ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 115526
Juneau, AK 99811-5526

Alaska Department of Fish and Game
Wildlife Restoration Grant

GRANT NUMBER: W-33-8

PROJECT NUMBER: 1.66

PROJECT TITLE: Evaluating research options for developing a GSPE sightability correction factor

PROJECT DURATION: 1 July 2007–30 June 2012

REPORT PERIOD: 1 July 2009–30 June 2010

REPORT DUE TO HQ: 1 September 2010

PRINCIPAL INVESTIGATOR: Kalin A. Kellie

WORK LOCATION: Interior Alaska (Region III)

COOPERATOR: Jay Ver Hoef (NOAA)

I. PROGRESS ON PROJECT OBJECTIVES DURING LAST SEGMENT

OBJECTIVE 1: Evaluate the effects of search intensity on sightability.

A student intern (C. Pylant) and I digitized data from the 1970s sightability study, organizing information into a Microsoft Access® database and relational GIS shapefiles. I combined this information with recent geospatial population estimation (GSPE) sightability data into a dataset useful for building a spatial sightability model. I combined sightability and search intensity data from the 1970s study and the current GSPE study into a single dataset in order to develop a logistic relationship between sightability and search intensity. This relationship expands on the one published in the moose survey technique manual developed by Gasaway et al. (1986:23) and encompasses a wider range of search intensities.

OBJECTIVE 2: Evaluate the sensitivity of the GSPE to variation in sightability and other sampling characteristics.

I generated 2 "known" populations from composites of >5 survey years at 2 different moose densities (>3 moose/mi^2 and <0.5 moose/mi^2). I averaged moose counts from units sampled in >1 year and interpolated unsampled units from those sampled. I developed a program in statistical software "R" (R Development Core Team 2008) to run simulated moose surveys and population estimates on the 2 "known" moose populations. Simulations included different levels of sampling, sampling ratios and stratification error. In addition, each simulation recorded the performance of reported GSPE precision. I created plots used to evaluate the combined effect of all parameters (i.e., multivariate comparisons). B. Taras (ADF&G DWC Biometrician) and J. Ver Hoef (NOAA)

recommended including sensitivity analyses related to trend detection as this is a significant goal of GSPE population estimation.

OBJECTIVE 3: Develop a spatial sightability model using percent canopy cover generated from satellite imagery.

Poor survey conditions prevented completion of sightability trials in Unit 20A scheduled for winter 2007. Because this 2-year pilot study is designed to provide the Alaska Department of Fish and Game (ADF&G) with timely recommendations for future sightability correction factor (SCF) and GSPE research, I modified the study design and used existing data for model development and analyses. I used FY08 operation funds slated for collecting Unit 20A sightability data to hire student intern C. Pylant in February 2008 to assist with data entry and basic analyses. A statewide vegetation classification called the National Land Cover Data set (NLCD 2001)[1], available through the U.S. Environmental Protection Agency, provided 30 m-resolution vegetation information for all of Alaska. I summarized vegetation into 3 different classification systems for building the vegetation layer for the SCF model, summarizing for each GSPE sample unit by percent vegetation type. J. Ver Hoef and I evaluated the effectiveness of these 3 classification systems as a covariate for sightability. Percent forest was chosen as the best covariate. J. Ver Hoef then created a nonlinear logistic SCF model using all Unit 20A data and McGrath Experimental Micro Management Area data through 2006. The model is based on average search intensity during the survey and the percent of forest pixels (30 m resolution) in the GSPE unit. The equation for calculating the variance for the SCF model still needs to be created and combined with the variance surrounding GSPE population estimates.

II. SUMMARY OF WORK COMPLETED ON JOBS IDENTIFIED IN ANNUAL PLAN THIS PERIOD

OBJECTIVE 1: Evaluate the effects of search intensity on sightability.
JOB/ACTIVITY 1C&D: Moose survey data entry and summary

Accomplishments: I revisited the logistic SCF-search intensity relationship derived from the raw data referenced in Gasaway et al. 1986 in combination with recent sightability information from GSPE sightability trials conducted from 1999 to 2006. Through a separate analysis conducted for the Galena area biologist, I also discovered that moose density may play a critical role in the relationship between search intensity and sightability. This may drastically affect recommendations for search intensity when conducting the GSPE. I have captured this aspect of GSPE sightability as a new job/activity (1d). I examined the relationship between moose density and search intensity using GPS track data from a 2005 GSPE survey. Based on this analysis, it is clear that moose density plays a role in the relationship between search intensity and sightability and should be included in these models.

