



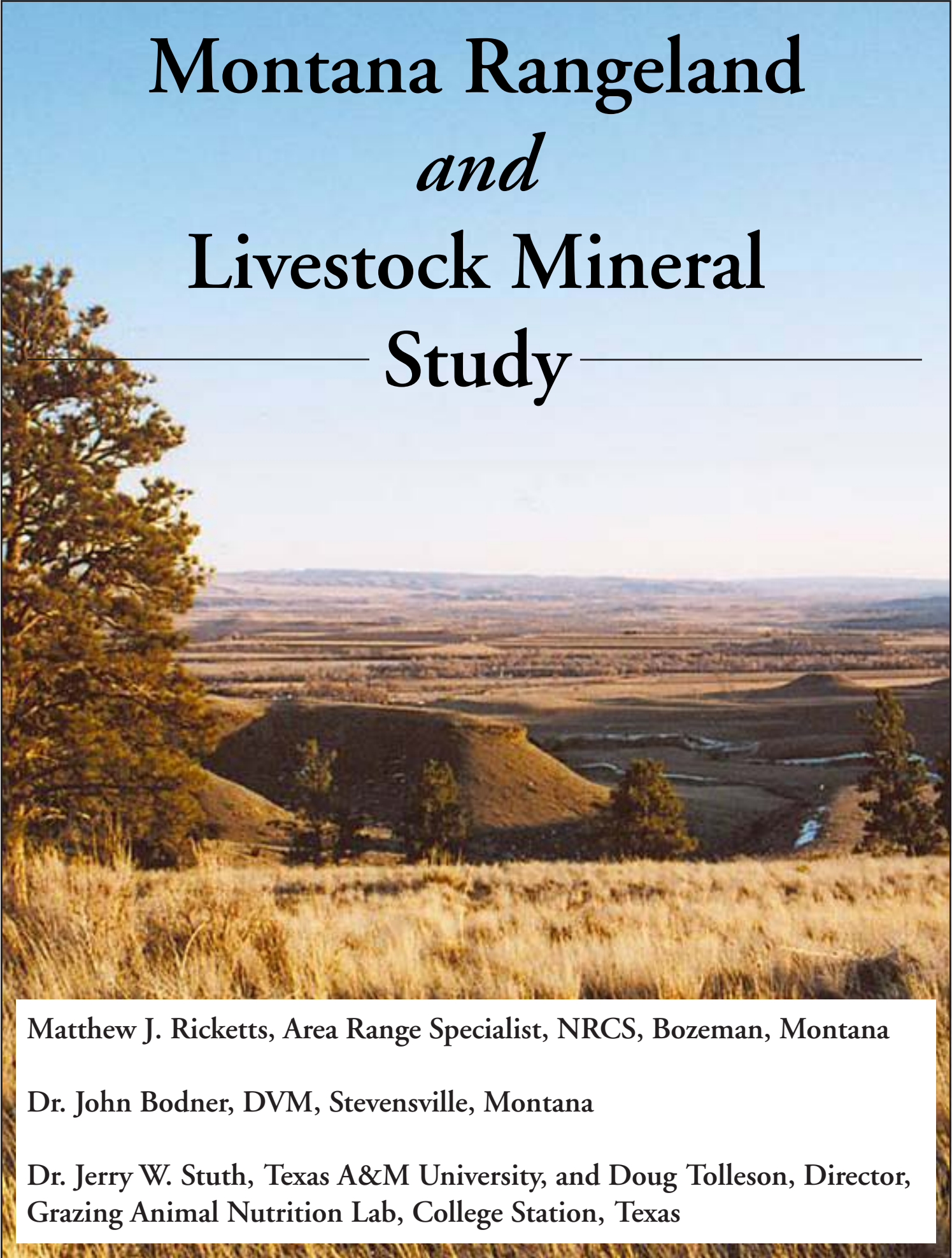
Montana Rangeland and Livestock Mineral Study

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Project Sponsors:

- Stillwater Range Association (A non-profit group of ranchers in Stillwater, Carbon and Yellowstone Counties, who are interested in learning and sharing information about rangeland.)
- Stillwater County Conservation District
- Upper Musselshell County Conservation District
- Stillwater County Extension Service
- Northern Stillwater Resource Area Working Group
- 13 Montana Conservation Districts
- Montana Grazing Lands Conservation Initiative
- Montana Department of Natural Resources and Conservation



Montana Rangeland *and* Livestock Mineral Study

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Objectives

- To determine mineral nutrition status in Montana range cattle
- To identify patterns of mineral deficiency based on rangeland resource areas
- To determine the ability of fecal Near Infrared Reflectance Spectroscopy (NIRS) to predict mineral status in free-ranging cattle, or:
- To discriminate between cattle with adequate versus inadequate mineral levels

Methods

Sampling occurred from July of 2000 to May 2002 and includes:

- 1) Collecting monthly liver biopsies on a total of 50 head of cattle in ten different rangeland herds reflecting different environments in Montana for mineral determination
- 2) Collecting blood samples from all 50 head of cattle three times a year to assess selenium and magnesium status
- 3) Collecting fecal samples from each individual cow, labeled to correlate with the liver biopsy and blood samples, for NIRS
- 4) Evaluating each cow for frame score, body condition score, and weight. Environmental conditions and physiological stage information were collected and the information entered into a computer based decision support system (NUTBAL-Nutritional Balance Analyzer) to predict future animal performance

