Grass Is Immortal

By: Senator John J. Ingalls, deceased

"Lying in the sunshine among the buttercups and dandelions of May, scarcely higher in intelligence than the minute tenants of that mimic wilderness, our earliest recollections are of grass, and when the fitful fever is ended, and the foolish wrangle of the market and forum is closed, grass heals over the scar which our descent into the bosom of the earth has made, and the carpet of the infant becomes the blanket of the dead.

Grass is the forgiveness of Nature—her constant benediction. Fields trampled with battle, saturated with blood, torn with the ruts of cannon, grow green again with grass, and carnage is forgotten. Streets abandoned by traffic become grass grown, like rural lanes, and are obliterated. Forests decay, harvests perish, flowers vanish, but grass is immortal.

Beleaguered by the sullen hosts of winter, it withdraws into the impregnable fortress of its subterranean vitality, and emerges upon the first solicitation of spring. Sown by the winds, by wandering birds, propagated by the subtle horticulture of the elements, which are its ministers and servants, it softens the rude outline of the world. Its tenacious fibers hold the earth in its place, and prevent its soluble components from washing into the wasting sea. It invades the solitude of deserts, climbs the inaccessible slopes and forbidding pinnacles of mountains, modifies climates, and determines the history, character, and destiny of nations.

Unobtrusive and patient, it has immortal vigor and aggression. Banished from the thoroughfares and the field, it abides its time to return, and when vigilance is relaxed, or the dynasty has perished, it silently resumes the throne from which it has been expelled, but which it never abdicates. It bears no blazonry of bloom to charm the senses with fragrance or splendor, but its homely hue is more enchanting than the lily or the rose. It yields no fruit in earth or air, and yet should its harvest fail for a single year, famine would depopulate the earth."
Grass, healer of the land.

This Guide will help livestock producers establish and manage grasslands in northern Missouri. It includes several forages common to northern Missouri, along with guidelines on how to establish and manage them for the most successful and productive stands.

Grass is a healer of the land. It builds soil and does not allow it to wash away.

Many acres in northern Missouri are too steep and too poor to plant crops such as soybeans and corn. However, these soils grow grass well.

Missouri grasslands provide the forage needed to produce beef, milk, wool, lamb and leather. With proper management, these grasslands can return a net income comparable to that of row crops. Proper grassland management is also beneficial to wildlife, as it provides nesting, escape, cover and food.

However, there are very few pastures in Missouri that are managed to their fullest potential. Soil tests on these fields often show low pH and fertility levels, especially on samples taken away from shade and water sources. Pastures are often overgrazed during periods of slow growth and underutilized during periods of rapid growth.

This Guide will provide producers, who rely on forages, necessary information to care for, and to get the most out of, their pastures and hayfields.

"Northern Missouri," in this guide, refers to the part of the state north of U.S. Highway 50.
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# Pasture & Hayland Seeding Rates
(PLS - Pure Live Seed)

<table>
<thead>
<tr>
<th>Species</th>
<th>Base Seeding Rate (Pounds PLS Per Acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Legumes</strong></td>
<td></td>
</tr>
<tr>
<td>Alfalfa</td>
<td>9.4</td>
</tr>
<tr>
<td>Alsike Clover</td>
<td>4.0</td>
</tr>
<tr>
<td>Annual Lespedeza</td>
<td>9.5</td>
</tr>
<tr>
<td>Birdsfoot Trefoil</td>
<td>6.2</td>
</tr>
<tr>
<td>Ladino Clover</td>
<td>3.7</td>
</tr>
<tr>
<td>Red Clover</td>
<td>7.6</td>
</tr>
<tr>
<td><strong>Cool-Season Grasses</strong></td>
<td></td>
</tr>
<tr>
<td>Canada and Virginia Wildrye</td>
<td>10.0</td>
</tr>
<tr>
<td>Kentucky Bluegrass</td>
<td>2.7</td>
</tr>
<tr>
<td>Orchardgrass</td>
<td>5.2</td>
</tr>
<tr>
<td>Reed Canarygrass</td>
<td>6.0</td>
</tr>
<tr>
<td>Redtop</td>
<td>2.1</td>
</tr>
<tr>
<td>Smooth Brome</td>
<td>10.0</td>
</tr>
<tr>
<td>Tall Fescue</td>
<td>10.0</td>
</tr>
<tr>
<td>Timothy</td>
<td>3.9</td>
</tr>
<tr>
<td>Western Wheatgrass</td>
<td>10.0</td>
</tr>
<tr>
<td><strong>Warm-Season Grasses</strong></td>
<td></td>
</tr>
<tr>
<td>Bermudagrass (seed)</td>
<td>2.6</td>
</tr>
<tr>
<td>Bermudagrass (sprigs)</td>
<td>20 bushels</td>
</tr>
<tr>
<td>Big Bluestem</td>
<td>10.0</td>
</tr>
<tr>
<td>Caucasian Bluestem</td>
<td>3.1</td>
</tr>
<tr>
<td>Eastern Gamagrass</td>
<td>10.0</td>
</tr>
<tr>
<td>Indiangrass</td>
<td>9.8</td>
</tr>
<tr>
<td>Little Bluestem</td>
<td>8.0</td>
</tr>
<tr>
<td>Sideoats Gramma</td>
<td>9.4</td>
</tr>
<tr>
<td>Switchgrass</td>
<td>5.9</td>
</tr>
</tbody>
</table>

Seeding rates are based on the optimum amount of seed necessary to produce a productive stand in a reasonable amount of time, and when planting is performed in a conscientious manner. The base rate above is used when making single species plantings with good seedbed preparation and seeding conditions. When only fair conditions can be attained, increase base rate by 25%. Although not recommended, if it becomes necessary to plant under poor conditions, increase base rate by 50%.
Formulating Mixtures

Formula
Base Rate of Species Wanted in Mixture X Adjustment Factor* X % Wanted in Mixture X
Acres = Pure Live Seed (PLS) Needed For Field

Example
A producer wants to seed a 10 acre field to a mixture of tall fescue, red clover and ladino clover. The field will be grazed, so a total of only 50% legumes should be planted. The producer wants 50% tall fescue, 35% red clover, and 15% ladino clover. Seed will be broadcast onto prepared seedbed. The field will be planted in April.

Calculations:

<table>
<thead>
<tr>
<th>Species in Mixture</th>
<th>Base Rate</th>
<th>Adjustment Factor*</th>
<th>% Wanted in Mixture</th>
<th>Acres in Field</th>
<th>Lbs. of Seed Needed for Field</th>
<th>Lbs. of Seed Needed/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tall fescue</td>
<td>10.0</td>
<td>1.75**</td>
<td>50%</td>
<td>10</td>
<td>105 lbs. PLS or 10.5 lbs/ac</td>
<td></td>
</tr>
<tr>
<td>Red Clover</td>
<td>7.6</td>
<td>1.25 **</td>
<td>35%</td>
<td>10</td>
<td>33 lbs. PLS or 3.3 lbs/ac</td>
<td></td>
</tr>
<tr>
<td>Ladino</td>
<td>3.7</td>
<td>1.25 **</td>
<td>15%</td>
<td>10</td>
<td>7 lbs. PLS or 0.7 lbs/ac</td>
<td></td>
</tr>
</tbody>
</table>

*Adjustment factor: Base rates need to be adjusted based on seedbed and seeding conditions. When only fair seedbed and seeding conditions can be attained, increase the rate by 25%. When necessary to plant under poor conditions, increase the base rate by 50%. When cool-season grasses are included in mixtures with legumes and planted at the same time, the cool-season grass rates will be increased again by 25% for fall plantings and 50% for spring and dormant plantings.

** Tall fescue adjustment factor = 1.75, increased by 25% for seedbed and seeding conditions and by additional 50% for spring planting a cool-season grass at the same time as a legume.

