23rd Annual Meeting

Southeast Deer Study Group

February 13-16, 2000
Wilmington, North Carolina

Hosted by
North Carolina Wildlife Resources Commission
North Carolina Chapter - The Wildlife Society

NORTH CAROLINA Wildlife RESOURCES COMMISSION

THE WILDLIFE SOCIETY

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THE SOUTHEAST DEER STUDY GROUP

The Southeast Deer Study Group was formed as a subcommittee of the Forest Game Committee of the Southeastern Section of The Wildlife Society. The Southeast Deer Study Group Meeting is hosted with the support of the directors of the Southeastern Association of Fish and Wildlife Agencies. 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

Year	Location	Meeting Theme
1985	Wilmington, NC	Socio-economic Considerations in Managing White-tailed Deer
1986	Gatlinburg, TN	Harvest Strategies in Managing White-tailed Deer
1987	Gulf Shores, AL	Management: Past, Present, and Future
1988	Paducah, KY	Now That We Got 'Um, What Are We Going To Do With 'Um?
1989	Oklahoma City, OK	Management of Deer on Private Lands
1990	Pipestem, WV	Addressing the Impact of Increasing Deer Populations
1991	Baton Rouge, LA	Antlerless Deer Harvest Strategies: How Well Are They Working?
1992	Annapolis, MD	Deer Versus People
1993	Jackson, MS	Deer Management: How We Affect Public Perception and Reception
1994	Charlottesville, VA	Deer Management in the Year 2004
1995	San Antonio, TX	The Art and Science of Deer Management: Putting the Pieces Together
1996	Orlando, FL	Deer Management Philosophies: Bridging the Gap Between the Public and Biologists
1997	Charleston, SC	Obstacles to Sound Deer Management
1998	Jekyll Island, GA	Factors Affecting the Future of Deer Hunting
1999	Fayetteville, AR	QDM – What, How, Why and Where?
2000	Wilmington, NC	Managing Deer in Tomorrow's Forests: Reality vs. Illusion

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

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

Name	State	Employer
Michael G. Shaw	Oklahoma	Oklahoma Department of Wildlife Conservation
David C. Guynn, Jr.	South Carolina	Clemson University
Charles Ruth	South Carolina	South Carolina Department of Natural Resources
Derrell A. Shipes	South Carolina	South Carolina Department of Natural Resources
Ben Layton	Tennessee	Tennessee Wildlife Resources Agency
E. L. "Butch" Young	Texas	Texas Parks and Wildlife Department
Bob Zaiglin	Texas	Harrison Interest LTD
W. Matt Knox	Virginia	Virginia Department Game and Inland Fisheries
Jim Crum	West Virginia	West Virginia Department of Commerce, Labor and Environmental Resources

Program Agenda

SUNDAY, FEBRUARY 13, 2000

1:00 – 6:00pm: Registration – Wilmington Riverside Hilton Lobby

3:00pm **Southeast Deer Committee Meeting**

6:00 – 10:00pm **Social/Dinner – Coast Line Convention Center**

MONDAY, FEBRUARY 14, 2000

7:00am – 5:00pm: Registration – Hotel Lobby

8:00am **Welcome - *John E. Pechmann*, Chairman, N.C. Wildlife Resources Comm.**

"Managing Deer in Tomorrow's Forests: Reality vs. Illusion"

Introduction and Theme Moderator: *David T. Cobb*, Chief, Division of Wildlife Management, N.C. Wildlife Resources Comm.

8:30am **Tomorrow's Managed Forest: What is the Reality?**
Bently Wigley, National Council of the Paper Industry for Air and Stream Improvement.

9:00am **Wildlife and Intensive Forestry: Going Places We Ain't Been Before.**
Karl Miller, Univ. of Georgia.

9:30am **Deer Management on Southern National Forests in the 21st Century: Challenges and Opportunities.**
Jim Wentworth, USDA, Forest Service.

10:00am **Break**

Forest Management Impacts on Deer Densities, Quality, and Hunting

Moderator: *Philip Hale*, Univ. of Georgia

10:30am **Foresters From Mars, Wildlife Biologists From Venus: Can We Manage the White-tailed Deer Universe?**
James F. Bullock, International Paper.

10:55am **Ten-Year Harvest Trends for White-tailed Deer in Intensively Managed Forest, in the Coastal Plain of South Carolina.**
George C. Muckenfuss and *William M. Baughman*, Westvaco Corp.

11:20am **Sustainable Deer Management within Differing Forested Landscapes.**
David S. deCalesta, USDA Forest Service.

11:45am **The Animal Rights Threat to Managing Deer in Tomorrow's Forests: Reality or Illusion?**
Deborah Green, College of William and Mary and *Johnny P. Stowe, Jr.*, S.C. Department of Natural Resources.

12:10pm **Lunch – Provided at hotel as part of registration fee.**

Forest Management Impacts on Vegetation for Deer
Moderator: *Mark Ford*, USDA, Forest Service

1:30pm **Improve White-tailed Deer Habitat, Biodiversity and Plant Species Richness with Imazapyr.**
Mark W. Thomas, American Cyanamid Co.

1:55pm **How Beneficial are Single Application Herbicides to White-tailed Deer in the Southeast?**
Jonathan W. Gassett, Ky. Dept. of Fish and Wildlife Resources; *Karl V. Miller*, Univ. of Georgia; *Valerie Sparling*, Fla. Fish and Wildlife Conservation Comm.

2:20pm **Effects of Herbaceous Competition Control in Piedmont Pine Plantations.**
Patrick D. Keyser and *V. L. Ford*, Westvaco Corp.; *David C. Guynn*, Clemson Univ.

2:45pm **High Quality Food Plots for Deer Work in Both Extremes of Forest Management.**
Kent Kammermeyer, Ga. Dept. of Natural Resources.

3:10pm **Break**

Technical Session IV - Moderator: *Matt Knox*, Va. Dept. Game and Inland Fisheries.

3:40pm **Modeled Effects of Selective-Harvest Strategies on Subsequent Antler Development.**
Bronson K. Strickland and *Stephen Demarais*, Miss. State Univ.; *Donnie Frels*, Tex. Parks and Wildlife Dept.; *Harry A. Jacobson*, Miss. State Univ.; *Karl V. Miller*, Univ. of Georgia; *David G. Hewitt*, Texas A&M Univ.-Kingsville; *M. Keith Causey*, Auburn Univ.

***4:00pm** **Periodic Harvesting on Fort Bragg, North Carolina: Older Bucks, but Not Enough.**
Mark S. Graham and *Richard A. Lancia*, N. C. State Univ.; *Donald H. Cockman*, Dept. of the Army.

4:20pm **First Year Results Following Implementation of Arkansas' Statewide 3-Point Antler Regulation.**
Michael E. Cartwright and *David F. Urbston*, Ark. Game and Fish Comm.; *Mark D. Duda*, Responsive Management.

4:40pm **Telephone Check-in as a More Effective Method for Monitoring Statewide Deer Harvest.**
Jonathan W. Gassett and *Roy Grimes*, Ky. Dept. of Fish and Wildlife Resources.

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

7:30pm **SHOOTING FROM THE HIP: Are We on Target or Shooting Ourselves in the Foot?**
Moderators: *R. Joseph Hamilton*, Ducks Unlimited and *David C. Guynn*, Clemson Univ.

TUESDAY, FEBRUARY 15, 2000

Technical Session V - Moderator: *R. Larry Marchinton*, Professor Emeritus, Univ. of Georgia

8:15am **Effects of Temporary Bait Sites on Movements of White-tailed Deer.**
Howard J. Kilpatrick and *Wade A. Stober*, Conn. Wildlife Division.

***8:35am** **Remote Monitoring of Scraping Behaviors of a Wild Population of White-tailed Deer.**
Karen A. Dasher, Clemson Univ.; *Jonathan Gassett*, Ky. Dept. of Fish and Wildlife Resources; *David A. Osborn* and *Karl V. Miller*, Univ. of Georgia.

8:55am **That New Car Smell: Deer Responses to Traditional and Non-Traditional Scents in Mock Scrapes.**
Ben H. Koerth and *James C. Kroll*, Stephen F. Austin State Univ.

9:15am **The Effects of Older-Age Buck Densities and Habitat Edges on Rub Distributions.**
Bryan S. Kinkel and *Grant R. Woods*, Woods & Associates, Inc.

9:35am **Break**

Technical Session VI - Moderator: *Lisa Muller*, Univ. of Tennessee

***10:05am** **A Genetic Approach to the Study of Population Structure in White-tailed Deer.**
Joel D. Anderson and *Rodney Honeycutt*, Texas A&M Univ.; *Kenneth Gee* and *Robert Gonzales*, Samuel Roberts Noble Foundation; *Randy DeYoung*, Miss. State Univ.

***10:25am** **Use of Microsatellite DNA Markers to Determine Paternity and Relatedness in Captive White-tailed Deer.**
Randy W. DeYoung, Miss. State Univ.; *Rodney Honeycutt* and *Joel Anderson*, Texas A&M Univ.; *Stephen Demarais*, Miss. State Univ.; *Kenneth Gee* and *Robert Gonzales*, Samuel Roberts Noble Foundation; *Loren Skow, Dierdre Honeycutt* and *Rachel Gallagher*, Texas A&M Univ.

10:45am **Prostaglandin $F_{2\%}$-induced Pregnancy Termination in Captive Deer during Early and Late Gestation.**
Robert B. Waddell, Robert J. Warren and *David A. Osborn*, Univ. of Georgia; *Darrel J. Kesler*, Univ. of Illinois; *John C. Griffin*, Univ. of Georgia.

***11:05am** **Preliminary Results from a Field Test of Deer Fertility Control on Kiawah Island, South Carolina.**
James D. Jordan, Town of Kiawah Island; *Robert J. Warren*, Univ. of Georgia; *Darrel J. Kesler*, Univ. of Illinois.

11:25am **Is White-tailed Deer Diet Quality a Function of Vegetation Diversity?**
Billy C. Lambert and *Timothy E. Fulbright*, Texas A&M Univ.