[1] http://www.epa.gov/mrlc/nlcd-2001.html

OBJECTIVE 2: Evaluate the sensitivity of the GSPE to variation in sightability and other sampling characteristics.
JOB/ACTIVITY 2A: Create 3 "known" moose populations to use in simulations

Accomplishments: I added an intermediate-density population (Unit 20E) to our simulations to provide a midpoint for analyses involving moose density. The objective has been altered in the proposal changes to reflect this.

JOB/ACTIVITY 2B: Run simulations on various sampling characteristics of the GSPE
Accomplishments: B. Taras and I reviewed simulations existing prior to his involvement. He re-ran all simulations using new techniques and investigated the possibility of obtaining spurious GSPE estimates when sample sizes are low in low density populations. Due to time constraints, he has not yet completed these simulations and they are currently slated to be completed by October 2010.

JOB/ACTIVITY 2C: Create a model to evaluate GSPE sensitivity
Accomplishments: Completion of data analysis was again delayed because statistical assistance was delayed. We have extended the project for 2 years in anticipation of any additional delays and to incorporate additional aspects of the analysis that have developed as a result of the preliminary work. All previous analyses related to this objective were rejected in favor of a new power analysis designed by J. Ver Hoef and modified by B. Taras to deal with multiple moose densities. The 3 simulated populations were analyzed for trend detection at various sample sizes, time periods, and magnitudes of trend. The remaining work on this objective includes interpretation of analyses and the generation of figures and tables that can be used in a publication.

JOB/ACTIVITY 2D: Review GSPE survey data for Interior Alaska
Accomplishments: I reviewed 84 GSPE surveys from 21 survey areas in Interior Alaska and compiled this information into 2 tables: one that delineated each survey separately and one that summarized information by survey area. I also conducted a multivariate analysis that considered the relative effects of moose density, survey area size, sample size, and season on GSPE survey precision.

OBJECTIVE 3: Develop a spatial sightability model using percent canopy cover generated from satellite imagery.
JOB/ACTIVITY 3C: Develop a spatial model for sightability

Accomplishments: The last of the methods for spatial SCF model were documented by J. Ver Hoef. The results were presented at the July 2009 regional meeting. The technique was not well-received by management biologists because they felt that it failed to capture aspects of sightability that are most likely to vary among surveys within a survey area. The SCF model is now ready to be written up for publication in a statistical journal and later be incorporated into a wildlife manuscript comparing SCF techniques.

JOB/ACTIVITY 3D: Validate the spatial model
Accomplishments: We examined model performance in various game management units. As part of this validation, J. Ver Hoef developed a power analysis that was then adapted and used in Job 2c.

OBJECTIVE 4: Writing.
JOB/ACTIVITY 4A: Draft a manuscript that presents findings on search intensity, GSPE sensitivity to variation in sampling characteristics

Accomplishments: I drafted the sections of this manuscript that detail the review of GSPE surveys and associated analyses. Simulations and power analyses will be incorporated as they are completed.

JOB/ACTIVITY 4B: Write a manuscript for a statistical journal with Jay Ver Hoef detailing the statistical model used in the spatial SCF.
Accomplishments: Jay Ver Hoef drafted the statistical methods and results in manuscript form for the spatially-modeled SCF.

III. COSTS INCURRED DURING THIS SEGMENT

No operating funds were used during this segment.

IV. SIGNIFICANT DEVIATIONS AND/OR ADDITIONAL FEDERAL AID-FUNDED WORK NOT DESCRIBED ABOVE THAT WAS ACCOMPLISHED ON THIS PROJECT DURING THIS SEGMENT PERIOD

I prepared presentations for regional meetings in July 2009 and December 2009 detailing various segments of this work and incorporated feedback from area biologists into the study design.

V. PUBLICATIONS

No publications were drafted during this period.

Literature Cited:

GASAWAY, W. C., S. D. DUBOIS, D. J. REED, AND S. J. HARBO. 1986. Estimating moose population parameters from aerial surveys. Biological papers of the University of Alaska, Institute of Arctic Biology, No. 22.

R DEVELOPMENT CORE TEAM. 2008. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. (http://www.r-project.org/) Accessed 25 August 2010.

VI. RECOMMENDATIONS FOR THIS PROJECT

This research has migrated from a 2-year pilot study to a 5-year study because the scope of the study is larger than anticipated and because biometrician time has been limited. At the completion of this project in 2012, we will have density-specific recommendations for GSPE application. In addition, we will identify scenarios where the GSPE is not logistically feasible for meeting management needs of trend detection at low density.

Finally, we will prepare an in-depth comparison among methods for obtaining a sightability correction factor and provide recommendations for applying SCFs to the GSPE. We expect to make additional recommendations regarding the development of an alternative method for monitoring moose populations at very low density that will improve power to detect population trends.

Prepared by: Kalin A. Kellie

Date: 25 August 2010