Pasture/Hay Management

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• Manage for Persistence, Quality, Yield
  – Soil sampling
  – Species selection & establishment
  – Nutrient management
  – Controlling competition
• Grazing management
Know Where You Stand
Soil Testing Pays

• Soil pH – limiting factor
  – Critical for persistence, quality, and yield
• Avoid potential nutrient deficiencies
• Reveal possible causes for poor production
• Apply enough plant nutrients
  – Avoid excessive expense
• Decide if you are going to follow guidelines!
  – Soil test recommendations are not directly tied to your economic situation
Obtaining a quality soil sample

- Sample every 3 to 4 years
- In a 20-acre field, there are 40 million pounds of soil. You send 1 pound to the lab.
- Bad Sample = Bad Decisions
Sample Like Areas

Sample 1

Gassy waterway

Sample 2

Old fence line

Sample 3

Hillside

Sample 4
Obtaining a quality soil sample

• Sample 6-8 inches deep in the soil
  • Take a uniform quantity of soil from each subsample
  • If using a shovel dig a hole and slice off one side
• After collecting 10-20 cores in a bucket - crumble the soil into small pieces and mix well.
• Remove rocks, grass and sticks.
• Place about a pint of soil in a soil sample box or zip-lock bag. Discard excess soil.
• Label the box for future identification.
Caution

• Avoid sampling soon after applying fertilizer, lime or manure.
  • Best to wait 1 year; at least 4-6 months

• Avoid sampling areas around watering points, shade trees, gravel roads and other known hot spots. Avoid old manure piles.
Sampling Timing

• Samples taken monthly in same spot 3 years in a row
  • Univ. of Illinois

• Potassium Levels
  – highest March – June
  – lowest August – September
  – Varied from 310 – 140 lbs/acre

• Potassium generally tests lower in dry conditions.
Obtaining a good soil sample

• Avoid sampling near feeding areas and shade trees in pasture

• Avoid sampling near road
Soil test data from one core is highly variable

Mean: 44  STD: 48
Accuracy can be increased by dividing fields based on known variability.

- Pasture:
  - Overall Mean: 44, STD: 48
  - Pasture mean: 20, STD: 17
  - Feeding area mean: 114, STD: 52

- Old manure piles

- Feeding areas
Interpreting Soil Test Results

• Low
  – Yield loss likely.
  – Forage quality is reduced.

• Medium
  – Yield loss possible.
  – Improved persistence.

• High
  – Benefits from fertilization unlikely.
All Soil Test Recommendations for P & K Include:

• Critical Level
  – Yield loss below this level
  – 30 – 40 lb P & 160+5(CEC) lb K

• Crop removal
  – How much goes out with the crop

• Build-up
  – Extra added to keep soil testing above target level.
Nutrient Cycle: Hay System

Inputs
- fertilizer
- manure
- legumes (N)

Exports
- remove 80% of nutrients in hay

Nutrient Cycle

3 tons of hay remove:
- 120 lb. nitrogen
- 27 lb. P₂O₅
- 102 lb. K₂O
Nutrient Cycle: Pasture System

**Inputs**
- fertilizer
- manure
- legumes (N)
- feed

Cow/calf pair, stocker removal rates
- 10 lb. nitrogen
- 7 lb. P$_2$O$_5$
- 1 lb. K$_2$O

**Exports**
- calves
- beef
Soil pH

- pH scale = 0 to 14
  0 = Strong Acid
  7 = Neutral
  14 = Strong Base

- For best plant growth and nutrient availability:
  pH = 6.2 to 6.5
Low pH\textsubscript{s} (below 5.5)

- **Increased aluminum solubility**
  - stunted root growth
  - reduced nutrient uptake

- **Reduced nutrient availability**
  - phosphorus

- **Poor legume growth**
  - survival and activity of N fixing bacteria reduced
  - reduced success of the symbiosis
Lime Provides the Basis for Fertility