11:45am **Lunch – On your own**

Technical Session VII - Moderator: *Jeff Beringer*, Mo. Dept. Conservation

1:15pm **Deer Herd Estimation Based on Catch-Per-Unit-Effort and Implications for Sharpshooting Efficiency.**
David M. Kocka and *David E. Steffen*, Va. Dept. of Game and Inland Fisheries; *Linwood R. Williamson*, Smithsonian Institution.

*1:35pm **A Comparison and Refinement of Three Methods for Estimating Deer Population Characteristics.**
William T. McKinley and *Stephen Demarais*, Miss. State Univ.; *Kenneth Gee*, Samuel Roberts Noble Foundation; *Harry Jacobson*, Miss. State Univ.

*1:55pm **Comparison of Infrared-Triggered Camera Estimates Versus Road Count.**
Roel R. Lopez and *Nova J. Silvy*, Texas A&M Univ.; *Phil Frank*, USFWS; *Jason D. Sebesta*, Texas A&M Univ.

*2:15pm **A Line Transect Sampling Method for Surveying Deer Populations in Forested Areas.**
Brian L. Pierce, *Scott C. Pettengill* and *John T. Baccus*, Southwest Texas State Univ.

2:35pm **A User Friendly Browse Survey.**
David W. Moreland, La. Dept. of Wildlife and Fisheries.

2:55pm **Break**

Technical Session VIII - Moderator: *E. L. "Butch" Young*, Tx. Parks and Wildlife Department

*3:25pm **Evaluation of Five Methods of Attaching Radio Transmitters to Male White-tailed Deer.**
Roel R. Lopez and *Nova J. Silvy*, Texas A&M Univ.; *Phil Frank*, USFWS; *Jason D. Sebesta*, Texas A&M Univ.

*3:45pm **Design and Evaluation of Deer Guards for Florida Key Deer.**
Jason D. Sebesta, *Roel R. Lopez*, and *Nova J. Silvy*, Texas A&M Univ.

*4:05pm **GIS Analysis of Deer-Vehicle Collisions at the Savannah River Site, South Carolina.**
Rakesh Malhotra, *Paul E. Johns*, *Marguerite Madden*, *Gary R. Wein* and *Jim M. Novak*, Univ. of Georgia.

*4:25pm **A Pilot Deer Depredation Assistance Program to Reduce Deer Damage Complaints in South Carolina.**
Emily C. Cope, S.C. Dept. of Natural Resources; *Greg K. Yarrow*, Clemson Univ.; *Charles Ruth*, S.C. Dept. of Natural Resources.

4:45pm **Business Meeting**

6:00pm **Social Hour**

7:00pm **Banquet**

WEDNESDAY, FEBRUARY 16, 2000

8:00am **Field Trip – Timber/Wildlife Management on Holly Shelter Game Land**

2:00pm **Return to Hotel**

***Indicates Student Paper**

ABSTRACTS

MONDAY, FEBRUARY 14, 2000

"Managing Deer in Tomorrow's Forests: Reality vs. Illusion" – Introduction and Theme Moderator: David T. Cobb, N.C. Wildlife Resources Comm.

8:30am

Tomorrow's Managed Forest: What is the Reality?
Bently Wigley, National Council of the Paper Industry for Air and Stream Improvement

Southern forests have long been managed for timber production and wildlife habitat, and an extensive body of information supports integration of these two objectives. For many reasons, however, forest management policies and practices are changing in the South. On public lands, there are fewer opportunities to engage in active forest management due to regulatory constraints and shifting priorities of some land management agencies. Changing demographics also may result in less active management by non-industrial private landowners. Management practices on industry ownerships are evolving in response to many factors, including market conditions, the Sustainable Forestry Initiative[SM] and other environmental objectives, uncertainties about timber supplies from public lands, and increased competition. Because of such considerations, future stand-level management strategies on industry lands likely will feature increased use of herbicides, fertilizers, and genetically improved planting stock, abbreviated rotations on some lands, more and earlier thinnings in stands on sawtimber rotations, and less use of prescribed fire. However, the exact nature and scope of these and other stand-level management practices are uncertain and will vary among ownerships, physiographic regions, and specific sites. Implications of changing forest management practices for white-tailed deer and other species will be highly dependent upon future conditions and dynamics at the landscape level. Future landscape conditions will continue to be heavily influenced by the diversity inherent in Southern forests and ownership patterns. However, continued collaboration among landowners, natural resource agencies, and other partners is required to ensure that southern forests provide desired ecological and economic functions and values now and in the future.

9:00am

Wildlife and Intensive Forestry: Going Places We Ain't Been Before.
Karl Miller, Univ. of Georgia

Management philosophies on forested lands in the Southeast are diverging. On public lands, social pressures have reduced emphasis on timber production and game management. On non-industrial private forest holdings, management objectives are diverse, but typically focus on synergistic production of economic returns and quality recreational opportunities. Economic pressures to maintain profitability and competitiveness on a global market has intensified forest management on commercial forests to maximize fiber production via intensive pine plantation management. Intensive pine silviculture which uses multiple techniques to limit competition by non-crop plant species and to enhance growth rates of pines, results in reductions in time until canopy closure and shortened rotation lengths. Habitat conditions at the stand level clearly fluctuate with the management techniques employed. Often these fluctuations reduce habitat quality for many wildlife species of interest, including white-tailed deer. Typical initial responses by wildlife biologists decry practices that negatively impact habitat conditions, and focus on attempts to enjoin their use. However, a historical perspective emphasizes that cooperative efforts between biologists and foresters can produce significant results. Thus, the wildlife habitat manager's goal, which must be pursued with an acute awareness of economic reality, is to arrange stands to maintain diversity in structure, age, and timber types, while concurrently investigating within-stand techniques that minimize negative effects of selected silvicultural techniques. Intensive forest management not only has resulted in new challenges to the wildlife biologist, but it also may provide some new opportunities. Maximal benefits may result from innovative landscape-level management with consideration of harvest scheduling, reserve areas, and stand juxtapositioning. Corporate, state, and private biologists must take a cooperative, proactive role to ensure that wildlife considerations are included in forest management in the 21st century.

9:30am

Deer Management on Southern National Forests in the 21st Century: Challenges and Opportunities.
James M. Wentworth, USDA, Forest Service

Deer managers in Southern National Forests face many challenges given the rapid changes occurring on these lands. Throughout the region, the past decade has seen a shift from clearcutting to other even-aged and uneven-aged systems as the dominant methods of harvest. This has been accompanied by an overall decrease in timber harvest levels. These changes have been most dramatic in the National Forests of the Southern Appalachians. Ongoing land management plan revisions are likely to result in additional reductions in management intensity over substantial portions of the Southern Appalachian National Forests. However, although older forest conditions will be emphasized, these Forests still are expected to provide a diversity of wildlife habitats including habitat for species utilizing young forests. Habitat relationship research has shown that deer herds in the Southern Appalachians are strongly influenced by acorn supplies. Deer nutrition, reproduction, weights, and antler development are affected by the availability of acorns. Clearcuts are used most intensively in spring and summer, and

browse use in clearcuts is greater than in mature forest during the growing season. Because of the abundance of browse available in clearcuts, overall percent utilization is low. These findings suggest that management trends on the Southern Appalachian National Forests are not likely to result in wide-spread reductions in deer densities. However managers still face many challenges including issues of hunter access, long-term maintenance of oak forests, and impacts on native plant communities.

Forest Management Impacts on Deer Densities, Quality, and Hunting – Moderator: Philip Hale, Univ. of Georgia.

10:30am

Foresters From Mars, Wildlife Biologists From Venus: Can We Manage the White-tailed Deer Universe?
James F. Bullock, International Paper

In the southern United States, forest and wildlife management are inextricably linked. Home to the first scientifically managed forest in the United States, the South is today considered to be the "wood basket of the world". Paramount to this consideration is the fact that the vast majority of forests in the region are in private ownership. During the past decade, a dichotomy has emerged which has accelerated change in silvicultural practices in the South: an increasing demand for paper and wood products versus decreasing availability of trees for harvest, changing land ownership patterns, and competition for land from non-forested uses. One strategy adopted by forest industry to address this dichotomy has been to intensify fiber and wood production, particularly on industrial forestlands. Forest management has long been widely held to be beneficial to many game and non-game wildlife species. The trend toward intensive forestry has generated considerable controversy over its impact to wildlife habitat and populations, including the white-tailed deer. Too often, this controversy is being driven more by political and social emotion than by scientific fact. It is imperative the forestry and wildlife professions work together to identify and resolve all concerns - political, social, and biological - rather than promoting individual agendas and viewpoints. This paper discusses factors which are influencing changes in how southern forests are being managed and offers a strategy to bring forestry and wildlife professionals together to identify and resolve forest and wildlife management issues as we go forward into the twenty-first century.

10:55am

Ten-Year Harvest Trends for White-tailed Deer in Intensively Managed Forest, in the Coastal Plain of South Carolina.
George C. Muckenfuss and *William M. Baughman,* Westvaco Corp.

During the past decade, forest management practices in the southeast have intensified to new levels. Westvaco, a forest products company owning 500,000 ac in the Coastal Plain of South Carolina, has implemented a management system that focuses on intensive timber management while maintaining and enhancing biological diversity. Through Westvaco's Ecosystem Based Multiple-Use Management System, intensive management practices have proven beneficial to both game and non-game species. Landscape scale forestry, based on Westvaco's management system, has created favorable habitat conditions for white-tailed deer across Westvaco's land base. White-tailed deer harvest numbers would appear to reflect these favorable habitat conditions. We offer two case studies examining ten-year trends in harvest data from 1989-98 on two traditional hunt clubs. The total lease area for each club is greater than 3,000 ac of intensively managed forest dominated by loblolly pine (*Pinus taeda*) plantations. Total harvest for male and female white-tailed deer for these two clubs show an increasing trend over time. There also has been no significant change in weight by age class or by sex. We believe intensive forest management practices will continue to provide beneficial effects to white-tailed deer populations in Coastal Plain areas of South Carolina. Coupled with sound deer management practices, this wildlife resource will provide an increasing source of revenue for forest products companies and a valuable recreational opportunity for sportsmen.

