Grazing and Nutrient Management:
Timing and Distribution
QUIZ: Which causes more over-grazing damage?

One cow on an acre for 100 days

One hundred cows on an acre for 1 day
Over-grazing is **not** a product of animal numbers

Over-grazing is a product of time
Efficiency - maximize solar energy capture

~10-15% solar energy capture

~85% solar energy capture
Increase density, increase yield

- Our goal is to maximize coverage. No bare soil.
Physiology of the cow

Bites/day, ease of rumen fill (efficiency)
Effective nutrient distribution
Short Periods of Impact + Variable Recovery Periods

Benefits to soil, plants and animals
Efficiency - maximize utilization
Adequate residual, taking top ½ or 1/3
Leaving more may shorten recovery

**Figure 38-3** The amount of leaf removed in a grazing affects the rate at which the plant regrows. Plant B loses far less leaf than plant A and thus draws less energy from roots, stem bases, and crowns. Less root is killed and it begins to regrow almost immediately.
What are adequate regrowth periods?

Actual varies by season and site:

May: 18-21 days
June: 24-30+ days
July: 30-35+ days
August: 35-40+ days
September: 40-45+ days
October: 60 days

Dry conditions: 60-90 days
Drought? 120 days +

Actual 2022 recovery periods from one Vermont dairy farmer’s records:

June – August 2022: 68 – 82 days
A diversity of roots, nutrient cycling
Benefits of introducing more forbs
Active soil biology
Organic N source – how relates to K and pH

Review of soil test lab results showed >90% of the samples from organically managed farms were deficient in nitrogen.

Without synthetic nitrogen, what is the source?

Legumes – an effective N source

BUT... need optimal K and pH
<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Low</th>
<th>Medium</th>
<th>Optimum</th>
<th>High or Excessive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphorus (P):</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Potassium (K):</td>
<td></td>
<td></td>
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<tr>
<td>Magnesium (Mg):</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Value Found</th>
<th>Optimum Range (or Average *)</th>
<th>Analysis</th>
<th>Value Found</th>
<th>Optimum Range (or Average *)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil pH (2-1, water)</td>
<td>5.5</td>
<td></td>
<td>Boron (B)</td>
<td>0.1</td>
<td>0.3*</td>
</tr>
<tr>
<td>Modified Morgan extractable, ppm</td>
<td></td>
<td></td>
<td>Copper (Cu)</td>
<td>0.1</td>
<td>0.3*</td>
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<tr>
<td>Macronutrients</td>
<td></td>
<td></td>
<td>Zinc (Zn)</td>
<td>0.3</td>
<td>2.0*</td>
</tr>
<tr>
<td>Phosphorus (P)</td>
<td>0.8</td>
<td>4-7</td>
<td>Sodium (Na)</td>
<td>10.0</td>
<td>20*</td>
</tr>
<tr>
<td>Potassium (K)</td>
<td>37</td>
<td>100-130</td>
<td>Aluminum (Al)</td>
<td>193</td>
<td>35*</td>
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<tr>
<td>Calcium (Ca)</td>
<td>547</td>
<td>**</td>
<td>Soil Organic Matter %</td>
<td>4.8</td>
<td>**</td>
</tr>
<tr>
<td>Magnesium (Mg)</td>
<td>38</td>
<td>50-100</td>
<td>Effective CEC, meq/100g</td>
<td>3.1</td>
<td>**</td>
</tr>
<tr>
<td>Sulfur (S)</td>
<td>8.0</td>
<td>11*</td>
<td>Base Saturation, %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micronutrients</td>
<td></td>
<td></td>
<td>Calcium Saturation</td>
<td>36.5</td>
<td>40-80</td>
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<tr>
<td>Iron (Fe)</td>
<td>9.4</td>
<td>7.0*</td>
<td>Potassium Saturation</td>
<td>1.3</td>
<td>2.0-7.0</td>
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<tr>
<td>Manganese (Mn)</td>
<td>4.3</td>
<td>8.0*</td>
<td>Magnesium Saturation</td>
<td>4.2</td>
<td>10-30</td>
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</tbody>
</table>

* Micronutrient and S deficiencies are rare in Vermont and optimum ranges are not defined; thus average values in Vermont soils are shown instead.
** Ranges shown are for Field Crops; Vegetable ranges are higher. Ranges for Calcium, Organic Matter, and Effective CEC vary with soil type and content.

