**RESEARCH PROJECT SUMMARY**

**Project Title:** Estimating population size of deer in the Black Hills and an evaluation of fall classification surveys for deer and pronghorn in South Dakota.

**Need:** White-tailed (*Odocoileus virginianus*) and mule (*O. hemionus*) deer are important ecologically and economically to the Black Hills; estimated numbers for deer range between 40,000 to 50,000 animals (Huxoll 2004; Terrall et al. 2005). Applications for deer licenses in 2010 were 11,275 for residents and 1,241 for non-residents, who applied for 4,900 resident and 392 non-resident licenses (Huxoll 2011). South Dakota deer hunters spent an average of $1,581 per year on deer hunting alone, and spent an average of 13 days hunting deer per year (U.S. Fish and Wildlife Service 2003). Non-consumptive wildlife watching also is popular with 45% of South Dakotans participating and spending an average of $738 per year on these activities (U.S. Fish and Wildlife Service 2003). Despite the importance of these species to the Black Hills, topography, vegetation, and behavior of these species make estimates of population size, or density, difficult to obtain and those available suffer from poor precision. General randomized tessellation stratified (GRTS) samples (Stevens and Olsen 1999; Stevens and Olsen 2003; Stevens and Olsen 2004) have become a popular sampling scheme for large-scale long-term environmental surveys. GRTS samples with reverse hierarchical ordering are designed to generate spatially balanced samples for any sample size. As such, GRTS sampling could provide robust estimates of density of deer for management units in the Black Hills. Such estimates of density would allow development of reasonable models that mimic population change and thus, allow refined management of deer in the Black Hills.

Fall deer classification surveys are used to determine recruitment rates and sex ratios in game management units across the state. Trends in recruitment and sex ratio data sets are used to assess harvest strategies and evaluate management direction. Recruitment estimates often impact harvest objectives and direction in many deer units. Fall classification data are also applied to other data sets to model deer populations in management units, but reliability of modeling relies heavily on accurate estimates of recruitment and gender makeup of the population. Small errors in sex ratios and recruitment will significantly affect estimates of future deer populations in most models. Current survey methods in South Dakota allow surveys to be completed over multiple months and using multiple methods, both shown in previous research to provide substantial biases. Other than the one year study done in the Black Hills
back in the 60’s (Progulske and Duerre 1964), no research has been conducted in South Dakota or similar habitats to evaluate these surveys.

Furthermore, the arbitrary designation of sample size objectives for both the pronghorn and deer herd composition surveys in South Dakota warrants additional investigation. Most likely the goal of 30 observations for deer counts is insufficient, however, selecting a larger sample goal subjectively may result in collecting more observations than needed. The pronghorn sample objective of 10% may seem sufficient, but it is unknown whether a smaller sample size would adequately represent the population recruitment, or if a larger sample is required.

Objectives:

1. Estimate population size of deer in the Black Hills using general randomized tessellation stratified samples.

2. Compare estimates of population size of deer among management units.

3. Evaluate factors affecting population size of deer relative to management units in the Black Hills.

4. Develop population model and survey methodology and recommendations to South Dakota Department of Game, Fish and Parks for implementation in the Black Hills.

5. Determine minimum sample size for deer and pronghorn classification surveys.

6. Compare September and October (deer) and August and September (pronghorn) counts.

7. Compare spotlight and daylight counts for deer surveys.

8. Assess feasibility of obtaining male:female ratios from deer survey data.

9. Evaluate impacts of other survey variations such as a) counting all deer observed vs. only conclusive counts, b) distance from cover, and c) number of observers for deer and pronghorn surveys.

10. Develop survey methodology and recommendations to South Dakota Department of Game, Fish & Parks for implementation of fall classification surveys for deer and pronghorn.

Study Location: Black Hills, South Dakota and Statewide

Expected Completion: June 2015
**Principal Investigator:** Dr. Jonathan A. Jenks, Distinguished Professor, South Dakota State University

**Other Personnel:** Kris Cudmore, Graduate Research Assistant, South Dakota State University

John Kanta, Regional Wildlife Manager, South Dakota Department of Game, Fish and Parks

Andy Lindbloom, Senior Big Game Biologist, South Dakota Department of Game, Fish and Parks

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