

Bison, Snow and Road Corridors: A two day workshop on January 18-19, 2006 to identify hypothesis driven questions, research, and management experiments that may resolve whether the Firehole-Mammoth corridor serves as a barrier to bison movements between the Central and Northern winter ranges during non-road grooming scenarios.

Workshop Organizing Committee:

Lisa Graumlich (Big Sky Institute)
Aaron Jones (Big Sky Institute)
Glenn Plumb (Yellowstone National Park)
Kathy Tonnessen (Rocky Mountain Cooperative Ecosystems Studies Unit)
Mike Yochim (Yellowstone National Park)

Workshop Recorders:

Troy Davis (Yellowstone National Park)
Julia Nelson (Big Sky Institute)

Invited Workshop Participants:

Keith Aune (Montana Fish, Wildlife and Parks)
John Borkowski (Montana State University)
Jason Bruggeman (Montana State University)
Mike Coughenour (Colorado State University)
Sarah Dewey (Grand Teton National Park) *will not attend*
Bob Garrott (Montana State University) *will attend first day only*
Cormack Gates (University of Calgary)
Peter Gogan (USGS-Biological Resources Division)
Dave Klein (University of Alaska) *will not attend*
Amy McNamara (Greater Yellowstone Coalition)
Mary Meagher (Yellowstone National Park - retired)
Tom Olliff (Yellowstone National Park)
Tim Reid (Yellowstone National Park)
Dan Reinhart (Yellowstone National Park)
DJ Schubert (Animal Welfare Institute)
Rick Wallen (Yellowstone National Park)
PJ White (Yellowstone National Park)

Background (excerpted from Gates et al. 2005):

Yellowstone National Park is the only area in the lower 48 states where bison have existed in a wild state since prehistoric times. Bison occupied the region encompassing the park from shortly after recession of the last glaciers 10,000 to 12,000 years ago, until they were nearly extirpated by market and subsistence hunting, and poaching by 1900. Yellowstone National Park is not a self contained ecosystem, covering only 8,983 km² or slightly more than 10% of the Greater Yellowstone Ecosystem (80,503 km²). Distribution, movements and population dynamics of

large mammal populations need to be viewed at spatial scales significantly larger than Yellowstone National Park itself in the context of historic spatial patterns, habitat composition, and landscape configuration and connectivity. Also, ecological processes play out over many decades so management actions may not be fully comprehended at shorter time scales.

Historical records for 1902 indicate the persistence of a small remnant bison population in the eastern central interior of the park (22-30 individuals). Northern Range bison were restored in YNP through captive breeding (1902-1915), followed by gradual release and eventual elimination of husbandry by 1952. Interchange between Central Range bison in the Pelican Valley and Northern Range bison was suspected as early as the 1920s, related to common summer range in the Mirror Plateau and western slopes of the Absarokas (Upper Lamar Valley). Bison were reintroduced to the central interior of the park in 1936. Interchange between bison in Hayden Valley and the Firehole via the Mary Mountain Trail was first documented in winter 1945 but probably occurred earlier. The bison using the two areas became known as the Mary Mountain herd. Movements in winter between the Pelican Valley and Hayden Valley historically occurred when wintering populations were high in the Pelican Valley and Hayden Valley, e.g. in winter 1956.

Bison in Yellowstone attempt to compensate for declining per capita food resources by range expansion, thus maintaining a relatively stable instantaneous density. However, compensation is not exact; population growth rate declines with density because high quality foraging patches are limited in overall area, are patchily distributed, and depleted first, forcing bison to shift to poorer quality patches as density increases. The likely demographic responses are decreased fecundity and increased juvenile mortality. At low to moderate densities, observed growth capacity has been highest for the Mary Mountain herd (13% to 16% annually), and was lower for the Pelican Valley and Northern Range herds (5% to 6% annually).

Yellowstone National Park includes five winter ranges. The Central herd uses Pelican Valley (55 km²), Mary Mountain (e.g. Hayden/Madison-Firehole, 152 km²), and West Yellowstone (80 km²). The Northern herd occupies Lamar Valley (234 km²), and Gardiner basin (98 km²). These ranges are connected by five primary movement corridors including Firehole-to-Mammoth (59 km), Firehole to West Yellowstone (21 km), Gardiner basin to Lamar (river route 15.2 km; road route 11.4 km), Mirror Plateau (Pelican to Lamar, 30 km), and the shortest corridor Pelican to Hayden (8 km). Range expansion has been gradual, rather than pulsed as described for another erupting bison population in northern Canada. Learning the presence of destination habitat (familiar areas) likely played a significant role in the development of calculated migration and increasingly fluid movements of bison between ranges.

Anecdotal information suggests that bison can break trail for considerable distances through deep snow (>1 m), but in addition to forage limitation, knowledge of destination is likely an important condition. The density of bison in adjacent ranges also likely determines the ability of bison to maintain trails that connect them in winter. Interchange between the Central and Northern Ranges occurred historically since the 1920s, primarily via a corridor over the Mirror Plateau, although movement between the Pelican Valley and Lamar Valley in winter via the unroaded Mirror Plateau is likely constrained in most winters by snow depth, steep terrain and the long distance between these winter ranges.

