina Wildlife Resources Commission
Kenneth L. Gee	Oklahoma	Samuel Roberts Noble Foundation
Michael G. Shaw	Oklahoma	Oklahoma Department of Wildlife Conservation

David C. Guynn, Jr.	South Carolina	Clemson University
Derrell A. Shipes	South Carolina	South Carolina Department of Natural Resources
Ben Layton	Tennessee	Tennessee Wildlife Resources Agency
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 8, 1998

1-6:00pm Registration - Hotel Lobby

3:00pm Southeast Deer Committee Meeting

Special Forum: Divergent Perspectives on QDM.

4:00pm Moderator: *Karl Miller*, Univ. of GA.

4:05pm QDM: Don't Let Impatience With Slow Change Undermine a Worthy Ideal.
Pat Durkin, Editor, Deer and Deer Hunting Magazine.

4:20pm QDM: Threat to Deer Hunting in Upper Midwest?
Keith R. McCaffery, WI DNR.

4:35pm Quality Deer Management Cooperatives: Two Case Studies in Southwestern Mississippi.
Don Bales, MS Coop. Extension Service.

4:50pm Quality Deer Management: What It Is and What It Isn't.
Brian Murphy, Exec. Dir., Quality Deer Management Assoc. and *Joe Hamilton*, Ducks Unlimited.

6-10:00pm Social/Dinner-Jekyll Island Visitors Center

MONDAY, FEBRUARY 9, 1998

7am-5pm Registration - Hotel Lobby

8:00am Welcome - David Waller, Director, GA DNR, Wildlife Resources Division

Welcome - Todd Holbrook, GA DNR, Chief of Game Management Section

Keynote Address- Mark Damian Duda, "The Public, The Hunter, and Deer Management."

Announcements and Instructions- Kent Kammermeyer, GA DNR, Wildlife Resources Division

The Paper Selection Process- Bob Warren, Univ. of GA.

Technical Session I-Moderator: *Bob Warren*, School of Forest Resources, Univ. of GA.

***9:00am Sociological and Land-use Factors Affecting Deer Management and Deer Damage in Virginia.**
Ben West and *James A. Parkhurst*, VA Tech.

9:20am The Impact of Changing Demographics on the Future of Deer Hunting.
Robert D. Brown, Texas A&M; *Billy Higginbotham* and *Don Steinbach*, Texas Ag. Extension Service.

9:40am Human Dimensions Affecting the Future of Deer Hunting: Strategies for Wildlife Managers.
Deborah Green, College of William and Mary and *Phillip D. West*, VA Dept. of Game and Inland Fisheries.

10:00am Break

Technical Session II-Moderator: *Bob Downing*, Retired, USF&WS.

10:30am Program Design Considerations to Promote Female Participation in Deer Hunting.
Clark E. Adams and *John K. Thomas,* Texas A & M Univ.; *Sara J. Steen*, Univ. of Kentucky.

10:50am White-tailed Deer Hunting as a Management Tool to Protect Rare Plants.
Johnny Stowe, SC DNR.

11:10am Allocating Resources Among User Groups: Current and Future Trends in Archery Deer Hunting.
Kimberly M. Mattson Hansen, MI State Univ., *William E. Moritz,* MI DNR; *Scott R. Winterstein* and *Ben R. Peyton*, MI State Univ.

11:30am Cost and Effectiveness of an Urban Deer Reduction Program Using Bowhunters.
Howard J. Kilpatrick and *W. David Walter,* CT Wildlife Division.

11:50am Can We Predict Age, Sex and Location of Deer-Vehicle Collisions by Season?
Paul E. Johns and *James M. Novak*, SREL

12:10pm Lunch (On Your Own - See Tote Bag Enclosure)

Technical Session III-Moderator: *Doug Hall*, USDA, Wildlife Services.

*1:30pm **Responses of Deer and Perceptions of Residents to a Herd Reduction in Coastal South Carolina.**
David W. Henderson, Robert J. Warren, and *Jennifer A. Schwartz*, Univ. of GA; and *R. Joseph Hamilton,* Ducks Unlimited.

*1:50pm **Live-Capture and Small-Scale Relocation of Urban Deer on Hilton Head Island, South Carolina.**
Jennifer S. Cromwell, Robert J. Warren, and *David W. Henderson*, Univ. of GA.

*2:10pm **White-tailed Deer Ecology and Management on Kiawah Island, South Carolina.**
James D. Jordan and *Robert J. Warren*, Univ. of GA.

*2:30pm **Bobcat/Deer Interactions and Human Attitudes on Cumberland Island National Seashore.**
Greg Nelms, Jeffrey J. Brooks, and *Robert J. Warren,* Univ. of GA.

2:50pm **Genetically Unique Populations Along the Coasts of Georgia and South Carolina.**
Michael H. Smith, Paul E. Johns, and *James Novak,* Savannah River Ecology Laboratory; *James R. Perdue,* Illinois State Museum.

3:10pm Break

Technical Session IV-Moderator: *Ken Gee*, Noble Foundation.

3:40pm **Deer Management - What Do You Do After Losing Your Credibility?**
Bret D. Wallingford and *George M. Kelly,* PA Game Commission.

*4:00pm **White-tailed Deer Impact on Forest Vegetation: Modeling Landscape-Level Deer Activity Patterns.**
Diane M. Krishon, and *Linda S. Gribko*, WV Univ.

4:20pm **Effects of Differential Harvest on Deer Herd Quality and Quantity on the Chaparral WMA.**
James F. Gallagher, David R. Synatzske, and Donald C. Ruthven, TX Parks and Wildlife Dept.

*4:40pm **High Fences and Genetics: Keeping Up in Paradise.**
Jonathan W. Day, LSU; and *Kyle Balkum, David Moreland,* and *Fred Kimmel* , LA Dept. Wildlife and Fisheries.

5:00pm **An Epizootic of Hemorrhagic Disease in Missouri.**
Jeff Beringer and *Lonnie P. Hansen,* MO Dept. of Conservation.

5:20pm **Dinner (On your own)**

7:30pm **SHOOTING FROM THE HIP--**
ANTI-HUNTING CONTROVERSY
Moderator: Joe Hamilton
Film: Fund For Animals
Hunting Advocate: Dr. Ernie Provost
Anti-Hunting Advocate: William D. Whitmore

TUESDAY, FEBRUARY 10, 1998

Technical Session V-Moderator: *Larry Marchinton*, Retired, Univ. of GA, School of Forest Resources.

8:10am **Right-Leg Management in a Left-Leg World.**
P.D. Keyser and *W. Matt Knox*, VA Dept. of Game and Inland Fisheries.

8:30am **Threats to Deer Management in Australia: A Case History on Conflict Resolution in Tasmania.**
Brian Murphy, Quality Deer Management Association.

8:50am **Opinions of Hunters and Rural Landowners Related to Quality Deer Management in Georgia.**
Daniel L. Forster, Todd Holbrook, and *Ken A. Riddleberger*, GA DNR.

9:10am **Procedures For County Initiation of Quality Deer Management.**
Daniel K. Grahl, Scott McDonald, Tip Hon, Terry Kile, and *Todd Holbrook*, GA DNR.

***9:30am** **Periodic Harvesting on Fort Bragg Military Installation, North Carolina: A Strategy to Obtain Older Bucks.**
Mark S. Graham and *Richard A. Lancia,* NC State Univ.; and *Donald H. Cockman,* Dept. of the Army.

9:50am **Break**

Technical Session VI--Moderator: *Harry Jacobson,* Retired, Mississippi State Univ.

***10:10am Antler Size Characteristics by Age: South Texas Versus South Georgia.**
Mickey W. Hellickson, Micah Goldstein, R. Larry Marchinton, and *Karl V. Miller,* Univ. of GA; *Robert E. Hall* and *Charles A. DeYoung*, Texas A&M Univ.; and *Stuart Stedman*, Wesley West Cattle Company.

***10:30am Influence of Plant Secondary Compounds on White-tailed Deer Antler Growth and Nutrition.**
Tyler A. Campbell and *David G. Hewitt*, Texas A & M.

***10:50am Comparison of Factors Used to Visually Estimate Age of Live Male White-tailed Deer.**
Mickey W. Hellickson, R. Larry Marchinton, Univ. of GA; *Robert E. Hall* and *Charles A. DeYoung,* Texas A & M Univ.; and *Stuart W. Stedman,* Wesley West Cattle Co.

11:10am Reliability of Yearling Antler Characteristics as Predictors of Antler Quality and Body Mass at Ages 2.5, 3.5, and 4.5 years in Texas White-tailed Deer.
James R. Ott, and *John T. Baccus*, Southwest Texas State Univ.; *Donnie E. Harmel, Eugene Fuchs,* and *William E. Armstrong*, TX Parks and Wildlife.

***11:30am An Evaluation of Intracranial Abscesses Among White-tailed Deer.**
Christopher D. Baumann and *William R. Davidson,* Univ. of GA.

11:50am Lunch (On your own)

Technical Session VII-Moderator: *Mark Ford,* Westvaco.

1:20pm Evaluation of Deer Damage to Soybean Production Using GPS/GIS Precision Agriculture Technology.
Lisa L. Muller and *Kelly S. Miller*, DE State Univ.; *Mark C. Conner*, DuPont Agricultural Products; *Steve J. Reddy*, Lebanon Agricorp; and *Carson L. Kennard*, DE DNR.

1:40pm Efficacy of Deer Stopper™ Repellent for Reducing White-tailed Deer Damage to Ornamental Plantings.
James B. Armstrong and *M. Keith Causey*, Auburn Univ.; *John T. Owen,* AL Ag. Experiment Station.

2:00pm **Use of the '4-Poster' Self-Treatment Device to Control Ticks on White-tailed Deer.**
J. Mathews Pound, J. Allen Miller, John E. George, USDA-ARS; and *Donnie E. Harmel*, TX Parks and Wildlife Dept.

***2:20pm** **Evaluation of Thermal Infrared Imaging For Detection of White-tailed Deer.**
Brian S. Haroldson, MN DNR, *Ernie P. Wiggers,* Univ. of Missouri; *Lonnie P. Hansen* and *Jeff Beringer,* MO Dept. of Conservation, and *Jay B. McAninch,* MN DNR.

***2:40pm** **Using Tame White-tailed Deer to Estimate Carrying Capacity in South Texas.**
Bronson Strickland and *Charles A. DeYoung*, Texas A & M.

3:00pm **Break**

Technical Session VIII-Moderator: *Steve Demaris*, MS State Univ.

***3:20pm** **Estrus Synchronization and Timed Artificial Insemination of Captive White-tailed Deer.**
James C. Kroll, Alex Smalling, Jason Seller, Ron Randel, and *Ben Koerth*, S.F. Austin State Univ.

***3:40pm** **Tarsal Scent Communication: What We Know, What We Might Know, and What We Want to Know.**
Jonathan W. Gassett, Karl V. Miller, Karen A. Dasher, David A. Osborn, and *R. Larry Marchinton,* Univ. of GA.

***4:00pm** **Scraping Behavior in White-tailed Deer: Back to the Drawing Board.**
Karen A. Dasher, Jonathan W. Gassett, David A. Osborn, and *Karl V. Miller,* Univ. of GA.