** Red clover increased by 25% for seedbed and seeding conditions.

** Ladino increased by 25% for seedbed and seeding conditions.

Adding Legumes to Existing Grass Stands

Legumes may be broadcast or drilled into existing grass stands. The percent legume wanted in the mix will total between 25 and 50%. The existing grass stand should make up 50 - 75% of the mix. If the existing grass stand has deteriorated to where the grass is less than a 50% stand, then a complete renovation should be planned. Use the same formula as above for calculating interseeding rates.

Example
A producer wants to overseed a field that has a 60% cover of tall fescue with annual lespedeza. It will be broadcast during the dormant period (Feb) with no seedbed preparation.
Calculations: Annual lespedeza 9.5 lbs. x 1.5 x 40% x 10 ac = 57 = 60 lbs.
Pasture & Hayland Seeding Dates

Cool-season Grasses and Legumes

Spring - March 1 to May 15
Fall - August 1 to October 1
Dormant - December 15 to March

Warm-season Grasses

Spring - April 15 to July 1
Dormant - November 15 to March 15

Lespedeza should not be seeded during fall seeding dates. It may be added during the dormant period.

Proper seeding within these dates will give the plants the best chance to get established before weeds or unfavorable (dry or cold) weather. Dormant seed dates are set to avoid warmer weather that may cause seed sprouting before cold weather.

Specie Selection

Plant forages that are suited to the soil environment and to the class of animals to be grazed. For example, a cow/calf producer should choose forages that produce well during the cow’s peak needs such as lactation (see spring calving cow chart) and/or provide low cost winter grazing. A fall stocker operation would need high quality forage available in late fall and early spring. Operations buying stockers in the spring (most common in northern Missouri) need quality forage throughout the summer, as well as in April and May.

While having both cool- and warm-season pastures, can provide high quality forage throughout the growing season, it is not generally recommended to mix them together. If cool- and warm-season grasses are mixed together, a high level of management will be needed to ensure the continued productivity of the stand.

Seedbed Preparation

A firm, weed-free seedbed is best for consistent successful seedings. If seed is to be broadcast, firm the ground with a roller or cultipacker before and after broadcasting seed. If drilling, make sure the seedbed is firm and plant no deeper than one-fourth inch. Legumes can be planted into a weakened stand of grass. A grass stand can be weakened by heavily grazing it the fall before, a light discing to kill one-half of the sod or using chemicals (follow label directions). A late July to August prescribed burn can also be effective. Good soil-to-seed contact and not planting the seed too deep is essential. Drills with agitators and oversized seed tubes will be needed for the bluestems and indiangrass if they are not beheaded. They can also be helpful for other hard to plant seeds such as smooth bromegrass. See Eastern gamagrass for its specific seeding recommendations.

Inoculate legume seed with its specific inoculant and plant within 12 hours of inoculation. Annual lespedeza and red clover are most effectively established by seeding in February and March. Unless seeded into endophyte infected fescue, it is advisable to let the grass establish for at least one-half year prior to planting the legume.
Calculating Pure Live Seed

All recommended seeding rates are based on the pure live seed (PLS) content of the particular seed lot being used. The percent of PLS is calculated by:

\[
\text{Percent PLS} = \left( \frac{\text{Total Germination} \times \text{Purity}}{100} \right)
\]

To determine the amount of bulk seed of this particular lot to be applied per acre, divide the pure live seed amount required by the percentage of pure live seed.

If we want to seed seven pounds PLS of this lot of fescue per acre, calculate by: 7 lbs. PLS divided by 89.55% (.8955) PLS = 7.8 lbs. bulk seed needed per acre.

Once the bulk seed needed is calculated, this information can be used to calibrate the seeding equipment to apply the proper amount of seed.

Example

Kind and Variety: Fescue

<table>
<thead>
<tr>
<th>Pure Seed</th>
<th>99.5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Crop</td>
<td>0</td>
</tr>
<tr>
<td>Inert Matter</td>
<td>.25%</td>
</tr>
<tr>
<td>Weed Seed</td>
<td>.25%</td>
</tr>
<tr>
<td>Germination</td>
<td>86%</td>
</tr>
<tr>
<td>Hard Seed</td>
<td>4%</td>
</tr>
<tr>
<td>Total Germ</td>
<td>90%</td>
</tr>
</tbody>
</table>

Origin: Backyard Lot No. 1

Date Tested: 3/91
Net Weight: 60 lbs
MO Permit: #F00001

Noxious Weeds

40 Buckhorn Plantain per lb.
30 Crabgrass per lb.

\[
\text{Germination 86\% + 4\% hard seed x 99.5\% Pure Seed} \times \frac{100}{100} = 89.55\% PLS
\]
Nutrient Removal

### Amount of estimated nutrient removal

<table>
<thead>
<tr>
<th>Crop</th>
<th>Nitrogen</th>
<th>Phosphorous</th>
<th>Potassium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa</td>
<td>0</td>
<td>14.0</td>
<td>50</td>
</tr>
<tr>
<td>Smooth Bromegrass</td>
<td>40</td>
<td>12.0</td>
<td>44</td>
</tr>
<tr>
<td>Tall Fescue</td>
<td>42</td>
<td>14.0</td>
<td>47</td>
</tr>
<tr>
<td>Orchardgrass</td>
<td>45</td>
<td>14.0</td>
<td>55</td>
</tr>
<tr>
<td>Red Clover</td>
<td>0</td>
<td>12.5</td>
<td>45</td>
</tr>
<tr>
<td>Timothy</td>
<td>36</td>
<td>13.5</td>
<td>56</td>
</tr>
<tr>
<td>Switchgrass **</td>
<td>25</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Big Bluestem **</td>
<td>25</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Indiangrass **</td>
<td>25</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Caucasian Bluestem **</td>
<td>25</td>
<td>5</td>
<td>12</td>
</tr>
</tbody>
</table>

* A producer should test his field(s) every three to four years to get the correct rate required.

** These rates of fertilizer are dependent on a soil with a pH of 5.6 - 6.0, a phosphorus level of 30 pounds per acre, and a potassium level of 160 pounds per acre.

The most economic benefit from nitrogen appears to be at a rate of 60 pounds per acre for the native, warm-season grasses used for hay. This should be applied no earlier than mid-May. A split application can be applied at green-up and early July.

Pasture fertility is commonly neglected. This reduces the production and number of species that can be grown. Pastures can vary greatly in their fertility needs, even within fields. It depends on land slope, stocking rate, shade winter haying patterns and water sources. All of these factors affect manure distribution. Soil test values for phosphorus and potassium are commonly three to five times greater within 50 feet of a lone shade tree than the general pasture (Jim Gerrish, Forage Systems Update, Vol. 2, No. 3). Evening out manure distribution by varying haying sites, subdividing fields, placing water within one-fourth of a mile of all points in a pasture, taking soil tests regularly, and separating high and low livestock use areas are all good steps to take for proper pasture fertility.
# Fertility Removed by Grazing vs. Haying Systems

<table>
<thead>
<tr>
<th></th>
<th>By Grazing When Pounds of Beef/Acre Removed</th>
<th></th>
<th></th>
<th>By Haying When Tons of Hay/Acre Removed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>125##</td>
<td>250#</td>
<td>500#</td>
<td>2 Ton*</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>4.5</td>
<td>9.0</td>
<td>18.0</td>
<td>100</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>2.2</td>
<td>4.5</td>
<td>9.0</td>
<td>20</td>
</tr>
<tr>
<td>Potassium</td>
<td>0.3</td>
<td>0.7</td>
<td>1.0</td>
<td>80</td>
</tr>
</tbody>
</table>

* 125# Beef/Acre removed approximately = 2 Tons/Acre of hay removed when; daily gain = 1.8#/day, intake = 3% of body weight/day and grazing efficiency = 30-35%.
What is Your Livestock Manure Worth?

