Forage Demand

100 pairs
4 bulls (Jun 1 – Aug 15) 2000 lb
1200 lb cows (@ BCS 5.0-5.5)
Calves 3 months on July 1, 2008
Grazing season May 1 – Oct 31

<table>
<thead>
<tr>
<th>Animal Weights and AUE Values</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow</td>
<td>1200</td>
<td>1200</td>
<td>1200</td>
<td>1200</td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td>Calf</td>
<td>300</td>
<td>370</td>
<td>440</td>
<td>510</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1200</td>
<td>1200</td>
<td>1500</td>
<td>1570</td>
<td>1640</td>
<td>1710</td>
</tr>
<tr>
<td>AUE</td>
<td>1.2 (+)</td>
<td>1.2 (+)</td>
<td>1.5</td>
<td>1.57</td>
<td>1.64</td>
<td>1.71</td>
</tr>
</tbody>
</table>

Average Animal Unit Equivalent (AUE) per pair = \( \frac{1.47}{2} \) AUE
Animal Unit Equivalent per bull = \( \frac{2.00}{2} \) AUE

How much forage do you need?

\[
(100 \text{ pairs}) \times (\frac{1.47}{2} \text{ AU/pair}) \times (6 \text{ mo}) = 882 \text{ AUM}
\]

\[
(4 \text{ bulls}) \times (\frac{2.00}{2} \text{ AU/bull}) \times (2.5 \text{ mo}) = 20 \text{ AUM}
\]

Total = 902 AUM

**Bonus**: How many acres of pasture (carrying capacity = 0.60 AUM/acre) would be needed to support this herd?

\[
902 \text{ AUM} \div 0.60 \text{ AUM/acre} = 1503 \text{ acres}
\]
Homework
(answers)

<table>
<thead>
<tr>
<th>Pasture</th>
<th>Site</th>
<th>Acres</th>
<th>Stocking Rate AUM/ac</th>
<th>AUM's</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Silty</td>
<td>250</td>
<td>0.50</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>Limy Upland</td>
<td>50</td>
<td>0.40</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>Silty</td>
<td>150</td>
<td>0.40</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Sand</td>
<td>150</td>
<td>0.30</td>
<td>45</td>
</tr>
<tr>
<td>3</td>
<td>Sandy</td>
<td>300</td>
<td>0.50</td>
<td>150</td>
</tr>
<tr>
<td>4</td>
<td>Silty</td>
<td>100</td>
<td>0.50</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Sandy</td>
<td>200</td>
<td>0.40</td>
<td>80</td>
</tr>
<tr>
<td>5</td>
<td>Silty</td>
<td>400</td>
<td>0.60</td>
<td>240</td>
</tr>
</tbody>
</table>

Total available AUM = 770

One Animal Unit Month (AUM) of forage = 780 lb air dried

One Animal Unit Day (AUD) of forage = 26 lb air dried

One Animal Unit (AU) of beef = 1,000 lb of beef animal

**Bonus:** How long could 80 cow-calf pairs (1.5 AUE each) graze Pasture 5 to reach the point where they removed 0.60 AUM/acre from that pasture?

\[
80 \text{ cow-calf pairs} \times 1.5 \text{ AUE} = 120 \text{ AU}
\]

AUM in Pasture 5:
\[
400 \text{ ac} \times 0.60 \frac{\text{AUM}}{\text{ac}} = 240 \text{ AUM}
\]

Length of time:
\[
\frac{240 \text{ AUM}}{120 \text{ AU}} = 2 \text{ months}
\]
# GSL Precipitation (inches)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct. – Mar.</td>
<td>3.36</td>
<td>5.52</td>
<td>6.04</td>
<td>6.04</td>
</tr>
<tr>
<td>April</td>
<td>2.14</td>
<td>2.45</td>
<td>2.05</td>
<td>8.09</td>
</tr>
<tr>
<td>May</td>
<td>3.04</td>
<td>6.67</td>
<td>6.28</td>
<td>14.37</td>
</tr>
<tr>
<td>June</td>
<td>3.66</td>
<td>4.15</td>
<td>2.86</td>
<td>17.23</td>
</tr>
<tr>
<td>July</td>
<td>2.95</td>
<td>4.51</td>
<td>3.48</td>
<td>20.71</td>
</tr>
<tr>
<td>August</td>
<td>2.15</td>
<td>0.50</td>
<td>6.40</td>
<td>27.11</td>
</tr>
<tr>
<td>September</td>
<td>1.76</td>
<td>2.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>19.06</td>
<td>26.04</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
GSL Cumulative Precipitation

- **Long-term Average**
- **2017 - 2018**
- **2018 - 2019**

Cumulative Precipitation (inches)

Oct-Mar Apr May Jun Jul Aug Sep
Grazing Systems

Jerry D. Volesky
Range / Forage Specialist
West Central Res. & Ext. Center
402 West State Farm Rd
North Platte, NE 69101
(308) 696-6710
jerry.volesky@unl.edu

Ranch Practicum - 2019
Elements of Good Grazing Management

1. Stocking rate
2. Timing of grazing (season of use)
3. Distribution
4. Kind/class of livestock
Grazing System:
A specialization of grazing management which defines the periods of grazing and non-grazing.

