October 2017

Guide Sheet for Developing a Prescribed Grazing System

Introduction

Prescribed Grazing is defined by the Natural Resources Conservation Service as "managing the harvest of vegetation with grazing and/or browsing animals". When applied properly and used effectively to **manage the intensity, frequency, duration, and timing of grazing** our natural resources (soil, water, animals, plants, and humans) are benefitted:

- Soil erosion is reduced and soil health is improved
- Water infiltration is increased and surface runoff is reduced. Water quality and riparian vegetative cover is improved
- Forage yield, availability, and quality are improved
- Livestock health and animal gains per acre are improved
- Wildlife disturbance is minimized and wildlife habit is improved

In managing the intensity, frequency, duration, and timing of grazing the first goal is to leave adequate residual leaf height to allow plants to continue carrying out photosynthesis. **Table 1** provides recommended residual leaf heights at which managers should end a grazing event, and move animals to the next pasture. Keep in mind that these are minimums, and leaving additional residual leaf height will generally allow for more vigorous regrowth. Many successful grazing managers will often employ a strategy of only allowing livestock to consume one-half of the available forage in a grazing event.

The second goal is to allow adequate time between grazing events such that leaf and root tissues have recovered and can withstand additional grazing. Grazing events that are too intense and too frequent reduce forage production and persistence.

Plant recovery from grazing is best judged by evaluating plant height. **Table 1** provides recommended heights for common forage species at which to begin grazing. Recovery can also be judged in days of regrowth. This is also available in **Table 1.** Days of regrowth required for recovery will vary by forage species and environmental conditions, and requires an understanding of your forage species growth patterns. In general, when moisture is adequate and temperatures are 60 – 80° F, cool season forage growth will be favored, and the shorter recovery/regrowth periods shown in **Table 1** are adequate. When moisture is adequate and temperatures are 80 – 100° F warm season forage growth will be favored, and the shorter recovery/regrowth periods shown in **Table 1** are adequate. When moisture and/or temperature conditions are outside of ideal ranges expect the longer recovery/regrowth periods to be required.

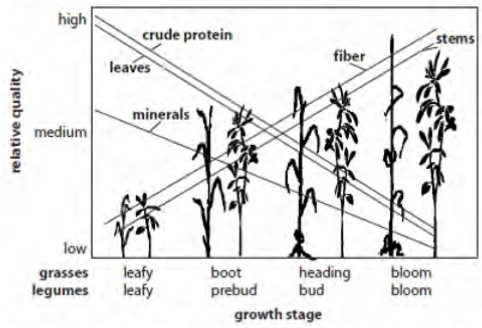
NOTE: There will be times (drought, extended cold) when needed recovery/regrowth periods will be longer than typically needed, and contingency plans associated with these periods need to be developed. Many successful grazing managers, in Georgia typically develop prescribed grazing systems that allow peak ± 30 days of recovery/regrowth, and have flexibility within the system to adapt to periods of faster and slower growth.

The third goal in carrying out prescribed grazing is to time grazing such that forage quality matches the nutritional needs of the livestock. Forage quality fluctuates throughout the year and is influenced by several factors. Primary amongst these factors are maturity and species. As forages mature and advance from the leafy vegetative stage to a more mature reproductive stage with higher proportions of stem and increased fiber forage quality drops (**Figure 1)**.

Forage quality differs by species as well. **Figure 2** demonstrates that all things being equal tropical

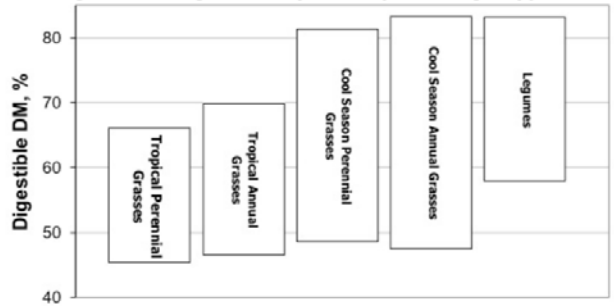
warm season grasses (e.g. bermudagrass) have lower forage quality potential than cool season grasses (e.g. tall fescue), and that legumes (e.g. clovers) typically have the highest forage quality potential.