1000 Lb. Beef Cow Produces 63 Lbs./Day

Contains: 0.3 Lbs. N @ $0.32/Lb. = .10

.27 Lbs. P205 @ $0.29/Lb. = .08

.26 Lbs. K @ $0.14/Lb. = .04

1 Cow = $0.22 Fertilizer/Day

$0.22 x 365 Days = $80.30/Cow/Year

100 Cow Herd $8030.00/Year

*Assumes A 50% Loss In Nitrogen

In a well managed grazing system, very few nutrients leave the farm.

If manure is evenly distributed throughout the paddocks, fertility can be maintained through natural nutrient recycling.
<table>
<thead>
<tr>
<th>Crop</th>
<th>pH Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa</td>
<td>6.0-7.0</td>
</tr>
<tr>
<td>Smooth Bromegrass</td>
<td>6.0-7.0</td>
</tr>
<tr>
<td>Red Clover</td>
<td>6.0-7.0</td>
</tr>
<tr>
<td>Kentucky Bluegrass</td>
<td>6.0-7.0</td>
</tr>
<tr>
<td>Ladino Clover</td>
<td>6.0-7.0</td>
</tr>
<tr>
<td>Tall Fescue</td>
<td>5.6-7.0</td>
</tr>
<tr>
<td>Timothy</td>
<td>5.6-7.0</td>
</tr>
<tr>
<td>Orchard Grass</td>
<td>5.6-6.5</td>
</tr>
<tr>
<td>Switch Grass</td>
<td>5.6-6.5</td>
</tr>
<tr>
<td>Big Bluestem</td>
<td>5.6-6.5</td>
</tr>
<tr>
<td>Indian Grass</td>
<td>5.6-6.5</td>
</tr>
<tr>
<td>Caucasian Bluestem</td>
<td>5.6-6.5</td>
</tr>
<tr>
<td>Birdsfoot Trefoil</td>
<td>5.6-6.5</td>
</tr>
<tr>
<td>Annual Lespedeza</td>
<td>5.0-6.2</td>
</tr>
<tr>
<td>Red Top</td>
<td>5.0-6.2</td>
</tr>
</tbody>
</table>
Establishment Period
(1-2 years)

After seeding, it is important to control weed competition. Annuals such as foxtail, cocklebur, and marestail, are often the most serious competition. Mow weeds before they get taller than two feet, leaving them five to six inches high. This will help keep weeds in check. Chemicals may also be used if label directions are followed. The Extension Office in your county can provide you with current information on approved chemicals.

Occasionally, stands will be good enough to lightly graze or hay during the first year. However, production will usually be less than in later years because many factors affect forage production. Time of the seeding, percentage of hard seed, soil fertility and weather conditions each play a major role in first year production. Warm-season grasses, for example, usually do not produce well until the second or third season. They often have a high percentage of hard seed and much of their growth in the first year is directed toward root development.

Established Plantings

Leaf area is very important to forages. Like every living thing, plants must have food. The only way forage plants can obtain food is through their leaves. When too much leaf area is removed, the plant must draw on root reserves. If this happens too many times, the plant dies. (See the chart below.)

As forages mature, quality drops, and they become less palatable to the grazing animal. When forage quality drops, animal performance (gain, milk production, etc.) also drops.

Two goals of proper management are: (1) keep the forage in a strong, active growing state and (2) keep the forage in a vegetative state as long as possible.

Types of Pasture Systems

There are basically three types of grazing systems: (1) continuous, (2) rotational (moving one herd between two to seven pastures) and (3) management-intensive (eight or more pastures). Each grazing system has advantages and disadvantages.

Continuous Grazing

The advantages of this system include lower setup costs (water and fence) and less required management. Animals can also eat their choice of plants, if the pasture is not overstocked (note this emphasis).

However, less beef is produced per acre and animals use only 30-35 percent of the available grass, less desirable plants begin to dominate, and it is difficult to maintain legumes and re-establish weakened areas with this system.

Rotational Grazing

The advantages of a rotational system include the following: the producer can match grazing to plant growth, the desirable plants have a period of rest and re-growth, there is an increase in both forage and animal production, and fields can be set aside for haying or fall stockpiling.
How Grasses Grow

Ninety-five percent of plant food is taken from the air.

Leaves are food factories. In the presence of sunshine they combine carbon dioxide from the air and water, nitrates, and minerals from the soil to make plant food. **Short tops mean short roots!**

Five percent is taken from the soil.

Roots gather raw materials: water, nitrates, and minerals which are converted into plant food by the leaves. Roots also serve as storehouses for food. This food is essential for regrowth. **Short roots mean less future grass production!**

Overgrazing will destroy both the leaves and the root.

The disadvantages are: increased costs for fencing and water supplies, more required management and labor, and it may still be difficult to maintain legumes or to reestablish weakened areas.

**Management-Intensive**

This last system, also called “time controlled grazing management” “cell,” or “short duration grazing,” has the advantages of: increasing forage production and promotes forage diversity. The grazing manager has better control of the grazing animal and so also the forage resource.

Paddocks can be skipped to provide nesting or winter cover during dormant periods. Then used at a time that is more compatible to wildlife needs. This method of grazing optimizes pounds of beef produced per acre, fewer weeds, better nutrient cycling and better utilization of available forage (up to 70 percent) during dormant periods.

The disadvantages include even higher initial costs for fencing and water and there is a higher level of management and labor required.

**Planning a System:**

In planning a pasture management system, you should first inventory your farm. The inventory should include at least the following:
- Personnel Available
- Animals (kind & growth stage)
- Identify & Communicate Goals
- Feed and Forage available (cool and warm-season forage)
- Land Resources available (owned, rented)
- Wildlife desired
- Physical layout (water, fences & handling facilities)
- Soils (yield potential for forages grown)

Make a decision to raise a certain number and class of livestock based on the forages and feeds available, their expected yields, time and experience of the operator(s), and availability of physical resources. If you are strongly set on the type of livestock to raise, then you will need to decide what changes you should make in your current forages and physical resources to meet their needs.
Managing Pasture Growth:

No matter what system you choose, however, leave enough leaf area on the plants to keep them strong and actively growing. Plants grow fastest early in the growth cycle. And, they can be grazed more often, as long as minimum grazing heights are observed. As plants mature, growth slows because the plant puts its energy into seed production.

Regrowth of cool-season grasses is reduced in northern Missouri during the summer, because of reduced rainfall and higher temperatures. If growth during the spring has been stockpiled animals can graze the paddocks longer in the summer, until the forages are grazed to the planned minimum grazing height. Minimum grazing heights are important to monitor because forages will not have enough leaf area to continue growth if they are grazed below these heights.

Another option to maintaining adequate rest periods is to divide the pasture(s) into enough paddocks to graze them the same number of days throughout the year. To do this, the maximum rest period is figured (say, 40 days). Then, the number of days in each paddock is decided upon (say, 4 days). The number of paddocks needed is $40/4 + 1 = 11$ paddocks. When forage growth is rapid, rest periods can be shorter, so fewer paddocks are needed. If the rest period needed for the grass to rebound is only 20 days, then only six paddocks will be needed in this example. The other five can be set aside for hay.

**Other Management Considerations:**

**Fall stockpiling** with cool-season grasses, especially fescue, is a good practice when animals must be fed throughout the winter. To stockpile a pasture, rest the pasture from August until October or November, then graze it through the fall and winter. Studies at the Forage Systems Research Center in Linneus, Missouri, indicate that fertilization at a rate of 40 to 60 pounds of nitrogen per acre in early August will economically boost production on fall stockpiled fescue pastures (40 pounds when conditions are dry, 60 pounds when the ground is moist). Stockpiling can reduce the amount of hay needed during the winter, especially if strip-grazed. Strip-grazing is where the herd is given only small segments of the pasture at a time so that each segment is grazed only once during the dormant season.

