Forage Basics

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Sections of this program have been adapted from programs written by Dr. Craig Roberts, State Forage Specialist, and Dr. Rich Crawford, former SW Center Superintendent.
Graziers Depend Heavier on Solar Energy than Fossil Fuel Energy
Management-Intensive Grazing

• Incorporates a grazing strategy and rest periods
  – Quality & quantity increases
  – Enhanced forage utilization
  – Persistence increases
  – Weed pressures may subside
When Grazing Begins

- In tall fescue…
  - growing point not removed
  - residual stubble contains chloroplasts
- In legumes like clover…
  - most chloroplasts are gone
  - many auxiliary buds (growing points) are gone
Plant Growth & Management: Plant Persistence

During grazing periods: control stubble height
- Keep growing points
- Provide for good photosynthesis
- Keep roots growing

Between grazing periods: schedule rest periods
- Allows for photosynthesis
- Allows leaves to regrow
- “Vegetative reproduction” (spreading plants) can occur
Orchardgrass Grazing Response

University of Kentucky Study
Dr. Ray Smith
Laura Schwer
Tom Keene
Methods

• Two similar orchardgrass plants were chosen from greenhouse.

• Both were managed the same for 6 months:
  – Clipped ~once per month
  – Supplied with good fertility (N,P, K) and water
Methods

• **Left plant simulates continuous grazing.**
  – Initially clipped to a 1 inch height
  – Then clipped weekly for the next 4 weeks at a 1 inch height

• **Right plant simulates rotational grazing.**
  – Initially clipped to a 3.5 inch height
  – Then clipped again at 3.5 inches four weeks later

• **Time lapse photography started at the beginning of the fifth week (day 29) for both plants.**
Day 1
(24 hours after clipping)
1” Continuous  3.5” Rotational
Day 2

1” Continuous    3.5” Rotational
Day 3

1” Continuous    3.5” Rotational
Day 4

1” Continuous  3.5” Rotational
Day 5

1” Continuous    3.5” Rotational
Day 6

1” Continuous  3.5” Rotational
**Corresponding Root Growth**

<table>
<thead>
<tr>
<th>% Leaf Removed</th>
<th>% Root Growth Stopped</th>
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<tbody>
<tr>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td>40</td>
<td>0</td>
</tr>
<tr>
<td>50</td>
<td>2 to 4</td>
</tr>
<tr>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>70</td>
<td>78</td>
</tr>
<tr>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>90</td>
<td>100</td>
</tr>
</tbody>
</table>

To remain healthy, 30% of grass root systems must be replaced annually.

- Stops root growth 12 days
- Stops root growth 18 days
Plant Growth & Management: Stand Persistence

- Short-lived perennials reseed
  - red clover

- Annuals reseed
  - annual lespedeza; crabgrass; annual ryegrass

- Bermudagrass given chance to spread

- A species may “thicken” by natural reseeding

![Diagram showing plant growth and management]

- Cows representing the species spread out across the grid, indicating persistence and growth.
Forage Quality

Working definition:
“high protein, low fiber”
### Pasture Forage Quality Readings

**479 samples from W. Virginia pastures**

<table>
<thead>
<tr>
<th>Pasture Nutrient Quality</th>
<th>Height</th>
<th>CP</th>
<th>ADF</th>
<th>NDF</th>
<th>TDN</th>
<th>RFV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inches</td>
<td>% Dry Matter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>7.5</td>
<td>21.9</td>
<td>27.3</td>
<td>47.5</td>
<td>67.0</td>
<td>132</td>
</tr>
<tr>
<td>75 Percentile</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Ave.</td>
<td>5.0</td>
<td>18.6</td>
<td>30.9</td>
<td>52.1</td>
<td>64.1</td>
<td>115</td>
</tr>
<tr>
<td>50 Percentile</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>3.0</td>
<td>15.3</td>
<td>33.8</td>
<td>56.9</td>
<td>60.5</td>
<td>102</td>
</tr>
<tr>
<td>25 Percentile</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</table>

1997-2001 Growing Seasons (samples taken monthly during growing season)
Most samples consisted of a mix of fescue, bluegrass, orchardgrass and clovers

<table>
<thead>
<tr>
<th>Hay Comparison</th>
<th>CP</th>
<th>ADF</th>
<th>NDF</th>
<th>TDN</th>
<th>RFV</th>
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</thead>
<tbody>
<tr>
<td>Good Orchardgrass</td>
<td>17.1</td>
<td>33.2</td>
<td>55.6</td>
<td>62.0</td>
<td>105</td>
</tr>
<tr>
<td>Aftermath Fescue</td>
<td>8.9</td>
<td>46.4</td>
<td>71.8</td>
<td>49.3</td>
<td>69</td>
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</table>
3 Factors Affecting Forage Quality

1. Maturity
Forage growth curve

- Quality
- Yield
- Best time to graze

Freshly grazed  Lush vegetative growth  Flowering and seeding
Surplus Forage into Baleage or Hay
• When 4th leaf emerges, the first leaf begins to die
• Most grasses will have no more than 3 live leaves any point in time
• Pasture quality begins to decline and is wasted

The 3 to 3½ leaf stage is the optimum stage for grazing
Grass Maintained in a Vegetative State is Most Productive
Effect of Residual Height on Total Annual Forage Yield

Dry Matter Yield at Various Cutting Heights

Species

Per. Ryegrass
Tall Fescue

Dry Matter Yield (lb/acre)
Which Program Fits your Management Style?
Based on your Needs and Resources

Take Half / Leave Half

3-Leaf
3 Factors Affecting Forage Quality

1. Maturity

2. Plant Part

1\textsuperscript{st} bite: leaves with low fiber

2\textsuperscript{nd} bite

3\textsuperscript{rd} bite: stems with high fiber
The best forage on the farm is always in the next paddock

Cattle select for high quality, low fiber forage
Crude Protein Content of Pastures

12-Paddock Rotation

The graph shows the change in crude protein content over the days pastured for three different types of pastures: Alfalfa, Bromegrass, and Composite. As the days on pasture increase, the crude protein content decreases for all types, with Alfalfa showing the steepest decline and Composite showing the least change.
Variation in Milk Production Between Pastures

Milk per cow fluctuates with rotational grazing.

