The Monroe Department of Natural Resources and Conservation

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13 Montana Conservation Districts
Stillwater County Conservation District
Upper Musselshell County Conservation District
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Montana Grazing Lands Conservation Initiative
Montana Department of Natural Resources and Conservation

Project Sponsors:

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

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

**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.

**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 range-land 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

**Summary**

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

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

**Table: Mineral Status and Nutrient Levels**

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>Magnesium</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
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<tr>
<td>Potassium</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Chelated Copper</td>
<td>1300ppm</td>
<td>950ppm</td>
<td>1200ppm</td>
<td>2200ppm</td>
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</tr>
<tr>
<td>Copper Sulfate</td>
<td>1000-1500ppm</td>
<td>2200ppm</td>
<td>2510ppm</td>
<td>2510ppm</td>
<td></td>
</tr>
<tr>
<td>Total Copper</td>
<td>2825ppm</td>
<td>1522ppm</td>
<td>2510ppm</td>
<td>2510ppm</td>
<td></td>
</tr>
<tr>
<td>Selenium</td>
<td>60ppm</td>
<td>30ppm</td>
<td>15ppm</td>
<td>20ppm</td>
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<tr>
<td>Chelated Zinc</td>
<td>1900ppm</td>
<td>1450ppm</td>
<td>15ppm</td>
<td>20ppm</td>
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<tr>
<td>Zinc Sulfate</td>
<td>800-1000ppm</td>
<td>2200ppm</td>
<td>1700ppm</td>
<td>2200ppm</td>
<td></td>
</tr>
<tr>
<td>Total Zinc</td>
<td>4200ppm</td>
<td>2300ppm</td>
<td>1700ppm</td>
<td>2200ppm</td>
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<tr>
<td>Vitamin A</td>
<td>250000 IU/LB</td>
<td>250000 IU/LB</td>
<td>250000 IU/LB</td>
<td>250000 IU/LB</td>
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<tr>
<td>Vitamin D</td>
<td>20000 IU/LB</td>
<td>20000 IU/LB</td>
<td>20000 IU/LB</td>
<td>20000 IU/LB</td>
<td></td>
</tr>
<tr>
<td>Vitamin E</td>
<td>300 IU/LB</td>
<td>300 IU/LB</td>
<td>300 IU/LB</td>
<td>300 IU/LB</td>
<td></td>
</tr>
</tbody>
</table>

3. Test the water for antagonistic mineral levels. (eg. sulfates greater than 500 ppm.)
4. Apply good grazing management that promotes a healthy and diverse population of forage species. Various species provide different minerals in different amounts and in different seasons.