Basic Forage Production

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Understanding the Animals

Understanding the Plants (Forage Management)

Grazing Principles
The Plants

- **Grass** - any one of a number of plant species that have leaves that are typically longer than they are wide, with parallel veins

- **Forb** - broadleaf plants that are not grasses, sometimes divided to separate out legumes

- **Legume** - plants that produce pod type fruits and are characterized by fixing atmospheric N

- **Browse** - the leaves and growing tips of forbs and woody shrubs
Understanding the Plants

**Annuals**
Plants that complete their life cycle in one year and need to be re-seeded to come back

**Perennials**
Plants that come back every year from vegetative plant parts without needing to be re-seeded
Annuals Vs. Perennials

Given identical growing conditions, which plants do you think will germinate and grow more quickly?

Which are costlier to keep?

What are some of the risks associated with relying on annuals?

What are some of the benefits of annuals?
Annuals and Perennials

- **Annuals**
  - Crabgrass
  - Kobe lespedeza
  - Ryegrass (annual)
  - Sudex
  - Pearl Millet

- **Perennials**
  - Orchardgrass
  - Tall Fescue
  - Timothy
  - Johnson Grass
  - Bermudagrass
  - Sericea Lespedeza
  - Dallisgrass
Perennial Browse Species

**Warm-Season**
- Cedar
- Elm
- Greenbriar
- Maple
- Oak
- Sumac
- Wild Plum
- Yaupon
- Buckbrush
- Multiflora rose
- Privet

**Cool-Season**
- Honeysuckle
Warm Season Vs. Cool Season

**Warm-Season Plants**
Plants that complete the majority of their growth in the summer at temperatures of 85-95°F

**Cool-Season Plants**
Plants that complete the majority of their growth in the fall and spring at temperatures of 65-75°F

Recommended 25% of pasture

Recommended 75% of pasture

Which of these will have the longest growing period?
Warm Season and Cool Season Plants

**Warm Season**
- Crabgrass
- Kobe lespedeza
- Sorghum/Sudan grass
- Pearl Millet
- Johnson Grass
- Bermudagrass
- Sericea Lespedeza
- Dallisgrass

**Cool Season**
- Orchardgrass
- Tall Fescue
- Timothy
- Ryegrass (annual)
- Wheat
Cool Season - vs- Warm Season
Fertility

- Fertilize by soil test
  - Method and Nutrients
  - Interpreting Results
- Apply at the right time
- Fertilizer Calculator

http://economics.ag.utk.edu/fertilizer.html
Information provided by soil test:

- Nitrogen
- Phosphorus
- Potassium
- pH
How Soil pH Affects Availability of Plant Nutrients

The difference of a soil pH of 5.6 vs. 6.2

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Amt. Used Annually (Lbs/acre)</th>
<th>Unit Price ($/lb)</th>
<th>Dec. in Efficiency (%)</th>
<th>Value of Decrease ($/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>60</td>
<td>$0.68</td>
<td>35%</td>
<td>-$14.28</td>
</tr>
<tr>
<td>P&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;5&lt;/sub&gt;</td>
<td>30</td>
<td>$0.64</td>
<td>50%</td>
<td>-$9.60</td>
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<tr>
<td>K&lt;sub&gt;2&lt;/sub&gt;O</td>
<td>30</td>
<td>$0.38</td>
<td>10%</td>
<td>-$1.14</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>-$25.02</strong></td>
</tr>
</tbody>
</table>

60-30-30 = $68.14 per acre
Effect of fertility on composition of unimproved pasture

Forages. 1995. Iowa St Press
Pounds of nutrients removed by crops

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>tall fescue (3.5 ton)</th>
<th>bermuda (8 ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>nitrogen</td>
<td>135</td>
<td>368</td>
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<tr>
<td>phosphate</td>
<td>65</td>
<td>96</td>
</tr>
<tr>
<td>potash</td>
<td>185</td>
<td>400</td>
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</tbody>
</table>

Ball and co-workers. 1996. Southern Forages.
To effectively manage:

- Identify it
- Is it Warm Season or Cool Season?
- Is it perennial or annual?
- Fertility requirements/timing
- Competition
Basic Steps to Improve Pastures

- Fertilize by soil test
- Control/Manage weeds
- Use clovers
Benefits of legumes

- Improved quality
- Decreased need for nitrogen
- Possibly lengthen grazing season
Cumulative yield of tall fescue/clover mixtures

How to plant legumes

When - Feb 15 to April 1

What - 2 lb white clover
        4 lb red clover
        8 lb annual lespedeza (hillsides)

How - before March 1 broadcast
        after March 1 drill
Basic Steps to Improve Pastures

- Fertilize by soil test
- Control weeds
- Use clovers
- Harvest for quality
The Quality vs. Quantity Dilemma

As Forage Matures

Amount Harvested

Quality

Protein & Energy Decrease
Fiber Increases
Quality versus Yield
Tall fescue protein content as plants mature

Write this down in BIG BOLD letters!