- Lime is the most economical amendment to apply
- Limestone (Calcium Carbonate)
- ENM (Effective Neutralizable Material) rates limestone’s effectiveness
- Smaller the particle size, the faster the action (higher ENM)
- No more than 2-3 tons per acre per year
- Sources: Ag Lime (~400-700 ENM); Dolomitic Lime (Mg source)
## Limestone Puts Nutrients to Work

### Percent Nutrient Availability

<table>
<thead>
<tr>
<th>pH (salt)</th>
<th>Nitrogen %</th>
<th>Phosphorus %</th>
<th>Potassium %</th>
</tr>
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<tbody>
<tr>
<td>4.0</td>
<td>30</td>
<td>23</td>
<td>33</td>
</tr>
<tr>
<td>4.5</td>
<td>53</td>
<td>34</td>
<td>52</td>
</tr>
<tr>
<td>5.0</td>
<td>77</td>
<td>48</td>
<td>77</td>
</tr>
<tr>
<td>5.5</td>
<td>89</td>
<td>52</td>
<td>100</td>
</tr>
<tr>
<td>6.5</td>
<td>100</td>
<td>100</td>
<td>100</td>
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</table>
Types of Forages

annual & perennial
cool-season & warm-season
grasses & legumes
forbs & browse
Plant Selection

• Cattle and Sheep
  – Grass + Legumes + Forbs (optional)

• Horse
  – Grass w/ Limited Legume

• Goats
  – Browse + Forbs + Grass
Balanced Forage System

Short seasonal "gaps" in forage supply

Yield

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Establishing
Initially, tillers depend on carbohydrates developed the previous fall. Then as leaf area explodes with additional tillers, new sugars are made.
Establishing

• Legumes
  – Legumes are broadleaf plants that fix atmospheric nitrogen through symbiotic relationship with rhizobia (nodule bacteria)
  – Inoculate legumes (lespedeza could be exception)
    • Inoculant specific to legume species
Grow Your Own Nitrogen

Legumes can fix 50-300 lbs N/Ac. Legumes transfer up to 20% of their fixed N to surrounding grass. Most N comes through manure and urine.
Establishing

• Forbs
  – Forbs are broadleaf plants that are not legumes
  • Brassicas – Forage rape, Kale, Swedes, Turnips
    – Planted in mid-April for summer or early August for fall grazing (75 days/75%)
• Weeds – Dock, Plantain, Dandelion, Chicory, Ragweed, Pigweed, Lambsquarter
  – Some weeds can be poisonous and are often avoided if paddocks are properly grazed
Weeds

Brassicas
Establishing

• Browse
  – Browse are broadleaf woody plants
    • Trees, Brambles, Shrubs, Vines
  – There are some browse plants that are poisonous
    • Numerous plants can cause problems; however, internet lists can be inaccurate either direction
Tall Fescue

• Hardiness and adaptable for many utilities

• Forage quality highest in spring and fall

• Waxy leaf = retains quality into winter
  – Stockpiling for deferred winter grazing

• Grazing height
  – 6 to 8” start; 3” stop
Tall Fescue

- **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**
Figure 1. Hyphae of the fungal endophyte grow between the cells (green) of the tall fescue plant. When building a novel endophyte-infected tall fescue, the toxic endophyte (red lines) is removed from the tall fescue plant to create an endophyte-free plant. Then, the novel endophyte (blue lines) is introduced into the plant.
Novel Endophyte Fescue

• The problem with “endophyte-free”
  – Reduced persistence, vigor and drought tolerance

• Some of the Available Novel Varieties:
  – MaxQ – Pennington
  – BarOptima Plus – Barenbrug
  – Estancia – Mountain View
  – Protek – DLF
Figure 3. Calf weaning weights of cattle grazing toxic or novel endophyte (NE; “Jesup MaxQTM”) tall fescue stands. Values are averages of two years’ data collected near Calhoun, Ga. (Bouton et al., 2000, and Watson et al., 2001).