4:20pm **Variation in the Utilization of Tree Species for Rubs by White-tailed Deer in Southwestern Tennessee.**
John R. Ouellette, R. David Frederick, Aaron W. Reed, and *Nathan M. Myers*, Univ. of Memphis; and *Tracy E. Rea,* Univ. of GA, SREL

4:40pm **Deer Response to Mock Scrapes With and Without Scents.**
Ben H. Koerth and *James C. Kroll*, S.F. Austin State Univ.

5:00pm **Business Meeting**

6:00pm **Social Hour**

7:00pm **Banquet**

WEDNESDAY, FEBRUARY 11, 1997

8:00am Sapelo Island Field Trip (vans will depart from front entrance of hotel)

8:30am White Oak Plantation Field Trip (vans will depart from front entrance of hotel)

2:00pm Return to Hotel.

***Indicates Student Paper**

ABSTRACTS

SUNDAY, FEBRUARY 8, 1998

Special Forum: Divergent Perspectives on QDM.
4:00pm Moderator: *Karl Miller*, Univ. of GA.

4:05 PM

QDM: DON'T LET IMPATIENCE WITH SLOW CHANGE UNDERMINE A WORTHY IDEAL.

Pat Durkin, Deer & Deer Hunting Magazine

Like it or not, quality deer management is an unstoppable force. Maybe it's not spreading as fast as its proponents would like, but I believe it will eventually dominate deer management -- if deer numbers remain high enough to slowly change opportunistic attitudes.

Some of us in the media have been reluctant to stand on the pulpit and try to convert the hunting masses to the quality deer management movement. Why? In my case, I believe this herd-management strategy will continue evolving on its own, and I believe proponents have enjoyed almost unequaled, unchallenged access to spread their message in newspapers and magazines -- without my small voice joining the chorus.

Besides, my only real problem with QDM isn't its science or goals, which are sound, but the righteous and almost evangelical zeal of some of its proponents. I worry that an arrogant attitude could undercut a worthy ideal. Proponents must appreciate the fact that attitudes change at each person's chosen speed. The hunting public -- bless its stubborn heart -- won't be swayed by force-feeding.

Proponents can't act as if they've been blessed by a vision, and then treat everyone who disagrees as mere sponges who need education -- although some of them are and do. Some basic aspects of QDM are being ignored by hunters who claim to follow it. Many pick and choose how to practice QDM, often backing off on the yearling buck kill, but not increasing their antlerless shooting. That's not a shortcoming of information in the media. It's often an conscious disregard for science and information. Don't expect even more education to change proudly stubborn skepticism.

Be patient, not patronizing. If deer herds remain high in the years ahead, I believe more hunters will make the attitude change that's necessary to carry out more balanced herd management. But as long as human attitudes change more slowly than deer produce, QDM won't spread like wildfire. Maybe we should settle for change that spreads slower than wildfire but faster than glaciers.

4:20 PM

QDM: THREAT TO DEER HUNTING IN UPPER MIDWEST?
Keith R. McCaffery, Wisconsin Department of Natural Resources

Quality Deer Management (QDM) was advanced in the Southeast to improve deer management of overpopulated privatized deer herds. Its success there led to exporting the concept to other regions. However, differences between regions in herd status and biology, landownership and hunting traditions are producing a mixed reception. QDM in the Southeast was aimed at improving the quality (nutritional status) of all deer; bucks, does and fawns. However, when QDM is applied to herds managed at lower densities (relative to K carrying capacity), the focus tends to slip off to being a "big buck" program. The idea of bigger bucks is easy to sell, but the market may be narrower than we desire. Self-interest and the quest for ever bigger bucks could undermine the North American Model of wildlife management where wildlife is held in public trust and allocated on the basis of law rather than landownership, social status, or wealth. Hunters, landowners, and regulatory agencies (biologists) need to work together to define the values we want from deer hunting, to understand the consequences of alternative harvest strategies, and to preserve equitable access to hunting opportunity and deer - both antlered and antlerless.

4:35 PM

QUALITY DEER MANAGEMENT COOPERATIVES: TWO CASE STUDIES IN SOUTHWESTERN MISSISSIPPI
Don Bales, Mississippi Cooperative Extension Service

Hunting clubs with small land bases have relatively poor success when attempting to practice Quality Deer Management (QDM). We formed the Fairchild Creek Group Deer Management Association in 1993 and the Craig Creek Group Deer Management Association in 1994 to determine if cooperatives could be used to increase the success of QDM. Mature buck harvest would be used as a measure of success.

All participating clubs collected data under the Mississippi Deer Management Assistance Program (DMAP). "Group Data Summaries" were completed for these areas and reports were issued at annual meetings. The annual meetings served to establish relationships among member clubs. We felt that these relationships could be used to build a genuine trust across club lines to protect younger bucks. Minimum buck harvest restrictions (15 inch main beam length) were used to increase the buck age structure. Adequate doe harvests were used to manage for a healthy herd with a high reproductive rate.

The Fairchild Group increased from 4,120 acres (2 clubs) in 1993 to 9,000 (9 clubs) by 1995. The Craig Creek Group increased from 8,075 acres (3 clubs) in 1994 to 11,270 acres (6 clubs) in 1996. Mature bucks (Age 3.5+) harvested increased from 0.9 to 3.25/sq. mi. and 1.5 to 2.65/sq.

mi. for the Fairchild Group and the Craig Creek Group respectively. The percent mature bucks in the harvest also increased from 23% to 63% for the Fairchild Group and increased from 36% to 67% for the Craig Creek Group. We concluded that a QDM Cooperative can be successful if member clubs are truly committed to self-imposed buck harvest restrictions.

4:50 PM

QUALITY DEER MANAGEMENT: WHAT IT IS AND WHAT IT ISN'T.
Brian Murphy, Quality Deer Management Association and *Joe Hamilton,* Ducks Unlimited

During the past decade, quality deer management (QDM) has become an increasingly popular white-tailed deer (*Odocoileus virginianus*) management strategy across much of the United States. QDM typically involves reducing the harvest of young males, increasing the harvest of antlerless deer, improving nutrition, maintaining accurate records, and enhancing hunting experiences. This strategy has been employed successfully by numerous landowners, hunters, and resource managers on both private and public lands, although failures have occurred. Most failures have resulted from unrealistic expectations, an insufficient area of land under management, inappropriate antlerless deer harvests, and allowing insufficient time to achieve desired objectives. A major obstacle preventing wider acceptance of QDM by hunters and biologists is the misapplication of region specific guidelines across the whitetail's range. QDM has also been criticized for promoting wildlife privatization, "trophy mania", and an elitist hunter mentality. We believe these criticisms are due largely to a lack of understanding of the true intent of QDM. This lack of understanding can, in part, be attributed to the rapidity at which QDM has gained popularity and to the diverse range of management objectives by those involved. QDM is a management philosophy/practice that unites landowners, hunters, and biologists in a common goal of producing biologically and socially balanced deer herds within existing environmental, social, and legal constraints. These constraints have and will continue to influence the acceptance, application, and success of QDM. As with any management approach, landowners and hunters should be aware of the associated costs and benefits. However, for an increasing number of landowners and hunters, QDM offers a desirable alternative to traditional management.

MONDAY, FEBRUARY 9, 1998

Technical Session I-Moderator: *Bob Warren*, School of Forest Resources, Univ. of GA.

*9:00 PM

SOCIOLOGICAL AND LAND-USE FACTORS AFFECTING DEER MANAGEMENT AND DEER DAMAGE IN VIRGINIA

Ben C. West and *James A. Parkhurst*, Virginia Tech

Concerns recently have been voiced about the effect of changing culture and land-use on deer management in the eastern U.S. As part of a broader effort to assess stakeholders' attitudes and perceptions toward deer damage and management in Virginia, we conducted a mail survey of agricultural producers and homeowners during the fall of 1996. Of the 1,502 questionnaires that were sent, 732 usable questionnaires were returned which resulted in an adjusted response rate of 52%.

To evaluate the effects of sociological factors on deer management, we examined the relationships between respondents' demographics (e.g., gender, education, living situation) and their perceptions about deer damage versus their opinions about deer and deer management. Although few (19.3%) respondents believed deer were a nuisance in Virginia, those who reported experiencing severe deer damage were much more likely to express this perception. Overall, respondents agreed with using recreational hunting to manage Virginia's deer population, but stated preferences for other management options were significantly related to respondents' gender and their current and past living situation (e.g., rural, suburban, urban).

Finally, we are currently evaluating the effect that unhunted lands may have on deer management and deer damage. By conducting case studies on two study areas in Virginia, we will be examining relationships between hunting, land-use, and deer damage, which will serve as the foundation for future, more detailed research.

The results of this research solidify the argument for continued education, especially for those individuals that are not typically targeted by educational programs (e.g., urban residents). Also, we will discuss the potential effects of hunting restriction on deer management in a landscape-scale perspective.

9:20 AM

THE IMPACT OF CHANGING DEMOGRAPHICS ON THE FUTURE OF DEER HUNTING IN AMERICA

Robert D. Brown, Texas A&M; *Billy Higginbotham,*and *Don Steinbach,* Texas Agricultural Extension Service

The population of the United States is changing more rapidly than most of us realize, and that change will have a significant impact on the future of deer hunting. Currently, only 8% of the U.S. population hunts, and participation in hunting by age group has been declining since 1955. The population of the U.S. was 262.8 million in 1995, and although the population is growing, the rate of growth is slowing, except in the states of California, Florida, and Texas. Immigration and the high birth rates of the latter population in those three states accounted for 54% of the total increase in the U.S. population between 1980 and 1990. Unfortunately, even where numbers of Americans are increasing, hunting is not. Between 1980 and 1990, 66.1% of the U.S. population growth was due to minorities, and this trend will continue to increase. Hispanics, African Americans, and Asians have historically low rates of participation in hunting. In Texas, for example, a state which will soon have a Hispanic majority, and a state where 24% of the total population hunts, only 6% of hunters are minorities. Likewise, our population is aging; the average age of a hunter is 38. Within the next 30 years a full 20% of the U.S. population will be over 65. That trend will continue as "baby boomers" mature. Women will numerically dominate the elderly population. Participation in nearly all outdoor activities except birdwatching decreases with age, and only about ½ % of the women in the U.S. hunt. Another trend impacting hunting is urbanization; over 75% of the U.S. population lives in urban areas, and those areas are growing faster than rural areas. Participation is low in urban areas, and those urban dwellers who do hunt tend to come from rural backgrounds. Likewise, the change in family structure portends to influence the future of hunting. Family size is decreasing, from 3.67 in 1940 to 2.63 in 1990, and the percentage of non-family households, and those headed by women, is increasing. Nationally, 61% of children spend some time in a single-parent household, and the person least likely to hunt or fish is a single female parent. Nearly half of such households live in poverty, and an increasingly diverse ethnicity only exacerbates the poverty problem. Minorities understandably spend far less on recreational activities than do Anglos. As our population becomes older, more ethnically diverse, more urban, and less affluent, attitudes towards hunting as an acceptable sport for others may become less tolerant. Despite such efforts as 4-H shooting sports programs, youth hunting associations, and Women in the Outdoors, this declining trend in hunting continues. If hunting is to continue as a wildlife management tool, if license sales and excise taxes are expected to continue to fund management programs, and if hunting is to continue to be a source of recreation, even for the few, then agencies must analyze their demographics and develop means of reversing this trend.