Figure 1. Effect of plant maturity on forage intake and digestibility



Source: *Adapted from Blaser, R., R.C. Hammes, Jr., J.P. Fontenot, H.T. Bryant, C.E. Polan, D.D. Wolf, F.S. McClaugherty, R.G. Klein, and J.S. Moore. 1986. Forage–animal management systems. Virginia Polytechnic Institute, Bulletin 86-7.*

Figure 2. Digestibility of major forage types



From: Hancock, D.W., et.al. 2014. Understanding and Improving Forage Quality. UGA Extension Bulletin 1425.

Understanding forage quality needs of your livestock, forage quality potential of your forages, and what influences forage quality are key to timing grazing such that adequate livestock performance can be achieved. Grazing forages while they are leafy and vegetative versus reproductive, and incorporating legumes into your forage system, will provide the most forage quality potential. **Table 2** provides forage quality needs for various livestock, and **Table 3** provides forage quality ranges for common forage species.

Obtain more information on forage quality by viewing the University of Georgia Extension Publication "Understanding and Improving Forage Quality" available here:

http://extension.uga.edu/publications/detail.cfm?number=B1425

Prescribed Grazing System Considerations

In initiating the design of any prescribed grazing system it is critical to take time to inventory the resource base. A good inventory will help you understand what is currently in place and the condition of the resources considered.

- Evaluate the forage types available, soil types, soil fertility levels, topography, and water sources
- Consider the livestock type, number, and livestock handling facilities in place
- Note any environmentally sensitive areas (e.g. riparian areas) that may require special management
- Consider the availability of capital, labor, and management expertise when designing your prescribed grazing system
- Set short term and long term goals for your prescribed grazing system in the context of available resources, and the current resource conditions versus desired future resource conditions.

The following considerations can help in designing a prescribed grazing system that will allow the intensity, frequency, duration, and timing of grazing to be managed effectively and efficiently.

Stocking Rate and Carrying Capacity

Stocking rate is generally considered as a measure of animals assigned to a unit of land area for a period of time. Carrying capacity is the maximum stocking rate, under given management conditions that can be applied without deterioration of the grazing resource.

The choice of stocking rate is considered the single most important grazing management decision, and should not exceed carrying capacity. Stocking rate effects operation profitability and:

- Forage plant growth and persistence
- Forage mass and allowance
- Animal performance
- Soil fertility and soil physical characteristics
- Water quality

No grazing strategy can overcome the negative effects that occur when stocking rate exceeds carrying capacity.

Soils

Different soil types have inherent characteristics that influence adapted forage species and potential productivity of a site. Understanding the characteristics of the soils on a particular operation can help you make primary pasture subdivisions. Grouping similar soils into pastures such that the plant community, potential productivity and grazing management strategies within the pasture will be similar. A few characteristics to consider are:

- Drainage class
- Flooding and ponding regimes
- Depth to restrictive layer
- Permeability
- Soil pH
- Percent soil organic matter
- Slope

Obtain more information regarding soils by visiting the **USDA - NRCS Web Soil Survey** website at:

http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

Forages

There is a wide array of forages available to producers in Georgia. Various annuals and perennials that provide warm season and cool season production. The key is combining this array into a combination of forages that are adapted to the site, fit the livestock, fit the grazing manager, and provide the maximum number of grazing days annually. Grazing managers in North Georgia may achieve this with a perennial forage base of tall fescue, bermudagrass, and white clover. While grazing managers in South Georgia may have a perennial forage base of bermudagrass and/or bahiagrass with cool season annuals (e.g. annual ryegrass, small grains) integrated to provide fall and winter grazing.