Table 1. Cow-calf performance on toxic or novel endophyte (NE) tall fescue stands.†

<table>
<thead>
<tr>
<th></th>
<th>Toxic</th>
<th>NE</th>
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<tbody>
<tr>
<td><strong>Cow Performance</strong></td>
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<tr>
<td>Wt. at end of breeding, lbs.</td>
<td>1110</td>
<td>1236</td>
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<tr>
<td>Wt. at end of weaning, lbs.</td>
<td>1005</td>
<td>1122</td>
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<tr>
<td>BCS at end of breeding ‡</td>
<td>5.4</td>
<td>5.7</td>
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<tr>
<td>Pregnancy Rate, %</td>
<td>44.7</td>
<td>85.1</td>
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<tr>
<td><strong>Calf Performance</strong></td>
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<td></td>
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<tr>
<td>Actual Weaning Wt., lbs.</td>
<td>461</td>
<td>529</td>
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<tr>
<td>Adj. (205 d) Weaning Wt., lbs.</td>
<td>436</td>
<td>504</td>
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<tr>
<td>ADG (birth to wean), lbs.§</td>
<td>1.7</td>
<td>2.1</td>
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<tr>
<td><strong>Replacement Heifers</strong></td>
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<tr>
<td>Actual Weaning Wt., lbs.</td>
<td>459</td>
<td>498</td>
</tr>
<tr>
<td>Calving Rate, %</td>
<td>64.1</td>
<td>90.6</td>
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</tbody>
</table>

† Adapted from University of Arkansas Experiment Station Reports by Coffey et al. (2007 and 2008).
‡ BCS: Body Condition Score.
§ ADG: Average Daily Gain.
<table>
<thead>
<tr>
<th>Participants</th>
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<tbody>
<tr>
<td>Agribusiness</td>
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<tr>
<td>Agrinostics</td>
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<td>DLF International Seeds</td>
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<td>Mountain View Seeds</td>
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<td>AgResearch USA</td>
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<tr>
<td>Pennington</td>
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<tr>
<td>Barenbrug</td>
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<tr>
<td>Dow AgroSciences</td>
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<td>University of Missouri</td>
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<tr>
<td>Extension</td>
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<tr>
<td>CAFNR</td>
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<td>Missouri Forage &amp; Grassland Council/Grassland Lands Conservation Initiative</td>
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<td>Nonprofits</td>
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<td>Noble Foundation</td>
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<tr>
<td>Government</td>
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<tr>
<td>USDA NRCS</td>
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<tr>
<td>United States Department of Agriculture Natural Resources Conservation Service</td>
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<tr>
<td>Alliance for Grassland Renewal</td>
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</tbody>
</table>

This seed lot has been tested and determined to contain at least 70% novel (selected) endophyte and no more than 5% off-type endophyte.
Forage Species

• Annual Cool Season Grasses
  – Annual Ryegrass
  – Small Grains
    • Wheat
    • Cereal Rye
    • Oats (winter kill)
Annual Ryegrass

- A good fit for thin fescue
- Rapid fall growth
- Retains green tissue nearly all winter
- Remains vegetative through May
- Reproduces by seed
- Remove cows mid-May
Forage Species

• Perennial Warm Season Grasses
  – Native
    • Big bluestem
    • Switchgrass
    • Indiangrass
  – Introduced
    • Bermuda
    • Old World Bluestems
Big Bluestem

- Drought tolerant
- Slow to establish
- Good production timing for our area
- Good quality if managed to avoid maturity
- Grazing
  - 12” start; 6” stop
  - Early September stop

Varieties: Bonanza; Goldmine; Rountree; Kaw; Oz 70
Indiangrass

- A late producer: 2 weeks later than big bluestem
- Lower yielding than big bluestem
- Not always persistent
- More suited for hay
- Grazing –
  - 12” start; 6” stop
  - Early September stop
Forage Species

• Annual Warm Season Grasses
  – Crabgrass
  – Pearl Millet
  – Sorghum-Sudan
Pearlmillet & Sorghum-Sudan

- Good Quality – High Yield
- Pearlmillet = No prussic acid
- Split nitrogen
- Nitrate toxicity possible in both
- Annual seeding required
- Grazing
  - Pearlmillet – 18 to 30” start; 8” stop
  - Sorghum-sudan – 24 to 30” start; 8” stop
Forage Species