**Endophyte-infected fescue** is a problem in many pastures in Missouri. This is caused by a fungus which grows in the fescue plant. The toxin the fungus produces has been shown to cause summer slump syndrome. Animals with summer slump exhibit poor weight gain, low conception, high body temperatures, reduced milk flow, and diarrhea. Often animals suffering from the toxin will be seen standing in ponds to lower their body temperature. In the winter, infected animals may lose tails.

**Minimum Grazing Heights**

<table>
<thead>
<tr>
<th>Introduced cool-season grasses &amp; legumes</th>
<th>3 inches</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>fescue, bromegrass, orchard grass, timothy, clovers, etc.</em></td>
<td></td>
</tr>
<tr>
<td>Native warm-season grasses</td>
<td>8 inches</td>
</tr>
<tr>
<td><em>indian grass, big bluestem, switch grass, etc.</em></td>
<td></td>
</tr>
</tbody>
</table>

Consideration should also be given to the heights the forage is allowed to reach before winter dormancy begins. This permits the plant time to rebuild root reserves for early growth next spring. Pastures that were grazed late or hard the fall before should be the last grazed the following spring.

**End of Growing Season Heights**

<table>
<thead>
<tr>
<th>Introduced cool-season grasses</th>
<th>6 inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native warm-season grasses</td>
<td>10 inches</td>
</tr>
</tbody>
</table>

Native warm-season grasses have higher minimums because most of their growth (and leaf area) is upright. Fescue, bromegrass and orchard grass grow more prostrate, so a lower percentage of the leaves are lost to grazing. Production (tonnage) is still comparable to cool-season grasses, even with the higher grazing heights.
hoofs or ears due to extreme constriction of the blood vessels. Mares often abort fetuses.

To manage infected pastures, (1) keep fescue from developing seed heads (the toxin concentrates in the stem and seed heads); (2) dilute it with other forages (such as legumes) or feeds; (3) rotate out of fescue during the summer months; and (4) renovate it (this is the most costly, but may be necessary in some situations). A complete kill of the infected fescue with tillage, smother crops and/or chemicals is necessary, as any infected fescue that survives will usually spread into the new seeding. (See the University of Missouri Agricultural Guides G4651 and G4646 for more information on managing fescue.)

Prescribed burning can be helpful in invigorating stands, reducing weeds and evening grazing pressure, if done properly. If not done properly, however, it can: weaken the stand, increase weed competition and/or cause property damage or loss of life. Missouri law holds the person setting the fire responsible for damage caused by fire or smoke. Anyone considering burning their pastures should attend a prescribed burn workshop and ask for a burn plan from the Natural Resources Conservation Service. This will tell you the best time to burn for what you want to accomplish and describe the necessary weather conditions, personnel, preparation and equipment needed to conduct the burn as safely as possible. Some counties have equipment available that can be rented to conduct prescribed burns. Contact your local Natural Resources Conservation Service office for more information.

Forage Testing

Producers are beginning to look at forage and hay testing as another management tool. Knowing the nutrient quality of the forage the livestock are eating and the livestock’s needs at different times of the year can help conception rates, herd health, birth weights and weaning weights. In the same way, knowing the quality of the hay being fed will help the producer know whether supplemental feeds will be needed. For example, if the hay has enough protein for a nursing cow, but not enough energy, corn would be a better supplemental feed than soybean meal. Testing the hay can keep the producer from giving the animals too little of one nutrient or another. There are many commercial laboratories that provide forage quality analysis at reasonable rates. Contact your local Extension Office for testing information and current costs. Extension Livestock Specialists and NRCS grassland specialists have programs to determine proper feed supplementation if hay or forage quality is known.

In determining an initial stocking rate for an unfamiliar pasture, the following formula can be used:

Animal Numbers = T.F.P/ac X ac X % G.E. X A.W. X I.R. X Days

T.F.P. = total forage production (in lbs/acre dry weight) Can use hay production, (plus stubble and regrowth), previous experience, clipping data, etc.

ac = acres in pastures

% G.E. = % grazing efficiency. Use 30% for a continuous system, 50% for 8-12 paddocks or pastures and 65% for 24 or more paddocks as a guide.

A.W. = average animal weight

I.R. = intake rate. Use 2% (.02) for maintenance, 3% (.03) for average growth and 4% (.04) for high growth.

Days = days of grazing planned.

For example, assume a 240 acre pasture that is continuously grazed with 700# steers for 180 days. Total forage production is estimated at 3 tons/acre (6000#). How many 700# steers can be carried?

\[
\frac{6000\# \times 240 \times .30}{700\# \times .04 \times 180} = 85 \text{ head}
\]

The same equation above can be used to calculate days of grazing if days and animal numbers are transposed.

continued on next page

For more information, see the University of Missouri Guide G4575 - “Making and Storing Quality Hay.” In general, forage and hay quality drops dramatically after the boot stage. Cutting hay when the grass is in the boot to early head stage and when the legumes are in the early bloom state of flowering are good general guidelines to follow.
In starting a controlled or Management-Intensive Grazing system, some other calculations are helpful:

Riparian Management

As water quality receives more attention, riparian areas are being identified as the most likely pollution sources in a pasture system. They provide water, shade and the most abundant, succulent forage during dry periods. Livestock are attracted to these areas, and may cause water fouling, streambank erosion and lowered vegetation quality can occur if access is not controlled. Some cost-share programs are now being targeted toward giving livestock alternative water sources rather than being allowed free access to streams.

Grazing Period (G.P)

\[
G.P. = \frac{\text{Rest Period needed (in days)}}{\# \text{ paddocks} - \# \text{ herds}}
\]

An example would be: A rest period of 20 days is needed in the spring to allow the forage enough time to rebound during it’s period of rapid growth. The pasture is split into 8 paddocks. Only 1 herd grazes the system. How long can each paddock be grazed?

\[
\frac{20}{8-1} = 2.85 \text{ days or almost 3 days}
\]

As growth slows, rest periods should be lengthened to allow the forage more time to recover. If the rest period needed is now 45 days, how many days should each paddock in the above example be grazed?

\[
\frac{45}{8-1} = 6.4 \text{ days or about 6.5 days (moves can be made in .5 day increments quite easily by alternating from morning to evening.)}
\]

This example highlights why forage growth should be stockpiled (built up) while it is rapidly growing. If not, there will not be enough grazing available to keep the livestock when growth slows. In the period of rapid growth, the trick is to rotate quickly enough to keep the grass in a vegetative state and keep the animals from grazing the grass down too short, yet graze long enough to use each paddock evenly. Some paddocks will probably need to be skipped and hayed during periods of rapid growth to keep all of them in a vegetative state. Flexibility is a great asset to the Management-Intensive Grazing system manager.

To figure number of paddocks:

\[
\frac{\text{Days of Rest/Period}}{\text{Days/Rotation}} + \frac{\text{Days/Rotation}}{\# \text{ Paddocks}}
\]

Example:

\[
20 + 1 = 8 \text{ paddocks} \quad \text{or} \quad 45 + \frac{6}{2.85} = 8.5 \text{ (use 8 or 9)}
\]

Acres per Paddock is simply: Total acres in pasture

\[
\frac{\# \text{ paddocks}}{}
\]

Using this example, \[
\frac{240 \text{ acres}}{8 \text{ paddocks}} = 30 \text{ acres/paddock}
\]

However, equal productivity in paddocks is more important than equal acres.
Ruminant animals have been grazing since the beginning of time. It is natural instinct. It is also natural for the grazing animal to select the most desirable plants and avoid others. By doing this the composition of the diet they consume is higher than the composition of the total forage available. Selective grazing is essential to free roaming animals. It allows them to balance their diet to stay healthy and reproduce. With free roaming animals, once the desirable forage growth had been removed the animals moved on to another area and gave the grazed area a period of rest. This period of non-use or rest was essential to the long term health and survival of the grassland resource.