After available pasture declined from heights of 8 to 10 inches to 2.5 inches, cows were rotated to a fresh pasture.
3 Factors Affecting Forage Quality

1. Maturity
2. Plant Part
3. Species
Types of Forages

annual & perennial
cool-season & warm-season
grasses & legumes
forbs & browse
Fescue

Yield Distribution: growing season
• **Endophyte fescue**
  – Fungus found in stem, leaf sheaths & seed
  – Produces alkaloids toxic to livestock
  – Increases progressively season long
  – Minimized in young growth
• **Endophyte-free fescue**
• **Novel “friendly-endophyte” fescue**
Novel Fescue

• The problem with “endophyte-free”
• “Friendly-endophyte” retains the good qualities of fescue
• Some of the Available Varieties:
  – MaxQ; BarOptima Plus E34; Duramax Armor; Estancia; Texoma MaxQII

<table>
<thead>
<tr>
<th></th>
<th>KY+</th>
<th>HM+4</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADG - Mt Vernon(2yr)</td>
<td>0.55</td>
<td>1.25</td>
</tr>
<tr>
<td>ADG - Fayetteville(2yr)</td>
<td>0.90</td>
<td>1.40</td>
</tr>
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</table>
Cool Season Grasses

- Perennial Ryegrass
- Tall Fescue
- Orchardgrass

Forage Growth Rate

Month: Feb, Apr, Jun, Aug, Oct, Dec
Orchardgrass

- Early spring producer
- Quick, high quality regrowth
- Little fall growth
- Susceptible to drought and disease
- Doesn’t tolerate close grazing
Bromegrass

- High quality forage
- Resistant to drought
- Slow regrowth after grazing or haying
- Doesn’t tolerate close grazing
- Difficult to establish
Matua

- An improved brome
- Grows earlier & later than brome
- Excellent quality
- Stays palatable in hot summer
- Needs intensive management or will not persist!
Kentucky Bluegrass

- Early spring producer
- Low growing
- Fills in with rhizomes
- Sometimes an indicator of overgrazing
Annual Ryegrass

- A good fit for thin fescue
- Often overtakes fescue!!!
- Rapid fall growth
- Retains green tissue nearly all winter
- Remains vegetative through May
- Reproduces by seed
Winter Grazing

Wheat
Triticale
Cereal Rye
Annual Ryegrass
Stockpiled Fescue

Stripgrazing
Nitrogen for Cool-season grasses

Mostly Unneeded

 Likely Profitable

April  June  August  October

Forage Yield
Brassicas - Turnips / Radishes
Cool Season Grass with Legumes

Cool season grass

Red Clover

White Clover

Lespedeza

Forage Yield

Feb Apr Jun Aug Oct Dec
Red Clover

- Short-lived perennial (biennial behavior)
- Must be allowed to go to seed or overseed periodically
- Mixes well with most cool season grasses
- Needs high fertility (P > 20 lbs/acre)

Always inoculate legumes
Limit legumes to 25-35% of stand
White (Ladino) Clover

- Stolons allow it to persist
- Excellent early growth
- Lower growing than red clover
Annual Lespedeza

- Tolerates low pH & drought
- Most growth after late June
- Must reseed itself
- Mixes well with cool season grasses
- Less N fixation than clovers
Cool Season Grass with Alfalfa
Alfalfa

- Needs high fertility and management
- Best for hay but excellent grazing for livestock
- Needs intensive grazing management
Bermudagrass

- Warm-season grass
- Rhizomes & stolons
- Challenge to establish
- Winterhardiness issue
Caucasian Bluestem

• Quick establishment
• Grows on poor soils but responds well to fertility
• Excellent choice for livestock producers
Crabgrass

- High quality summer annual
- July / August grazing
- 2 improved varieties available:
  - Red River
  - Quick-N-Big
- Must reseed annually
Native Warm Season Grasses

Yield Distribution: growing season

[Diagram showing yield distribution of Cool-season Grass, Eastern Gamagrass, and Switchgrass across different seasons (Spring, Summer, Fall) with yield measured in tons/A.]
Big Bluestem

• Drought tolerant
• Harder to establish than introduced species.
• Good production timing for our area
• Must be managed!!!
Switchgrass

- 2-3 weeks earlier than Big Bluestem
- Often ready for grazing before the cool season grasses have stopped producing.
- Well adapted to wetter sites
- Aggressive - Competitive
Summer Annuals

- Sorghum Sudan
- Pearl Millet
- Teff
A Balanced Forage System

Forage Yield

Feb Apr Jun Aug Oct Dec

CS Perennial

Clover

WS Annual or Perennial

CS Annual
Ozarks Farm – 10 paddocks / 20% WSG

CSG = Cool Season Grass  WSG = Warm Season Grass
Questions?