• Legumes
  • Clover
  • Annual Lespedeza
  • Alfalfa
Where to Go From Here – Phase 1
Starting from a straight K31 fescue base

• No-till clover (Sept 1) or frost seed clover (Dec-Feb)
• Frost-seed lespedeza (Feb-Mar)
• No-till annual rye grass into stand (Sept 1)
• Kill or retard old stand – No-till mix of fescue and annual rye grass or orchardgrass (Sept 1)
  – Frost seed clover and/or lespedeza into new grass stand (Dec – Feb)
• Convert entire farm to novel fescues – Spray-smother-spray approach is imperative!
Where to Go From Here – Phase 2

Developing the warm season grass grazing platform

10-25% of the grazing system

• Warm Season Annual – Cool Season Annual
  – If willing to manage a rotational system of annuals

• Caucasian Bluestem

• Native Warm Season Grasses
  – If willing to assume a potentially slow and challenging establishment process

• Bermudagrass
  – Seeded or Sprigged
  – Works well as a part of the hay-grazing system
  – High N demand
Establishing

• Establishing or renovating
  – Reduce weed and existing forage competition
  – Establishing – glyphosate burndown; no-till drill insure better seed placement
  – Renovating – paraquat burndown for existing grass pasture; mowing or grazing is another option then seeding
  – Tillage is an option but avoid erodible areas and monitor weed emergence.
Establishing: Spray-Smother-Spray

- Two herbicide applications are needed to kill many perennial forages, especially E+ tall fescue
- If replacing E+ tall fescue, clip seed heads in spring if they are present
- Spray existing forage with a glyphosate (ideally, existing forage is 3 to 4 inches tall and growing)
- Plant a summer annual as a “smother crop”
- In late summer, spray smother crop with glyphosate
- Plant new forage in September
Establishing

• **Proper seeding date**
  – Environmental conditions adversely influence stand

• **Proper seeding rate**
  – Recommended seeding rates are based on pure live seed
  – factor in estimated loss when conditions are not ideal

• **Proper seeding depth**
  – Soil to seed contact necessary
  – Too deep – can run out of energy
  – Too shallow – root placement and moisture issues
Drill Seeding

• Cool Season Grass
  – September

• Warm Season Grass
  – May

• Legumes: Clover and Alfalfa
  – Avoid planting same time as grass
  – September
Frost Seeding Legumes

- Seed broadcast in late winter (February)
  - Clover and lespedeza
- Freezing and thawing action plus rain help cover the seed
- Not recommended for alfalfa
- Seeding Rates, Depths, Dates
  - MU Guide #4652 - http://extension.missouri.edu/p/G4652
Pure live seed (PLS)

\[ \%\text{PLS} = (\%\text{Purity} \times \%\text{Germination})/100 \]

\%Purity = \% of seed that is the desired forage seed

\%Germination = \% of seed that germinates when planted
Planting Depth

- Most small seeded grasses and legumes should be planted at $\frac{1}{4}$ to $\frac{1}{2}$ inch below the soil surface
Plant Nutrients

• 16 essential nutrients
  – Carbon, Oxygen, and Hydrogen most abundant
    • Photosynthesis
• Nitrogen, Phosphorus, and Potassium
  – Plants uptake large amounts
  – Plants can only use certain forms of each nutrient
• Terms
  – Organic = living or once living
  – Inorganic/synthetic = manmade
Consequences of Forgoing Nutrient Management

- Reduced forage production
- Reduced forage quality
- Reduced persistence of desirable species
- Excessive weeds and brush
- Depend on expensive fertilizer to bring field back up to testing standards
Should I Fertilize Pastures?

• Soil test levels
• Forage selection
  – CSG vs WSG
  – Legumes
• Forage need & value
  – Stocking density
  – Price of hay
Am I Fertilizing a Crop of Weeds?

• If a high percentage of the foliage in pastures are weeds, don’t give them an edge with fertilizer.