“Green GROWS Green.”
Plant growth rate at various stages of growth

Phase 1
- low leaf area, light interception
- reduced photosynthetic rate
- new growth comes from energy stored in roots and crown
- slow regrowth after grazing

Phase 2
- high leaf area, light interception
- young, efficient leaves
- high photosynthetic rate
- fast growth rate

Phase 3
- high leaf area, light interception
- old inefficient leaves
- seedhead or bloom production
- lower photosynthetic rate
- energy used to produce seed
- slow growth rate
Growth season of tall fescue

Forage needs of herd

Undergrazing will occur

Overgrazing will occur
Understanding the Animals
Botanical Composition of Grazing Animal Diets

Livestock Species

- Bison
- Horses
- Cattle
- Sheep
- Goats
- Deer

% of Diet

Grass
Forb
Browse
Goats Prefer Browse
Sheep Prefer Grazing including forbs
Both are Selective

Look at the muzzle
Foraging Preference - dependent on forages available and animal experience

- **Desirable**
  - Multiflora rose
  - Briars
  - Ironweed
  - Ragweed
  - Lambsquarter
  - Sericea lespedeza
  - Annual lespedezas
  - Honeysuckle
  - Spiny amaranth
  - Pigweed
  - Privet
  - Kudzu
  - Buckbush
  - Curly dock
  - Winter annuals

- **Intermediate**
  - Bermuda
  - Chickweed
  - Thistle
  - Burdock
  - Tree of heaven
  - White clover
  - Buttercup
  - Japanese grass

- **Undesirable**
  - Horse nettle
  - Black nightshade
  - Perilla mint
  - Poison hemlock
<table>
<thead>
<tr>
<th>Forage Type</th>
<th>Crude Protein (%)</th>
<th>Energy (TND) (%)</th>
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</thead>
<tbody>
<tr>
<td><strong>Hay</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor Hay</td>
<td>8</td>
<td>50</td>
</tr>
<tr>
<td>Grass Hay</td>
<td>12</td>
<td>58</td>
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<tr>
<td>Mixed Hay</td>
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<td>50</td>
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<tr>
<td>Legume Hay</td>
<td>18</td>
<td>62</td>
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<tr>
<td><strong>Pasture</strong></td>
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<td></td>
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<tr>
<td>Alfalfa</td>
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<td>62</td>
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<tr>
<td>Bahiagrass</td>
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<td>51</td>
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<tr>
<td>Bermudagrass</td>
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<td>55</td>
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<td>Chicory</td>
<td>15</td>
<td>65</td>
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<tr>
<td>Clover Pasture</td>
<td>25</td>
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<tr>
<td>Cowpea</td>
<td>16</td>
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<tr>
<td>Kudzu</td>
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<td>55</td>
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<tr>
<td>Mature Pasture</td>
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<td>50</td>
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<tr>
<td>Millet (pearl)</td>
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<tr>
<td>Rye</td>
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<td>Sudangrass</td>
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<td>Switchgrass</td>
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<tr>
<td>Tall Fescue</td>
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<td>Vetch (common)</td>
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<tr>
<td>Wheat</td>
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<td><strong>Browse Species</strong></td>
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<td>Broomsedge</td>
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<td>Brush</td>
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<tr>
<td>Curled Dock</td>
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<td>Honeysuckle</td>
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<tr>
<td>Hackberry</td>
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<tr>
<td>Juniper (leaves)</td>
<td>6</td>
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<tr>
<td>Oak Skin</td>
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<td>65</td>
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<tr>
<td>Mulberry (leaves)</td>
<td>21</td>
<td>72</td>
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<tr>
<td>Sumac</td>
<td>13</td>
<td>77</td>
</tr>
</tbody>
</table>

Grazing Management

Manipulation of animal grazing to supply the forage needed for the grazing animal to achieve production goals while obtaining desired plant, land and economic responses.
Rotational vs. Continuous Stocking

Continuous stocking

Rotational stocking

Strip grazing

Creep grazing

Creep gate

Forward creep grazing
Guidelines for Grazing System Design

1. Water placement
2. Paddock shape
3. Number of paddocks
4. Follow the landscape
5. Use of similar grazing capacities
6. Plan alleyways for animal movement only
Impact of Distance to Water on Forage Utilization

Graph showing the temporal utilization rate (% of standing crop) as a function of distance from water (feet). The graph indicates a decrease in utilization rate as the distance from water increases.
Paddock Shape

- Keep paddocks as near square as possible
  - Improves uniformity of grazing
  - Interacts with distance to water
- With shorter grazing periods, shape is less critical
- Amount of fencing required varies with paddock shape

Area = 1 acre  
Perimeter = 834.84 ft.

Area = 1 acre  
Perimeter = 1043.55 ft.

Area = 1 acre  
Perimeter = 1147.9 ft.
Number of Paddocks

- Select based on utilization and performance goals
- Consider grazing tolerance of forages
- Base on regrowth characteristics of forages
- Look at the economic potential of various systems

Paddocks needed = 

\[(\text{Rest period/Grazing period}) + 1\]
Follow the Landscape

- Better fit for forages to soil capability
- Provides better ability to pull paddocks out of rotation for hay harvest
- Evens out pasture productivity
Use Similar Grazing Capacities

- Better maintains forage availability and quality throughout a grazing period
- Keeping paddocks similar sized may result in nutritional stress
  - Need to focus on stocking rate and animal production when setting fences
Impact of Grazing Rotation on Forage Quality

![Graph showing the impact of different grazing rotation strategies on forage quality over the course of the study. The graph indicates a decrease in IVOMD (in vitro organic matter digestibility) percentage over time, with three different rotation regimes: daily, weekly, and continuous. The graph highlights a significant drop in IVOMD starting from Day 22, marking the beginning of Cycle 2.](image-url)
Closing Thoughts

- If you are a livestock producer, you are a forage producer

- When managing a plant, ask:
  - Is it grass/forb/browse?
  - Is it annual/perennial?
  - Is it warm season/cool season?
Closing Thoughts

- Pursue science-based information

- Know your animals: 
  Grazing behavior including preferences
Questions?