11:20am

Sustainable Deer Management within Differing Forested Landscapes.
David S. deCalesta, USDA Forest Service

Impacts of white-tailed deer on sustainability of ecosystem resources, including hardwood regeneration, shrubs, herbaceous vegetation, wildlife habitat, and wildlife communities are affected by deer density and availability of landscape forage. We assessed impact of deer at 4 different densities (10, 20, 40, and 64 deer/mi^2) over a 10-year span on hardwood regeneration, herbaceous and shrub vegetation, wildlife habitat, and the songbird community within eastern deciduous forests. We also assessed impact of deer on these resources at 2 levels of landscape forage availability (managed interior forest and mixture of interior forest and interspersed agricultural and suburban areas). From these and other studies, we developed ecosystem response curves that illustrate the impact of deer on sustainability of ecosystem resources as a joint function of deer density and landscape forage availability. From these analyses, we demonstrate that managing deer herds for optimum sustained yields (harvests) as a cultural-socio-economic goal results in non-sustainability of a variety of ecosystem resources from the standpoint of ecological goals. Management designed to sustain deer harvests and ecosystem resources must integrate biology, culture, and economics and possibly redefine levels of deer harvest that integrate and promote sustainability across ecosystem resources.

11:45am

The Animal Rights Threat to Managing Deer in Tomorrow's Forests: Reality or Illusion?
Deborah Green, College of William and Mary and *Johnny P. Stowe, Jr.,* S.C. Dept. of Natural Resources

Animal rights extremism has been identified as a serious impediment to wildlife management. Although animal rights activists target activities other than hunting, the importance of hunting as a deer management technique, as well as concerns about habitat damage caused by deer overabundance, make restrictions on deer hunting a particular concern to wildlife managers. The purpose of our paper is to: 1) review the nature and scope of animal rights attacks on white-tailed deer hunting; 2) evaluate the extent to which such activities threaten present and future deer management; and 3) discuss what wildlife managers can do to prevent or respond to such threats. Our methods included searching federal and state codes, case law, and legal news and law review articles via several legal and news databases to identify relevant cases, journal articles, news items, and Internet sites concerning animal rights activists' efforts to stop deer hunting. We identified several ways in which animal rightists' activities impede deer hunting including: hunter harassment, court-ordered delays or cancellations of planned hunts, and successful pressure to revise management strategies, such as substituting non-lethal methods or sharpshooting for hunts. Other (as yet unsuccessful) tactics include prohibitions on deer hunting to protect endangered species and general bans on firearms possession and/or hunting on public lands. We will discuss how wildlife managers can successfully respond to such attacks through: 1) supporting appropriate legislation and regulations, 2) hunter education, and 3) public education.

Forest Management Impacts on Vegetation for Deer – Moderator: Mark Ford, USDA, Forest Service.

1:30pm

Improve White-tailed Deer Habitat, Biodiversity and Plant Species Richness with Imazapyr.
Mark W. Thomas, American Cyanamid Co.

Imazapyr is the most widely used herbicide in Southern forestry. It is considered by many wildlife and forest managers as one of the most environmentally sound herbicides used today, largely because many plants preferred by white-tailed deer are tolerant to imazapyr. Imazapyr belongs to the imidazolinone family of herbicides and works on an enzyme found only in plants. It carries a "caution" label and is registered by the EPA in Toxicity Category IV, the category reserved for products possessing the highest level of safety. Imazapyr maintains and often increases total plant biodiversity, or what we refer to as plant species richness. Imazapyr may decrease plant species diversity for the first few months after an application, but over time, diversity in the plant community returns to original (or higher) levels. In this process of recolonization, many legumes (lespedeza, partridge pea), *Rubus* species (blackberry, dewberry), forbs, and vines that are tolerant to imazapyr become more abundant. In Noxubee County, Mississippi, plant species richness was documented one and two years after

mechanical and chemical site preparation (Wilson, et. al., 1993). Treatments included roll-chop and burn, imazapyr application with burn, and imazapyr application without a burn. Two 40-year-old pine hardwood forests served as a basis for comparison. The total number of plant species identified for roll-chop/burn (avg. = 149:'91, avg. = 128:'92), imazapyr/burn (avg. = 136:'91, avg. = 117:'92), and imazapyr/no burn (avg. = 130:'91, avg. = 117:'92) were found to be similar when compared to the pine-hardwood stands (avg. = 117:'91, avg. = 133:'92). Imazapyr is widely used by forest and wildlife managers in the Southern forest region to improve white-tailed deer habitat and increase hunter and game visibility while also providing competition control for fast-growing pines. Other game species like wild turkey, rabbits, and quail as well as non-game species like breeding songbirds and neotropical migratory birds also benefit from straight imazapyr applications. Tankmixing with other herbicides is inappropriate when managing for wildlife, as they may reduce desirable wildlife food plants.

1:55pm

How Beneficial are Single Application Herbicides to White-tailed Deer in the Southeast?
Jonathan W. Gassett, Ky. Dept. of Fish and Wildlife Resources; *Karl V. Miller,* Univ. of Georgia; *Valerie Sparling,* Fla. Fish and Wildlife Conservation Comm.

In the southeastern United States, mechanical and chemical site preparation is frequently used to control competing vegetation in pine plantations. Most forestry herbicides are effective against competitive woody vegetation, but the impacts on herbaceous vegetation can vary. Shifts in the developing plant communities brought on by herbicide use may have a significant impact on the quality of wildlife habitat. We assessed the effects of imazapyr, picloram+triclopyr, hexazinone, and mechanical (rake + windrow) site preparation treatments on white-tailed deer food availability at 1-4 years post treatment in longleaf pine (*Pinus palustris*) plantations located in the upper coastal plain of South Carolina. Treatment plots were replicated three times and were approximately 20-25 acres. Vegetation was sampled in permanently marked, systematically located quadrants during August 1993-1996. In years 1-3 post treatment, density of woody stems (both high and low preference) was highest in the mechanical treatment sites. In year 1 post treatment, highly preferred vines occurred more frequently in the imazapyr and mechanical treatment sites. In year 3 post treatment, the density of highly preferred herbaceous stems was higher in the hexazinone than in the imazapyr and picloram+triclopyr treatment sites. For all herbicide treatments, preferred herbaceous stems increased in density from year 1 to 2 but decreased thereafter, indicating that the application of certain forestry herbicides may concurrently suppress undesirable woody vegetation while also providing short-term benefits to deer habitat. Our results appear consistent among single herbicide applications. The impacts of multiple herbicide applications or tank mixes remain unknown.

2:20pm

Effects of Herbaceous Competition Control in Piedmont Pine Plantations.
Patrick D. Keyser and *V. L. Ford,* Westvaco Corp.; *David C. Guynn,* Clemson Univ.

Seven different sites in the Virginia Piedmont were experimentally sprayed with five different rates/combinations of herbaceous control herbicides in 1990. The sites included five different site-prep treatments applied in 1989 (drum chop/burn, hexazinone/burn, pile, pile/disc, and burn). Two sites each were treated by piling and the granular hexazinone/burn combination; in each case a sandy loam and a clay loam site were selected. All of the herbicide treatments and a control were applied randomly in three replications on each site (a total of 21 location/block combinations). Vegetation responses were measured the application year and for two years thereafter in July by a line-intercept method. In September of 1991 (year two) all sites were operationally sprayed for hardwood brush control (imazapyr). Results were analyzed in a two-way ANOVA with rate and location as factors. Results were significant for most levels and interactions ($P > 0.0001$). Results indicated that all classes of herbaceous vegetation were dramatically reduced the first year. During the second and third growing seasons, most species/groups showed substantial improvement, in many cases matching the control. Some species, notably lespedezas, faired more poorly. Since the site-prep treatments were essentially unreplicated, results were more variable and inferences are weaker. However some trends seemed consistent. Specific responses for both rates/combinations and locations will be discussed.

2:45pm

High Quality Food Plots for Deer Work in Both Extremes of Forest Management.
Kent Kammermeyer, Ga. Dept. of Natural Resources

White-tailed deer are no longer managed solely as a by-product of forest management. Deer habitat has been impacted by intensive pine management in the Piedmont and Coastal Plain and the lack of timber management in the Appalachian Mountains. High quality food plots containing cool season grasses and clovers can mitigate some of the negative impacts of both extremes. Less than 0.5% of an area in high quality food plots can produce higher deer harvests, higher populations, increased body weights, better antler development, and higher reproduction than similar areas without these plots. Significant QDM results (older buck age structures) have been shown with as little as 1.5% of the area in cool season food plots. Reported production of agronomic forages ranges from 2.5-5.0 tons/ac/year dry weight versus forested acreage producing 80-800 lb in a clearcut, less than 10 lb in mature forest, and only 3 lb in pole timber. Thus, forage quantity in a single acre of food plot can exceed forage in 500-1,000 ac of unmanaged mature forest or 10-125 ac of intensive clearcut. High quality forages in these plots range from 15-30% protein versus only 5-15% in native forages. Cool season forages in food plots also provide high quality forage in the winter stress period when native forages are dormant and low quality. Planting costs range from only $100-$300/ac if farm equipment is available. Reseeding annuals or perennials can reduce costs significantly in the second year and thereafter. Supplemental feed is an alternative to food plots, however it is 3 to 20 times more expensive. Finally, food plots are beneficial and justifiable to manage for many other wildlife species, including wild turkey, black bear, songbirds and rabbits. The approach is viable and achievable for private hunt clubs as well as government agencies.

Technical Session IV – Moderator: Matt Knox, Va. Dept. Game and Inland Fisheries.

3:40pm

Modeled Effects of Selective-Harvest Strategies on Subsequent Antler Development.
Bronson K. Strickland and *Stephen Demarais,* Miss. State Univ.; *Donnie Frels,* Tex. Parks and Wildlife Dept.; *Harry A. Jacobson,* Miss. State Univ.; *Karl V. Miller,* Univ. of Georgia; *David G. Hewitt,* Texas A&M Univ.-Kingsville; *M. Keith Causey*, Auburn Univ.