• Decide whether to fertilize, spray or do both
Phosphorus (P) and Potassium (K)

- Chemical forms change in soil
- Plants uptake:
  - Phosphorus as phosphate - $P_2O_5$
  - Potassium as potash - $K_2O$
- Not prone to leaching
- Clings to soil particle and organic matter
- Can be built up in the soil over time
Low phosphorus

• Poor crop growth
  • Critical for energy conversions in plant
  • Affects all aspects of growth
  • Poor root development
  • Low Mg uptake

• Poor legume growth
  • Reduced survival and activity of N fixing bacteria
Low potassium

- Poor crop growth
  - inhibition through reduced enzyme activity
  - impaired water uptake
- Reduced disease resistance
- Reduced winter hardiness
Organic Matter

- Improves:
  - Soil Physical Condition
  - Moisture Holding Capacity
  - Aeration
  - Cooler Soils
  - Internal Drainage
  - Nutrient Storehouse Capability
  - Microorganism Activity
  - Rooting Depth
• A soil that has 4% organic matter contains 80,000 lbs. of organic matter per acre.

• For every 1% organic matter, there are approximately 20 lbs. of residual nitrogen per acre. It also holds 3.6 gallons of water held per square yard.
Pasture Fertility

- Fertilizer requirements differ for pastures compared to hay
  - 75% to 90% P and K returned
  - 25% to 50% N as manure + urine returned and 50% to 75% lost
- 40 to 50 lb N to grow 1 Ton of CSG
Your Cheapest Fertilizer Source
<table>
<thead>
<tr>
<th></th>
<th>Dairy</th>
<th>Steers</th>
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<tbody>
<tr>
<td>Urinations / day</td>
<td>8 - 12</td>
<td>8 - 12</td>
</tr>
<tr>
<td>Urine volume (qt)</td>
<td>1.4 - 3.3</td>
<td>0.9 - 2.8</td>
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<tr>
<td>Urine N (lb. / mo.)</td>
<td>5 - 22</td>
<td>5 - 16</td>
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<tr>
<td>Defecations / day</td>
<td>7 - 15</td>
<td>7 - 15</td>
</tr>
<tr>
<td>Fecal N (lb. / mo.)</td>
<td>4 - 13</td>
<td>2 - 6</td>
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(Whitehead, 1996)
Improved Manure Distribution

One paddock of 3–pasture rotation

Feet north from water

Feet east from water

10 - 20
20 - 30
30 - 40
> 40

Piles per 500 ft²

One paddock of 24–pasture rotation

Feet south from water

Feet west from water

30 - 40
40 - 50
50 - 60
60 - 70
> 70

Piles per 500 ft²
# Improved Manure Distribution

<table>
<thead>
<tr>
<th>Rotation Frequency</th>
<th>Years to get 1 pile / sq. yard</th>
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<tr>
<td>Continuous</td>
<td>27</td>
</tr>
<tr>
<td>14 day</td>
<td>8</td>
</tr>
<tr>
<td>4 day</td>
<td>4-5</td>
</tr>
<tr>
<td>2 day</td>
<td>2</td>
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Hay Feeding Impacts Nutrient Cycling
Forage Systems Research Center Study – Linneus, MO
Investigators: John Lory, Dave Davis, Rob Kallenbach, Justin Sexton

• 3 Treatments; 3 Replications
  – Stationary Hay Rings
  – Moved Hay Rings
  – Bales Unrolled Around Pasture

• 13 cows per treatment with one collared

• 15 fescue bales fed to 13 cows in 42 days
Treatment 1: Hay Ring in Set Feeding Area.

Treatment 2: Move Hay Ring Every Other Day. Unroll Hay in a New Spot Daily.

Move Hay Feeding Sites Often

• Regularly move feeders and feeding areas around the pasture.
• Do not use the same pasture for supplemental feeding every year.
• Do not feed toxic K31 hay in established “novel” endophyte fescue fields.
Before You Fertilize
Grazing Management = Utilization

• Continuous grazed systems
  • 30% utilization of forage
  • Animals consume 600 lb. of every ton of forage

• Management intensive grazing
  • 50 to 70% utilization
  • Animals consume 1,000 to 1,400 lb. of every ton of forage
Fertilizing on a budget

• Target low testing soils.