While a diverse forage system is a worthy goal be certain to understand the characteristics and management requirements of the forages that are already in place on your operation before adding additional species. Also, keep in mind that pasture forage composition often becomes more diverse as good prescribed grazing is implemented. Find more information on various forage species here:

http://www.nrcs.usda.gov/wps/portal/nrcs/detail/ga/technical/landuse/pasture/?cid=stelprdb1269349

Fencing

Using fencing to subdivide pastures into smaller units will transfer grazing management decisions about intensity, frequency, duration, and timing of grazing away from the livestock and to the grazing manager.

Fencing materials are diverse and each has its place. In planning your fencing consider the following:

- Type of livestock being managed
- Need for predator exclusion
- Your familiarity with fencing materials and willingness to learn use of other materials
- If you are introducing electric fencing to your operation be certain that livestock get trained to it
- Temporary electric fence can add tremendous flexibility to your operation at low cost
- And remember that all fencing requires checking and maintenance.

In developing your fencing keep in mind that pasture shape does matter. Square pastures require less fencing material, and research has shown that livestock grazing use within square pastures is better distributed and more uniform. Develop square pastures to the extent practical. Try to avoid long narrow pastures or triangular shaped pastures. Also, consider efficient animal movement when developing your fencing. Gate placement is critical to efficient movement. **Figure 3** shows right and wrong gate placement between pastures, and from pastures to lanes.

Figure 3. Gate Placement

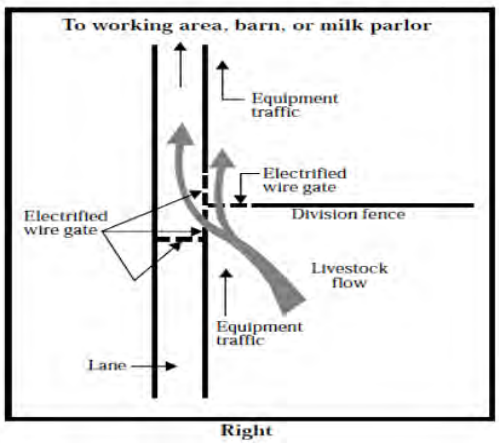
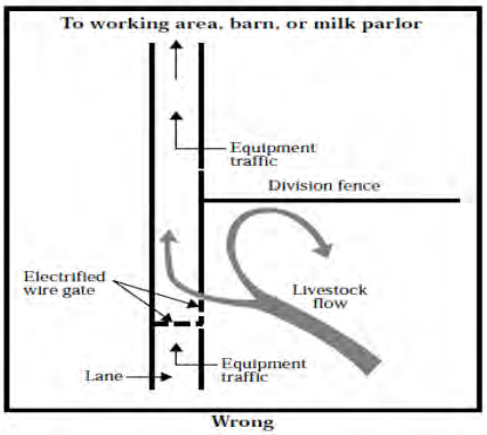


Figure 3 (continued). Gate Placement



From: USDA – NRCS, National Range and Pasture Handbook.

Lanes provide for efficient movement of livestock between pastures, and from pastures to working facilities. They also can become significant sources of erosion. If lanes are developed try to position them on contours, and limit their use to facilitating livestock movement only. Regular vehicle traffic will increase erosion problems. In some instances all or portions of lanes may need heavy use area protection to address problems that occur with frequent and heavy use.

Livestock Water

Water is essential to livestock production. There are several sources of water that can be used to supply livestock water, but keep in mind that livestock prefer cool water with low levels of sediment. A pressurized supply system will offer the most flexibility in a prescribed grazing system.

Direct livestock access to surface water should be managed to prevent soil erosion and impaired water quality.

Location of livestock water within a pasture impacts grazing distribution and uniformity of pasture use. Research has shown that as travel distance from livestock water sources increases over 800 feet livestock use of those portions of pastures decreases, lowering forage utilization and pasture production. Locating livestock water such that it is accessible within 800 feet of all pasture acres not only improves forage utilization, but reduces energy used by livestock for maintenance, and increases animal performance. It also helps to better distribute animal waste throughout the pasture.

Additionally, locate water away from shade and mineral feeders. Congregating any of these in a single location will encourage increased loafing, less uniform use of the pasture and generally lead to soil erosion and poor distribution of animal waste back on the pasture. In particular consider using portable mineral feeders to attract livestock into underutilized areas of a pasture.