As human populations increased, man took control of more of the earth’s surface, and nature’s grazing system was interrupted. Man built fences to keep their animals in and trespassers out. Once the fences went up, animals were no longer free to roam but were confined to a specific area for whatever time period the owner or manager decided. Any type of grazing management must consider the animal’s and plant’s requirements space and time. How managers decide to use these variables will affect the efficiency of the whole forage resource.

There are several types of grazing management available: continuous, switchback, rotational, deferred rotational, short duration, high intensity-low frequency, controlled rotational and Management-Intensive Grazing. Continuous grazing is the most widely practiced form by far. It is easy and requires very little thought or management. With continuous grazing one pasture is used throughout the year by a herd of animals. An area is stocked at a rate to consume the expected forage production for that growing season. The pasture may be over or under stocked from year to year due to variations in weather patterns. With continuous grazing, animals can selectively graze the more desirable plants and leave less desirable ones to mature. As plants mature they become less desirable and are repeatedly skipped in preference to new growth from plants that have been previously grazed. As this process continues, the grazed plants become overgrazed and other areas are undergrazed. The overgrazed plants become weakened and begin to thin and die. Desirable forage plants are replaced by lower quality less desirable weedy species.

The alternative to continuous grazing is some form of managed rotational grazing, whereby animals are moved from one pasture to another allowing each pasture to rest before being regrazed. This type of system tries to mimic nature’s system. The main reason for implementing any type of grazing management system is to give plants a chance to rest and regrow replenishing carbohydrate reserves so that the pasture stays healthy and productive. Management of a grazing system revolves around the rest period. The length of the rest period depends on how fast the plants are recovering and producing new growth and how severe or short the pasture was grazed earlier. If sufficient, actively growing residual is left, pastures will recover faster and produce more total growth. However, if pastures are allowed to rest too long, forages become more mature and less desirable for the grazing animal.

Management-Intensive Grazing is becoming increasingly popular because of the need for graziers to become more competitive in cost of production. To stay in business, producers must find ways to increase production efficiency to cover the rising costs of land, labor and operating expenses. One way to increase production efficiency is managing grazing to increase harvesting efficiency of the forages produced. With continuous grazing harvesting efficiency is generally between 30 and 40%. This means that 65 to 75% of our production is not available for grazing. With
that 60-70% of our production is not available for grazing. With Management-intensive Grazing harvesting efficiencies can run over 60% due to higher stock densities and more even utilization of pastures. The quicker a group of animals can evenly graze an area to the desired level the higher the harvesting efficiency will be. Conversely, the longer animals stay in a particular pasture with adequate forage the lower the harvesting efficiency will be. This is due to loss by fouling by manure and urine, trampling from bedding and refusal due to lower quality. Again the time factor enters in.

While controlling the time of the rest period is crucial for the long term health and survival of the pasture, controlling the time of the grazing period is crucial to animal efficiency and economic productivity. Management-intensive Grazing places emphasis on controlling both time periods keeping the needs of both the grazing animal and the forage resource in mind to reach an optimum level of economic efficiency and environmental sustainability.

The greater control we have of rest periods, grazing periods and stock density, the more efficient the system becomes. To gain control means reducing the size of the grazing area and time of the grazing period by fencing the grazing unit into several subunits or paddocks. The number of paddocks needed will be determined by the level of efficiency that you want to achieve, and the time, labor and capital resources you have available to build and manage the system. If time and money are a limiting factor, then start small and build up, increasing the intensity of the system over time. A minimum of 6 to 8 pastures are needed to gain meaningful control over the time factor. The greater the number of paddocks you have, if they are stocked properly, the more efficient will be the system and the higher the returns to management.
In sustainable systems, economic and environmental benefits cannot be separated, for without one you cannot have the other. Environmental practices that are not economical will not be adopted or sustained due to economic constraints. On the other hand, practices that are geared solely towards profitability without regard to the environment or condition of the resource base will not be sustainable over the long term. One of the best ways to get long term conservation on the ground is to find cost effective ways it can be done.

The following is a listing of benefits observed by participants using well thought out and applied grazing systems.

### Environmental and Economic Benefits

<table>
<thead>
<tr>
<th>Improved vegetative cover -</th>
<th>reduced runoff potential; reduced soil erosion</th>
</tr>
</thead>
<tbody>
<tr>
<td>More vigorous root system -</td>
<td>increased water infiltration; improved response to rainfall; reduced soil erosion potential</td>
</tr>
<tr>
<td>Improved nutrient distribution -</td>
<td>reduced nutrient runoff; reduced fertilizer application; reduced pollutants in watershed</td>
</tr>
<tr>
<td>Healthy, vegetative sward -</td>
<td>reduced herbicide usage; reduced potential chemical runoff; improved soil carbon and nitrogen cycling; less outside inputs entering the system</td>
</tr>
<tr>
<td>Increased plant diversity -</td>
<td>improved wildlife habitat; climatic persistence; improved use of available nutrients; longer season for active cycling of nutrients</td>
</tr>
<tr>
<td>Improved soil health/condition -</td>
<td>increased earthworm populations; improved infiltration; improved fertility</td>
</tr>
<tr>
<td>Reduced time and/or access to streams -</td>
<td>reduced streambank erosion; improved streambank cover/shade; improved wildlife/aquatic habitat; reduced pollutants reaching stream</td>
</tr>
</tbody>
</table>

All of these environmental benefits and improvements lead to..

<table>
<thead>
<tr>
<th>Increased production -</th>
<th>increased carrying capacity; increased per acre gains; maintained/improved individual average daily gains; maintained/increased milk production; improved animal health; decreased culling rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decreased Costs -</td>
<td>feed; fertilizer; weed control; fuel/machinery; labor; animal waste storage and handling</td>
</tr>
</tbody>
</table>

To manage grasslands effectively we need to understand the plant-soil-water-animal interrelationships.
We can manage this complex ecosystem for profitability and environmental sustainability only if we understand the interactions of all the variables. In other words, what effect each component has on the other and the whole and what reaction each will produce.

In today's society we have to realize that farming is not only a way of life but it is a business. If we are to stay competitive in the business world we have to plan for our success. No one plans to fail, they just fail to plan. If we are to be economically and environmentally sustainable, we can't leave it to chance.

Factors that Lead to Success

1. Being open minded - receptive to new ideas, new ways to do things
2. Having a positive attitude - you have to believe it will work first
3. Being observant - knowing what was happening
4. Managing by a plan - you have to know where you are going and how to get there or you will never know if you make it
5. Staying flexible - knowing when changes are needed and making them
Principles

1. Animal type (size, age, production potential, stage of growth/lactation) influences the nutrient requirements of the livestock.

2. Animal performance on pasture will be affected by the type of livestock and the quality of pasture.

3. The higher the quality and management of pastures - the higher the nutrient requirement/production potential livestock should be used as harvesters.

4. Livestock performance is 75% intake & 25% forage quality - maximize intake.

5. Length of grazing period per paddock affects: intake, quality, animal performance, utilization, regrowth, and manure distribution.

6. Balance yield and quality based on livestock needs.

7. Livestock (harvesters) may be the easiest component to change in the system.

8. Length of rest period per paddock affects: health, vigor, regrowth, and quality of pasture.


10. Size of paddock determines: stock density, length of grazing period, utilization rate, and manure distribution.
Rest Periods

Cool-season Grasses
14-16 DAYS during first rotation (April)
20-30 DAYS during fast growth (May-Jun. 15)
30-40 DAYS during slow growth (summer or cold)
20-30 DAYS during fall (Sept.-Dec.)