Selective-harvest strategies based on antler characteristics, designed to protect younger bucks from harvest, may negatively impact the population by protecting "low-quality" bucks and increasing harvest of "high-quality" bucks. Selective-harvest strategies designed to promote harvest of "low quality" bucks are common but have not been critically evaluated. We developed a selective-harvest model to evaluate the potential effects of different selection criteria on subsequent antler development, using antler data for 293 bucks with southern origin from captive herds in Alabama, Georgia, Mississippi, and Texas. Our model randomly removes bucks that are vulnerable with each selection criterion, repeats this procedure 10,000 times, and calculates a mean antler score of the remaining bucks at 4.5 years of age. We applied average harvest rates of 25, 50, and 75% for bucks eligible with each criterion. Effects of selection criteria were compared to the mean antler size following a random harvest of bucks with no selection criterion. At 25% harvest rates, none of the selective-harvest criteria significantly impacted antler development at 4.5 years of age. At 75% harvest rates of the 1.5 year age class, a "4-point rule" (a buck with 4+ points is eligible for harvest) decreased population antler size. A selection criterion of 13 inches inside spread applied to the 2.5-year age class at a 75% harvest rate also reduced population antler size. Our results suggest that selective-harvest strategies using antler characteristics at 1.5 and 2.5 years of age with high harvest rates of vulnerable bucks may impact population-level antler quality at 4.5 years of age. However, we emphasize that use of antler-based, selective-harvest criteria must be evaluated within the larger context of deer management goals. Where buck age structure limits antler development, the benefit of any harvest strategy that allows bucks to reach older age classes may supercede the potential negative effect of reducing the population's ultimate mean antler size. For example, in the Lower Coastal Plain physiograhic region of Mississippi a 75% harvest rate of bucks with < 4 points would protect only 36% of the yearling age class. A 75% harvest rate of bucks with > 4 points would protect 89% of the yearling age class. We recommend that where harvest restrictions are used to protect young, smaller-antlered bucks, educational efforts should emphasize the benefits of also protecting larger-antlered young bucks.

*4:00pm

Periodic Harvesting on Fort Bragg, North Carolina: Older Bucks, but Not Enough.
Mark S. Graham and *Richard A. Lancia,* N. C. State Univ.; *Donald H. Cockman,* Dept. of the Army

Either-sex hunting has been practiced on the 160,000-ac installation since 1981, but disproportionate hunting pressure on males has yielded antlered harvests comprised primarily of yearlings (1994:63.4%). During 1995-1999, periodic harvesting (hunting every other year) was implemented 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 34,000 ac 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. After two cycles of closing and opening the first periodic area, the age structure of harvested bucks became progressively older (multinomial chi-square, P=0.01). However, within each age class, the total numbers of bucks harvested during 2 years from each annual area equaled or exceeded the numbers harvested during 1 year from each corresponding periodic area. One reason the periodic areas did not compare as favorably as expected against the annual areas was the presence of 30,000 ac of danger areas adjacent to the study areas. These danger areas became off-limits to deer hunting after the 1993 deer season and acted as sources of older bucks for the annual areas. Results from the second cycle deer harvest (1999) for the second periodic area also will be presented. Periodic harvesting is being discontinued at Fort Bragg in favor of managing a special area with annual hunts and antler restrictions.

4:20pm

First Year Results Following Implementation of Arkansas' Statewide 3-Point Antler Regulation.
Michael E. Cartwright and *David F. Urbston,* Ark. Game and Fish Comm.; *Mark D. Duda,* Responsive Management

A statewide mandatory antler regulation was implemented in Arkansas for the fall 1998 deer season. The regulation, commonly called the 3-point rule, required that legal antlered bucks have a minimum of 3 points (one inch or longer) on one antler. The reported harvest was a new state record (179,225) composed of 31% antlered and 69% antlerless. The antlered harvest decreased by 37,779 (41%) and the antlerless harvest increased by 49,699 (67%). Resident licensed deer hunters were surveyed in February 1999 to obtain post-season information on hunter opinions and attitudes toward deer hunting regulations. Most hunters (76%) supported the mandatory 3-point rule for bucks, and most (57%) had no problem identifying legal bucks or does. About equal numbers were very concerned or not concerned about accidentally killing an illegal deer. Forty-one percent said they thought other hunters complied with the 3-point rule all of the time, 45% indicated compliance some of the time. Many (46%) hunters said they had not discovered bucks killed in violation of the 3-point rule. Hunters were divided relatively equally on their opinion of the effect of the 3-point rule in introducing young hunters to deer hunting. Many hunters (49%) said the 3-point rule added to their enjoyment of hunting; whereas 32% said the regulation took away from their enjoyment. Most (87%) said they were willing to continue giving up the chance to shoot small antlered bucks for a chance to shoot larger antlered bucks in future years. Most (75%) supported mandatory regulations

such as the 3-point rule to promote quality deer management. A large majority (86%) supported continuation of the 3-point rule for at least another deer season, but 47% would not support further restrictions. Overall, the antlered buck harvest decreased substantially in 1998 with a concurrent increase in antlerless harvest. Hunter support remained high following the first year implementation of a statewide mandatory 3-point antler regulation.

4:40pm

Telephone Check-in as a More Effective Method for Monitoring Statewide Deer Harvest.
Jonathan W. Gassett and *Roy Grimes,* Ky. Dept. of Fish and Wildlife Resources

Deer harvest reporting by hunters is an integral part of the management of a state's deer resources. Mandatory check stations seem to provide a mechanism for the collection of reliable and consistent data upon which managers can base their harvest recommendations. Unfortunately, this type of system has its drawbacks. Data recorded at check stations is often not available until after the hunting season, giving managers no early indication of how the season is progressing. The short time frame between the receipt of check station data and recommendations for the following year also can cause problems. The Kentucky Department of Fish and Wildlife Resources recently switched from mandatory check station reporting to mandatory phone check-in. Under this new system, hunters are required to call an automated phone system and respond to questions about their harvest. Currently, our system collects information on hunter identification (social security number), county of kill, sex, antler characteristics, weapon type, tag type, and time and date of check-in. The hunter is then given a confirmation number to record on the carcass tag. This information is instantaneously stored into a Microsoft, Access database that is immediately accessible to the state deer coordinator. Compared to our previous system, the tele-check method of data collection is currently providing the department with accurate and instantaneous harvest information, greater compliance by hunters, and operates at a considerably lower cost. We feel that this system may allow other states to more effectively monitor their statewide deer harvest and subsequently make better harvest recommendations.

TUESDAY, FEBRUARY 15, 2000

Technical Session V – Moderator: R. Larry Marchinton, Professor Emeritus, Univ. of Georgia

8:15am

Effects of Temporary Bait Sites on Movements of White-tailed Deer.
Howard J. Kilpatrick and *Wade A. Stober*, Conn. Wildlife Division

Food at temporary bait sites has been used to manipulate movements of white-tailed deer for research and management purposes. Bait has been used to capture deer, apply amitraz to deer for controlling ticks, employ immunocontraceptive agents, increase hunter success rates, and implement sharpshooting programs. Little information exists on the effects of bait on deer movements. Our objectives were to examine the effects of bait on deer movements and size of home ranges and core areas during the fall and winter-spring periods. We captured and marked deer with radiocollars and numbered ear tags from 1995 to 1997. Deer locations were triangulated 6 times during a 24-hour period each week. We used the adaptive kernel method of program CALHOME to estimate home ranges and core areas using the 95% and 50% probability distribution. Baiting occurred during fall 1997 and spring 1998. No baiting occurred during fall 1996 and spring 1999. Deer exhibited 4 responses to baiting. If established bait sites were within deer core areas (n=11), deer maintained or shifted their original core areas towards the bait site. If established bait sites were outside deer core areas but within annual home ranges (n=14), deer established new core areas (n=2), abandoned core areas distant from bait sites (n=6), or shifted existing core areas closer to bait sites (n=6). No deer used bait sites outside their annual home range. Deer with bait sites outside their core areas exhibited greater shifts towards bait sites then deer with bait sites within their core areas ($P<0.001$). There was no differences in core area size between the baiting and no-baiting period during the spring ($P=0.915$) or fall ($P=0.307$) seasons. If bait sites were established outside deer core areas, shifts in core areas towards bait sites were greater during spring then during fall and differences approached statistical significance ($P=0.091$). All collared deer with bait sites in home ranges were documented to use bait sites. We conclude that temporary bait sites have no effect on home-range and core-area size but may effect core areas of activity. Although deer shifted closer to bait sites, deer with bait sites in core areas used bait sites more frequently and likely will be most vulnerable to management activities at bait sites. Our data suggest that capturing or removing deer during the spring-winter period will be more effective than during the fall period. Removing deer or hunting over temporary bait sites should only affect the local deer herd in the immediate area.

*8:35am

Remote Monitoring of Scraping Behaviors of a Wild Population of White-tailed Deer.
Karen A. Dasher, Clemson Univ.; *Jonathan Gassett,* Ky. Dept. of Fish and Wildlife Resources; *David A. Osborn* and *Karl V. Miller,* Univ. of Georgia

We observed scraping behaviors of white-tailed deer on 3,460 ac of quality managed property in the Georgia Piedmont. We continuously monitored six scrapes over a 2-year period (12 scrapes) with motion-activated video cameras. Marking events by males occurred primarily during the pre-rut and rut, with 97% of marking occurring between 1 October and 9 December. Visitations to scrapes continued throughout the rut, but were almost non-existent prior to and following the rut. Approximately 85% of male visits and 75% of female visits occurred after dark. Females visited scrapes more often than males ($P<0.001$); however, males interacted with the scrapes more frequently than females ($P<0.05$). We found that many males, of various ages, mark the same scrapes. We also discovered that males readily investigate scrapes without scent-marking. Additionally, females frequently investigated scrapes and apparently marked scrapes with their foreheads and mouths. This suggests that they likely are receiving breeding information about males in the area, as well as depositing scents. Although previous studies of captive deer have documented that subordinate males do not scrape or only scrape later in the rut, we found that 1.5 and 2.5 year-old deer scrape during the same time periods and at the same locations as older males. The suppression of marking behaviors observed in captive studies is likely the result of forced associations. With the use of motion-activated cameras, we documented conflicting and previously unreported information on white-tailed deer social behavior at scrapes.

8:55am

That New Car Smell: Deer Responses to Traditional and Non-Traditional Scents in Mock Scrapes.
Ben H. Koerth and *James C. Kroll,* Stephen F. Austin State Univ.