Pasture Number and Size

When considering fencing and livestock water within your prescribed grazing system two questions will arise:

- How many pastures do I need?
- What size should pastures be?

The answers relate to the duration and frequency of grazing events on each pasture, and in answering them it is ideal to consider the needs of the plants we are managing.

When forage plants are grazed, and growing conditions are good, regrowth will occur. This new regrowth is typically at an attainable grazing height within 2 to 7 days following the initial grazing. It would be ideal to have grazing periods on pastures then that are 7 days or less. **Table 1** provides typical regrowth/recovery periods needed. These periods vary based on growing conditions, and basically range from 14 to 30 days. Using this information and the following

formula a recommendation for the number of pastures needed can be calculated:

$$\frac{Days\ of\ recovery/regrowth}{Days\ of\ Grazing} + 1 = No.of\ Pastures$$

Using the recommendations of 14 to 30 days of recovery/regrowth and 2 to 7 days of grazing the answer in this scenario ranges between 3 and 16 pastures. The reality is that the number of pastures needed varies within the context of the particular operation, growing conditions, and grazing strategies. A reasonable plan starting out is to begin with 5 to 8 pastures that are permanently fenced, and with good placement of water can easily be subdivided with temporary fence providing 10 to 16 pastures or more. Keep in mind that having more pastures available increases system flexibility, and allows you to better adapt management to the conditions at any given time.

Determining pasture size can be calculated as well with the following information, and the formula below:

- Animal weight (WGT)
- Animal dry matter intake rate as a % of animal body weight (%DMI)
- Number of animals being grazed (No.)
- Planned days of grazing (Days)
- Available forage (in lbs./acre dry matter)
- % Grazing efficiency (%GE)

$$\frac{(WGT\ x\ \%DMI\ x\ No.x\ Days)}{(Avaialble\ Forage\ x\ \%GE)} = Pasture\ Size$$

For example a beef cow/calf operation with 50 head, averaging 1,200 lb., with a desired pasture occupancy period of 4 days, typically turning into pastures with 1,500 lbs./acre dry matter, and 50% grazing efficiency would calculate as:

$$\frac{(1{,}200\ x\ 0.026\ x\ 50\ x\ 4)}{(1{,}500\ x\ 0.50)} = 8.3\ acres$$

The landscape and characteristics of your operation will likely require variation from these calculations. But, utilizing them will provide you with operational targets to consider in your planning. Typical Dry matter intake rates are provided in **Table 4**, and grazing efficiency estimates are provided in **Table 5.**

Pasture Monitoring

Pasture monitoring is key to pasture management. Monitoring assists the livestock producer in tracking long-term and short-term trends in pasture use and condition. Evaluation of the trends and grazing record information can assist the livestock producer in making further management decisions associated with grazing intensity and frequency, fertility applications, pasture renovation, and other management options. Keeping grazing records related to each grazing event and at least once annual Pasture Condition Scoring is recommended.

Contingency Plans

Even with the best management, there will be times when forage supply is inadequate to meet animal needs. Drought, extended cold, and periods of excess precipitation may require modest or perhaps radical adjustments to the prescribed grazing plan.

The following websites can be helpful in monitoring long term weather predictions for planning purposes:

http://agroclimate.org/

http://droughtmonitor.unl.edu/

http://www.cpc.ncep.noaa.gov/

Following are some management suggestions that are appropriate when forage supply is less than ideal:

Develop flexibility into your system from the start:

- Don't allow stocking rate to exceed the operation's carrying capacity
- Place water so that pastures can be grazed efficiently, and easily subdivided with temporary fence
- Have a diverse forage system that includes warm and cool season forages

Monitor your forage supply:

- Take regular inventory of how many days of grazing remain on the operation, and anticipate when supplemental feeding will have to begin if stressful conditions are not relieved.
- Be efficient with the forage that you do have, and minimize waste.
- Look for alternative forage sources that you may not have considered such as hayfields or even crop fields. Look for nearby fields that could possibly be leased.