- 5) Collecting stock water samples and analyzing for any antagonistic mineral levels
- 6) Evaluation of rangeland conditions for typical ecological sites, similarity to potential, plant community type, and productivity in order to associate livestock mineral status with the particular grazing environment and conditions
- 7) Relating results to rangeland resource units, associated weaning percentages, and livestock health costs of each ranch, to see if an association can be made between mineral status and herd productivity

- 8) Cluster analysis statistical techniques will be utilized to identify any resulting patterns

Summary

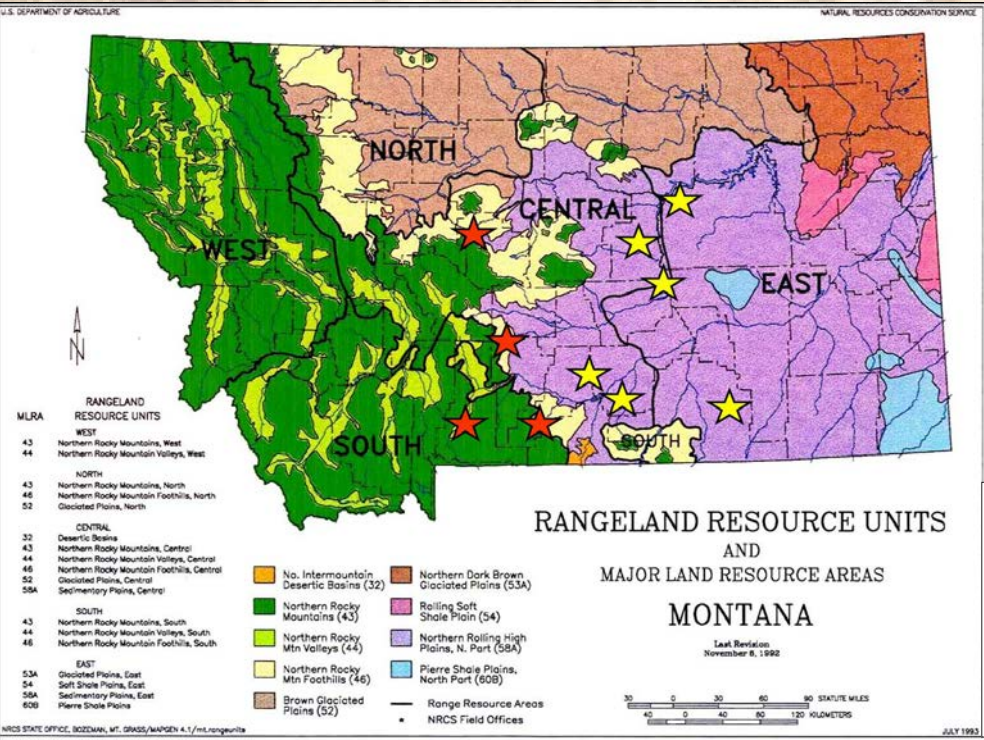
- Mineral status is affected by Range Resource Area
- Diet quality is affected by Range Resource Area

- NIRS predictive equations to determine mineral status were low to moderately successful for the entire dataset
- NIRS predictive equations for ranch and resource area showed improved performance
- Discriminant equations for Cu deficiency were successful, but can be improved with more samples or by developing ranch or region specific datasets

Recommendations

1. The suggested mineral supplementation formulations are presented below. Consumption should be between 2-4 ounces daily. 45-60 days before calving and before weaning are the most critical times.
2. For the Foothills – the primary concern is appropriate selenium supplement. Copper and zinc levels are adequate. Low levels of copper and zinc sulfate are suggested, approximately 1000-1500ppm to account for varying forage quality.

Minerals	Foothills	Valleys	Sedimentary Plains-Low ppt	Sedimentary Plains-Medium ppt	Sedimentary Plains-High ppt
Calcium	12%	12%	12%	12%	12%
Phosphorous	12%	12%	12%	12%	12%
Magnesium	2%	2%	2%	2%	2%
Potassium	2%	2%	2%	2%	2%
Chelated Copper			1300ppm	950ppm	
Copper Sulfate	1000-1500ppm	2200ppm	1525ppm	1200ppm	2200ppm
Total Copper			2825ppm	2510ppm	
Selenium	36ppm	30ppm	10ppm	15ppm	20ppm
Chelated Zinc			1900ppm	1450ppm	
Zinc Sulfate	800-1000ppm	2200ppm	2300ppm	1700ppm	2200ppm
Total Zinc			4200ppm	3150ppm	
Vitamin A	250000 IU/LB	250000 IU/LB	250000 IU/LB	250000 IU/LB	250000 IU/LB
Vitamin D	20000 IU/LB	20000 IU/LB	20000 IU/LB	20000 IU/LB	20000 IU/LB
Vitamin E	300 IU/LB	300 IU/LB	300 IU/LB	300 IU/LB	300 IU/LB



Gathering a fecal sample

Project Area and Sample Locations

- Northern Rocky Mountain Foothills, 15-19" ppt. zone
- Northern Rocky Mountain Valleys, South, 10-15" ppt. zone
- Sedimentary Plains, low avg, 11-13" ppt. zone
- Sedimentary Plains, medium avg, 14-15" ppt. zone
- Sedimentary Plains, high avg, 16-19" ppt. zone



Trochar inserted and liver sample being extracted