Since the early 1990s Central Range bison have migrated in increasing numbers north to Blacktail Deer Plateau and the Gardiner basin in winter using a new route associated with the

road allowance between Madison Junction and Mammoth, with most migrants returning to the Hayden Valley for the rut. There is no documented movement of Northern Range Bison to the Central Range via the road corridor. The three key variables determining winter forage availability are previous summer precipitation, snowpack characteristics, and elk and bison density (i.e., forage demand). Inter-range movements of bison should not generally be constrained by winter snowpack in non-road grooming scenarios during most winters. The notable exception to this rule is thought to be the Firehole-Mammoth corridor that may serve as a barrier during all non-road grooming scenarios.

Bison population and spatial dynamics are sensitive to variation in several key variables and interactions between variables. Systematic research has not been carried out on the ability of bison to move through snow under the variety of circumstances present in Yellowstone National Park, and thus the assertion that the Firehole-Mammoth corridor could have historically or currently serve as a barrier to bison movements between the Central and Northern winter ranges during non-road grooming scenarios is constrained by several key uncertainties including a) the threshold depth/density of snow at which low and high density forage-limited bison cannot move through corridors in search of better foraging conditions, b) terrain characteristics (slope, ruggedness) that affect the snow depth/density threshold preventing movements, c) the relationship (shape and scale of the curve) between winter forage availability and probability of bison movement, and d) the relationship (shape and scale of the curve) between winter forage availability, bison density and bison over-winter mortality. To address these uncertainties, Yellowstone National Park seeks to understand the opportunities for research and management experiment(s) designed to test the permeability of the Firehole to Mammoth corridor for bison movement under variable bison population abundance, forage productivity/availability, and snow conditions with a specific focus on the road section between the Madison Administrative Area and Norris Junction.

Workshop Objectives:

The objective of this workshop is to identify a focal suite of hypothesis driven questions that serve as a foundation for research and management experiments that can be practicably implemented to resolve the assertion that the Firehole-Mammoth corridor serves as a barrier to bison movements between the Central and Northern winter ranges during non-road grooming scenarios. This two day workshop is expected to serve as a coarse filter analysis to identify hypothesis driven questions, and practicable research and management experiments, with the expectation that additional effort will need to subsequently occur to fully develop detailed experimental designs, schedules and budgets. The outcomes of this workshop will initially inform the development of alternatives being considered by the ongoing winter use planning effort for Yellowstone NP, Grand Teton NP, and JD Rockefeller, Jr. Memorial Parkway, and may subsequently serve as the basis for a “Request For Proposals” to conduct research and management experiments addressing this issue.

Workshop Agenda:

January 18 - Wednesday

- 8:30AM Welcome – Glenn Plumb
- 8:40-9:00 Winter Use Planning Overview – Mike Yochim
- 9:00-9:30 Overview of 2005 “Gates” Report – Cormack Gates
- 9:30-10:00 Overview of recent GPS bison movement data – Rick Wallen
- 10:00 – Noon Group Discussion: Develop an Impact Hypothesis Diagram scaled to the Firehole to Mammoth corridor with a specific focus on the road section between the Madison Administrative Area and Norris Junction - Facilitated by Cormack Gates
- Noon – 1PM Catered Lunch at HRC and informal discussion
- 1:00-5:00 Group Discussion: Identify Hypothesis Driven Questions - Facilitated by P.J. White

January 19 - Thursday

- 8:30AM Welcome – Glenn Plumb
- 8:40-Noon Group Discussion: Identify Research and Management Experiments - Facilitated by Kathy Tonnessen
- Noon – 1PM Catered lunch at HRC and informal discussion
- 1PM-4PM Group Discussion: Finalize and Recommend Hypotheses, Research, and Management Experiments - Facilitated by Glenn Plumb

Workshop Logistics:

- Lodging will be provided for the nights January 17, 18, 19 as needed, at the Best Western, Gardiner, Montana at the Govt. Rate of \$53.10. Reservations can be secured by calling Diane Eagleson at the BSI office (406-994-2374). Invitees that expect to incur travel, lodging, or other expenses attending the workshop should contact Diane regarding reimbursement procedures.
- The workshop will convene at the YNP Heritage Research Center Conference Room, Gardiner, Montana. The HRC [located adjacent west of the Gardiner school and just north of the Yellowstone Arch] opens at 8AM and you will enter through the front door and sign in at the front desk. Signs will provide directions to the Conference Room.

- A cold lunch will be catered each day. Dinner on Wednesday January 18 will be provided at the Park Street Grill, Gardiner, Montana.

Workshop Report:

The Organizing Committee will prepare a Final Report that will be made available to workshop participants and posted on the internet by February 28, 2006.

Literature Cited:

Gates, C.C., B. Stelfox, T. Muhly, T. Chowns, and R.J. Hudson. 2005. The ecology of bison movements and distribution in and beyond Yellowstone National Park: A critical review with implications for winter use and transboundary population management. Final Report to Yellowstone National Park, April 2005. Faculty of Environmental Design, University of Calgary, Calgary, Alberta, Canada. Report available online at:
<www.nps.gov/yell/technical/planning/gates/index.htm>