9:40 AM

HUMAN DIMENSIONS AFFECTING THE FUTURE OF DEER HUNTING: STRATEGIES FOR WILDLIFE MANAGERS

Deborah Green, College of William & Mary; *Phillip D. West,* Virginia Department of Game and Inland Fisheries

Changes in both hunting practices and cultural attitudes about hunting necessitate greater attention to the human dimensions of deer management. We reviewed scientific research (wildlife management and social science publications and presentations) and print media (national and regional newspapers published in the southeast) to identify issues affecting the future of deer hunting. Analysis of these materials revealed several important themes. Foremost among these are: 1) changing demographics (particularly the effects of urbanization, and corresponding shifts in the characteristics of the deer hunters); 2) concerns about hunter ethics (especially with respect to animal welfare/rights, and fair chase, as affected by weapons technology and privatization of deer populations); and 3) increasing human/deer interaction in non-hunting situations (both greater opportunities for seeing deer, and more property damage, accidents and disease). The overall impact of these human dimensions has been a decline in the number of deer hunters, lack of familiarity with hunting traditions, and growing concern about public health and safety. Strategies we recommend for wildlife managers interested in ensuring the future of deer hunting include intensifying informational efforts concerning hunting practices and firearm safety, particularly among youth, women, and urban populations. Ways of counteracting political pressures both from within the hunting community (such as from governing boards of state wildlife agencies that mandate bag limits at odds with biological recommendations) and without (such as public objections to controlled hunts in suburban/urban areas) are also addressed. Finally, the necessity of clearly differentiating hunting from illegal and unethical activities (such as poaching and trespassing) is emphasized.

Technical Session II-Moderator: *Bob Downing*, Retired, USF&WS.

10:30 AM

PROGRAM DESIGN CONSIDERATIONS TO PROMOTE FEMALE PARTICIPATION IN DEER HUNTING

Clark E. Adams, Texas A&M University; *Sara J. Steen,* University of Kentucky; *John K. Thomas,* Texas A&M University

This study was conducted to determine the social relationships that led to hunting participation in female versus male hunters. Past studies have shown that the majority of hunters were white middle aged or retired males. Most male hunters were introduced to hunting through male kinship networks (e.g., fathers, male relatives or friends) between the ages of 12 and 15 years old. Past methods of hunter recruitment have relied exclusively on two-parent households in which one or both were hunters. However, demographic change data showed that the number of

single parent (female) households have nearly tripled in the last 2 decades. One of the factors affecting the future of deer hunting will be to understand how nontraditional subsets (e.g., females) of the population become hunting participants.

A questionnaire was sent to 2,200 female hunting license purchasers to determine hunting initiation patterns, motivation, and constraints. A final effective response rate was 33% (sampling error + 3.5%). Male hunter data was taken from previous study. There were differences ($P < 0.05$) between female and male hunters on initiation ages and hunting instructors. No differences were found between groups on achievement-oriented hunting motivations. Our study showed that female hunters were initiated into hunting by husbands; motivated to hunt because of achievement, affiliative, and appreciative reasons; and confronted few barriers to their participation. Female's family participation in hunting was linked closely to her own participation. Future hunting recruitment efforts targeting females (e.g., Outdoor Women's Workshops) should focus on the familial and affiliative aspects of hunting.

10:50 AM

WHITE-TAILED DEER HUNTING AS A MANAGEMENT TOOL TO PROTECT RARE PLANTS

Johnny Stowe, South Carolina Department of Natural Resources

White-tailed deer (Odocoileus virginianus) are known to harm many species of rare plants. Of the four primary types of wildlife damage management techniques (i.e. habitat manipulation, exclusion, repellents, and lethal control), lethal control is the most effective in controlling deer populations in wildland situations. Regulated hunting for white-tailed deer - in addition to fulfilling societal needs such as providing outdoor recreational opportunities, and helping people to bond with nature - can also be an effective and money-generating management tool to regulate white-tailed deer populations in order to fulfill another societal need, i.e., environmental protection. I examine white-tailed deer hunting through the lens of Aldo Leopold's Land Ethic, and discuss situations on South Carolina's heritage preserves in which deer hunting is used to protect rare plants, some of which are federally-endangered. This information is valuable to wildland managers charged with protecting rare plants, and it provides a sound philosophical and ecological justification for deer hunting.

11:10 AM

ALLOCATING RESOURCES AMONG USER GROUPS: CURRENT AND FUTURE TRENDS IN ARCHERY DEER HUNTING

*Kimberly M. Mattson Hansen,*Michigan State University*; William E. Moritz,* Michigan Department of Natural Resources*; Scott R. Winterstein* and *R. Ben Peyton,*Michigan State University

Archery deer hunting has become very popular in Michigan within the past thirty years. This is evidenced by a five-fold increase in the number of archery hunters throughout the state. Originally, archery hunting regulations were fairly liberal, primarily designed to provide additional hunting opportunities. Early legislation allowed for a long archery season, use of tree stands and compound bows, and archery either-sex tags in addition to a firearm tag. Because of the initial small number of participants, archery hunting was thought to have little impact on the deer herd. However, archery harvest numbers have grown from 3 to 28 percent of the total harvest since 1967. Several factors may have influenced these increases. Advancements in archery equipment (e.g. compound bows) and techniques, such as tree stands and baiting, have led to a high degree of technical specialization among hunters and likely contribute to a higher hunter success rate. With a significant proportion of deer being harvested by archery hunters, concerns have been raised that there may be biological impacts on the herd. Recent evaluation of check station data has shown significant differences in the sex and age compositions of archery and firearm harvested deer. The large number of bow hunters has also resulted in controversy regarding potential competition between gun and bow hunters for trophy bucks. These trends and associated issues must be assessed periodically to maintain an effective deer management program that achieves equitable allocation of resources to all stakeholders.

11:30 AM

COST AND EFFECTIVENESS OF AN URBAN DEER REDUCTION PROGRAM USING BOWHUNTERS

Howard J. Kilpatrick and *W. David Walter*, Connecticut Wildlife Division

Many communities have struggled with the difficult task of selecting an effective and publicly-acceptable management option to reduce overabundant white-tailed deer *(*Odocoileus virginianus) herds. The cost and effectiveness of bowhunting as a management tool in residential areas is not well documented. We assessed cost, effectiveness, and deer recovery rates of a controlled archery hunt to reduce an overabundant white-tailed deer herd in a residential community. A community-supported archery hunt was implemented to reduce the local deer herd within the residential community from 15 September - 21 December 1996 and 1997. A rigorous hunter selection process was employed to select qualified archers. In addition to state hunting laws, the committee developed additional guidelines to increase the safety and effectiveness of the hunt, and to minimize potential conflicts between user-groups. The archery hunt reduced the local deer herd by at least 50% during the first year and many residents

experienced some relief of deer damage to landscape plantings after the hunt. Data from hunter surveys indicate that shooting accuracy experienced by archers under hunting conditions was lower than shooting accuracy experienced during a prehunt shooting proficiency test. Hunter recovery rates of radio-collared deer were lower than recovery rates reported on hunter surveys. No hunting accidents occurred, no conflicts between hunters and residents were reported, and no deer hit with arrows died outside the hunting area The most significant cost to the community was additional law enforcement personnel required to respond to protesters. We conclude that under some circumstances, a well designed archery hunt with a rigorous hunter selection process can be an effective management tool for reducing urban deer herds. We recommend modifications in the shooting proficiency test and hunting framework to increase the hunt effectiveness.

11:50 AM

CAN WE PREDICT AGE, SEX AND LOCATION OF DEER-VEHICLE COLLISIONS BY SEASON?

Paul E. Johns and *James M. Novak,* Savannah River Ecology Lab

With the increase in deer populations and the continued development of rural areas, the number of deer-vehicle collisions has increased dramatically. The reasons for the increase have been the subject of conjecture and hypothesis, but little data is available to test these hypotheses. In 1990, a study was begun on the Savannah River Site near Aiken, S.C. to determine when and where deer-vehicle accidents were occurring and the characteristics (age and sex) of the animals involved. Data were analyzed for the years 1990-1997 to determine differences among (lunar cycle) seasons in the spatial clustering of collisions and the sex and age of the deer. The results of this analysis agreed with the behavioral patterns of white-tailed deer reported by Hirth (1977). There was a strong relationship between season and both age ($\chi^2 = 17.67$, $P = 0.039$) and sex ($\chi^2 = 27.84$, $P < 0.0001$) but the seasonal patterns for each main effect did not interact ($\chi^2 = 11.91$, $P = 0.218$). Location of accidents was analyzed for changes in spatial clustering among seasons. Clustering of collisions was consistent among seasons but the relative ranking of clusters varied between seasons. The constancy of the groupings in space is a function of traffic patterns on the SRS and the shifts in ranking are most likely a function of the changing movement patterns of animals with season. We as biologists should use this type of data to educate the driving public to the seasonal hazards of driving in areas where deer are prevalent.

Technical Session III-Moderator: *Doug Hall,* USDA, Wildlife Services.

*1:30 PM

RESPONSES OF DEER AND PERCEPTIONS OF RESIDENTS TO A HERD REDUCTION IN COASTAL SOUTH CAROLINA

David W. Henderson, Robert J. Warren, and *Jennifer S. Cromwell,* University of Georgia; *Joseph Hamilton,* South Carolina Department of Natural Resources (Present Address: Ducks Unlimited Lowcountry Initiative)

Conflicts between humans and white-tailed deer (*Odocoileus virginianus*) in Sea Pines (SP) on Hilton Head Island, SC have increased recently. These conflicts include landscape damage, deer-vehicle collisions, and concern about tick-borne diseases. Our objectives were to evaluate responses of deer and perceptions of residents to a localized herd reduction of 50%. We chose the Gull Point (GP) and Baynard Cove (BC) areas of SP because of high local deer densities (1 deer/5 acres). We radio-collared 11 adult does in each area during Fall (Oct-Dec) 1995, and monitored their movements during Winter (Jan-Mar) 1996. In August 1996 we mailed 400 surveys to residents. We randomly chose GP as our control area; BC then received the 50% herd reduction treatment during Fall 1996. No radio-collared deer were removed. We conducted telemetry again in Winter 1997 and mailed surveys again in March 1997. Telemetry data were compared on both areas before versus after the reduction. Winter home range sizes did not differ between the control and treated areas before the herd reduction (1996), but were significantly greater ($P<0.05$) on the treated versus control area after the herd reduction (1997). Before versus after the reduction, residents in the treated area saw about 50% fewer deer, whereas residents in the control area saw about the same number of deer. Residents in the treated area did not notice less damage to plants. Our study demonstrates how biological and human dimension data can be integrated, allowing authorities to make informed decisions regarding the SP deer herd.

