

Rocky Mountains Cooperative Ecosystem Studies Unit
Project Summary

Project Title: Forecasting in Support of Adaptive Management of the Rocky Mountain National Park Elk Herd

Discipline: Natural
Type of Project: Technical Assistance/Research
Funding Agency: National Park Service
Other Partners/Cooperators: Colorado State University
Effective Dates: July 1, 2019 – June 30, 2024
Funding Amount: \$25,864

Investigators and Agency Representative:

NPS Contact: Hanem Abouelezz, Landscape Ecologist, Rocky Mountain National Park 1000 US Highway 36, Estes Park, CO 80517, hanem_abouelezz@nps.gov

Investigator: N. Thompson Hobbs, Colorado State University, Natural Resource Ecology Laboratory, NESB B227, Fort Collins, CO 80523, 970-491-5738, nthobbs@nrel.colostate.edu

Project Abstract:

Project Goals – The National Park Service manages the abundance of elk wintering in Rocky Mountain National Park (RMNP) to meet objectives specified in the Elk and Vegetation Management Plan (EVMP). The EVMP seeks to reestablish a healthy balance between the elk herd and the habitat they use, allowing for the restoration of over browsed aspen and willow communities, increases in biodiversity and maintaining and improving world class wildlife viewing opportunities. The EVMP specifies that the elk population will be maintained within a target range of 600 – 800 animals. To achieve these objectives, the population is managed adaptively, based on the science produced, in part, by this partnership. Each year, the size of the population will be assessed relative to the target range and, based on this assessment, management actions will be chosen to assure that the trajectory of the population remains within that range.

Essential to the success of this approach is a model of elk population dynamics that allows managers to forecast the effect of alternative management actions on the elk population. In earlier work, Hobbs and Hoeting (2009) and Ketz et al. (2016) developed forecasting models that predicts the future size of the RMNP elk population based on historic data and current census estimates. Because the model uses historic data to estimate uncertainties associated with these predictions, it is feasible to specify the probability that the next year's population will be within limits specified by park management. It is also feasible to estimate the probability distribution of the current population size in a way that includes historic as well as current data and that responds to all sources of uncertainty revealed by the full, historical time series of observations of the elk population. Counts are adjusted for animals that are present within park boundaries but not observed during ground counts using a prior distribution on detection probability obtained from the analysis of Ketz et al. (2018). This model provides a firm, statistically defensible basis for adaptive management of the park's elk herd.

Project Objectives – Adaptive management will be implemented as follows. Each year, the size of the park's population and its sex and age composition will be estimated using modern census methods developed as part of a previous project. Ground counts and classification will be conducted three times each month, October – April. Using the forecasting model, the current year's data will be combined with the full time series of data in from previous years to estimate the probability distribution of the current and subsequent year's population size. These probability distributions form the basis for choice of management actions outlined under the EVMP, including culling of animals, aversive conditioning of animals and/or protecting vulnerable habitat with fencing projects. Moreover, the model's predictions from the previous year will be compared with the current, realized population estimate obtained from census. This comparison may motivate changes in the model to improve the accuracy of its predictions. If the park collects aerial census data on elk on the winter range, that information may also be used. This cycle will be repeated annually, allowing continuous improvement in the model and in management.