Legumes
24-32 DAYS throughout the season
40-45 DAYS for seed production

Introduced Warm-season Grasses
14-21 DAYS during early fast growth
21-28 DAYS during normal growing conditions
35-45 DAYS during slower growth (cool, cloudy, or dry)
45-60 DAYS during adverse weather (drought)

Native Warm-season Grasses
30-45 DAYS during normal growth
45-60 DAYS during adverse weather
(should never have rest periods less than 30 days if stands are to be maintained)

Grazing Periods
The faster the growth the shorter the graze period
3-5 days maximum spring
5-9 days maximum early summer
9-12 days late summer, or winter dormancy
5-9 days fall

For optimizing animal performance - rotate;
Dairy cattle - 1-2 times per day
Stocker cattle - every 1-2 days
Cow/Calf - every 2-5 days, during periods of optimum growth.

Estimated Dry Matter in Pounds Per Inch

<table>
<thead>
<tr>
<th>Pasture Kind</th>
<th>Fair</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native Tall Warm-season</td>
<td>50-100</td>
<td>100-200</td>
<td>200-300</td>
</tr>
<tr>
<td>Tall Fescue and Nitrogen</td>
<td>150-250</td>
<td>250-350</td>
<td>350-450</td>
</tr>
<tr>
<td>Cool-season Grass and Legume</td>
<td>100-200</td>
<td>200-300</td>
<td>300-400</td>
</tr>
<tr>
<td>Red Clover or Alfalfa</td>
<td>150-200</td>
<td>200-250</td>
<td>250-300</td>
</tr>
<tr>
<td>Mixed Pasture</td>
<td>150-250</td>
<td>250-350</td>
<td>350-450</td>
</tr>
</tbody>
</table>
Livestock Considerations

Cow/Calf

- Should be able to minimize outside inputs
- Should match calving/breeding period with quality forage period
- Should have the longest grazing season
- Has more fluctuations in nutrient requirements
- Should be able to increase carrying capacity, increase beef production per acre, and/or decrease costs
- Need functionally efficient cows

Stockers

- Potential for higher returns from good forage management
- More consistent nutrient requirements
- May require more outside inputs
- May require more/better facilities
- Steers vs heifers?
- Fall vs spring purchase?
- Purchase size?
- Should be able to get 1.5-2.0 lbs. ADG and 500-800 lbs. beef/ac

Sheep

- Potentially the most efficient grazing animal
- Good conversion of forage to meat and wool
- Complement rather than compete with other livestock
- Provide good biological weed control
- Help diversify farm income
- Help maintain plant diversity in pastures
- Require more fencing
- Should manage to lamb on pasture to cut expenses

Replacement Heifers

- Can have higher returns per acre
- Higher nutrient requirements
- Need to gain 1.75 lbs. per day from weaning to calving at 2 years
- May need more supplementation
- Longer growing cycle than stockers
- Usually have a higher average intake than stockers
- Good grazing management can achieve target weight at a lower cost
Dairy

- Potential for the highest return from grass management
- Has highest nutrient requirement
- Requires more time and management
- Requires more overhead
- Requires more outside inputs
- Shade and water are more critical
- Grazing management can reduce feed costs and other outside inputs
- Grazing may reduce animal waste handling costs
- Grazing management may reduce some overhead costs
- Grazing may improve health/life of herd
- Milk production can be maintained with MIG
- MIG may reduce equipment cost and maintenance
- Most profitable system will be seasonal, grass based with cows that are adapted and efficient grazers
Seasonal Grazing Strategies

Spring Green Up

Delay fertilization until late spring if needed to extend the growth curve

Begin grazing the first paddock at 3-4" and move rapidly until you get to a paddock that has reached the desired turn in height of 6-10"

Normally, the first 3 months of the grazing season you will only need to graze about 50% of your paddocks

Options:
- Cut hay on remaining 50% once then put back in rotation
- Graze another group of animals on the other 50%
- Use a leader/follower grazing plan letting high producing animals topgraze and lower producers clean up
- Increase acreage of warm-season grasses to delay green-up and lengthen productive period
- Strip-grazing stockpiled fescue in the winter on some of the paddocks will delay and slowdown spring regrowth
- Setting aside the areas that were strip-grazed in winter for hay, then grazing through summer, and setting aside for stockpiling in fall has worked pretty good most years

Do not tighten up grazing too soon - keep paddocks larger and move through quicker allowing animals to top graze and build some reserve

Do not worry about grazing utilization (harvest efficiency) at this time - we can make up for that when growth slows

Mid-Late Summer

Start intensifying grazing management

Recovery is slower, rest periods need to be longer

Shoot for higher utilization of grass

Management Options:
- Stay longer in each paddock
- Move when grazed down to desired height
- Subdivide or strip graze within each paddock to achieve higher utilization and extend rest period

Need to be able to graze paddock to desired level before regrowth starts
If paddocks are too large, may have to use a forward wire and a back wire to prevent grazing new growth - water becomes a more critical factor.
Seasonal Grazing Strategies

Late Summer • Drought

Make maximum use of plants such as lespedeza, birdsfoot trefoil, native warm-season grasses
Get really intensive - strip graze each paddock taking grass to minimum grazing height
Calculate reserve herd days or cow days grazing left
Start culling - beat the rush to the sale barn!
Wean early-run weaned calves ahead of dry cows and supplement them
Let dry cows have lowest quality forage and clean up pastures
As conditions worsen, feed hay on paddocks to supplement pasture - resist the temptation to buy feed
When you are out of grass and hay sell all of your livestock
Then it will rain tomorrow!!

Fall•Winter

Apply 40-60 lbs. Nitrogen to cool-season grasses in early August.
Defer grazing (stockpile) 1 acre of fescue per animal unit
Rotationally graze through the rest of the cool-season pastures
Surplus warm-season forage may be grazed after a hard freeze if needed - will need a protein supplement
Once grass growth has quit and rotational pastures are fully utilized start strip-grazing stockpiled fescue
Calculate forage available per acre, figure daily forage required for the herd, use a 70% utilization rate if moving every 2 days, figure the size strip required for the time period

Example:

3000 lbs. forage/acre
60 cows @ 30 lbs./cow/day = 1800 lb. required/day
70% utilization = 1800/.70 = 2571 lbs on offer
2571/3000 = .86 acre per day required
2 day graze period = 1.72 acre
40 acre field 1320 x 1320
43560 x 1.72/1320 = 56.76 or 57' per strip for 2 days

Start with the first strip closest to the water point, pull a single portable wire across the area to give the calculated area needed, after this is grazed down move the wire forward the required distance, there is no need for a backfence as there is no regrowth occurring
The **Real Cost Saver**  Stockpiling and **Stripgrazing Tall Fescue**

1 AC Fertilized Fall Grown Tall Fescue Will Meet the Nutrient Requirement of a 1000 lb. Cow for 75 Days

60 lb N Applied To 3” Fescue Aug. 15 Produced 3000 lbs/AC x 75% Utilization = 2250 lbs.
Available/30 lb/Cow/Day = 75 days
@ $0.32/lb N Cost = $0.24/Cow/Day Cost
Keys to Successful Grazing

Keep your system simple and flexible

Water is the key to flexibility

Water should be within 800 feet of the livestock

Water should be available in each paddock

Make paddocks as nearly square as possible

Keep plant growth vegetative

Follow topography/key landscape lines to make major paddock subdivisions

Combinations of permanent and temporary fencing give the most flexibility

Strive for a balance between per acre gains and individual animal performance

A combination of two classes/species of livestock will utilize forage more efficiently

Forage test

Soil test

Use legumes

Graze off as quickly and uniformly as possible then give adequate rest

Leave enough leaf area to capture solar energy for quick regrowth

Have a plan

Keep records, monitor and make adjustments
Many times grazing management decisions are often made on the "seat of the pants" day to day basis. With 'Management-intensive Grazing' the emphasis is placed on the increased management of the system. One aspect of management that is often overlooked is a systematic approach to monitoring the system. There are some simple objective indicators that can be easily determined and used to help make grazing management decisions. The indicators listed below give a good framework for a monitoring system that can be used to determine how well the system is working and when adjustments need to be made. The forms on the following 2 pages may be used as an example to record monitoring information or you can make your own, just do it!