Recommndations for Grass Pasture - Establishment (2AE)

<table>
<thead>
<tr>
<th>Limestone (Target pH of 6.2)</th>
<th>Nitrogen, N</th>
<th>Phosphate, P₂O₅</th>
<th>Potash, K₂O</th>
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</thead>
<tbody>
<tr>
<td>tons / Acre</td>
<td>lbs / Acre</td>
<td>lbs / Acre</td>
<td>lbs / Acre</td>
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<tr>
<td>2.5</td>
<td>50</td>
<td>120</td>
<td>140</td>
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</table>
What about our stocking rates?

Is supply and demand in balance?

Is pasture managed like a crop?

Are we giving ourselves enough of a buffer? What is our longest recovery period? Do recovery periods increase over the season? And have we built in extended recovery periods of dry weather conditions?

If not – we are likely overstocked. How do we either add more acres to graze (increase supply) or decrease animal numbers (demand)?
Which employees would you rather be paying?
Strategies to improve nutrient distribution

1. Use higher stock density – shorter occupation periods and smaller paddocks
2. Move the mineral feeder, reduce heavy use area
3. Portable water, move the location, sized appropriately
4. Shade? Only when critical for heat stress
5. Supplemental feeding – high, dry ground. Vary the location, minimize impact
6. Stockpiled feed or bale grazing (we can look at this more in the next session)
Figure 1 – Distribution of feces and urine from 36 lactating dairy cattle grazing a .74 ha pasture. Data were collected from six grazing days from July to April 1998. Concentric arc lines are at 10-increments from the water tank.
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Stock Density Example

36 cows x 1200 lbs = 43,200 lbs
43,200 lbs / 1.85 acres = 23,351 lbs livewt/ac

36 cows x 1200 lbs = 43,200 lbs
43,200 lbs / .46 acres = 93,913 lbs livewt/ac

Figure 1 – Distribution of feces and urine from 36 lactating dairy cattle grazing a .74 ha pasture. Data were collected from six grazing days from July to April 1999. Concentric arc lines are at 10-increments from the water tank.
Efficiency – well functioning infrastructure

Both of these scenarios cost the farmer money
*** Animal Health, Milk Quality, and Labor Costs
Distance Cattle Travel to Water Affects Pasture Utilization Rate

Utilization rate shown to drop to less than 20% where water greater than 1,100 ft away

“The recommendation of 800 feet is probably best used in a system designed for maximum forage use.”

“The distance that livestock travel to water has a profound influence on grazing distribution and subsequent pasture utilization rates. We recommend that pasture systems be designed to provide water sources within 600 to 800 feet of all areas of the pasture for optimum uniformity of grazing.” – J. Gerrish, P. Peterson, R. Morrow
Free unrestricted access to surface water causes erosion and nutrient loading
Signs of heat stress

Factors impacting heat stress:

Temperature
Relative humidity
Wind
Solar radiation
Ground cover
Height of forage
Access to water
Diet (i.e., digestible forage)
Nighttime temperatures
Hide color
Breed
Hair coat
The downside of shade
Hedgerows for emergency use
Hedgerows - more than just shade

Can be a feed source

Slow down drying summer winds which increase soil evaporation

Attract dew, pollinators and beneficial insects

Shelterbelts in winter as well
WHAT IS THE BEST WAY TO MAKE CHANGE?

“The light bulb did not get invented by incrementally increasing the brightness of the candle.”

Most breakthroughs do not come from aiming for incremental improvements.

We need big steps that come from complete mindset changes. A PARADIGM SHIFT
It is possible to be 100% efficient and 0% effective. Let’s make sure we are hitting the right target.
Winter feeding
How much is every day worth?
Bale Grazing
Dramatic improvements to overgrazed land with carbon and nutrient applications

May - Year 1

May - Year 2
Winter water can be a challenge

Need to consider access and impact on nutrient loading
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<th>MPH</th>
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</tbody>
</table>
Mud
Increases stress
Increases energy requirements
Decreases intake
Increases risk of disease
Cheryl Cesario
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