• Apply lime first.

• Low rates (20 lb. P$_2$O$_5$ / acre) on fescue reduces grass tetany.

• Manure can be an excellent fertilizer.
  – Chicken litter, turkey litter or livestock manure.
  – Have manure source tested for accurate application rates.
Do I need Nitrogen?

• Using legumes?
• Am I intensively grazing?
• Can I cut hay on my pastures in May?
• Do I have more land than cattle to graze it?
• Does it increase the beef, milk or hay sold on my farm?
Overseeding Legumes

- Clover or Lespedeza
- For an annual approach use 4 lb red clover, ½ lb white clover, 8 lb lespedeza
- Use inoculants if minimal legumes are in the pasture
- February seedings better chance than April
- Must maintain pH and phosphate levels for clover

Goal \( \rightarrow \) 25-30% legume component in pastures
N Fertilizer and Legumes
Do they Mix?

• Not very well

• N fertilizer increases grass growth – competes with legumes
  • Grass smothers legumes

• MU Research
  • 25 lbs/a N reduced lespedeza
  • 100 lbs/a N eliminated it

• Use low rate N only in the fall
  – Improved grass root development
  – Stockpiling fescue
When Should I Fertilize?

• Fescue Endophyte is most toxic in stems & seed heads.
  – Produced in late spring.
  – N fertilizer in spring produces more stems & seed heads.
  – Strategy: Apply N after initial growth is removed by grazing.
  – Apply N in late spring or fall.
Nitrogen for Tall Fescue Spring Pasture

Spring fertilization for Pasture:
- apply nitrogen in early May
- extends spring forage into July
Nitrogen for Tall Fescue Fall Pasture

Fall fertilization for Pasture:
- apply nitrogen in mid August
- increases and extends fall forage
- less response; higher potential value

Herd forage demand

Forage Yield

April June August October
Surplus Forage into Baleage or Hay
Weed Control

• Weeds are opportunists
  – Overgrazing + low pH + low fertility = reduced competition of forage plants
  – Poor weed control methods only compounds the problem
Cattle Response to Weed Control

Results:
Cattle Grazing Response
Albany

Fix Points 4 Months After Application (10/28-11/24)

- **Treated** – 77%
  (869 fixes)

- **Untreated** – 23%
  (328 fixes)

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Weed Control Methods

- Cultural
- Mechanical
- Chemical
#1 Weed Management Tool

- Healthy Stand = Competitive
#2 Proper Grazing

- Managed Intensive Grazing provides more consistent results compared to continuous grazing systems.
- Exception is poisonous weeds and some woody perennials which must be managed with mechanical and chemical control methods.
#3 Timely Mowing

- Mowing is an effective tool in addition to grazing
- Can reduce weed seed production of annuals and biennials
- Can help weaken perennial weeds and used in combination with herbicide management
#4 Herbicide Applications

- Many cases necessary to shift competitive advantage back to pasture or hay forages
- Many cases cheaper and more effective than mowing
- Must decide if weeds are more numerous than legumes because products that effectively control weeds will control legumes
Herbicide Program Failures

• 1) Spraying Too Early or Late or Not Often Enough
  – AKA: Wrong Growth Stage
• 2) Misidentification of Weed
• 3) Poor Environmental Conditions
• 4) Wrong Product or Product Placement
• 5) Not Calibrating = Coverage and Rate
• 6) Not Reading Label

Eddie Funderburg - http://www.noble.org/ag/soils/weedcontrolprograms/
1) Too Late More Than Too Early

• Usually efficacy corresponds to weed size
• Smaller weed = increased control
  – Actively growing = receptive to herbicide uptake
  – Less energy to recover
• There are exceptions for some perennials
  – Too early is a negative
  – Some require multiple applications
2) Weed ID