Examples: short duration, deferred rotation, season-long continuous, etc.
Grazing Systems: History

Pre- 1900: Continuous grazing

Early 1900’s: 2 to 5 pastures - - deferment or rest period important

1950’s: Voison (France) - Pasture rotations

1960-1970’s: Savory (South Africa) – Short duration grazing (SDG) (Holistic approach)

1980’s: Gerrish – Management intensive grazing (MIG)

2000’s: Ultra-high stock density grazing, mob grazing, regenerative grazing
Grazing Systems

• Allow us to:
  – Manipulate grazing distribution
  – Control **timing of grazing** (season of use)
Season-long Continuous

- Easiest to manage – only decide how many head for how long.
- May have less than desirable grazing distribution
- Risk of range damage in preferred areas.
- Cattle performance is very good with proper stocking rate.
Rest Rotation

- One pasture rested 1 (or more) full year.
- Increase in vigor for rested pasture.
- Proportionally higher stocking rate on other pastures.
- Grazed pastures may have better grazing distribution.
Deferred-Rotation

- Each pasture grazed 1 time per year.
- Increase in vigor for late-spring and early summer deferred pastures.
- Well suited for range grasses that benefit from seasonal rotation in grazing.
- Good grazing distribution.
Deferred rotation example schedule

* Each year, pastures move up 1 step from the time period they were grazed the previous year.

<table>
<thead>
<tr>
<th>Year</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 15 – Jun 5</td>
<td>Past. 1</td>
<td>Past. 2</td>
<td>Past. 3</td>
<td>Past. 4</td>
<td>Past. 5</td>
</tr>
<tr>
<td>Jun 5 – Jul 5</td>
<td>Past. 2</td>
<td>Past. 3</td>
<td>Past. 4</td>
<td>Past. 5</td>
<td>Past. 1</td>
</tr>
<tr>
<td>Jul 5 – Aug 10</td>
<td>Past. 3</td>
<td>Past. 4</td>
<td>Past. 5</td>
<td>Past. 1</td>
<td>Past. 2</td>
</tr>
<tr>
<td>Aug 10 – Sep 18</td>
<td>Past. 4</td>
<td>Past. 5</td>
<td>Past. 1</td>
<td>Past. 2</td>
<td>Past. 3</td>
</tr>
<tr>
<td>Sep 18 – Nov 1</td>
<td>Past. 5</td>
<td>Past. 1</td>
<td>Past. 2</td>
<td>Past. 3</td>
<td>Past. 4</td>
</tr>
</tbody>
</table>
Short Duration
(Intensively Managed)

• Each pasture grazed 1 or more times per year.
• Inputs for fence and water developments.
• Plans can include significant flexibility (use dates, stocking and grazing of specific pastures, etc.).
• Excellent grazing distribution.
Short Duration (Intensively Managed)

• Key Elements:
  – Number of grazing periods per year
  – Avoiding multiple grazing events (re-grazing) on an individual plant
  – Length of grazing periods
  – Length of recovery period
Short Duration
(Intensively Managed)

• Short-duration grazing: most often planned to have 2 or more grazing periods per year.

• Some intensively managed systems have pastures grazed only once per year.
Key Principle

Grazing Rotations (cycles)

• On arid and semi-arid grasslands:
  – There is NO advantage to more than 1 grazing period during the primary growing season – (but, may include early spring ‘flash’ graze and / or a dormant season grazing period)
On irrigated, subirrigated, or high rainfall grasslands:

- Two or more grazing periods can be effectively used to capitalize on regrowth potential of the forage.
Low Stocking Density

High Stocking Density (Mob grazing)
Stocking density: head/acre (or lb beef/acre) at any point in time
Stocking rate: head/acre over a given period of time (time factor)

* 5 head for 21 days for both pastures (entire unit) = same stocking rate
Length of Grazing Period
Length of Rest Period
# Upland Range Grazing Period Length