Scrapes have been recognized as playing a key role in scent communication among white-tailed deer. Mock scrapes have been used widely as a hunting technique when natural scrapes do not occur in the location desired by hunters. The commercial scent industry has developed numerous products to enhance attractiveness of mock scrapes to deer. However, little is known about whether the animals are attracted to scents used in mock scrapes primarily as a sexual attractant or out of simple curiosity. To determine effectiveness of traditional (buck and doe urine) and non-traditional scents in mock scrapes, infrared-triggered cameras were placed on mock scrapes treated with various scents to monitor deer visitations. In 1998, four replications of mock scrapes with rutting buck urine, mock scrapes with estrous doe urine, mock scrapes with human urine, and no treatment were monitored from 11 October – 5 December in Houston and Trinity Counties, Texas. Mock scrapes were constructed in areas typified by published descriptions of natural scrapes. All treatments received visitations by deer. For bucks, treatments receiving the most visits were scrapes with rutting buck urine and scrapes with human urine. No difference could be detected between these two treatments in either the number or age of bucks. Mock scrapes with estrous doe urine were not different from no treatment. Primary visitation of mock scrapes occurred during a 3.5-week period extending about 2.5 weeks prior to normal peak rut and 1 week after. In 1999, six replications

of mock scrapes with rutting buck urine, mock scrape with estrous doe urine, mock scrape with "new car" scent, and natural scrapes were monitored beginning October 26. Preliminary data indicate deer readily visited all treatments regardless of scent used on mock or natural scrapes. Results indicate scents used in conjunction with mock scrapes are eliciting curiosity behavior and have little or no sexual attraction. Possible applications of using mock scrapes in deer censusing also will be discussed.

9:15am

The Effects of Older-Age Buck Densities and Habitat Edges on Rub Distributions.
Bryan S. Kinkel and *Grant R. Woods,* Woods & Associates, Inc.

The relationships between deer observation rates and habitat type edges on the density of rubs were studied in western Tennessee. The study site is a 488-ac area characterized by highly dissected upland plateau physiography and mature upland oak/hickory habitat with power-line rights-of-way and timber stand diversity providing habitat edges. Physical characteristics and spatial distribution data were collected from all rubs that occurred within randomly located transects covering 18.4 ac (3.76% of the study site). The location of edges created by changes in plant communities were identified within each transect. Habitat "edges" were classified into various categories for comparison. There was a relationship between densities of rubs > 2.5" in diameter and observation rates of 2.5 year-old and older bucks ($P = 0.059$). Rub densities showed strong variation by habitat edge type, edge sub-type, and distance from the edge. The relationship between buck observation rates and rub densities suggests rub density surveys may be used to indicate densities of 2.5 year-old and older bucks. In addition, because bucks prefer using specific types of habitat edges for rubbing locations, habitat diversity/species composition should be considered when developing habitat manipulation or management plans. This information can be used to increase the observability of mature bucks and hunter satisfaction.

Technical Session VI – Moderator: Lisa Muller, Univ. of Tennessee

*10:05am

A Genetic Approach to the Study of Population Structure in White-tailed Deer.
Joel D. Anderson and *Rodney Honeycutt,* Texas A&M Univ.; *Kenneth Gee* and *Robert Gonzales,* Samuel Roberts Noble Foundation; *Randy DeYoung,* Miss. State Univ.

Traditionally, studies of population structure and subdivision in white-tailed deer have used intensive trapping and survey methods. The use of genetics, along with other types of information, can enhance these traditional survey methods. A total of 230 white-tailed deer, occurring in a semi-enclosed management unit of about 3,000 ac, were drop netted over a period of five years (1994-1999). Either blood or tissue samples were taken from each individual for further genetic typing, with the use of 21 DNA microsatellite loci. These genetic loci revealed high levels of heterozygosity (genetic variation) and demonstrated a high degree of accuracy in terms of establishing relationships among individuals. Estimates of relatedness among deer inside and outside the enclosed unit provided a means of: 1) determining the degree to which deer populations are subdivided based on relatedness and restricted habitat use, and 2) evaluating the extent to which enclosures, even semi-permeable ones, influence genetic exchange and population subdivision in white-tailed deer.

*10:25am

Use of Microsatellite DNA Markers to Determine Paternity and Relatedness in Captive White-tailed Deer.
Randy W. DeYoung, Miss. State Univ.; *Rodney Honeycutt* and *Joel Anderson,* Texas A&M Univ.; *Stephen Demarais,* Miss. State Univ.; *Kenneth Gee* and *Robert Gonzales,* Samuel Roberts Noble Foundation; *Loren Skow, Dierdre Honeycutt* and *Rachel Gallagher,* Texas A&M Univ.

Molecular genetic methods recently have attracted increasing interest from wildlife professionals, with diverse applications from forensic science to estimation of relatedness among individuals. Microsatellite DNA markers have proven especially useful due to their high degree of polymorphism. However, isolation of microsatellite repeats is an expensive and time-consuming process. In addition, the ability of microsatellite markers to determine relatedness (including paternity or maternity) can be diminished by typing errors due to the presence of null alleles or differential amplification of alleles. We examined published ovine, bovine, and cervid microsatellite sequences for potential use in white-tailed deer. Synthetic primers were optimized for white-tailed deer and used to amplify nuclear DNA via PCR. Potential markers were evaluated for quality (i.e. polymorphism, null alleles, differential amplification) using a DNA library from a semi-enclosed population of white-tailed deer in central Oklahoma. Captive deer from single- and multiple-sire breeding pens in Mississippi and Texas were used to further evaluate the marker panel and verify accuracy of paternity designation. The process resulted in a panel of 21 microsatellite markers suitable for determination of relatedness in these populations.

10:45am

Prostaglandin $F_{2\%}$-induced Pregnancy Termination in Captive Deer during Early and Late Gestation.

Robert B. Waddell, Robert J. Warren and *David A. Osborn*, Univ. of Georgia; *Darrel J. Kesler,* Univ. of Illinois; *John C. Griffin,* Univ. of Georgia

Prostaglandin $F_{2\%}$ ($PGF_{2\%}$) is a hormone that causes lysis of the ovarian corpus luteum and a decrease in progesterone concentrations and can terminate pregnancy in several mammals. We tested its effectiveness in captive does during early gestation (EG = 5-9 weeks pregnant) and late gestation (LG = 16-22 weeks pregnant). Date of breeding was observed for 16 does; 8 were assigned randomly to the EG group and 8 to the LG group. Does were shot with a biobullet containing 25 mg of $PGF_{2\%}$ in a rapid release formulation. We then monitored doe behavior in video-equipped stalls. Of the 8 does in the EG group, 3 delivered fawns in May and June. The remaining 5 aborted, but 3 of these subsequently exhibited estrus and conceived and delivered fawns in August and September. Of the 8 does in the LG group, 1 delivered fawns in June. The remaining 7 aborted. Our study determined that $PGF_{2\%}$-induced pregnancy termination in deer is more successful later than earlier in gestation. Field tests currently are underway on Kiawah Island, South Carolina to further evaluate the potential applicability of this method of fertility control.

*11:05am

Preliminary Results from a Field Test of Deer Fertility Control on Kiawah Island, South Carolina.

James D. Jordan, Town of Kiawah Island; *Robert J. Warren,* Univ. of Georgia; *Darrel J. Kesler,* Univ. of Illinois

In 1998, we completed a deer ecology study on Kiawah Island, an 8,000-ac residential-resort community near Charleston, South Carolina. Spotlight surveys indicated a density of about 90 deer/mi^2, but the deer were nutritionally and reproductively fit (1.3 fawns/doe, with 40% of fawns conceiving). Conflicts with deer included foraging on landscape vegetation and about 50 deer-vehicle collisions per year. We tested fertility control as a means of reducing fawn production because a municipal ordinance prohibited firearms discharge. We divided the island into 3 areas and chose 2 that had similar levels of residential development and deer numbers. One of these served as our untreated control area, and the other received intensive treatment of unmarked does with prostaglandin $F_{2\%}$ ($PGF_{2\%}$) to abort fetuses. Between 22 January and 28 February 1999, does seen from tree stands and along roads in the treated area were shot with a biobullet containing 25 mg $PGF_{2\%}$ in a rapid release formulation. We shot 207 biobullets, of which 174 were classified as good hits. To assess treatment effectiveness, we collected 21 adult does during March and April 1999 in both areas. All of the 8 does (100%) collected in the control area were pregnant, compared to 5 of 10 does (50%) from the treated area. We excluded 3 does collected from the boundary between control and treated areas. Data were collected on treatment effort and will be presented. Treatments will be repeated during winter 2000.

11:25am

Is White-tailed Deer Diet Quality a Function of Vegetation Diversity?
Billy C. Lambert and *Timothy E. Fulbright,* Texas A&M Univ.

The relationship between habitat diversity, habitat quality, and seasonal nutritional stability of white-tailed deer diets is poorly understood. A widely accepted, but unproven, paradigm in habitat management is that plant diversity plays a key role in diet composition and subsequent nutrition. Vegetation species richness and beta diversity (changes in diversity between points in the landscape) were determined by vegetation sampling during spring, summer, and fall 1997 and 1998 on 7, 1,853-ac study sites on the Galvan ranch in Webb county, Texas. White-tailed deer fecal piles also were collected from each area during each season. Feces were analyzed for percent nitrogen (N) and fecal diaminopimelic acid (DAPA), and microhistological analysis was used to determine diet composition. Based on microhistological analysis results, simulated diets were constructed and nutritional analyses were performed. Fecal N, DAPA, diet digestibility, diet crude protein, diet digestible energy, and diet gross energy were used to index dietary quality. Regression analyses were used to determine the relationships between habitat diversity indices and dietary quality indices and to determine the relationship between fecal indices and simulated diet indices. Within our range of habitat diversities, diet quality and seasonal variation in diet quality were unrelated to habitat diversity. White-tailed deer may be able to cope with low habitat diversity through selective foraging. Also, fecal indices may not be accurate indicators of diet quality in south Texas.

