Project Summary
Rocky Mountains Cooperative Ecosystem Studies Unit

Project Title: Yellowstone Bison – Movement Ecology and Population Management Scenarios

Discipline: Natural
Type of Project: Research
Funding Agency: National Park Service
Other Partners/Cooperators: Colorado State University
Effective Dates: 9/1/2009 – 8/1/2014
Funding Amount: $ 39,833

Investigators and Agency Representative:
NPS Contact: Rick Wallen, Wildlife Biologist, Yellowstone Center for Resources, POB 168, Yellowstone
NP, WY, 82190; 307.344.2207, rick_wallen@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: Our current understanding of migratory patterns exhibited by Yellowstone bison is
that groups of animals move to low elevation winter ranges in response to population density and
climatic conditions, with some influence driven by annual forage production and individual body
condition. Of importance to decision makers is whether we can predict the movement patterns of the
population in a manner that effective risk management actions can be planned in advance of bison
arriving at the boundary (e.g. an annual plan of action put in place in the autumn or early winter
in order to manage both population abundance and risk of brucellosis transmission to livestock).

The goal of the analysis is to understand the biological drivers that most influence bison
migration to boundary winter ranges from higher elevation summer range, and to use this
understanding to forecast bison movements. Initially, a simple model will be built to describe the
movement patterns that exist in the GPS data set, showing bison movements toward boundary ranges.
The first product (expected in October 2010) will describe movements in the absence of any
covariates associated with migratory patterns, and will identify behaviors that individual animals
exhibit based on detailed review of the GPS locations recorded in the dataset. The final product
will explain these movements using a Bayesian, state-space model. The state-space model will
predict the probability of bison movements among identified polygons of habitat, including low
elevation winter ranges along the park boundary. Covariates will be data on 1) available forage
estimates derived form NDVI, 2) overwinter snow pack characteristics and temperature, 4) diet
nutritional quality, and 5) population abundance and distribution.   YELL will provide these data
to Colorado State University (Final report to YELL expected in Sept 2011).

A second analysis will be a management experiment using the population model of Yellowstone bison
currently being completed by Dr. Hobbs at Colorado State University (due to be completed by 30
November 2009). This initial model evaluates the consequences of two possible management scenarios
with the expected outcomes being predictions about how the population may respond numerically and
how the demographics and brucellosis prevalence parameters may be affected by each scenario. This
work described in this agreement will incorporate one additional scenario for consideration. This
additional scenario will evaluate removal strategies aimed at stabilizing population growth rate
and decreasing the prevalence of brucellosis sero-positive bison. Removal strategies to be
evaluated will be chosen based on discussion between Yell and Dr. Hobbs. In addition, the model
will be updated through collaboration with Dr. Hobbs and YELL using monitoring data collected by
the Bison Ecology and Management Program. Using the updated model, new projections will be made in
October of 2010 based on data collected during 2009-2010. The updated model will be used to
evaluate alternative management actions in the adaptive management process used by the interagency
bison management partnership.

Outcomes with Completion Dates:
     1) Migratory movement models are due in October of 2010 and September of 2011.
     2) Population scenario reports are due in July of 2010 and October of 2010.

Keywords: habitat modeling, bison, population management scenarios, Yellowstone National Park,
Colorado State University