Alberta Conservation Association
2008/09 Project Summary Report

Project name: *Southwest Montane Elk Sightability Project: Improving Winter Range Counts and Observed Sex Ratios*

Project leader: Mike Jokinen

Primary ACA staff on this project (including seasonals): Mike Jokinen, Nathan Webb

Partnerships:
The SW Montane Elk Steering Committee was formed in 2005 and consists of the following collaborative partners and funding sources:

Shell Canada Ltd., Devon Energy Corporation, Alberta Sustainable Resource Development, Alberta Sport, Recreation, Parks and Wildlife Foundation, World Wildlife Fund, Spray Lakes Sawmills, University of Alberta, University of Calgary, Oregon State University, Parks Canada, Alberta Conservation Association, Canadian Wildlife Federation, Alberta Ingenuity Fund, Safari Club International, Boone and Crockett Club, Southwest Alberta Sustainable Community Initiative and NSERC.

Key findings:

- Early results suggest bull elk (3 point+) display different patterns of space use within their winter range when compared with cow elk. Bull elk also appear to occupy smaller winter home ranges on average. This may lead to population trend estimates that understand the proportion of bulls in the area.

Abstract
In Alberta, elk are highly valued as an important component of large mammal predator-prey systems, as a recreational resource, and as an indicator species for assessing the impacts of industrial activity. In some areas, elk are also a major source of conflict with landowners as they compete with domestic stock for forage. Because of the diversity of perspectives surrounding elk, accurate population estimates are important for informing management decisions that attempt to balance a controversial species.

Elk aerial surveys in Southwest Alberta are currently conducted as total winter range counts during weather conditions that result in large elk congregations, providing good sightability. While these surveys provide a useful measure of relative abundance through time, they are a minimum count and do not allow estimates of the proportion of the population that are missed. Mature bull elk (3 point+) typically travel in smaller groups and may exhibit differential habitat use from cow groups. It is likely that estimates of bull numbers gained from trend surveys are biased low due to differential sightability between the two sexes.

Elk survey data could therefore be enhanced with development of methodology that correct winter range counts for sightability or identify new survey areas that would improve the accuracy of observed bull: cow ratios. Utilizing radio collared elk data gathered as part of the Southwest Montane Elk Study, it may be possible to identify winter ranges used by mature bull elk that are not currently surveyed, and if necessary, develop a site-specific model to predict the proportion of both bull and cow elk that are observed during winter range counts based on weather conditions, observed group sizes, time of year, and habitat factors. In fiscal year 2008/2009, we used previously collected GPS collar location data from both mature bull and cow elk to examine patterns of spatial overlap between the two sexes during the period when aerial surveys would be conducted (January-March). Mature bull and cow elk showed different patterns of space use throughout the winter, suggesting that current surveys may underestimate bull: cow ratios if they are focused on large elk congregations.

Introduction

Determining the number of ungulates missed during surveys is a crucial component of interpreting survey results (Caughley 1974). Not accounting for sightability during aerial surveys can cause substantial errors in the resulting population calculations, including biases in sex and age structure and wide confidence intervals (Caughley 1974, McCorquodale 2001). Slight changes in weather patterns have proven to influence herding behaviour of elk, with potentially important implications for the proportion of elk observed during a survey (Boyce 1989, Allen 2005). Even trend-type surveys, which seek to estimate the trajectory of population change, may suffer when sightability differs within a survey or among surveys (Lancia et al. 1996).

Elk aerial surveys in Southwest Alberta are currently conducted as total trend counts during weather conditions that result in large elk congregations, providing good sightability. While these surveys provide a useful measure of elk relative abundance through time, they are a minimum count and do not allow estimates of the proportion of elk missed. From an elk harvest management perspective, mature bull elk typically travel in smaller groups and may exhibit differential habitat use from cow groups. It is likely that estimates of bull: cow ratios derived using the current survey approach are biased due to differential sightability between the two sexes.

Methods

Using previously collected GPS collar location data from both mature bull (3 point+) and cow elk during 2008, we examined patterns of spatial overlap between the two sexes during the period when aerial surveys would be conducted (January-March). We developed 95% Minimum Convex Polygon and kernel home ranges in ArcGIS 9.2 for each collared elk and calculated the amount of within- and between-sex overlap. We tested for differences in space-use using one-tailed t-tests, ANOVA and Volume of Intersection calculations in Microsoft Excel and R.

Results

We compared percent overlap of 5 mature (3 point+) bull elk and 13 cow elk during winter 2008 (January-March). Elk collars were on a 2 hour fix interval and the number of fixes per animal during ranged from 665 to 1056 locations. Our initial observation suggest mature bull elk winter home range size is half that of cow elk on average.