Technical Session VII – Moderator: Jeff Beringer, Mo. Dept. Conservation

1:15pm

Deer Herd Estimation Based on Catch-Per-Unit-Effort and Implications for Sharpshooting Efficiency.
David M. Kocka and *David E. Steffen,* Va. Dept. of Game and Inland Fisheries; *Linwood R. Williamson,* Smithsonian Institution

From 4 January to 8 March, 1999, 125 white-tailed deer were removed by sharpshooting from 328 ac of the Smithsonian Institution's Conservation and Research Center (CRC) in Warren County, Virginia. Deer were removed to reduce the potential for disease transmission to endangered, exotic ungulates and reduce damage to ornamental shrubs around buildings. Attempts in the early 1980's to manage the deer population on CRC through controlled hunts resulted in public controversy, congressional hearings, and the eventual loss of lethal control options. Since 1995, non-lethal control measures, including installation of $150,000 in fencing, were unsuccessful in managing the deer population. As a result, sharpshooting was initiated in 1999. All deer (> 6,300 lb edible meat) were donated to the Hunters for the Hungry, and all processing costs were paid for by CRC. On each occasion when deer were shot, data were collected on actual time spent shooting and the number of deer killed. Minutes per deer killed ranged from 4.7 to 30.0 with a mean of 12.4. Removal methods using catch-per-unit-effort data produced a population density estimate of 277 deer/mi^2 (95% confidence interval = 244-392). We discuss recommendations to maximize future sharpshooting efforts at CRC and to design sharpshooting programs that also provide unbiased population estimates and applications to urban deer situations.

*1:35pm

A Comparison and Refinement of Three Methods for Estimating Deer Population Characteristics.
William T. McKinley and *Stephen Demarais,* Miss. State Univ.; *Kenneth Gee,* Samuel Roberts Noble Foundation; *Harry Jacobson,* Miss. State Univ.

Interest in intensive deer management and public concerns for effects of expanded antlerless harvest have led to a need for quantitative estimates of population density, sex ratio, and fawn crop. We compared population characteristics using estimates derived from three techniques: (1) Infrared-monitored camera systems according to Jacobson et al. 1996; (2) infrared-monitored camera systems using capture/recapture of marked females; and (3) a traditional spotlight survey. We applied our techniques during fall and winter on two fenced study areas in Mississippi and during winter on one fenced study area in Oklahoma. We compared results from the three techniques to a "best estimate" of population characteristics generated from the percent recovery of tagged deer, the minimum known number of bucks derived from the pictures, and supplemental videotaped observations. Recapture on film of marked deer in MS was 83% to 100% with no difference between bucks and does. However, recapture in Oklahoma was 29%, with a difference between bucks (21%) and does (36%). The Jacobson et al. technique was generally closest to our "best estimate" for density, sex ratio, and fawn crop. The spotlight count typically deviated greatest from our "best estimate" for all population characteristics. We recommend camera-based estimates be conducted during winter with a camera density of 1camera/100 ac, pre-baiting for 4-6 days, a 10-minute camera delay, and a duration of no less than 5 consecutive days with 24 or 36 exposure film checked daily.

*1:55pm

Comparison of Infrared-Triggered Camera Estimates Versus Road Count.
Roel R. Lopez and *Nova J. Silvy,* Texas A&M Univ.; *Phil Frank,* USFWS; *Jason D. Sebesta,* Texas A&M Univ.

Use of infrared-triggered cameras in estimating deer populations has increased in recent years. However, the performance of this technique compared to other population estimation methods such as road counts (i.e., spotlight counts) is limited. We compared data from infrared-triggered cameras and weekly road counts for a small, relatively closed population of Key deer (*Odocoileus virginianus clavium*). Between January 1998 and October 1999, 22-25 deer were marked with neck collars on No Name Key (971 ac), Monroe County, Florida. A weekly road census (sunrise, sunset, and night) was conducted between March 1998 and October 1999. These census routes were used to estimate deer density using a Lincoln-Petersen index. Similarly, 8 infrared-triggered cameras (121 ac/camera) were used to estimate deer numbers weekly. Road census data estimated 99-117 deer (mean = 107). Camera data estimated a significantly higher ($P < 0.001$) deer number (166-194, mean = 179). We attribute low population estimates using road census data to limited vegetation visibility, limited road access, and differences in urban and wild deer behavior. We propose infrared-triggered cameras improve estimates of Key deer on small, isolated islands.

*2:15pm

A Line Transect Sampling Method for Surveying Deer Populations in Forested Areas.
Brian L. Pierce, Scott C. Pettengill and *John T. Baccus,* Southwest Texas State Univ.

Spotlight strip transect sampling is used extensively for monitoring white-tailed deer populations throughout the United States. Unfortunately, the strip transect method of bounded counts is burdened with strict statistical assumptions, the most limiting of which are the requirements for a complete census within the sampled area and an accurate estimate of sample area size. These limitations produce severe biases in habitats with dense, obstructive vegetation (forest) and/or when the target species is not randomly distributed. Line transect sampling theory is more robust to changes in target distribution, does not require a complete census within the sample area, and integrates the factors which affect visibility into the estimate of target density. We provide results from a two-year study of white-tailed deer in the Edwards Plateau region of Texas where dense stands of Ashe Juniper (*Juniperus ashei*) detrimentally affect the traditional spotlight strip transect sampling method. We demonstrate the utility of a new spotlight line transect sampling method which is relatively fast (0.24 hr/mi; SD=0.08), spatially accurate to within the limits of the ranging device and GPS used (49.9 ft; SD=45.6), consistently obtains larger sample sizes per transect (> 50%), and returns more information per sighting (count, composition, and spatial location) than traditional spotlight strip transect sampling methodology. These results indicate the new spotlight line transect method is less biased than traditional spotlight strip transect sampling, more efficient in terms of cost per unit effort (hr/deer), and yields additional data (sighting locations) applicable for monitoring habitat use.

2:35pm

A User Friendly Browse Survey.
David W. Moreland, La. Dept. of Wildlife and Fisheries

Browse surveys have been used by biologists with the Louisiana Department of Wildlife and Fisheries for many years. During the deer restocking program, biologists were asked to select areas for restocking based upon 14 indicator species. Browse surveys have been used in conjunction with harvest data to provide population estimates to clubs and landowners. When the Deer Management Assistance Program came on line statewide in 1981, the work-load for biologists increased. Since then, most browse work consists of simple, cursory-type surveys not involving any detailed measurements. A species transect survey has been developed by the Deer Study Section that is fairly simple to use and measures species availability, species utilization and regeneration, and utilization of indicator browse species and desirable hardwood trees. Survey work initially was done on land with a known deer harvest so population estimates could be established based upon the harvest and utilization measured by the survey. The species availability figures provide the manager with information regarding habitat needs of the area. The regeneration measurements provide the manager with information that will, over time, indicate trends in regeneration and utilization of desirable browse species and hardwood trees. The transect survey is relative simple to conduct and can be completed in a short time.

Technical Session VIII – Moderator: E. L. "Butch" Young, Tx. Parks and Wildlife Department

*3:25pm

Evaluation of Five Methods of Attaching Radio Transmitters to Male White-tailed Deer.
Roel R. Lopez and *Nova J. Silvy,* Texas A&M Univ.; *Phil Frank,* USFWS; *Jason D. Sebesta,* Texas A&M Univ.

We evaluated 5 methods of attaching radio transmitters to male Key deer (*Odocoileus virginianus clavium*). Radio transmitters (0.53-4.1 oz) were attached to Key deer using vinyl neck collars (n = 37) and vinyl/elastic neck collars (n = 9). Radio transmitters also were attached to deer antlers with plastic ties (n = 9), leather collars (n = 12), and radiator hose clamps (n = 10). Neck collars were problematic for mature males during the breeding season. Approximately 32% (12/37) of the non-expandable collars resulted in neck injuries. Forty-two percent (8/19) of the non-expandable collars were torn off during the breeding season. Radio transmitters attached using plastic ties or leather collars also were ineffective (92% torn off during breeding season, 12/13). Radio transmitters attached using radiator hose clamps were more effective (0% torn off, 0/10). Antler transmitters attached with radiator hose clamps appear to be the most effective means of radio-tagging adult males. We believe the use of antler transmitters is more acceptable to the public, particularly in the study of urban deer.

*3:45pm

Design and Evaluation of Deer Guards for Florida Key Deer.
Jason D. Sebesta, Roel R. Lopez, and *Nova J. Silvy,* Texas A&M Univ.

Highway mortality is a major cause of death for the endangered Florida Key deer (*Odocoileus virginianus clavium*). The Florida Department of Transportation plans to fence a portion of U.S. Highway 1 to prevent deer mortality. However, a method is needed (i.e., deer guard) to prevent deer from entering access roads along the fenced portion. Previous research on mule deer (*O. hemionus*) indicated deer guards were ineffective. Mule deer walked the guard's 3.9-in spaced cross-members but did not jump the 12-ft guard. We installed 2 prototype deer guards between 2 pens housing Texas white-tailed deer (*O. v. texanus*) at Welder Wildlife Refuge, Sinton, Texas. An initial prototype (modeled after the mule deer guard) was constructed of lightweight wood materials (12 ft-long) with cross-member spacing set at 3.9 in. For deer safety, guards were installed at ground level. Based on observation of tracks, deer were able to jump the prototype. However, when guards were extended to 18 ft, no deer jumped the guards. Infrared-triggered cameras captured 3 images of deer crossing the 18-ft guard by stepping between cross-members. Elevating the 18-ft guard above ground level prevented crossing.

*4:05pm

GIS Analysis of Deer-Vehicle Collisions at the Savannah River Site, South Carolina.
Rakesh Malhotra, Paul E. Johns, Marguerite Madden, Gary R. Wein and *Jim M. Novak,* Univ. of Georgia

Deer-vehicle collisions are a common occurrence on highways of the Eastern United States. Although they occur year round, such collisions particularly are frequent during the fall deer rutting season. This study uses aerial photographs and GIS to analyze deer-vehicle collisions at the Savannah River Site (SRS), South Carolina. Being a restricted area, SRS personnel have collected accurate data on deer collisions that occurred from 1991 to 1999. Collisions were separated based on season to control for seasonal variability in deer behavior, and only collisions occurring in fall were selected for this analysis. Buffers of 820, 1640, and 3,280 ft were created around collision points. Information on vegetation, topography, presence of water bodies, and road conditions were derived from 1:16,000 true-color and color infrared aerial photographs taken during the same time. These characteristics were then statistically compared to control values obtained for similar buffers around random points along roads. The analyses of data for 3 buffer zones provides us with information on the resolution of influencing factors, i.e., which factors influence deer-vehicle collisions, and at what distance from the collision does their influence wane. Results then are used to create a spatial model to identify conditions conducive to deer-vehicle collisions. The spatial model then is used to predict sites of high, medium, and low potential for future deer-vehicle collisions. It is hoped that by understanding spatial factors related to deer-vehicle collisions, management practices can be implemented to reduce such incidents by altering the conditions around areas with high potential for collisions.

