An Overview of Recent Deer-Vehicle Collision Research in Arkansas

Philip A. Tappe (Phone: 870-460-1352, Email: tappe@uamont.edu),
Michael C. Farrell (Phone: 719-524-5297, Email: mike.farrell2@us.army.mil), and
Donald I.M. Enderle (Phone: 770-270-7678, Email: denderle@photoscience.com), Arkansas Forest Resources Center and School of Forest Resources, University of Arkansas, Monticello, AR 71656.

Abstract

An expanding human population combined with a growing white-tailed deer (*Odocoileus virginianus*) population has resulted in an escalation of the number of deer-vehicle collisions in Arkansas. In response to this increase, we initiated research to help understand the scope of the problem and to investigate factors contributing to deer-vehicle collisions (DVCs) on Arkansas highways.

In Arkansas, vehicle accident reports filed with the Arkansas State Police are currently the most extensive and reliable source of information on DVCs. We used these reports to gather data on DVCs over a 4-year period, 1998 – 2001. A total of 5,858 reports of DVCs were obtained and used to document mean vehicle-damage estimates, mean numbers of human injuries and deer deaths, mean numbers of collisions by time of day and month, and proportions of bucks and does involved in collisions by month.

The same 5,858 DVC reports were used to conduct an examination of the influence of county-level factors on the density (no. /1000 km) of reported DVCs in Arkansas. Principal components (PCA) and regression analyses were used to evaluate the importance of county-level factors, such as human population densities/urbanization, landcover composition and arrangement, timber harvest levels, deer density indices, and highway densities and characteristics.

Of the 5,858 DVC reports, 3,170 were spatially referenced to specific locations on highways, thus allowing for an evaluation of site-specific factors that may influence the locations of DVC occurrences in Arkansas. We used logistic regression analyses to evaluated the importance of landcover patterns, landcover characteristics, and number of stream/highway intersections within 400, 800, and 1200 m of collision sites; landcover crossing types and maximum topographic relief within 100 m of collision sites; and distances to nearest forest and to nearest water. Furthermore, we developed models for each physiographic region of the state, as well as a state-wide model, to identify high risk areas along Arkansas highways.

Collisions were documented in all months, but we found most (>50%) occurred during October – December with a peak in November. The number of collisions was greatest between 5:30 p.m. and midnight with a smaller peak occurring between 5:00 - 7:00 a.m. Most deer (67.5%) were killed as a result of the collisions; 32.5% were injured and fled the collision site. We do not know the ultimate fate of these animals. Overall, 48.3% of the collisions were with bucks and 51.7% were with does. However, we found this proportion varied by month, ranging from 24.1% bucks and 75.9% does in June to 64.7% bucks and 35.3% does in November (Fig. 3). Annually, the human injury rate averaged 0.7%. Reported, estimated damage to individual vehicles averaged almost $2.7 million/year with a mean of $1,926 per collision. Based on an assumed reporting rate of approximately 17%, we estimated that Arkansas could potentially have up to 18,000 DVCs annually with a loss of almost $35 million in vehicle damage.

We found that deer-vehicle accident occurrence in Arkansas counties was influenced more by roadway features, level of urbanization, and human population densities than by deer densities or landscape characteristics. PCA indicated two important components contributing to DVC densities in Arkansas counties. Component 1 represented a predominantly forested matrix with high edge density and contrast. Component 2 described an urban environment, with high road densities, human population densities, and average daily traffic counts. These 2 components were strongly related to DVCs ($r^2 = 0.55$, $P < 0.001$), with Component 2 explaining the most variation (71.4%).

Landcover characteristics of DVC sites were useful in predicting site-specific probabilities of deer-vehicle collisions. Based on 31 site-specific variables, correct classification rates of predictive models (DVC sites vs. non-DVC sites) ranged from 62% - 70%. Five groups of factors strongly correlated with DVC locations were the: (1) presence and amount of water; (2) presence of a diverse association of land cover types; (3) amount and size of urban area; (4) amount and size of forested area; and (5) density of pastures and agricultural crops.

Information derived from these studies can aid land managers, agencies, and policy makers in making informed decisions related to DVC mitigation. Additionally, our results provide a foundation for future research targeted at increasing our knowledge of interactions between wildlife and roads, and for further research into DVC mitigation strategies.

Biographical Sketch: Philip A. Tappe is a professor of wildlife ecology and management, Associate Director of the Arkansas Forest Resources Center, University of Arkansas Division of Agriculture; and Associate Dean of the School of Forest Resources, University of Arkansas at Monticello. He received his B.S. and M.S. from Stephen F. Austin State University, and his Ph.D. from Clemson University.