Visual Forage Indicators

- Color - degree of greenness
- Forage density - how thick is desirable vegetation
- Uniformity of grazing
- General paddock rating - vigor, health: poor-excellent
- Rate of regrowth

Measured/Calculated Forage Indicators

- Length of grazing period
- Length of rest period
- Residue height at end of grazing period
- Inches of grazeable forage in paddock and next paddock
- Pounds per acre of available grazing ahead of you
- Reserve herd days - the number of days grazing left if no more growth occurred - forage available in all paddocks

Stock Indicators

- Manure - consistency: loose or stacked
  - stacked indicates mature, fiberous, low quality
  - looseHEET cake indicates leafy, vegetative, high quality
- Manure - distribution: well distributed or concentrated
- Body condition scores
- Measured performance - average daily gain, milk production, breeding
- Stocking rates and stock density - may change throughout the year
- Health - general health of the livestock

Environmental Indicators

- Erosion problems
- Trails or paths developing
- Streambank erosion and cover
- Plant diversity
- Manure distribution
- Earthworm populations
- Wildlife presence or use
## Determining Grassland Condition / Trend

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>PARAMETER -</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1) Plant Population</strong></td>
<td>desirable</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>intermediate</td>
<td>3 2</td>
</tr>
<tr>
<td></td>
<td>undesirable</td>
<td>1 0</td>
</tr>
<tr>
<td><strong>2) Plant Diversity</strong></td>
<td>broad &gt; 7</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>medium 4-5</td>
<td>3 2</td>
</tr>
<tr>
<td></td>
<td>narrow &lt; 2</td>
<td>1 0</td>
</tr>
<tr>
<td><strong>3) Plant Density</strong></td>
<td>dense &gt; 95%</td>
<td>4</td>
</tr>
<tr>
<td>Desirables and intermediates are;</td>
<td>medium</td>
<td>3 2</td>
</tr>
<tr>
<td></td>
<td>sparse &lt;65%</td>
<td>1 0</td>
</tr>
<tr>
<td><strong>4) Plant Vigor</strong></td>
<td>strong</td>
<td>4</td>
</tr>
<tr>
<td>Desirables and intermediates are;</td>
<td>medium</td>
<td>3 2</td>
</tr>
<tr>
<td></td>
<td>weak</td>
<td>1 0</td>
</tr>
<tr>
<td><strong>5) Legumes in Stand</strong></td>
<td>&gt; 40%</td>
<td>4</td>
</tr>
<tr>
<td>Percent of legumes by weight make up;</td>
<td>20-29%</td>
<td>3 2</td>
</tr>
<tr>
<td></td>
<td>&lt;10%</td>
<td>1 0</td>
</tr>
<tr>
<td><strong>6) Severity of Use</strong></td>
<td>light</td>
<td>4</td>
</tr>
<tr>
<td>The degree and frequency is;</td>
<td>moderate</td>
<td>2 4</td>
</tr>
<tr>
<td></td>
<td>heavy</td>
<td>2 0</td>
</tr>
<tr>
<td><strong>7) Uniformity of Use</strong></td>
<td>uniform</td>
<td>4</td>
</tr>
<tr>
<td>The uniformity of grazing use is;</td>
<td>intermediate</td>
<td>3 2</td>
</tr>
<tr>
<td></td>
<td>spotty</td>
<td>1 0</td>
</tr>
<tr>
<td><strong>8) Soil Erosion</strong></td>
<td>slight</td>
<td>4</td>
</tr>
<tr>
<td>Sheet, rill, gully and stream bank is</td>
<td>moderate</td>
<td>3 2</td>
</tr>
<tr>
<td></td>
<td>severe</td>
<td>1 0</td>
</tr>
<tr>
<td><strong>9) Woody Canopy</strong></td>
<td>&lt; 11%</td>
<td>4</td>
</tr>
<tr>
<td>The canopy over 6 ft. makes up;</td>
<td>21-30%</td>
<td>3 2</td>
</tr>
<tr>
<td></td>
<td>&gt;40%</td>
<td>1 0</td>
</tr>
<tr>
<td><strong>10) Plant Residue</strong></td>
<td>excessive</td>
<td>0</td>
</tr>
<tr>
<td>dead and decaying plant material is;</td>
<td>appropriate</td>
<td>2 4</td>
</tr>
<tr>
<td></td>
<td>deficient</td>
<td>2 0</td>
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### TOTALS

<table>
<thead>
<tr>
<th>PASTURE CONDITION / TREND</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>0-10 = Very Poor</td>
<td></td>
</tr>
<tr>
<td>11-20 = Poor</td>
<td></td>
</tr>
<tr>
<td>21-30 = Good</td>
<td></td>
</tr>
<tr>
<td>31-40 = Very Good</td>
<td></td>
</tr>
</tbody>
</table>

33
General
This Job Sheet was designed for use by persons with different levels of technical ability. It can be used quickly and without tools, to visually estimate the condition and trend on grassland. For example, when it asks for a % the user should make their best visual estimate. It reminds the user to evaluate 10 items important to grassland condition/trend. With experience, condition/trend surveys will be quite consistent between users.

Use this form to inventory up to 5 different fields or sites, or to record change on the same field or site for 5 years. Enter the Grassland Group for the site being evaluated. Acres can be the total acres in the field or the acres represented by the evaluation. The month and year should be recorded at M _ and Y _.

Category
1) Plant Population - Visually estimate the ~ composition by weight of each plant grouping and assign a weighted value. Desirable, intermediate and undesirable will vary with site, kind of grazing animal and intended use.

2) Plant Diversity - Is the number of different kinds of plants that are well represented on the site. If only one kind of plant occurs, diversity is narrow; if eight or more kinds are present, diversity is broad.

3) Plant Density - Ignore undesirables and visually estimate density of living desirable and intermediate species that would be present at a two inch stubble. Is there room for more desirable and intermediate plants?

4) Plant Vigor - Are the desirable and intermediate species healthy and growing at their potential? Some things to look for are; color, leaf area index, reproduction, presence of weeds, rate of growth and regrowth, etc.

5) Legumes in Stand - Visually estimate the % composition by weight, of the legumes present in the stand, for the area being evaluated.

6) Severity of Use - Close and frequent use causes loss of vigor, reduces desirable species, promotes erosion and runoff. Light use allows excessive residue buildup, blocks sunlight, reduced palatability, and production.

7) Uniformity of Use - Uniform grazing has all plants grazed to a moderate, uniform height throughout the field. Spotty grazing appears uneven, with some plants or parts of the field grazed heavily and others lightly.

8) Soil Erosion - Visually observe and collectively evaluate all types of erosion and determine the severity for the area being surveyed.

9) Woody Canopy - Estimate the percent canopy (shaded area at noon) of woody cover over six feet tall.

10) Plant Residue - Appropriate residue provides adequate ground cover to retard runoff, improve water intake, return nutrients to the soil surface and provide a favorable microclimate for biological activity.