*4:25pm

A Pilot Deer Depredation Assistance Program to Reduce Deer Damage Complaints in South Carolina.
Emily C. Cope, S.C. Dept. of Natural Resources; *Greg K. Yarrow,* Clemson Univ.; *Charles Ruth,* S.C. Dept. of Natural Resources

The white-tailed deer population in South Carolina has increased and is considered by some to be overpopulated in certain areas. With this increase in deer numbers, there has been an increase in deer damage complaints and actual damage to agricultural crops. The South Carolina Department of Natural Resources (SCDNR) has attempted to satisfy deer damage complaints by issuing shoot-to-kill depredation permits to agricultural producers who experience deer damage. However, this program is a problematic and a tremendous burden on SCDNR Enforcement Officers. Generally, depredation permits have not proven successful in reducing damage and only serve as a means to appease agricultural producers experiencing deer damage. Due to these problems, SCDNR and Clemson University tested a pilot program to reduce deer damage complaints. The pilot program was implemented in two counties ranking high in depredation complaints. In these counties, agricultural producers could acquire depredation permits and educational packets about non-lethal damage reduction alternatives from their local county Cooperative Extension offices. Agricultural producers then had the option to implement the control techniques themselves or contract private, professional Nuisance Wildlife Control Operators (NWCOs) for assistance. Follow-up survey results

indicated a significant decrease in complainants' perceived level of damage (P = 0.0001) and intolerance of damage (P = 0.0018). This leads to the assumption that the pilot program was successful in reducing deer damage complaints. However, educational packets were not considered successful because the use of non-lethal control alternatives decreased significantly (P = 0.001 for repellents and scare tactics, P = 0.009 for fences) throughout the project period. Under the guidelines of this pilot program, no NWCOs were contacted for assistance demonstrating that rural complainants would rather handle depredation problems themselves than pay someone for assistance. When asked if the program should be expanded statewide, all groups (agricultural producers, Enforcement Officers, NWCOs, and Extension personnel) responded favorably. However, county Extension personnel had the highest negative response of any group surveyed.

***Indicates Student Paper**

APPENDIX I
STATE NARRATIVES

ALABAMA

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

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

Historically, deer were abundant in Alabama until unrestricted hunting and changes in land use reduced their numbers to only a few thousand animals in a couple of isolated locations by the early 1900's. The Game and Fish Department began cooperative restocking of suitable habitat as early as 1925, and with growing public support, the Department accelerated restocking efforts through the 1960's. Today, all 67 counties have huntable deer populations and an open deer season. The current statewide preseason population estimate is 1.75 million deer. South and south central Alabama support the highest concentrations of deer and currently command the highest deer hunting lease fees. All counties have a 73-day gun deer season, allowing the harvest of one antlered buck per day. Age structure of harvested bucks is very young, with the majority of bucks taken being 1.5 years old. The 1998-99 deer harvest was comprised of 57% bucks and 43% does.

Over 2,100 Cooperators covering more than 4 million acres are currently enrolled in Alabama's Deer Management Assistance Program (DMP). By allowing the use of antlerless tags to meet harvest quotas, the DMP has given many landowners and hunting clubs the opportunity to manage their properties for better quality deer that the normal hunting seasons and bag limits did not offer. The DMP has been very successful in Alabama, but the need still exists for other options for managing deer herds on properties not enrolled in the program. For the 1999-2000 hunting season, either-sex hunting opportunities were increased in most counties, to as much as 45 days of the 73-day gun deer season. This increase should provide the framework many landowners, hunting clubs, etc. need to manage their properties as they wish, without having to enroll in the DMP. It is also hoped this increase in either-sex hunting opportunities will help stabilize expanding deer herds found in many parts of the state.

ARKANSAS

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

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

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

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

FLORIDA

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

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

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

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

GEORGIA

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

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

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

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

KENTUCKY

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

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

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

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

LOUISIANA

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

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

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

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

While the success of the wildlife management programs and DMAP have demonstrated that proper deer management is effective, there is still more work to be accomplished. An example of this is the need for further development of either-sex hunting opportunities. Progress is being made along these lines because, in 1994, a regulation was passed that allows hunters to harvest one antlerless deer and one antlered buck per day on doe days. The daily limit had been one deer per day. It is hoped that this regulation will encourage hunters to shoot a doe since they would often pass them up in hope of seeing and shooting a buck.

MARYLAND

Maryland, often referred to as "America in Miniature", has four physiographic regions- the Coastal Plain, Piedmont, Ridge & Valley, and the Appalachian Plateau. The land uses vary from northern hardwood timber in the extreme western portion of the state to the loblolly pine forest in the Chesapeake Bay and coastal region. Central, southern and eastern sections of the state support agricultural uses. Forests cover 43 percent of the state with agricultural lands comprising 38 percent.

Maryland's deer population survived only in the remote mountain sections by 1900. Habitat destruction and uncontrolled hunting had eliminated deer from the rest of the state. Restocking deer began in the early 1900s when deer from Pennsylvania, Michigan and Wisconsin were released. Deer restocking accelerated after World War II with deer from the Aberdeen Proving Grounds (Maryland) being introduced throughout the state.

Western Maryland experienced its first deer season in the 1920s. With mandatory check stations instituted in 1931 thirty-one deer were reported taken in the Western Maryland counties of Allegany and Garrett. The first antlerless season was held in 1957 and by 1960 deer hunting occurred state-wide (except for Montgomery County).

Maryland's current deer seasons are as follows: Archery - Middle of September through end of January; Modern Firearm - Saturday after Thanksgiving through second Saturday of December ; Muzzleloader - three days in late October and two weeks covering late December and early January. One Saturday in mid-November is set aside for youth firearm deer hunting only. Antlerless permits are required only in three western counties. Antlerless permits are issued in these counties due to intense hunting pressure with the potential of an extremely high harvest.

Maryland's human population totals 5.1 million. Fifteen percent of the state is classified as development. This developed section of Maryland has expanded by 38 percent during the past 30 years. This section contains the most rapidly growing deer population. Conflicts between people and deer continue to proliferate within this area.

Maryland recently completed a statewide deer plan. The primary goal is to maintain healthy deer populations as a valuable component of Maryland's ecosystems, stabilize deer population numbers throughout the state, then gradually adjust populations to bring them into acceptable ranges for the social and environmental conditions of individual communities. The primary strategies are as follows: make deer population management decisions, including target population levels and selection of management options, based upon local management units, in consultation with local communities; directly support research and expanded application of non-lethal deer control methods, including birth control and behavior modification; change Maryland's hunting laws to give the Department greater flexibility in increasing deer bag limits, particularly antlerless deer; establish and use procedures that can safely and efficiently remove deer from specific areas through means other than regulated hunting.

MISSISSIPPI

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

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

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

Even though antlerless harvest was first allowed on private clubs as early as 1960, many hunters in Mississippi are resistant to following currently accepted, scientifically based harvest recommendations of biologists. Therefore, deer management in the state ranges from intensive "quality deer" strategies to bucks-only harvest on some areas. Much of the antlerless harvest and management objectives are currently being accomplished through the very successful Deer Management Assistance Program (DMAP). In 1990 there were about 900 cooperators in the program, encompassing 2.3 million acres. The harvest ratio of antlered to antlerless on DMAP land 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 an oak-hickory cover type dominating and shortleaf pine common in the southeastern portions. Between these 2 largest provinces lie the Ozark Border and Osage Plain transition provinces. The Ozark Border is similar to the Ozark Plateau, however, it's soils are richer and more productive. The Osage Plains is chiefly prairie in nature; however, most native prairie has been converted to cool season pastures. The Mississippi Lowland province, located in southeastern Missouri, is best described as a broad flat alluvial plain under intensive agriculture, with a small amount of bottomland hardwood forest.

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

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

Deer herd management in Missouri is accomplished on a unit basis. Quotas of permits that allow the harvest of antlerless deer are established annually for each of 57 management units. Antlered-only permits are unlimited. Quotas are based on population modeling, harvest statistics from mandatory check-ins, conservation agents' perceptions of populations and crop damage reports. Stabilization of deer populations in most parts of Missouri is desirable and emphasis in recent years has been on increasing doe harvests through liberal quotas.

NORTH CAROLINA

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

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

The 1998 pre-season population estimate was 950,000 deer. During the 1999-00 hunting season, either-sex regulations in about two-thirds of the state allowed 6 does to be taken throughout the entire season (September-December). In the Coastal Plain, densities and buck harvests have stabilized somewhat and there have been accompanying increases in doe harvests (almost 50% of the total in many counties). Piedmont herds are being affected by urbanization and conflicts between deer and people are becoming more evident. Work is ongoing to evaluate techniques for increasing antlerless harvests without adding to existing conflicts between hunters and landowners. Herds are continuing to increase in the good habitat of the foothills area of the upper Piedmont and lower Mountain regions. Mountain populations are relatively stable and either-sex hunting is being incorporated gradually into those areas where herds are sensitive to severe environmental conditions and fluctuations in high energy foods like acorns occur.

OKLAHOMA

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

Oklahoma slopes southeastward from an elevation of 5,000 ft at Black Mesa in the panhandle to 327 ft on the Red River in the southeastern corner. Topography is generally flat or rolling, exceptions being the Wichita Mountains in the southwest, the Arbuckle Mountains in the south-central section, and the Ouachita, Boston, and Ozark Mountains along the eastern border. Average annual precipitation ranges from a low of 15 inches in the panhandle to 45 inches in the southeast part of the state.