*1:50 PM

LIVE-CAPTURE AND SMALL-SCALE RELOCATION OF URBAN DEER ON HILTON HEAD ISLAND, SOUTH CAROLINA

Jennifer S. Cromwell, Robert J. Warren, and *David W. Henderson,*University of Georgia

White-tailed deer (*Odocoileus virginianus*) have become increasingly abundant in urban and suburban areas. Many urban residents are opposed to lethal methods of deer control and insist that live-capture and relocation of deer is a viable and humane method of population control. We tested this relocation technique in the Sea Pines residential area on Hilton Head Island, South Carolina. Nineteen deer were captured with rocket nets in the southern part of Sea Pines and marked with radio-transmitter collars. Ten of these deer were relocated to a Forest Preserve on the island and 9 were released at the capture site (controls). We telemetrically monitored deer movements over 24-hour periods at 1 day, 3 days, 5 weeks, and 10 weeks post-capture, and compared movement rates and post-capture dispersal for relocated versus control deer. Mean

movement rates (m/hr) did not differ between the 2 groups of deer nor among days post-capture. Relocated deer tended to have greater dispersal distances from the release site than control deer. We analyzed deer mortality over 3-month and 1-year intervals post-capture. Relocated deer had higher mortality over the 3-month interval post-capture because of capture-related causes ($P < 0.005$, $t = 31.8$, $df = 17$) than control deer. However, deer released on site had greater mortality than relocated deer over the 1-year interval because of higher noncapture-related mortality ($P < 0.005$, $t = 49.6$, $df = 15$).

*2:10 PM

WHITE-TAILED DEER ECOLOGY AND MANAGEMENT ON KIAWAH ISLAND, SOUTH CAROLINA

James D. Jordan and *Robert J. Warren*, University of Georgia

We are conducting an ecological assessment of deer on Kiawah Island, which is an 8,000-acre coastal, residential-resort community located off the South Carolina coast near Charleston. Seasonal spotlight surveys revealed a density of about 1 deer/5 acres. We collected 10 deer in December 1996, and March and August 1997 using the trap-and-kill method. Mean ($\pm$ SE) body weights of adult deer were higher than normal for barrier islands (101.6 ± 3.8 and 131.8 ± 11.3 lbs for females and males, respectively). Kidney fat indices and humerus marrow fat levels also indicated deer were in excellent nutritional condition. Serological analyses from 25 deer revealed exposure to ehrlichia (52% positive) and Lyme disease (13% positive). In utero pregnancy rates of adult does averaged 1.3 fawns/doe. Two of 6 female fawns examined were pregnant, including 1 fawn that had twins. Seasonal scent station surveys indicated a relatively high bobcat population (about 2 bobcats/mile^2). Preliminary analyses revealed that deer occurred in bobcat scat. Track-plot surveys pinpointed certain areas of high deer use and their proximity to residential areas. Public meetings have been held to inform the residents of research activities and results. A final deer collection will occur in December 1997, and all samples will be analyzed prior to the 1998 Deer Group Meeting. Future management of this deer herd will require nontraditional methods because of a 1995 town ordinance that prohibits discharge of firearms.

*2:30 PM

BOBCAT-DEER INTERACTIONS AND HUMAN ATTITUDES ON CUMBERLAND ISLAND NATIONAL SEASHORE

Greg Nelms, Jeffrey J. Brooks, and *Robert J. Warren,* University of Georgia

An important natural resource issue along the Atlantic Coast is the management of high-density insular white-tailed deer (Odocoileus virginianus) populations. Cumberland Island National Seashore (CINS), administered by the National Park Service, is Georgia's largest barrier island. Surveys conducted on CINS in 1979 indicated a high deer population with commensurate impacts on vegetation and deer physiological parameters. Annual managed hunts were initiated

in 1980; however, a 1986-87 deer study on CINS indicated the population was unaffected by the hunts and recommended increased public hunts and/or predator restoration. In 1988 the decision was made to attempt restoring the once extant bobcat (Lynx rufus) population on CINS. The bobcat reintroduction effort, though initially controversial, successfully restored the population. Shortly thereafter, an analysis of deer hunter harvest data showed increases in deer weights and declines in hunter success. Part one of the current study was designed to identify and interpret trends in deer indices and harvest data, determine bobcat food habits, measure vegetation response, and compare these with previous results. In part two, we measured human attitudes and knowledge concerning the restored bobcats, using a 40-item, self-administered, drop-off questionnaire. Five user groups (day-only visitors, developed-site campers, backcountry campers, deer hunters, and island residents) were targeted to compare their attitudes. Preliminary data through January 1997 will be presented. This study will provide an evaluation of deer indices on CINS and information about bobcat-deer interactions and human attitudes toward predator restoration efforts.

2:50 PM

GENETICALLY UNIQUE POPULATIONS ALONG THE COASTS OF GEORGIA AND SOUTH CAROLINA

Michael H. Smith, Savannah River Ecology Laboratory; *James R. Purdue,* Illinois State Museum, *Paul E. Johns* and *James M. Novak,* Savannah River Ecology Laboratory

Studies of the genetic characteristics of white-tailed deer indicate the presence of a number of unique populations along the coast of Georgia and South Carolina. Deer in this area are descended from relic populations that survived the great reduction in deer numbers that occurred during the first part of this century. Genetic differentiation over short distances was observed for both maternally inherited mitochondrial genes and biparentally inherited nuclear genes. In fact many island populations, as well as adjacent mainland populations have unique genes. Overall genetic divergence at the nucleic acid level for mitochondrial DNA seems to be related to geographical distance between the populations. This spatial pattern makes it likely that female dispersal is limited and generally accounts for 13 to 22 % of the total dispersal. Similarly male dispersal is also limited and, although larger than female dispersal, is still not adequate to homogenize gene frequencies over distances that can easily be traversed by deer in a relatively short time. White-tailed deer on the coastal plain occur in geographically distinct genetic populations that maintain their genetic characteristics over time. The reasons for this type of distribution and the implications for the management of these populations will be discussed.

Technical Session IV-Moderator: *Ken Gee*, Noble Foundation.

3:40 PM

DEER MANAGEMENT - WHAT DO YOU DO AFTER LOSING YOUR CREDIBILITY?
Bret D. Wallingford and *George M. Kelly*, Pennsylvania Game Commission

Pennsylvania is a state of 12 million people, >1 million white-tailed deer, >1 million hunters, and a strong deer hunting tradition. In 1979, the Pennsylvania Game Commission (PGC) established habitat-based deer density goals for each management unit with the objective of carrying the number of deer that forested land can support without adverse effects on tree regeneration. It was not until 1988 that the PGC began to aggressively reduce deer numbers toward goal. The result was fewer deer, decreasing satisfaction among many sportsmen, and loss of agency credibility. Although the 1997 deer density was 48% above goal, dissatisfaction among a segment of our hunting public led the PGC to substantially reduce the antlerless license allocation. As a result, we expect an 8-10% population increase. The solution is to develop an informed public that supports scientifically based deer management. We have taken several steps to advance the solution, including the addition of a deer biologist specializing in information and education, the formation of an agency-wide deer management committee, and providing employees with professional training in systematic development of informed consent. Further marketing will require assistance from experts outside the agency and the use of modern technologies to reach all stakeholders in deer management.

*4:00 PM

WHITE-TAILED DEER IMPACT ON FOREST VEGETATION: MODELING LANDSCAPE-LEVEL DEER ACTIVITY PATTERNS
Diane M. Krishon and *Linda S. Gribko,* West Virginia University

White-tailed deer (*Odocoileus virginianus*) herbivory has been identified as a major impediment to the survival and growth of forest understory vegetation in the northeastern United States. Foresters and ecologists often suggest that deer densities be constrained at reduced levels through administration of hunting. However, the public demand for hunting opportunity often outweighs concerns about understory vegetation and state wildlife agencies have been reluctant to reduce deer densities to the suggested levels. Rather than controlling deer densities directly, it may be possible for land managers to manipulate habitat and browsing pressure through carefully planned timber harvest.

We are developing methods whereby deer habitat use patterns can be related to understory vegetation condition and complexity across large landscapes. The long-term objectives of this research are to 1) model changes in deer habitat use patterns due to forest overstory

fragmentation caused by dispersed timber harvest and 2) to formulate specific harvest patterns that minimize white-tailed deer impact on vegetation.

As an initial step, baseline deer habitat use patterns were investigated in summer 1997 on two experimental forests, the 8,430-acre Westvaco Wildlife and Ecosystem Research Forest in south-central West Virginia and the 3,075-acre WV University Research Forest on the northern border of the state. Within each forest, fecal pellet group counts were conducted on geolocated 1.83-m radius circular plots at a sampling intensity of 1 plot per 2 ha. We used Geographic Information Systems technology and a spatial statistics technique known as "kriging" to model fecal deposition patterns. Preliminary results revealed moderate spatial contagion in the data. We are now incorporating topographic data to improve the predictive capability of the spatial model.

4:20 PM

EFFECTS OF DIFFERENTIAL HARVEST ON DEER HERD QUALITY AND QUANTITY ON THE CHAPARRAL WMA

James F. Gallagher, David R. Synatzske, and *Donald C. Ruthven,* Texas Parks and Wildlife Department

An investigation of helicopter census for determining deer populations was conducted on the Chaparral WMA during 1983-84. Less than half of the deer present were counted during flights covering 100% of the area. Since deer densities were apparently much higher than previously thought, it was suggested that the deer population might support a greater harvest.

Differential harvests were applied to the East and West deer management units on the Chaparral WMA from 1985 - 1992. Harvest rates for the West management unit were based on the number of antlered and antler less deer as determined by the 100% helicopter count. The same harvest rates were applied to the antlered and antlerless populations of the East management unit, but the number of deer was corrected according to the following formula:

$$AP = (OP/CA) - [(OP/CA) * DR]$$

Where AP = Adjusted population
OP = Observed population
CA = Crude accuracy derived from 1983 helicopter census study (0.40)
DR = Duplication rate derived from 1983 helicopter census study (0.13)

A 20% harvest rate was applied to both units under the above criteria in 1985 and 1989 -1992. In 1986 – 1988 a 15% harvest rate was applied due to lower than desired population densities. Antlerless-only hunts were not conducted during the 1988 – 1991 hunting seasons, but some does were collected for other research studies. Achieved harvest over the eight year period were 92 – 146% of desired harvest for the West unit, and 86 – 124% for the East unit.

Total deer numbers declined on the East unit over the eight-year period, while total numbers increased on the West unit. Similar trends were noted in the mean age of bucks harvested, percent mature bucks in the harvest, hunter success rates for mature bucks, and the number of hours spent hunting to harvest a mature buck. The number of fawns per doe tended to decline for both units over the period. The number of does per buck declined on the West unit, but tended to increase on the East unit.

This study indicates that although census data obtained from 100% helicopter counts yield conservative estimates of population parameters, this does not justify an increased harvest of the population.

This research was funded by the Federal Aid in Wildlife Restoration Act; Federal Aid Project W-127-R-2, Job No. 93.

*4:40 PM

HIGH FENCES AND GENETICS: KEEPING UP IN PARADISE

Jonathan W. Day, Louisiana State University; *Kyle Balkum, David Moreland,* and *Fred Kimmel,* Louisiana Department of Wildlife and Fisheries

While Louisiana may lag behind the nation in economics, education, and environmental quality, it is doing its best to keep abreast of the latest trends in deer management. High fences and importation of northern deer to improve herd genetics is being promoted in the Bayou State. Two years ago the Louisiana Department of Agriculture and Forestry was given authority by the state legislature to regulate deer farming. When the "alternative agriculture" law was interpreted by LDAF to include the regulation of white-tail shooting preserves, it created a conflict between LDAF and the Louisiana Department of Wildlife and Fisheries. LDWF is the state agency which has always regulated hunting. An agreement was finally reached between the two agencies, and Louisiana is now in the shooting preserve business. Information will be presented concerning the chain of events that led to this legislation, the conflict it created, and the resolving of the issue between the two agencies.