<table>
<thead>
<tr>
<th>Grazing period length</th>
<th>Grazing system treatments</th>
<th>Stocking rate (AUM/acre)</th>
<th>Stocking density (AU/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>Continuous grazing – moderate</td>
<td>0.75</td>
<td>0.15</td>
</tr>
<tr>
<td>150</td>
<td>Continuous grazing – heavy</td>
<td>1.13</td>
<td>0.23</td>
</tr>
<tr>
<td>37</td>
<td>4-pasture DR – moderate</td>
<td>0.75</td>
<td>0.60</td>
</tr>
<tr>
<td>37</td>
<td>4-pasture DR – heavy</td>
<td>1.13</td>
<td>0.90</td>
</tr>
<tr>
<td>3</td>
<td>50-pasture rotation – moderate</td>
<td>0.75</td>
<td>7.50</td>
</tr>
<tr>
<td>3</td>
<td>50-pasture rotation – heavy</td>
<td>1.13</td>
<td>11.25</td>
</tr>
<tr>
<td>- -</td>
<td>Control (non-grazed)</td>
<td>- -</td>
<td>- -</td>
</tr>
</tbody>
</table>

DR = deferred-rotation  
Heavy stocking rate is 1.5X moderate stocking rate
<table>
<thead>
<tr>
<th>Pasture</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>47</td>
<td>48</td>
</tr>
</tbody>
</table>

**Continuous (150 days)**

<table>
<thead>
<tr>
<th>Pasture</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

**4-pasture deferred rotation (37 days)**

<table>
<thead>
<tr>
<th>Pasture</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

**50-pasture rotation (3 days)**

<table>
<thead>
<tr>
<th>Pasture</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

| 47      |      |      |      |        |           |        |
| 48      |      |      |      |        |           |        |
| 49      |      |      |      |        |           |        |
| 50      |      |      |      |        |           |        |
Average end of grazing period residual stubble height by stocking rate, 2010 - 2017.
50-pasture rotation
Heavy stocking
1.13 AUM/acre

50-pasture rotation
Moderate stocking
0.75 AUM/acre
Continuous grazing
(150 days)
Moderate stocking rate

Continuous grazing
(150 days)
Heavy stocking rate
Continuous grazing: interdunal site
Continuous grazing: interdunalal site
Frequency of occurrence of switchgrass, 2010 - 2018

Switchgrass

Frequency of occurrence (%)

2010 2012 2014 2016 2018

4PDR H
4PDR M
50PR H
50PR M
Cont H
Cont M
Control
Frequency of occurrence of western ragweed, 2010 - 2018
Annual herbage production averaged across all treatments and stocking rates, 2010 - 2018.

Total May + June precipitation (inches)
13.97  9.63  1.86  7.93  9.99  7.90  5.90  6.41  12.08
Difference in herbage production between 2010 and 2018.

Within grazing system, production difference between 2010 and 2018 with unlike letters differ (P<0.05).
Herbage production of inter-dune (ID) sites across years and stocking rates.

Herbage production (lb/acre)

4-DR 50-Rotation Continuous

Grazing treatment production with unlike letters significantly differs (P<0.05).

AB Grazing treatment production with unlike letters significantly differs (P<0.05).
Conclusions:

- Higher stocking rates resulted in shorter end of grazing period residual stubble heights.
- 3-day grazing periods (50-P-R) resulted in similar stubble height across topographical positions.
- 150-day grazing periods (Cont) resulted in greatest variability of stubble height and shorter stubble height in interdunes.
Conclusions:

• Spring/early-summer precipitation appears to be the greatest driver of annual production.

• Compared to baseline production (2010), higher stocking rates resulted in a greater reduction of production compared to lower stocking rates.

• However -- negative impacts of higher stocking rates were much less than expected.

• Interdune sites in the continuous treatment had the greatest reduction in production compared to 3-day (50-P-R) and 37-day (4-DR) treatments.
Intensively Managed

Mob-Grazing, Ultra-High Stock Density
Length of grazing period ➔ Very Short!

Stocking Density:
40,000 lb beef/acre (400 AU/acre) (30 – 60 hd/acre)
to
1,000,000 lb beef/acre (1000 AU/acre) (800 to 1200 hd/acre)
Mob-Grazing, Ultra-High Stock Density
(200,000 lb beef/acre, 200 – 300 hd/acre)
Mob-Grazing, Ultra-High Stock Density

1,000,000 lb beef/acre
(800 – 1200 hd/acre)
Ultraghigh Stocking Density Grazing (Mob)

Building soils
- Increased organic matter
- Increased fertility

Uniform fecal and urine deposition

Increased pasture productivity

Increased species diversity

Increased harvest efficiency

Increased animal production per acre
# Meadow Grazing Systems Study

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Stocking rate (AUM/acre)</th>
<th>Stocking density (lb/acre)</th>
<th>Grazing days/season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mob grazing (120 paddocks)</td>
<td>3.0</td>
<td>200,000</td>
<td>0.5</td>
</tr>
<tr>
<td>4-pasture rotation (1X–over in 60 d) (4-PR-1)</td>
<td>3.0</td>
<td>6,400</td>
<td>15</td>
</tr>
<tr>
<td>4-pasture rotation (2X-over in 80 d) (4-PR-2)</td>
<td>3.0</td>
<td>4,800</td>
<td>20</td>
</tr>
<tr>
<td>Continuous</td>
<td>3.0</td>
<td>1,500</td>
<td>60</td>
</tr>
<tr>
<td>Control (non-grazed)</td>
<td>- -</td>
<td>- -</td>
<td>- -</td>
</tr>
<tr>
<td>Haying</td>
<td>- -</td>
<td>- -</td>
<td>- -</td>
</tr>
</tbody>
</table>

