

**Project Summary**  
**Rocky Mountains Cooperative Ecosystem Studies Unit**

**Project Title:** Develop Service-wide Review and Population Models for Ungulate Management in the National Park Service

**Discipline:** Natural  
**Type of Project:** Technical Assistance/Research  
**Funding Agency:** National Park Service  
**Other Partners/Cooperators:** Colorado State University  
**Effective Dates:** 7/1/2011 - 9/1/2014  
**Funding Amount:** \$230,500 [FY13: \$42,500; FY12: \$40,000; FY11: \$148,000]

**Investigators and Agency Representative:**

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**Project Abstract:** Colorado State University in cooperation and collaboration with the Biological Resource Management Division will:

Task 1

1. A complete literature review and electronic catalog of historic and contemporary National Park Service (NPS) ungulate management practices. Two research assistants from Colorado State University will be the primary lead on this task, with assistance from BRMD staff.
2. Identification of data needs from parks to conduct a service-wide review, acquisition of that data, and compilation of an electronic database that summarizes this information. The research assistants will be the primary lead on this task, with assistance from BRMD staff.
3. Assistance and participation in a workshop that will bring park managers together to determine the current state of knowledge and approach to ungulate management in the NPS. Assist with the summary workshop report and edits. The research assistants will be the primary lead on this task, with assistance from BRMD staff and Dr. Hobbs
4. A comprehensive report for NPS leadership that details methods, findings, strengths, weaknesses, and recommendations for current and future ungulate management in the NPS. BRMD staff will be the primary lead on this task, with assistance from the research assistants and Dr. Hobbs.

Task 2

1. Acquisition of all available and relevant population and ecological data on ungulate management in the NPS (e.g., population surveys, demographics, habitat conditions, vegetation maps, etc.).
2. Development of a general ungulate population model for management purposes. The model will incorporate the effects of different culling and fertility control regimes, relate population goals with management efforts, include density dependent feedbacks and environmental stochasticity, and estimate sources of uncertainty in a Bayesian framework.
3. Development of 2-3 park- and species-specific ungulate population models for NPS management purposes illustrating the general approach accomplished in 6. Park- and species-specific models to be developed will depend on NPS needs and data availability. Models will be conducted in a Bayesian framework in a similar fashion as the general ungulate model (see task 2 above), but will also incorporate site- and/or population-specific attributes and knowledge (e.g., see task 1 above).
4. Provide technical assistance to NPS biologists at BRMD, so that NPS may increase capacity to use the models for analysis, and to build and refine future models. Final report that describes model development, code, and implications for NPS monitoring, management, and research programs.
5. Submission of manuscript to a peer-reviewed journal. The manuscript will cover the theoretical basis for the model(s), describe development and methods of model formulation, and discuss major conclusions.

**Outcomes with Completion Dates:**

Task 1 -- September 1, 2014  
Task 2 -- September 1, 2014

**Keywords:** population models, ungulate management, National Park Service, Colorado State University