• Apply Eye Balls per Acre
  – Evaluate pastures at proper times

• Annuals
  – Broadleaf weeds
  – Summer and Winter

• Biennial/Perennials
  – Broadleaf weeds
  – Brush
  – Sedges
Annuals

• Winter and Summer Annuals
• 1” to 4” seedlings w/ max size of 10”
• Control options w/ two goals
  – Reduce competition w/ crop
  – Reduce seed production
• Options: MIG, Mowing, Herbicide
• Herbicides: 2,4-D containing products (+dicamba, GrazonNext, Crossbow)
Biennials

- Thistles: Bull, Musk, Tall
- Wild Carrot/Queen Anne’s Lace
- Poison Hemlock
- Best Timing = rosette in fall or early spring
- Herbicides:
  - 2,4-D containing products
  - GrazonNext
  - 2,4-D + Dicamba
- Mowing after bolting (flowering stalk) prior to seed production
Perennials

• Deep perennial root system
  – Mowing can help reduce seed production
  – Retreatment usually necessary

• Tough above ground parts = unpalatable and difficult for herbicide penetration

• Control methods: incorporating browsing, cultural, herbicide

• Product timing and placement important
  – Timing – early summer
  – Placement – foliar, basal, cut stump, soil
Broomsedge Bluestem

- Warm Season Grass Perennial
- Thrives where CSG won’t
- Improve Cultural
- Improve Grazing
- Spot treat or Rope Wick
  - Glyphosate
Coralberry/Buckbrush

- Perennial w/ creeping underground rootstock
- Best Timing = Prior to full leaf in spring
- 2,4-D (2 qts) or GrazonNext
- Mowing – weak option
Horsenettle/Bullnettle

- Perennial w/ rhizomes
- Best Timing
  - Vegetative to Fruit
- Grazon products
- Cimarron Max or Chaparral
  - tougher on fescue
Sericea Lespedeza

- Cultural and Mechanical
  - 7 goats per acre for 3 years
  - Mowing when 12” all season will help

- Chemical
  - PastureGard
  - June = 12” tall
  - August-September = bud to bloom
Locust

- Black Locust and Honey Locust
- Trees with thorns
- Timing and Placement
  - Foliar – seedlings
  - Basal – up to 6” diameter
  - Cut stump – larger trees
- Products – triclopyr and picloram containing products
- Consider adding petroleum product to mix for cut stump
Blackberry

- Upright and Cane types
- Avoid mowing the year of application
- Best Timing = fall (late September to early October)
- Multiple years usually required
- Control – Products containing metsulfuron (Cimarron Max or Chaparral) or triclopyr (PastureGard or Remedy)
Poisonous Plants

• Poisoning
  – Depends on availability and quantity of plants
  – Stage of growth and time of year
  – Kind of animal

• Livestock avoidance
  – Animals tend to avoid those plants that can cause harm w/ poisoning generally occurring when food sources are limited
  – Maintain diverse and vigorous stands of nutritious plants and avoid over-grazing
  – Maintain fence rows and barn lots
  – Avoid baling areas with populations of poisonous plants prior to controlling
Poisonous Plants

- Perilla Mint
  - Serrated leaf margin
  - Purple or green leaves
  - Minty odor
- Acute Respiratory Distress Syndrome
- Scout from mid-April to mid-June
- Control – 2,4-D containing products (+dicamba, GrazonNext, Crossbow)
- Mowing before seed production
- [https://utextension.tennessee.edu/publications/Documents/W135.pdf](https://utextension.tennessee.edu/publications/Documents/W135.pdf)
Poisonous Plants

- Cocklebur
- Red/Black specks on mature stem
- Egg shaped bur w/ curved spines
- Control – 2,4-D containing products (+dicamba or GrazonNext)
3) Spray When Conditions Are Right

- Wind < 10 MPH but not perfectly still
- Drought stress = limited uptake
- Temp above 50 F
4) Product Selection and Placement

• Select Based on Weed Rating Guides

• Will have to weigh the amount of desirable broadleaves to junk
  – Legumes at 20%?
  – Dominating weeds = lower quality + potential health risks

• Placement
  – Foliar: Broadcast or Spot
  – Basal Bark: Ground up 24”
  – Cut Stump: Fresh
5) Calibration