5:00 PM

AN EPIZOOTIC OF HEMORRHAGIC DISEASE IN MISSOURI

Jeff Beringer and *Lonnie P. Hansen,* Missouri Department of Conservation

Hemorrhagic disease (HD) is a cause of mortality for white-tailed deer (*Odocoileus virginianus*) and other ruminants although the magnitude of most outbreaks is unknown. Typically HD occurs during late summer and early fall when decomposition and scavenging of dead deer can be rapid. As a result most deer deaths that result from HD epizootics are likely not reported. During 1996 HD was reported in 8 states including Missouri. As part of a white-tailed deer survival study we were actively monitoring 97 radio-marked deer when the HD outbreak

occurred. Of 97 radio-marked deer, we suspect 8 (8%) died from HD. Mortalities consisted of 5 adult females, 2 yearling females and 1 yearling male. Field technicians found remains of 5 unmarked deer that may also have died from HD. We tested blood from 96 deer taken by hunters in the immediate area and 15 (16%) were positive with epizootic hemorrhagic disease virus (EHDV) or blue tongue virus (BTV) agar gel immunodiffusion tests. Check station attendants noted hoof interruptions in only 2 of the 96 deer sampled. We received no public reports of dead deer during this period. Results of this study may assist biologists in estimating mortality and population impacts of HD epizootics.

TUESDAY, FEBRUARY 10, 1998

Technical Session V-Moderator: *Larry Marchinton*, Retired, Univ. of GA, School of Forest Resources.

8:10 AM

RIGHT-LEG MANAGEMENT IN A LEFT-LEG WORLD

Patrick D. Keyser and *W. Matt Knox,* Virginia Department of Game and Inland Fisheries

Work on Davis Island during the 1970's provided a model for the management of deer herds on private lands in the South. Since that time a number of workers have reported on similar, albeit less spectacular, results on various properties throughout the South. More recently discussion among deer biologists and managers has involved the limitations of management on marginal lands. It is thought that density-dependent responses are muted or absent on marginal ranges. Further consideration must be given management approaches which presuppose density-dependent responses on better habitats in the South. Physical parameter responses may be modest in herds at densities below "I" carrying capacity. These herds are operating under the dynamics of the left-leg of the productivity parabola, and may not exhibit strong right-leg responses. Based on analysis of deer herds in Virginia and reported deer densities in other Southeastern states, it seems probable that it is only the occasional, and not the typical herd, that is at right-leg densities. Thus, from a practical standpoint, many deer ranges in the South can be seen to be either marginal on the one hand, or understocked (below "I") on the other hand, and therefore may not show classical density-dependent responses. If this is the case, there are significant implications to deer management recommendations and strategies in the region. Data from Virginia and other areas are reviewed with special emphasis on "C" (cultural carrying capacity), "K" (biological carrying capacity), and their relationship to productivity and physical parameters, and their implications for deer herd management.

8:30 AM

THREATS TO DEER MANAGEMENT IN AUSTRALIA: A CASE HISTORY ON CONFLICT RESOLUTION IN TASMANIA

Brian Murphy, Quality Deer Management Association

During the past decade, there have been numerous threats to the future of deer hunting and management in Australia. This is particularly true in Tasmania where potential deer herd deregulation and the introduction of new gun control legislation resulted in significant biological, social and political changes. Tasmania is the island state of Australia located 300 km off the southeast coast. Fallow deer (*Dama dama*) are the only deer species present and the current wild population is estimated at 15,000-18,000. Previous deer management strategies failed to find sustainable solutions to agricultural damage, competition with livestock, and declining herd quality. As a result, during the early 1990's, Tasmanian farmers aggressively lobbied the

Tasmanian Parks and Wildlife Service (TPWS) to remove all legal protection on wild deer. In response, the Tasmanian Deer Advisory Committee Inc. (TDAC) began implementation of a statewide Quality Deer Management (QDM) program in 1993. The initial program proved successful, although the need for a more comprehensive strategy soon became apparent. In 1994, the TDAC implemented a strategy called Property-based Game Management (PBGM) which incorporates QDM. This combination of approaches proved so effective that landowners ceased their push for deregulation and joined the TDAC in support for the establishment of a Game Management Unit (GMU) within the TPWS. This unit was established in July 1996 and represents only the second GMU in Australia. The implications of national gun control legislation, introduced in 1996, are also discussed.

8:50 AM

OPINIONS OF HUNTERS AND RURAL LANDOWNERS RELATED TO QUALITY DEER MANAGEMENT IN GEORGIA

Daniel L. Forster, H. Todd Holbrook, and *Ken A. Riddleberger,* Georgia Department of Natural Resources

In light of increasing interest in quality deer management (QDM) in Georgia, a mail survey was conducted to determine attitudes of landowners and deer hunters toward state-mandated QDM regulations. From September to November 1996, we mailed separate survey instruments to 3,857 rural landowners (seven questions) and 4,491 deer hunters (11 questions) in two waves. Responses were received from 1,906 landowners (49.4% response rate) and 1,738 deer hunters (35.2% response rate) with a sampling margin of error of 2.2% and 2.4%, respectively. Responding landowners owned an average of 440 acres, were largely deer hunters (51.5%), and indicated a 48.2% support level for mandated minimum antler spread/count regulations while a third (35.4%) opposed. Support for QDM restrictions was significantly higher among landowners who hunt deer, had larger land holdings, or had land holdings in the north, west central, and southwest part of the state. Landowners expressed regional support for reducing the total deer population and permitting the harvest of antlerless deer throughout the entire season in Deer Management Units (DMU) with higher relative deer densities and agricultural conflicts. Hunters surveyed were largely male (96.1%), averaged 41.8 years-old, and possessed an average of 20.1 years of hunting experience. Hunters strongly favored a four point on one side restriction (48.7%) in favor of a 15" minimum spread (26.3%) and showed little support for a reduction in the buck limit. A total of 47.6% favored and 37.8% opposed imposing statewide antler restrictions on buck harvest. The majority of hunters in the central and southwest Georgia DMUs favored imposing antler restrictions. More experienced hunters generally showed greater support for antler restrictions and reducing buck limits over less-experienced hunters. These results suggest a minority but significant level of landowner and hunter support on a statewide level but majority support for state-mandated antler restrictions exists in some central and southwest Georgia DMUs.

9:10 AM

PROCEDURES FOR COUNTY INITIATION OF QUALITY DEER MANAGEMENT
Daniel K. Grahl, Scott McDonald, Tip Hon, Terry Kile, and *Todd Holbrook,* Georgia Department of Natural Resources

The Georgia Department of Natural Resources, Game Management Section recently developed a multi-step process for the initiation of countywide quality deer management (QDM) regulations. The procedure was developed to provide a standard for addressing the growing interest in regulatory statutes mandating quality deer management on private lands. Inquiries from the public have increased since the establishment of countywide QDM in Dooly, County Georgia in 1993. It is the Department of Natural Resources' position that QDM can be practiced voluntarily by landowners/hunt clubs without regulatory statutes. However, the process allows regulatory consideration of antler restrictions in a county where a strong majority favors state regulation.

The process must be initiated by an organized group of sportsmen in the prospective county. The steps of the procedure include: 1) Written request from the sportsmen group to the Game Management Section; 2) Information and education, including newspaper articles and public meetings; 3) Two public opinion surveys to determine level of support from landowners and sportsmen; 4) Assessment of deer herd condition and age related antler characteristics; and 5) Regulation proposal.

The Game Management Section received written requests from sportsmen groups in Harris, Meriwether, and Worth counties, Georgia during 1997. Following efforts to educate hunters and landowners opinion surveys were mailed to estimate support for the regulation. Special regulations were proposed as appropriate for each county based on survey results and analysis of data collected from harvested deer.

It is likely that sportsmen groups in other counties will be requesting the Department to consider this type of regulation. Results from three counties, the value and methodology of the procedure are discussed.

*9:30 AM

PERIODIC HARVESTING ON FORT BRAGG MILITARY INSTALLATION, NORTH CAROLINA: A STRATEGY TO OBTAIN OLDER BUCKS
Mark S. Graham and *Richard A. Lancia,* North Carolina State University; *Donald H. Cockman,* Department of the Army

Either-sex hunting has been practiced on the 160,000-acre installation since 1981, but disproportionate hunting pressure on males has yielded an antlered harvest comprised primarily of yearlings (1994:63.4%). In 1995, periodic harvesting (hunting every other year) was started in selected areas as a strategy for harvesting older bucks without imposing buck selection criteria on

hunters. To evaluate the efficacy of this strategy, we divided 28,400 acres into 2 annually and 2 periodically harvested areas. Periodic areas were closed in different years to minimize the loss of hunting opportunities. Check station, radio telemetry, track count, spotlight count, and hunter effort data were collected. The first periodic area was closed during 1995. When hunted again in 1996, bucks were hunted without selection criteria and the doe quota was doubled from 1994. The proportion of ≥2.5 year bucks in the antlered harvest increased from 36.5% in 1994 (n=54) to 52.7% in 1996 (n=55; P=0.09). Mean statistics of antlered bucks increased between 1994 and 1996: 103.8 lbs gross weight to 110.6 lbs (P=0.03), 1.79 cm antler beam diameter to 2.07 cm (P=0.01), and 4.07 antler points to 4.75 (P=0.07). In the annually harvested control area there were no significant differences for the preceding statistics among the 1994, 1995, and 1996 antlered deer harvests: percent ≥2.5 year bucks (P=0.72), gross weight (P=0.72), antler beam diameter (P=0.63), and antler points (P=0.15). The second periodic area was closed in 1996 and hunted again in 1997. Results from 1997 and data on densities and movements of deer in the study areas will be presented. Larger changes in harvest parameters are expected after the second closed/open cycle. Preliminary results indicate that periodic harvesting could gradually increase the age structure of a pressured buck population without imposing buck selection criteria on hunters.

Technical Session VI--Moderator: *Harry Jacobson,* Retired, Mississippi State Univ.

*10:10 AM

ANTLER SIZE CHARACTERISTICS BY AGE: SOUTH TEXAS VERSUS SOUTH GEORGIA

Mickey W. Hellickson and *Micah Goldstein,* The University of Georgia; *Robert E. Hall* and *Charles A. DeYoung,* Texas A&M University-Kingsville; *R. Larry Marchinton* and *Karl L. Miller,* The University of Georgia; *Stuart Stedman,* Wesley West Cattle Company

Biologists often debate the antler potential of deer in different parts of their range, however comparable data rarely are available. The "Golden Triangle" of Texas and the Flint River areas of Georgia are two of the leading producers of record antlers in the Southeast. We randomly sampled (N = 661, 1985-96) a white-tailed deer population on the Faith Ranch in Dimmit County, Texas and compared antler size characteristics of males (≥2.5 years old) by age to a harvested sample (N = 254, 1993-95) collected in Dooly County, Georgia. Males harvested in the Georgia sample were not randomly collected but should be representative of the population. Among age classes, all antler characteristics increased until 4.5 years of age. For all antler characteristics, Georgia males 2.5 and 3.5-years-old were larger than Texas males of the same age. Georgia males ≥4.5 years had greater gross Boone and Crockett Club (BCC) score (F = 5.31, P = 0.022) and antler length (F = 6.38, P = 0.012) than Texas males, but other parameters measured did not differ. A higher percentage of Georgia males ≥4.5 years old scored above 125 (71% vs. 56%), 150 (17% vs. 12%), 160 (10% vs. 4%), and 170 (7% vs. 1%) BCC points. Mean percent annual increase in BCC score for Georgia males were 34% (1.5-2.5), 14% (2.5-3.5), 7% (3.5-4.5), 3% (4.5-5.5), and -7% (5.5-6.5). Mean percent annual increase in BCC score for Texas

males for the same ages were 54%, 22%, 13%, 8%, 2%, -3% (6.5-7.5), and -1% (7.5-8.5). Highest correlations with age for the Texas sample were BCC score (R = 0.728, P = 0.0001) and antler length (R = 0.728, P = 0.0001). Highest correlations with age for the Georgia sample were basal diameter (R = 0.539, P = 0.0001) and antler length (R = 0.527, P = 0.0001).