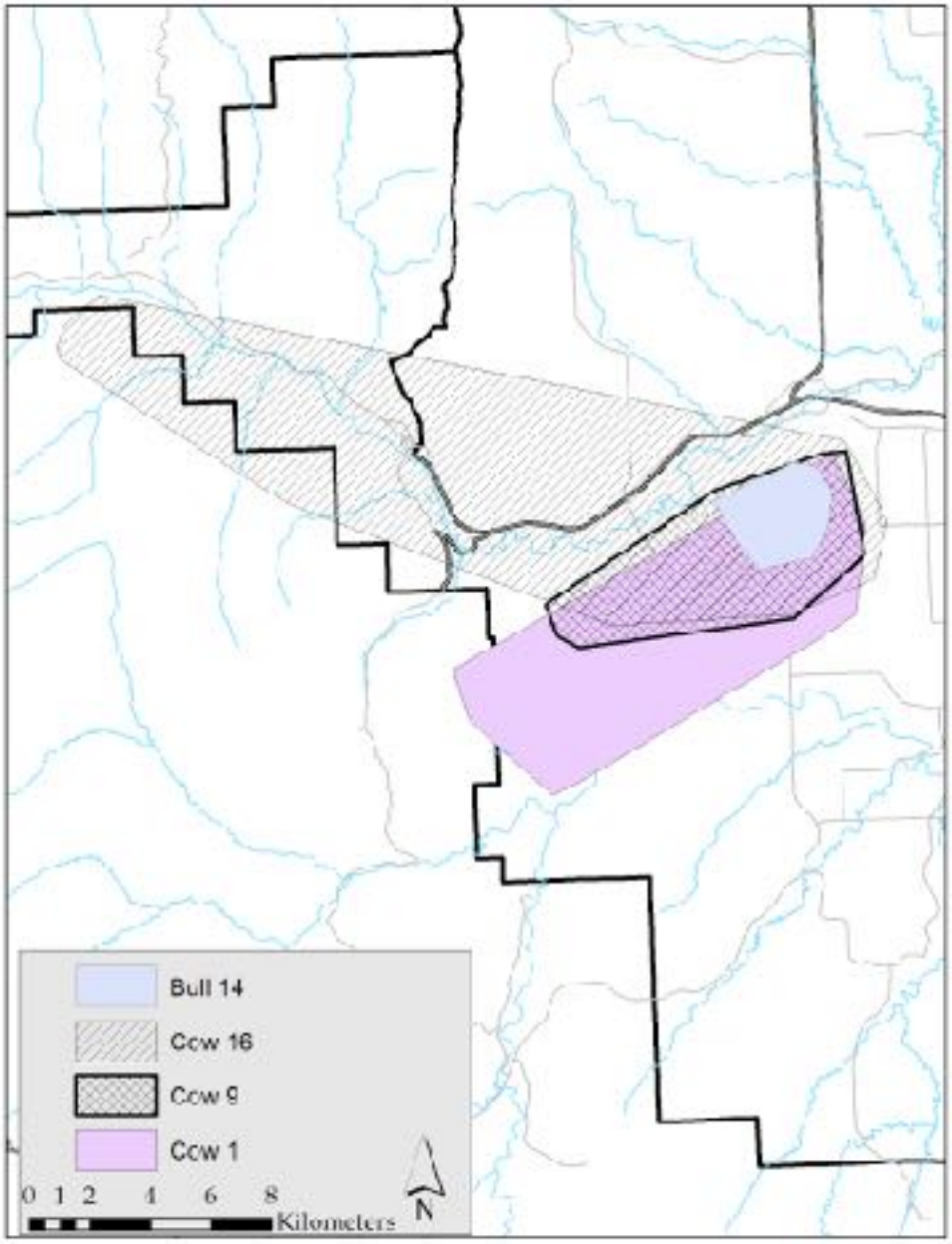

Figure 1. Minimum Convex Polygons (95%) of bull and cow elk winter range utilization in Wildlife Management Unit 302 (Jan-Mar) 2008.

Individual bull and cow elk used consistent home range boundaries from January-March, allowing pooling of all GPS collar data from each animal across all 3 months. When pooled,

mature bull elk home ranges overlapped less with cow elk home ranges than cows overlapped with each other (P=0.017), indicating that bulls utilized different home ranges than cows during winter. Finally, volume of intersection analyses indicated that bulls and cows showed different patterns of space use within their home ranges (P =0.040).

Conclusions

Bull and cow elk in southwestern Alberta exhibited differential patterns of space use during the winter of 2008. In fiscal year 2009, we will increase our sample size by incorporating 2009 winter range data, testing for yearly differences. If spatial overlap between bull and cow elk continues to be low, we will develop a resource selection function for bull elk, identifying areas of high probability of winter use. We will conduct aerial surveys of areas identified by the model as having a high probability of use by bulls to determine if these areas are occupied by bulls and should be included in winter range counts. If spatial overlap between bull and cow elk is high, we will develop a sightability model to correct the number of bulls and cows observed during winter range counts in order to develop more accurate estimates of sex ratios.

Communications

- Our project objectives and staff bio's highlighted on the Southwest Alberta Montane Elk Study Website: (http://www.montaneelk.com).
- Participation on the SW Alberta Montane Elk Study Steering Committee meetings.
- Poster – Spatial distribution of elk within the Southwest Montane: Improving winter range counts and sex ratios, information session at Shell Center, Calgary, February 12th, 2009.
- Poster - Spatial distribution of elk within the Southwest Montane: Improving winter range counts and sex ratios, Alberta Chapter of the Wildlife Society annual conference, Edmonton, March 7-8th, 2009.

Literature cited

Allen, J.R. 2005. Use of sightability models and resource selection functions to enhance aerial population surveys of elk (*Cervus elaphus*) in Alberta. M. Sc. Thesis, University of Alberta, Alberta Canada. 69pp.

Boyce, M.S. 1989. The Jackson elk herd. Chapter 3: the elk population. Cambridge University Press.

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Lancia, R.A., J.D. Nichols and K.H. Pollock. 1996. Estimating the number of animals in wildlife populations. Pages 214-253 *In* T.A. Bookhout, editor. Research and management techniques for wildlife and habitats. The Wildlife Society. 740pp.

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