*Grazing period:* ~ May 22 – Aug. 10 for 4-PR-2 and Jun 10 to Aug. 10 for other grazed treatments.
Mob grazing

- 36 head
- Pasture area: 17 acres
- 120 rectangular paddocks, 0.14 acres
- Moved 2 times/day
- Target of 60% trampling
Objectives

- Forage utilization
- Harvest efficiency
- Herbage production
- Species composition
- Animal performance
- Animal activity
- Soil microbial biomass
- Soil carbon & nutrient status
- Litter decomposition
- Root growth
Percent trampled vegetation in 4-PR-1, 4-PR-2, and mob grazed pasture during 2010, 2011, and 2013. \(^{ab}\) Treatments with like lowercase letters do not differ (P > 0.05).
Mob grazing occurred 1 week prior to photo
Vegetation disappearance (harvest efficiency / consumed) in 4-PR-1, 4-PR-2, and mob grazed pasture during 2010, 2011, and 2013.

ab Treatments with like lowercase letters do not differ (P > 0.05).
Animal Performance at BBR

In all years (2011-2017), average daily gain (ADG; lbs/head/day) for steers in the 4PR2 treatment was greater than that for steers in the 4PR1 and mob treatments ($p = 0.0018$).

Daily gain of steers in 4PR1 was greater than mob in all years except in 2013 and 2017, when there were no differences.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4PR1</td>
<td>0.70 $^B_a$</td>
<td>0.70 $^B_a$</td>
<td>0.68 $^B_a$</td>
<td>1.23 $^B_b$</td>
<td>0.18 $^B_c$</td>
<td>0.57 $^B_a$</td>
<td>0.29 $^B_c$</td>
</tr>
<tr>
<td>4PR2</td>
<td>2.00 $^A_a$</td>
<td>1.14 $^A_c$</td>
<td>1.45 $^A_b$</td>
<td>1.54 $^A_b$</td>
<td>1.28 $^A_c$</td>
<td>1.39 $^A_b$</td>
<td>1.10 $^A_c$</td>
</tr>
<tr>
<td>Mob</td>
<td>0.29 $^C_c$</td>
<td>0.42 $^C_b$</td>
<td>0.55 $^B_c$</td>
<td>0.95 $^C_a$</td>
<td>-0.29 $^D_d$</td>
<td>0.22 $^C_c$</td>
<td>0.15 $^B_c$</td>
</tr>
</tbody>
</table>

1 Different uppercase letter within columns differ ($P < 0.10$).

2 Different lowercase letters within rows differ ($P < 0.10$).
Steer steps taken per day during late June through early August periods, 2013

Late June  | Early July | Mid-July | Late July | Early Aug.

Steps/day:
- Late June: 4,000
- Early July: 6,000
- Mid-July: 5,000
- Late July: 3,000
- Early Aug.: 2,000

Within time period, bars with like letters do not differ (p > 0.05)

AB
Animal Activity
Soil Organic Matter at BBR

Overall soil properties did not differ among treatments and did not change over the 8 years of the study.

**Carbon** - Soil organic matter did not differ over the 8 years of the study.

<table>
<thead>
<tr>
<th>Year</th>
<th>Depth (inches)</th>
<th>Mean SOM (%)</th>
<th>SE +/-</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>0-4</td>
<td>2.6</td>
<td>0.83</td>
</tr>
<tr>
<td></td>
<td>4-8</td>
<td>0.7</td>
<td>0.15</td>
</tr>
<tr>
<td>2018</td>
<td>0-4</td>
<td>2.8</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td>4-8</td>
<td>0.6</td>
<td>0.16</td>
</tr>
</tbody>
</table>
Soils
• After 8 years (2017), no difference between treatments in Organic Matter, Carbon, Nitrogen, Phosphorus, or other soil components.
Conclusions / Summary

• All grazed treatments had similar effects on botanical composition and aboveground plant production.
• Expect lower daily gains with mob grazing and single occupation 4-pasture rotation (4-PR-1) compared to other treatments.
• Even with high trampling levels (about 60%), there was no soil response.
• Minimizing trampling so that grazing efficiency (intake/consumption) is high appears to be the best strategy when mob grazing.
Questions