• Calibration = covering the plant part with proper amount of product

• Calibration Guide: http://extension.missouri.edu/p/G1270

• $5940 = (43,560/88) \times 12$
6) Read The Label

- Label = Law
- Contains
  - Active Ingredient
  - Application Rate
  - Delivery Methods
  - Safety Precautions
  - Target Pests
  - Surfactants Needed
• Manage for Persistence, Quality, Yield
  – Soil sampling
  – Species selection & establishment
  – Nutrient management
  – Controlling competition
• Grazing management
Grazier – “Solar Panel Manager”

Undesirable Solar Panels
Bare Soil
Overgrazed Plants
Mature Plants
Weeds
Management-Intensive Grazing

Incorporates a grazing strategy and rest periods

– Persistence increases
– Quality & quantity increases
– Enhanced forage utilization
– Weed pressures subside

<table>
<thead>
<tr>
<th>Percent of Rest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddock #</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>10</td>
</tr>
</tbody>
</table>
Manage for 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
• Maintains vegetative production
University of Kentucky Simulated Grazing Study
Day 1
(24 hours after clipping)
1” Continuous    3.5” Rotational
Day 2

1” Continuous  3.5” Rotational
Day 5

1” Continuous  3.5” Rotational
## Corresponding Root Growth

<table>
<thead>
<tr>
<th>% Leaf Removed</th>
<th>% Root Growth Stopped</th>
</tr>
</thead>
<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
What happens to the roots?

- When grazed, plants "self-prune" their roots so that they can be supported by above ground structures.
- The pruned roots decompose into valuable OM.
Forage Quality

Working definition: “high protein, low fiber”

Directly related to INTAKE
3 Factors Affecting Quality

1. Maturity
2. Plant Part
3. Species
Maturity: Time of Harvest

Early Harvested Forage
- Thin Cell Wall
  - Low NDF = high intake
  - Low ADF = high energy

Late Harvested Forage
- Thick Cell Wall
  - High NDF = low intake
  - High ADF = low energy
• When the 4th leaf emerges, the first leaf begins to die
• Most grasses will have no more than 3 live leaves at any point in time
• Grass maintained in vegetative state is more productive
• Pasture quality begins to decline and is wasted
Plant Part

- Quality
- Yield
- Best time to graze

- Freshly grazed
- Lush vegetative growth
- Flowering and seeding
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><strong>High</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 Percentile</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><strong>Ave.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 Percentile</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><strong>Low</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 Percentile</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>
</tbody>
</table>

1997-2001 Growing Seasons (samples taken monthly during growing season)
Most samples consisted of a mix of fescue, bluegrass, orchardgrass and clovers
Effect of Stage of Harvest on Fescue Hay Quality and Animal Gain

<table>
<thead>
<tr>
<th>Stage of Harvest</th>
<th>DM Intake lb/day</th>
<th>% Digestibility</th>
<th>% Protein</th>
<th>Lb of hay fed per lb of gain</th>
<th>Lb of hay per acre 1st cutting</th>
<th>ADG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late boot to head, cut May 3</td>
<td>13.0</td>
<td>68</td>
<td>13.8</td>
<td>10.1</td>
<td>1334</td>
<td>1.39</td>
</tr>
<tr>
<td>Early bloom stage, May 14</td>
<td>11.7</td>
<td>66</td>
<td>10.2</td>
<td>13.5</td>
<td>1838</td>
<td>0.97</td>
</tr>
<tr>
<td>Early milk stage – seed forming, May 25</td>
<td>8.6</td>
<td>56</td>
<td>7.6</td>
<td>22.5</td>
<td>2823</td>
<td>0.42</td>
</tr>
</tbody>
</table>

Source: Mont Montgomery
Univ. of TN
500 lb Holstein Heifers
Summary

• Soil Sample your fields properly and routinely

• Establish a balanced forage system
  – Extended grazing; Consider replacing toxic K31

• Spread your cheapest fertilizer
  – Apply N when need extra forage
    • August for stockpiling
  – Maintain P and K levels

• Livestock prefer good weed control

• Timely grazing and/or hay harvest critical
  – Persistence and Quality