*10:30 AM

INFLUENCE OF PLANT SECONDARY COMPOUNDS ON WHITE-TAILED DEER ANTLER GROWTH AND NUTRITION

Tyler A. Campbell and *David G. Hewitt,* Texas A&M University-Kingsville

Browse species consumed by white-tailed deer are defended from herbivory by plant secondary compounds (PSMs). Mammals detoxify PSMs through a 2-phased system of biotransformation, which yields strong organic acids. One mechanism for buffering acids is the mobilization of calcium and other alkaline salts from the skeletal system. White-tailed deer consuming brush and producing excess acids during antler formation may utilize minerals essential for antler development, such as calcium and phosphorus, as skeletal buffers, resulting in altered mineral composition, density, and/or morphological characteristics in the antlers. Research objectives were to examine the effects of PSMs on 1) nitrogen and mineral metabolism, 2) acid-base balance, and 3) antler development in mature white-tailed deer. Fifteen male white-tailed deer were randomly assigned to 1 of 3 diets. Diets were fed *ad libitum* throughout the 1997 period of antler growth as follows: 2% NH_4Cl, which causes metabolic acidosis; 3% tannic acid, a representative PSM; and a basal ration without additive. Two digestion trials were completed with each deer to determine nutrient balance. Antler characteristics (i.e., length, mass, and density [g/cc]) and mineral composition were calculated upon velvet shedding. 1-way and 2-way (Diet x Trial) RCB design ANOVA were completed for the appropriate parameters. No difference in the change in gross Boone and Crockett score (minus inside spread) was seen (P=0.4019) between 1996 antlers (all deer on basal ration), and 1997 antlers. However, the individual variation within diet was large (SD = 17.05,12.42, and 11.5, respectively). Additional results and implications will be discussed.

*10:50 AM

COMPARISON OF FACTORS USED TO VISUALLY ESTIMATE AGE OF LIVE MALE WHITE-TAILED DEER

Mickey W. Hellickson, University of Georgia; *Robert E. Hall* and *Charles A. DeYoung,* Texas A&M University; *Stuart W. Stedman,* Wesley West Cattle Company; *R. Larry Marchinton,* The University of Georgia

The practice of selectively harvesting deer by estimated age is becoming a more commonly used technique in managing deer herds. However, characteristics used to estimate age on the hoof have not been evaluated. We randomly captured (N = 666, 1985-96) free-ranging male white-tailed deer on the Faith Ranch in Dimmit County, Texas and compared various antler and body

measures for estimating age. Highest correlations with age were gross Boone and Crockett Club (BCC) score ($\underline{R}$ = 0.728, $\underline{P}$ = 0.0001), main beam length ($\underline{R}$ = 0.727, $\underline{P}$ = 0.0001), inside spread ($\underline{R}$ = 0.704, $\underline{P}$ = 0.0001), basal diameter ($\underline{R}$ = 0.698, $\underline{P}$ = 0.0001), stomach girth ($\underline{R}$ = 0.692, $\underline{P}$ = 0.0001), and chest girth ($\underline{R}$ = 0.668, $\underline{P}$ = 0.0001). Number of antler points (≥1 inch) were more highly correlated ($\underline{R}$ = 0.577, $\underline{P}$ = 0.0001) with age than were the additional body measures of forehead width ($\underline{R}$ = 0.490, $\underline{P}$ = 0.0001), head length ($\underline{R}$ = 0.490, $\underline{P}$ = 0.0001), and shoulder height ($\underline{R}$ = 0.446, $\underline{P}$ = 0.0001). The subjective characteristics of amount of gray facial hair ($\underline{R}$ = 0.519, $\underline{P}$ = 0.0001) and occurrence of a roman nose ($\underline{R}$ = 0.486, $\underline{P}$ = 0.0001) were also correlated with age, but less significantly than antler characteristics. Multiple regression analyses indicated the most significant variables were BCC score and stomach girth ($\underline{R}^2$ = 0.621) for a 2-variable predictive model; BCC score, inside spread, and stomach girth ($\underline{R}^2$ = 0.628) for a 3-variable model; and BCC score, total points, inside spread, and stomach girth ($\underline{R}^2$ = 0.633) for a 4-variable model. Antler characteristics, specifically BCC score, main beam length, and inside spread appear to be more useful for visually estimating age of live deer than body characteristics.

11:10 AM

RELIABILITY OF YEARLING ANTLER CHARACTERISTICS AS PREDICTORS OF ANTLER QUALITY AND BODY MASS AT AGES 2.5, 3.5, AND 4.5 YEARS IN TEXAS WHITE-TAILED DEER

James R. Ott and *John T. Baccus,* Southwest Texas State University; *Donnie E. Harmel, Eugene Fuchs,* and *William E. Armstrong,* Texas Parks and Wildlife

The relationship between antler characteristics of yearling white-tailed deer and antler characteristics of bucks in later age classes is a poorly understood area of the biology of free-ranging white-tailed deer. The form of this relationship (-, 0, +) is critically important since it determines the effect of management strategies that entail selective harvest of yearling age-class individuals, based on variation in antler characteristics, on the mean antler characteristics of later age classes. We measured antler characteristics and live body mass at ages 1.5, 2.5, 3.5, and 4.5 years for 140 white-tailed deer reared in the captive herd maintained at the Kerr Wildlife Management Area (Hunt, Texas) during the period 1973 to 1990. As yearlings 43 of these bucks were spike-antlered and 97 were fork-antlered. All deer were maintained on a 16% crude protein diet ad libitum. The Boone & Crockett scoring system was used to summarize overall antler quality of each deer at each age. We then compared the expression of both antler traits and body mass at ages 2.5, 3.5 and 4.5 of spike- and fork-antlered yearling bucks. Gross Boone and Crockett scores (GBC), components of GBC, and body mass, of fork-antlered yearlings exceeded those of spike-antlered yearlings at ages 2.5, 3.5, and 4.5 years ($P < 0.001$ for each age class comparison). Moreover, the average GBC score of bucks at ages 2.5, 3.5, and 4.5 years was reliably predicted by yearling GBC score. These results show that differences between spike- and fork-antlered yearlings are maintained through maturity and that the relative expression of antler traits at age 1.5 years is a reliable predictor of overall antler quality at ages 2.5, 3.5 and 4.5 years within this study population.

*11:30 AM

AN EVALUATION OF INTRACRANIAL ABSCESSES AMONG WHITE-TAILED DEER

Christopher D. Baumann and *William R. Davidson*, University of Georgia

In the southeastern United States, an intracranial abscessation/suppurative meningoencephalitis (brain abscess) syndrome was described as a disease principally of adult male white-tailed deer (Odocoileus virginianus). The geographic distribution, etiology, demographics, seasonality, and prevalence of this disease were evaluated by surveying disease diagnostic laboratories and by examining both natural mortality and hunter-harvested deer skulls. Intracranial abscesses were diagnosed as the cause of death or illness in 97 of nearly 4,500 (2.2%) white-tailed deer from 12 states and 4 Canadian provinces. The bacterium Actinomyces pyogenes was isolated from 61% of cases; 20 other genera of bacteria also were isolated. The disease was strongly gender-biased ($P<0.01$) with 87% of cases occurring in males, and the overall prevalence among males was 4.9%. Cases were seasonal, primarily occurring from September through April. A total of 418 natural mortality buck skulls were examined from southeastern states, and 9% of the skulls from Arkansas, Georgia, Florida, and South Carolina had characteristic lesions. Skulls from hunter-harvested bucks in the southeast had a lesion prevalence of 1.4%. The similar prevalence among natural mortality bucks (9%) and bucks examined at southeastern diagnostic laboratories (8.4%) suggests that this disease accounts for slightly less than 10% of the natural buck mortality in this region. The predilection among adult males suggests this disease should be considered when practicing quality deer management.

Technical Session VII-Moderator: *Mark Ford*, Westvaco.

1:20 PM

EVALUATION OF DEER DAMAGE TO SOYBEAN PRODUCTION USING GPS/GIS PRECISION AGRICULTURE TECHNOLOGY

Lisa I. Muller and *Kelly S. Miller*, Delaware State University; *Mark C. Conner,* DuPont Agricultural Products; *Steve J. Reddy,* Lebanon Agricorp; *Carson L. Kennard,* Delaware Department of Natural Resources and Environmental Control

The white-tailed deer is the main wildlife species that causes damage to soybeans and corn in Delaware. Deer depredation on soybeans has been reported to be high; however, the effect of browsing on actual soybean yield needs to be quantified. We identified 8 fields in Sussex Co., Delaware (5 full-season soybean plantings; 3 short-season plantings established in winter-wheat stubble). Fields ranged in size from 7.3 - 69.7 ha. Three to 8 plots (9.1 x 60 m) were randomly placed along the outer edge of each field. These plots were mapped using global positioning system (GPS). A random sample of plants (mean of 1306 plants/plot) was counted for signs of

damage from deer browsing. All plots were counted at 8 weeks. Plots mapped early in the growing season were counted at 2-week intervals until soybeans were 8 weeks old. Soybean damage from other sources was also recorded and mapped. The distance from the center of each plot to the nearest woods was measured using a range finder.

Deer use of each plot was highly variable; the percent of browsed plants ranged from 0 - 93.1%. During harvest in early November 1997, we will obtain soybean production per plot using a combine equipped with a yield monitor and GPS. We will compare yield to percentage of plants damaged by deer, nearness of plots to woods, and other sources of damage. Potential effects of deer browsing on soybean production will be used to determine acceptable deer population numbers and guide management in Delaware.