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

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

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

SOUTH CAROLINA

South Carolina's deer herd reached an extremely low point around the turn of the century with deer becoming essentially non-existent in the Piedmont and Mountains (the upstate). Fortunately there were good residual populations associated with the major rivers in the Coastal Plain. Restoration efforts began in the 1950's and involved the capture and relocation of approximately 200 deer from the Coastal Plain to the upstate. All restocking efforts utilized native deer. Over the last 20 years, changes in agriculture and more importantly, changes in forestry related activities have created exceptional deer habitat in most parts of the state. Currently, huntable populations exist in all 46 counties and many areas have over 50 deer per square mile and annual harvest rates of around 20 deer per square mile.

Deer hunting in South Carolina is characterized by two distinct season frameworks. The Coastal Plain encompasses 28 counties where the deer season begins on August 15, September 1, or September 15 and continues until January 1. In this region, roughly two-thirds of the state, dog hunting is allowed; however the activity is declining significantly. Baiting is allowed in the Coastal Plain and although there are short buck only archery seasons in a few Coastal Plain game zones, special weapons seasons are generally lacking. The 18-county Piedmont and Mountains deer season begins on September 15 and October 1 respectively and ends on January 1. There are liberal archery and/or primitive weapons seasons in all areas. Neither dog hunting or baiting is allowed in the upstate.

With the exception of Wildlife Management Areas, season dates statewide are set in statute. In the Coastal Plain, methods of taking deer are set in statute as are bag limits for antlered deer. However, many coastal game zones have no season or daily limit on antlered deer. In the upstate and on Wildlife Management Areas, bag limits and methods of take are set by SCDNR regulation. SCDNR has statewide authority with respect to the harvest of antlerless deer and as deer populations have increased, programs have provided more opportunity for hunters to harvest antlerless deer on all lands. Currently, all parts of the state have designated either sex days and typically every Friday and Saturday from October 1 to Thanksgiving are either sex days with additional days set the last two days of the season.

SCDNR offers two optional antlerless deer tag programs for the entire state. The Antlerless Deer Quota Program (ADQP) began in 1965 and continues today as a means for private landowners/leesees to harvest antlerless deer. With the ADQP, qualified applicants are issued an antlerless deer quota based on the density and condition of the local deer population, the size of the tract of land, and the recreational and agricultural objectives of the property owner. Currently, approximately 3,000 properties encompassing over 4 million acres participate in the ADQP. In 1994 a second program, the Individual Antlerless Deer Tag Program was implemented. Unlike the ADQP which is property based, this program is hunter based and allows anyone to purchase up to 4 antlerless deer tags which can be used on any property they are permitted to hunt (including many WMA's). Individual tags can not be used on properties already enrolled in the ADQP. Currently, over 30,000 hunters participate in the Individual Tag Program. With the liberalization of either-sex days and the availability of two optional tag programs, South Carolina deer hunters now harvest nearly equal numbers of bucks and does.

Department objectives continue to include stabilization (reduction in some areas) of the deer population and increased efforts to moderate the social costs of a high deer population, e.g. agricultural depredation, deer vehicle collisions, urban deer situations, etc.

TENNESSEE

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

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

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

Deer management in Tennessee is conducted on a unit basis, with 2 major units. Unit A comprises the middle and western counties of the state and has the longest seasons and the most liberal bag limits. Unit B comprises the eastern counties and has shorter seasons and more conservative bag limits. Within each unit, county deer herds are managed separately. Population models as well as other biological parameters (age/sex structure, weights, antler dimensions) are used to assess the status of each herd, and desired doe harvests are determined. Doe harvests are accomplished through the issuance of quota permits allocated by drawing. Since 1975, the antlerless harvest in Tennessee has increased from 23% to over 41% of the total harvest in 1997.

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

TEXAS

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

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

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

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

In 1998, Texas implemented a new program. Managed lands deer permits were made available to any landowner willing to follow guidelines provided by the local TPWD wildlife biologist or technician. If the landowner accepts the number of buck and doe permits that

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

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

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

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

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

VIRGINIA

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

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

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

WEST VIRGINIA

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

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

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

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

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

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

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

APPENDIX II
STATE DEER HARVEST SUMMARIES

Table 1. Southeastern deer harvest summaries, 1998-99.

State	Land Area (sq.mi.)	Deer Habitat (sq.mi.)	Deer Habitat (% Total)	Percent Forested	Deer Range Unoccupied	% Land Area Public Hunting	1998-99 Harvest Male	1998-99 Harvest Female	1998-99 Harvest Total
AL	51,628	48,014	93	66	0	4.0	222,471	167,829	390,300
AR	52,609	44,677	85	53	0	12.0	78,764	100,461	179,225
FL	51,628	29,280	57	45	0	16.0	69,785	16,283	86,068
GA	57,800	33,163	57	57	0	6.0	199,836	227,164	427,000
KY	40,395	39,654	97	59	0	8.5	84,999	72,552	157,551
LA	41,406	26,562	64	52	0	4.0	129,002	114,398	243,400
MD	9,837	8,766	89	43	0	4.0	43,905	29,664	73,570
MO	69,561	21,396	31	31	0	4.3	131,438	94,180	225,618
MS	47,296	31,250	66	66	0	6.0	142,027	133,565	276,361
NC	48,794	36,699	75	62	0	6.0	128,480	87,102	215,582
OK	69,919	34,960	50	19	0	2.0	51,137	28,871	80,008
SC	30,207	21,920	73	63	0	7.0	130,000	120,000	250,000
TN	42,246	25,770	61	49	0	8.5	82,348	73,327	155,675
TX	261,914	129,592	49	40	<10	<2	237,507	155,066	392,573
VA	39,682	31,479	79	63	0	7.0	108,194	67,578	178,528
WV	24,064	22,889	95	79	0	9.0	110,128	84,778	195,839

Table 1. (Continued)

State	Harvest/mi^2 Occupied Habitat	Method of Data Collection[a]	Estimated Pre-season Population	Length of Season (Days)			Method for Setting Seasons[b]	% Land Area Open to Dog Hunting
				Archery	Black Powder	Firearms		
AL	7.6	1,2,3	1,750,000	109	17	73	1,2	70
AR	4.0	1	1,000,000	151	25	37	1,2	81
FL	2.9	2	n/a	30	3	72	1,2	20
GA	12.9	1,2,3,4	1,170,000	35	7	70-80	1,2,3	10
KY	4.0	1,3,4,5	553,000	119	9	14	1,3	0
LA	9.2	1,2,3	1,000,000	123	14	60	1,2,3	80
MD	8.4	1,2,3,4	247,000	87	16	13	1,2	0
MO	10.5	1,2,4	850,000	98	20	15	1,2	0
MS	5.8	1,2,3	1,500,000	62	14	60	1,2,3	99
NC	5.9	1,2,3,4	950,000	24-54	6	18-71	1,2,3	53
OK	2.3	1,3	400,000	78	9	9	1,2	0
SC	11.4	1,2,3	1,000,000	12	10	70-140	1,2,3	60
TN	6.0	1,4	874,468	30-52	10-14	22-39	1,2,3	0
TX	3.0	2,3,4	3,785,178	30	9	58-87	1,2	0
VA	5.7	1,2,3,4	950,000	43-73	12-24	12-42	1,2	55
WV	8.5	1	890,000	65	6	18	1,2	0

[a] 1-Check Station; 2-Mail Survey; 3-Jawbone Collection; 4-Computer Models; 5-Telephone Survey

[b] 1-Harvest and Biological; 2-Department/Commission Regulatory; 3-Legislative

Table 1. (continued)

State	No. Deer Hunters	5-Year Trend	Hunting License Fees		% Hunting Success		Typical Fine Illegal Deer	Avg. Leasing Fees/Acre
			Resident	Non-Resident	Archery	Firearms		
AL	210,600	Down	$16	$202	25	50	$150-600	$2-11
AR	250,000	Stable	$10.50-25	$95-195	n/a	n/a	$150-1000	$2-4
FL	127,000	Stable	$12	$151	n/a	n/a	$250-500	$2-5
GA	316,567	Down	$19	$177	11	56	$500	$3-15
KY	260,271	Up	$33.50	$116	25	52	$350	n/a
LA	177,800	Stable	$21-42	$96-212	25	57	$500	$3-30
MD	87,000	Down	$24.50	$120.50	40	60	$500	$5-35
MO	400,000	Stable	$15	$125	15	75	$100-250	$2-4
MS	161,650	Down	$17-32	$105-225	40	63	$150	$3-5
NC	285,000	Stable	$25	$80	n/a	49	$200-500	$2-6
OK	188,219	Stable	$29	$201	13	23	$500-1000	$2-5
SC	180,000	Stable	$18	$50-189	n/a	76	$200	$4-10+
TN	225,508	Stable	$39-50	$105.50-156	23	41	$50-500	$4
TX	515,389	Down	$19	$250	15	59	$25-500	$5
VA	230,000	Down	$25-50	$122-174	31	51	$50-850	n/a
WV	345,000	Stable	$25	$110	19	52	$282-562	$1-5

Table 1. (Continued)

State	Mandatory Hunter Education	Number 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	10,000
AR	Yes	6	6	Yes	Yes	Yes	No	8,399
FL	Yes	n/a	n/a	Yes	Yes	Yes	No	n/a
GA	Yes	7	7	Yes	Yes	Handicap	No	9,000
KY	Yes	5	4	Yes	Yes	Yes	No	4,306
LA	Yes	2	n/a	Yes	Yes	Handicap & >60	No	2,500
MD	Yes	1	1	Yes	Yes	Handicap	No	3,200
MO	Yes	3	1	Yes	Yes	Yes	No	8,651
MS	Yes	4	1	Yes	Yes	Handicap & ≥65	Yes	7,500
NC	Yes	5	5	Yes	Yes	Handicap	No	6,000
OK	Yes	1	0	Yes	Yes	Handicap	No	647
SC	Yes	2	2	Yes (18 co.)	Yes	Yes	Yes (28 co.)	3,821
TN	Yes	3	1	Yes	Yes	Handicap	No	n/a
TX	Yes	5	1	WMAs only	Yes	Yes	No	n/a
VA	Yes	7	5	Yes	Yes	Handicap	No	n/a
WV	Yes	3	3	Yes	Yes	No	No	12,778

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