Value
Where needed, use weighted values and interpolate. For example: if you cannot decide between a value of 2 or 3 use a value of 2.5.
## Cell History for Year

### Notes:

<table>
<thead>
<tr>
<th>Padd. No.</th>
<th>Date &amp; Time</th>
<th>In</th>
<th>Out</th>
<th># of Days</th>
<th># of Head</th>
<th>In</th>
<th>Out</th>
<th>Precip.</th>
<th>Temp.</th>
<th>Wind</th>
<th>G. Rate</th>
<th>L. Cond.</th>
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<tr>
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### Visual Observation System:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Precip.</th>
<th>Temp.</th>
<th>Wind</th>
<th>Growth Rate</th>
<th>Livestock Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wet</td>
<td>Hot</td>
<td></td>
<td>Rapid</td>
<td>Excellent</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>windy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Normal</td>
<td>Moderate</td>
<td>Normal</td>
<td>Moderate</td>
<td>Average</td>
</tr>
<tr>
<td>4</td>
<td>Dry</td>
<td>Cool</td>
<td>Calm</td>
<td></td>
<td>Poor</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Padd. No.</td>
<td>Date &amp; Time</td>
<td>In</td>
<td>Out</td>
<td></td>
<td></td>
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<tr>
<td>-----------</td>
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<table>
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<tr>
<th># of Days</th>
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<table>
<thead>
<tr>
<th># of Head</th>
<th>In</th>
<th>Out</th>
</tr>
</thead>
</table>

Precip.

Temp.

Wind

G. Rate

L. Cond.

Notes:

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<table>
<thead>
<tr>
<th>Padd. No.</th>
<th>Date &amp; Time</th>
<th>In</th>
<th>Out</th>
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</tr>
</thead>
</table>

Precip.

Temp.

Wind

G. Rate

L. Cond.

Notes
Management-intensive Grazing

Words of Wisdom and Other Ruminations

Management-intensive Grazing is a management tool, and as with most tools requires work.

Any increases in production or decreases in inputs must be offset by an increase in management. Replace horsepower with brainpower.

Management-intensive Grazing will work on any type of operation but will not work for all types of operators.

Do not be afraid to make mistakes. MIG is a learning process. Knowledge comes with experience, experience comes with practice, practice comes with mistakes.

The grass is always greener on the other side of the fence. The paddocks ahead of you should always be of higher quality than the one you are leaving.

Fast growth, fast moves; slow growth, slow moves.

The higher level of performance you want the faster you will need to move.

Quality of pasture is not all that influences animal performance. Quantity of available pasture is just as important. Remember bite size affects intake.

To manage grasslands effectively we need to understand the soil-water-air-plant-animal interrelationships. We can manage this complex ecosystem for profitability and environmental sustainability only if we understand the reaction the manipulation of one will have on the whole ecosystem.

The most profitable forage management system will match livestock nutritional needs to forage availability and harvest for optimum quality and maximum utilization.

Managing the grazing resource requires controlling the grazing animal. Fences and watering facilities makes this possible with domestic animals. Whether they are controlled to the betterment or detriment of the resource is finally in the hands of the manager.
**Spring Calving Cow Nutritional Needs**

**Warm-Season Grasses**
Indiangrass, Eastern Gamagrass, Big Bluestem, Switchgrass, Sideoats Grama, Little Bluestem and Caucasian Bluestem, Bermudagrass.

**Cool-Season Grasses**
Orchardgrass, Timothy, Smooth Bromegrass, Tall Rescue, Reed Canary Grass, Kentucky Bluegrass, Canada Wildrye, and Western Wheatgrass Redtop.
Figure 4.6 Seasonal forage availability of common forage species in Zone D.
Legumes are highly palatable and nutritious forage crops. If properly inoculated, they fix atmospheric nitrogen in the soil, reducing the need for purchased nitrogen fertilization.

Several species can extend the growing season for cool-season pasture, provide high quality forage into summer, and increase hay quality. Birdsfoot trefoil and annual lespedeza compliment warm-season grass pastures. Rhizobia inoculants specific to each legume species should be applied to the seed, less than 12 hours prior to planting. Inoculated seed should not be exposed to sunlight.

We have not singled out native legumes or discussed them in detail in this guide, because they have not been widely planted or researched as much as the species we have listed here. However, they form an important part of the rangeland plant community, fixing nitrogen, improving palatability and providing food for wildlife. Illinois bundleflower, prairieclovers, leadplant, catclaw sensitivebrier, slender and roundhead lespedeza and sessile tickclover are all highly nutritious and are preferred by livestock and wildlife. They decrease under uncontrolled, heavy grazing.
10 Reasons to Add Legumes to Your Pastures

Lower Nitrogen Fertilizer Costs
Legumes have the ability to obtain nitrogen from the atmosphere and fix it in nodules on the roots. The amount of nitrogen fixed varies depending on species, stand density, soil fertility, weather and the amount of leaf surface left on the legumes. Numerous studies have shown that legumes can fix from 60 to 200 pounds of nitrogen per acre per year. This represents a fertilizer value of from $18 to over $60 per acre per year.

Improved Forage Quality
Forage quality of legumes is generally higher than that of most grasses at the same stage of maturity. Legumes are generally higher in crude protein, digestibility and mineral content and are digested quicker than most grasses. The result is higher quality and the potential for better animal performance.

Better Growth Distribution
The addition of legumes to grass pastures often extends the grazing season and fills voids in grass mono-cultures. Use of proper legume species can provide additional spring and fall grazing to warm-season grass pastures. Other legumes can furnish quality grazing during the summer months when cool-season pastures are less productive.

Increased Forage Yield
Contrary to what some believe, the total yield from grass/legume mixtures is usually increased over straight grass pastures. Studies conducted at the University of Kentucky over several years have shown that red clover grown with tall fescue pastures produces more total yield than straight tall fescue fertilized with 180 lb. N/acre.

Reduced Risk
Having a mixed sward of grasses and legumes constitutes a lower risk factor than having a pure stand of either one alone. Mixed swards are less susceptible to devastation from disease, insects and adverse weather conditions.

Added Benefits in Crop Rotations
In addition to adding nitrogen to succeeding crops, legumes can improve soil tilth by creating deep root channels which benefit subsequent crops, by increasing water intake rate increased organic matter and easier rooting avenues for less adventurous species.

Reduced Animal Toxicities
Growing legumes with tall fescue is the number one strategy used to combat endophyte problems associated with tall fescue. Grass tetany problems can also be reduced or eliminated by the presence of legumes in the animal's diets. Care should be taken to select legumes that exhibit low bloat potential or include grasses in the pasture mixture.
Environmental Acceptance

Because of legume plants’ ability to 'fix' nitrogen through Rhizobium bacteria, legumes provide a natural slow release nitrogen, which is more environmentally sound than commercial nitrogen. Legumes, because of their flowering habit, furnish pollen and nectar for honeybees and tend to increase populations of beneficial insects. Legumes in the sward also provide food for many species of wildlife.

Aesthetic Value

Legumes provide color and diversity to grass sward when flowering. A mixed sward is generally more eye appealing than a monoculture.

Increased Profit Potential

The use of legumes can have an enormous impact on the economics of pasture based agriculture. Due to the potential for higher nutrition levels with the addition of legumes, animal performance on pasture should be better. Several studies have shown more milk production, higher weaning weights, higher average daily gains and higher reproductive efficiency when legumes make up a significant portion of the pasture sward. Legumes also reduce expenses by lowering nitrogen fertilizer expense and supplemental feed costs. Legumes in forage programs give dual benefits: 1) increased production and performance and 2) decreased costs. Legumes truly are sustainable forage plants and fit well into a sustainable forage/livestock program. Legumes are agronomically sound, environmentally friendly and economically advantageous.

*Parts of this text were taken from a pamphlet prepared by Dr. Don Ball, Extension Agronomist/Professor, Auburn University and Dr. Garry Lacefield, Extension Agronomist/Professor, University of Kentucky.