1:40 PM

EFFICACY OF DEER STOPPER™ REPELLENT FOR REDUCING WHITE-TAILED DEER DAMAGE TO ORNAMENTAL PLANTINGS

James B. Armstrong and *M. Keith Causey,* Auburn University; *John T. Owen,* Alabama Agricultural Experiment Station

A 2-year study was undertaken to assess the efficacy of Deer Stopper™ repellent for reducing white-tailed deer damage to ornamental plantings. Efficacy testing was done, using a captive deer herd at Auburn University's White-tailed Deer Research Facility and two field sites, Piedmont Substation, Camp Hill, AL and Stimpson Wildlife Sanctuary, Jackson, AL. All study sites used Japanese Holly (Ilex crenata) plants, a highly preferred browse species in this area. Plants were randomly arranged between treatment and control. Treatment plants were sprayed with prescribed applications of Deer Stopper™ and percent defoliation and browsing estimated for each plant. Repeated measures analysis of variance was used to compare effectiveness of treatments. During the first three months of the study deer became acclimated to the plants with little browsing pressure to either treatment or control plants. Once deer started browsing significantly on the shrubs, the mean number of leaves on the treatment plants was consistently higher ($df=26,1$; $F=22.11$; $P=0.0001$) than the mean number of leaves on the control plants. Preliminary analyses of these data suggest that Deer Stopper™ was effective in reducing browsing damage to Japanese Holly.

2:00 PM

USE OF THE "4-POSTER" SELF-TREATMENT DEVICE TO CONTROL TICKS ON WHITE-TAILED DEER

J. Mathews Pound, J. Allen Miller, and *John E. George,* USDA-ARS-Knipling-Bushland U.S. Livestock Insects Research Laboratory; *Donnie E. Harmel,* Texas Parks and Wildlife Department

Lyme disease, the most prevalent vector-borne human disease in the United States, is caused by the spirochete *Borrelia burgdorferi* which is transmitted in the Northeast by the blacklegged tick, *Ixodes scapularis*. Approximately 95% of adult females feed on white-tailed deer, and of these approximately 90% attach on the ears, head, neck, and brisket. Studies in the Northeast indicate that *I. scapularis* cannot be maintained in the absence of white-tailed deer. This dependency led Agricultural Research Service (ARS) scientists to develop and patent the '4-poster' self-treatment device to control ticks on both antlered and anterless white-tailed deer. The '4-poster' has a central bin containing bait and a feeding port and two acaricide applicator rollers at each end. The design forces deer to rub their heads, necks, and ears against acaricide-treated rollers during feeding. During year one of a study to evaluate efficacy of Point-Guard® (2% amitraz) applied with the '4-poster' against lone star ticks (*Amblyomma americanum*), 97.4, 96.1, and >99% of adult, nymphal, and larval ticks, respectively, on deer were controlled, and free-living ticks in the pasture were reduced by 23.9, 41.1, and 68.4%. During year two, control of free-living ticks was 86.3, 86.8, and 100%, respectively. Through the USDA Northeast Area-wide Tick Control Project, ARS began testing efficacy of '4-posters' in reducing the incidence of Lyme disease in humans in 5 Northeastern states.

*2:20 PM

EVALUATION OF THERMAL INFRARED IMAGING FOR DETECTION OF WHITE-TAILED DEER

Brian S. Haroldson and *Ernie P. Wiggers,* University of Missouri; *Lonnie P. Hansen* and *Jeff Beringer,* Missouri Department of Conservation; *Jay B. McAninch*, Minnestoa Department of Natural Resources

Traditional methods used to monitor white-tailed deer (*Odocoileus virginianus*) populations often provide variable results, are difficult to apply in the field, or are dependent upon weather conditions. Development of techniques providing more reliable information is needed to evaluate deer population dynamics and assess management activities. Thermal infrared imaging techniques have been under investigation for over 25 years. While initial attempts to survey big game populations met with limited success, technological advancements in modern infrared systems have resolved several prior limitations, providing new opportunities to evaluate this technology for wildlife surveys. We used a state-of-the-art thermal infrared imaging system to estimate deer abundance on a 4,900-acre study site in central Missouri.

Ten replicated surveys were flown to assess the accuracy and precision of estimates derived by thermal imaging. Quadrat sampling was incorporated during all infrared flights to maximize detection. Replicated mark-resight surveys (n=11) provided base-line deer abundance data. Based on a mark-resight estimate of 351 deer, the mean thermal imaging detection rate equalled 50% (range 27%-79%). The majority of this variation was attributed to human factors related to equipment operation, such as search technique and flight coverage. By strictly adhering to a standardized search protocol, variability in population estimates can be reduced. Accuracy can be enhanced by decreasing the rate of movement of the sensor and achieving total coverage of the study site. Biologists need to acquire a better understanding of the operation of thermal imaging equipment and adapt this technology to meet specific surveying needs.

*2:40 PM

USING TAME WHITE-TAILED DEER TO ESTIMATE CARRYING CAPACITY IN SOUTH TEXAS

Bronson K. Strickland and *Charles A. DeYoung,* Caesar Kleberg Wildlife Research Institute

Traditional methods for estimating white-tailed deer (*Odocoileus virginianus*) carrying capacity have been to measure forage dry matter, nitrogen, and energy. The accuracy of the these methods is questionable due to the numerous assumptions involved. We used tame white-tailed deer to estimate carrying capacity by allowing them to forage in moveable enclosures for 30 days and measuring their mass change. Their mass change was then used in an equation which predicts digestible energy intake (kcal) within each enclosure. Carrying capacity was then calculated from digestible energy estimates. Plant biomass and precipitation were measured during the experiment.

Data were collected on the 39,804-acre Faith Ranch in Dimmit County, Texas from March 1996 to May 1997. Objectives of the study were (1) to determine the instantaneous carrying capacity of white-tailed deer habitat in south Texas by measuring digestible energy in enclosures; (2) compare carrying capacity estimates to plant biomass; and (3) compare carrying capacity estimates to precipitation.

Instantaneous carrying capacity estimates ranged from 25.8 deer/mi^2/year to 166.7 deer/mi^2/year. Total live biomass ($r = 0.817$, $P = 0.025$), and precipitation ($r = 0.919$, $P = 0.003$) were positively correlated to carrying capacity estimates. Total dead biomass ($r = -0.952$, $P = 0.001$) was negatively correlated to carrying capacity estimates.

Currently, we are developing a new equation to predict intake from mass change using south Texas deer. We hope our results, combined with Hellickson (1991) and Draeger (1996), will yield a model that will predict carrying capacity from habitat features.

Technical Session VIII-Moderator: *Steve Demaris*, MS State Univ.

*3:20 PM

ESTRUS SYNCHRONIZATION AND TIMED ARTIFICIAL INSEMINATION OF CAPTIVE WHITE-TAILED DEER

James C. Kroll, Alex Smalling, Jason Sellers, Ron Randel, and *Ben Koerth,* Stephen F. Austin State University

Recent interest in intensive management and production of trophy white-tailed deer has generated interest in artificial breeding of the species. In addition, these techniques may permit more controlled studies on the role of genetics and nutrition in antler development, since they would allow synchronized breeding of the same sire to numbers of females to produce sufficient sample sizes. Previous attempts to produce synchronized estrus in cervids have involved Controlled Internal Drug Release (CIDR) vaginal implants, injections of progesterone (PG) and/or pregnant mare serum gonadotropin (PMSG), luteolyse, internal progesterone sponges, norgestomet and cloprostenol. Our study examined the feasibility of using Syncromate-B™ ear implants, commonly used in cattle estrus synchronization, to induce estrus in whitetails. Sixty-three females were divided into 5 research groups of 10 and one group of 13. Four groups were implanted with 1.25 cm of a Syncromate-B™ ear implant. The remaining two groups were not synchronized and received natural service. Time until estrus was estimated by direct observation of males introduced to two synchronized groups immediately after implant removal at 14 days; and, by radioimmuno assay. From these studies, it was determined ovulation occurred within 60 h post-implant removal. Hence, one experimental group was inseminated at this time, using a standard sheep/goat speculum and semen injection device. An attempt was made in each case to deposit semen *in utero*, but cervical and vaginal depositions also were made. Overall pregnancy rate on first service resulting from timed insemination was 70%.

*3:40 PM

TARSAL SCENT COMMUNICATION: WHAT WE KNOW, WHAT WE MIGHT KNOW, AND WHAT WE WANT TO KNOW

Johnathan W. Gassett,Karl V. Miller, Karen A. Dasher, David A. Osborn, and *R. Larry Marchinton*, University of Georgia

Tarsal glands likely are the most socially important scent-producing glands in white-tailed deer. Over the past two decades we have presented the results of numerous studies that investigated behavioral, physiological, and morphological aspects of tarsal scent production. Although these previous presentations have provided detailed descriptions of specific aspects of tarsal communication, an integrative discussion of our current understanding of the social importance, and mechanisms underlying tarsal scent production has not been presented. In this presentation,

we review and integrate previous studies and well as present results of additional studies to provide a comprehensive description of what is known about tarsal scent communication. Our studies demonstrate that although activity of the sebaceous and apocrine components of the gland itself do not vary among seasons or age classes, nor between the sexes, the glandular structures and the unique hair morphology allow for the efficient capture and retention of urinary compounds. Our chemical analyses of the tarsal scent gland reveal that volatile profiles vary greatly among individuals and may represent a scent profile for individual recognition. These volatile profiles also vary among sex, age class, and season and may provide odor cues specific to social and reproductive status. Numerous species of bacteria are resident on the tarsal tuft; greatest species richness is found in mature males. Thus tarsal scent production likely results from an interaction between resident bacteria, glandular secretions, urinary steroids, and perhaps other urinary constituents.

*4:00 PM

SCRAPING BEHAVIOR IN WHITE-TAILED DEER: BACK TO THE DRAWING BOARD

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

Collection of behavioral data on white-tailed deer historically has relied on captive populations or incidental observations of wild deer. Inferences gained from these studies typically are limited because they were conducted under highly artificial conditions, or because of small sample sizes. Motion-activated 35mm cameras also have been used, but still-photography cannot adequately capture behaviors. We developed a technique that continuously records behaviors with motion-activated video cameras. We currently are using this method to investigate scraping behavior, an integral part of white-tailed deer communication during the breeding season. Previous penned studies and anecdotal evidence suggest that scrapes are produced exclusively by dominant bucks to convey status to conspecifics. Captive animal research indicates that subordinate males do not rub-urinate in scrapes. However, based on our current study, subordinate males not only rub-urinate in scrapes, but often initiate scrapes, suggesting that previous reports are artifacts of forced associations among penned animals. Our preliminary analyses also suggest that while scrapes may be defended by one individual, they are more commonly visited by several male conspecifics. Development of this technique should allow us to validate or refute traditional theories on white-tailed deer scraping behaviors, as well as numerous other behaviors.

4:20 PM

VARIATION IN THE UTILIZATION OF TREE SPECIES FOR RUBS BY WHITE-TAILED DEER IN SOUTHWESTERN TENNESSEE

John R. Ouellette, R. David Frederick, Aaron W. Reed, and *Nathan M. Myers*, The University of Memphis; *Tracy E. Rea,* University of Georgia, SREL

The use and preference for certain tree species for rubbing by male white-tailed deer (Odocoileus virginianus) have been the focus of many investigations. Much of the available literature have reported that male white-tailed deer are highly selective in their choice of tree species to be rubbed, based on location and physical characteristics of tree species. However, there have been contradictions in the results of these investigations regarding the aromatic qualities of tree species rubbed and their importance with respect to rut. We tested the association of rubbing selected tree species by male white-tailed deer with the aromatic qualities of trees utilized at a site in southwestern Tennessee. Physical characteristics of trees rubbed and those of other available trees in the area, utilization of tree species versus their availability, and temporal patterns and locations of rubbing activity were assessed. Rubs were examined on 767 trees over a two-year period. The temporal frequency and distribution of rubs were ascertained using a GIS data base. Results indicated a significant association between frequency of trees rubbed and aromatic characteristics of trees utilized, but did not indicate any association between these tree species and rut. The patterning and distances between rubs will be presented to support association between the composition of certain habitats and the location of tree species with respect to rut for each year. We feel that many of the contradictions surrounding this signpost behavior may be attributed to the patterning of rubs. Drawing from the data, we will present several hypotheses for why and how these contradictions have occurred.

4:40 PM

DEER RESPONSE TO MOCK SCRAPES WITH AND WITHOUT SCENTS

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

Scrapes have been recognized as playing a key role in deer communication. In addition, mock scrapes have been a favored hunting technique and the commercial scent industry has developed numerous products to enhance the attractiveness of mock scrapes to deer. However, little is known whether the animals are attracted primarily to visual or olfactory cues. To determine the effectiveness of scrapes with and without scents, infrared-triggered cameras were placed on mock scrapes to monitor deer visitations. Four replications of mock scrape only, mock scrape with rutting buck scent, mock scrape with estrous doe scent, rutting buck scent only and estrous doe scent only were monitored from 14 October - 30 October 1996 in Houston and Trinity Counties, TX. This period typically is considered the pre-rut period for this area with the average peak rut occurring about 2 November. Mock scrapes and scent only stations were constructed in

areas typified by published descriptions of scrapes. Areas were chosen near food plots with little understory vegetation and the presence of an overhanging limb. All treatments received visits by deer. For bucks the treatments receiving the most visits were scrape with buck scent, scrape with doe scent and doe scent alone. There was an increasing nocturnal use of scrapes with increasing buck age. For does the only treatment significantly different was doe scent without a scrape. As with bucks, adult doe visits were primarily nocturnal. Fawns exhibited more diurnal activity at mock scrapes.

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 an amendment to the Constitution allowing a Forever Wild Trust to acquire land for public recreation and state operated WMAs.

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 from 1.31 million in 1991-92 to 1 million in 1996-97. 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 1991-92, even though either-sex hunting opportunities were increased annually. The increased removal of does began to decrease the population in 1992-93 through the present.

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

As one might expect, this increase in either-sex hunting days and bag limit resulted in a steady increase in the harvest of does. Statewide, the percentage of does in the harvest has increased from an average of 27.4% annually during the 1980's to 47.7% during the 1990's. As a result, the population has been reduced to near 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. To accomplish such a goal will require some innovative educational programs, since most of the hunters are accustomed to harvesting deer from high deer populations.

KENTUCKY

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

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

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

The largest problem in managing Kentucky's deer herd is conflict with 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, 31 deer were checked in the Western Maryland counties of Allegany and Garrett. By 1960, deer hunting was state-wide, except for Montgomery County.

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

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

MISSISSIPPI

Mississippi contains 8 major soil regions that vary greatly in fertility and use. Predominate land uses are forestry and agriculture. Forests, which occupy 55% of the state include natural stands of hardwoods, pines, mixed pine-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 and Fish Commission was established by the State Legislature in 1932 and by 1940 a deer restoration project, funded principally by Pittman-Robertson moneys, was well underway. Deer were translocated from 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 type 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 east to west. Sand sage and shinnery oak grasslands are common along the western border and in the panhandle.

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

Perhaps the greatest challenge in managing Oklahoma's deer herd is that over 95% of the land is privately owned. Coupled with this is the fact that much of this land is used for an agriculture-based economy which is not always compatible with deer production. Deer habitat is especially scarce in the southwest portion of the state, and in many areas of eastern Oklahoma, 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 an actual count of the number of deer killed. These data were provided by hunters at Department operated check stations and from cooperating club data. It appears to contrast 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 an extremely low point at the turn of the century and disappeared completely from the Piedmont and Foothills. Restoration efforts began in the early 50's and deer were restored to all of the Piedmont and Foothills. All restocking efforts utilized deer from the coastal plain of South Carolina. Huntable populations currently exist in all 46 counties.

Current Department objectives include 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 ($12-$25).

The history of Tennessee's deer herd is similar to that of other states. The low point in numbers of deer occurred at the turn of the century, when it is estimated that the herd numbered less than 2,000 deer. Restoration of the state's deer herd was begun in the 1930's and 40's and continued until 1985. During the initial years of restoration activities, most deer were obtained from out of state, with the states of North Carolina, Texas, and Wisconsin providing the bulk of the deer that later served as in-state sources for subsequent stocking. From 1940 to 1985 over 9,000 deer were stocked in 72 of Tennessee's 95 counties. Since the 1940's, herd growth has been substantial and consistent, with the herd now estimated to be approximately 829,000. The deer harvest has grown accordingly, from 113 in 1949 to over 149,000 in 1996.

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. Unit B comprises the eastern counties and has shorter seasons and more conservative bag limits. Within each unit, county deer herds are managed separately. Population models as well as other biological parameters (age/sex structure, weights, antler dimensions) are used to assess the status of each herd, and desired doe harvests are determined. Doe harvests are accomplished through the issuance of quota permits allocated by drawing. Since 1975 the antlerless harvest in Tennessee has increased from 23% to over 40% of the total harvest in 1996.

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 than 150 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 and 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 and 1940'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 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 mountains should remain excellent in the future.

APPENDIX II
STATE DEER HARVEST SUMMARIES

Table 1. **Southeastern deer harvest summaries, 1996-97.**

State	Land Area (sq. mi.)	Deer Habitat (sq. mi.)	Deer Habitat (% Total)	Percent Forested	Deer Range Unoccupied	% Land Area Public Hunting	1996-97 Harvest Male	1996-97 Harvest Female	1996-97 Harvest Total
AL	51,628	48,014	93	66	0	2.2	253,092	113,708	366,800
AR	52,609	44,677	85	53	0	12.0	104,060	48,400	152,460
FL	58,560	29,280	50	45	0	16.0	66,055	12,391	78,446
GA	57,800	33,163	57	57	0	6.0	199,074	202,284	401,358
KY	40,395	39,654	97	59	0	8.0	95,253	54,517	149,770
LA	41,406	26,562	64	52	0	6.0	122,044	112,656	234,700
MD	9,837	8,766	89	43	0	4.0	38,694	23,009	61,735
MS	47,296	31,250	66	62	0	6.0	159,952	174,178	334,130
MO	69,561	21,396	31	31	0	4.3	123,962	91,499	215,942
NC	48,794	36,699	75	62	0	6.0	126,900	64,200	191,100
OK	69,919	34,960	50	19	0	2.0	42,899	21,357	64,256
SC	30,207	21,920	73	63	0	7.0	81,981	75,873	163,758
TN	42,246	25,770	61	49	0	8.5	100,972	48,658	149,630
TX	261,914	129,592	49	40	<10	<2	190,754	143,065	333,819
VA	39,682	31,782	80	79	0	9.8	124,118	82,915	209,108
WV	24,064	22,889	95	79	0	9.0	111,521	75,159	187,136

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	7.6	2	1,500,000	109	17	72	2	70
AR	3.5	1	900,000	151	17	36	1,2	81
FL	2.7	2	n/a	30	3	72	1,2	75
GA	12.1	1,2,3,4	980,000	35	51-79	51-79	1,2,3	10
KY	3.8	1,3,4,5	473,000	119	9	10	1,2	0
LA	8.8	1,2,3	1,000,000	123	14	60	1,2	80
MD	7.04	1,2,3,4	250,000	87	16	15	1	0
MS	10.7	1,2,3	1,500,000	62	14	47	1,2,3	99
MO	10.09	1,2,4	800,000	98	20	11	1,2	0
NC	5.2	1,2,3,4	900,000	24-60	6	18-69	1,2,3	53
OK	1.8	1,3	325,000	78	9	9	1,2	0
SC	7.0	1,2,3	750,000	12	10	70-140	1,2,3	60
TN	5.8	1,4	827,617	23-33	9-14	18-31	1,2,3	0
TX	3.3	2,3,4	3,385,386	29	9	64	1,2	0
VA	6.6	1,2,3,4	900,000	43-73	12-24	12-42	1,2	55
WV	8.2	1	850,000	69	6	18	1,2	0

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

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

Table 1. (Continued)

State	No. Deer Hunters	5-Year Trend	License Fees		% Hunting Success		Typical Fine Illegal Deer	Average Leasing Fees/Acre
			Resident	Non-Resident	Archery	Firearms		
AL	220,900	Stable	$16.00	$202.00	20	45	$150-600	$2-10
AR	250,000	Stable	$11.50-26.00	$95-195	n/a	n/a	$150-1000	$2-4
FL	140,095	Stable	$11.00	$150.00	n/a	n/a	$250-500	$2-5
GA	314,049	Stable	$19.00	$177.00	36	60.7	$500.00	$2-10
KY	207,000	Up	$34.00	$116.50	25	63	$300.00	$3.00
LA	180,200	Stable	$21-42	$96-212	30	54	$500.00	$3-21
MD	90,000	Decline	$24.50	$120.50	40	50	$500.00	$5-35
MS	165,024	Down	$17-32	$105-225	130	60	$150.00	$3-10
MO	400,000	Up	$11-15	$75-110	20	40	$200-300	$2.00
NC	285,000	Stable	$25.00	$80.00	n/a	49	$150.00	$2-6
OK	214,836	Up	$29.25	$201.00	13	22	$500-1000	$2-5
SC	176,114	Up	$18.00	$105-155	n/a	n/a	$200.00	$4-10
TN	179,896	Down	$39.00	$105.50-156.00	23	48	$50-500	$4.00
TX	576,448	Decline	$19.00	$250.00	15	54	n/a	$5.00
VA	250,000	Down	$25-50	$122-174	28.2	49.5	$50-850	n/a
WV	300,000	Stable	$25.00	$80.00	24	45	$282-562	$1-5

Table 1. (Continued)

State	Mandatory Hunter Education	No. Fatal Hunting Accidents		Mandatory Blaze Orange	Handguns Permitted	Crossbows Permitted	Drugged Arrows Permitted	Highway Kill (Minimum)
		All	Deer					
AL	Yes	3	3	Yes	Yes	Handicap	No	3,000
AR	Yes	5	3	Yes	Yes	Yes	No	9,353
FL	Yes	n/a	n/a	Yes	Yes	Yes	No	n/a
GA	Yes	4	4	Yes	Yes	Handicap	No	8,584
KY	Yes	3	1	Yes	Yes	Yes	No	4,500
LA	Yes	3	2	Yes	Yes	Handicap & over 60	No	2,500
MD	Yes	3	2	Yes	Yes	Handicap	No	3,100
MS	Yes	7	6	Yes	Yes	Handicap & 65 & over	Yes	7,500
MO	Yes	1	0	Yes	Yes	Yes	No	8,600
NC	Yes	3	3	Yes	Yes	Handicap	No	8,000
OK	Yes	0	0	Yes	Yes	Handicap	No	n/a
SC	Yes	6	6	Yes	Yes	Yes (28 co.)	Yes (28 co.)	5,904
TN	Yes	7	6	Yes	Yes	Handicap	No	n/a
TX	Yes	1	1	No	Yes	No	No	Unknown
VA	Yes	5	2	Yes	Yes	Handicap	No	Unknown
WV	Yes	3	2	Yes	Yes	No	No	10,901

NOTES

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