Reduce livestock demand:

- Cull animals that are unproductive
- Consider early weaning of offspring

When all available grazing has been used, select a "sacrifice" pasture for supplemental feeding. Confining livestock to the sacrifice pasture will protect the additional pastures from severe overgrazing. Yes, these areas will be damaged. They may require long rest periods or renovation when good growing conditions return. However, renovating the limited sacrifice area is far better than facing the need to renovate all pastures.

When favorable growing conditions return, monitor conditions in each pasture more closely. Extend the length of the recovery/regrowth period 5 – 7 days beyond normal. This will help ensure root systems have adequately recovered.

Summary

A few points to remember as you approach development of your prescribed grazing system:

- Inventory the resources you have in place
- Determine where opportunities for improvement exist
- Plan for flexibility
- Avoid exceeding carrying capacity
- Develop a livestock water system to enhance grazing distribution
- Develop a diverse forage system
- Plan fencing to match your management and provide for efficient animal movement
- Monitor pastures regularly to track trends and usage
- Anticipate problems that may occur and develop contingency plans ahead of time for handling them.

For more information contact your local USDA - NRCS Service Center.

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Table 1. Dry Matter Productivity, Recommended Grazing Heights, and Estimated Regrowth / Recovery Period by Forage Species						
Forage Species	**Average Production[/1] (lbs/Ac.-Inch)**	**Production Range[/2] (lbs/Ac.-Inch)**	**Annual Producti-on[/3] (lbs/Ac.)**	**Plant Height to End Grazing[/4] (inches)**	**Plant Height to Start Grazing (inches)**	**Approximate Recovery / Regrowth (Days)**
Warm Season Grasses						
Bahiagrass	225	100-350	8,000	1-2	5	20-28
Bermudagrass, common	260	150-500	8,000	2-3	5	18-28
Bermudagrass, hybrid	260	150-500	12,000	3-5	6	18-28
Big Bluestem	100	50-250	9,000	4	8	25-40
Crabgrass	140	75-200	6,000	2-4	5	18-28
Dallisgrass	250	150-350	6,000	2-4	5	21-30
Eastern Gamagrass	100	50-250	9,000	8	12	28-45
Indiangrass	100	50-250	9,000	5	10	28-40
Johnsongrass	150	100-250	7,000	6	20	21-30
Millet	150	100-250	10,000	9	15	21-30
Sorghum-Sudan hybrids	150	100-250	8,000	6-8	18	21-30
Switchgrass	100	50-250	9,000	8	12	30-45
Cool Season Grasses						
Annual Ryegrass	250	75-400	6,000	2-3	5	14-25
Orchardgrass	180	75-300	7,000	3-5	6	20-30
Small Grains	150	75-250	6,000	3-4	8	14-25
Tall Fescue	210	100-350	9,000	3-4	8	21-30
Cool Season Legumes						
Alfalfa	225	75-400	9,000	3	8	20-25
Clover, (arrowleaf or crimson)	200	100-300	5,000	2-4	6	14-25
Clover, red	220	100-300	7,000	2-3	4	18-25
Clover, white	200	75-300	5,000	2-3	4	18-30
Warm Season Legumes						
Lespedeza, annual	150	50-250	3,000	2-3	4	20-30
Sericea Lespedeza	200	150-250	4,000	4-6	8	18-25
Mixtures						
Bermudagrass / legumes	250	100-400	9,000	2-3	6	14-30
Tall Fescue / alfalfa	225	75-400	7,000	3	7	20-30
Tall Fescue / bermudagrass	250	150-350	9,000	3	6	18-30
Tall Fescue / legumes	190	80-325	8,000	3	6	18-30
Grazed Forest / Browse						
Annual Production Variable. Target Utilization of 50% or Less of the Available Forage On Site						60-90

[/1] The values should be used only as guides. They represent average values taken from many sources from across the region from thick, well fertilized, actively growing stands. Wherever possible use known production values.

[/2] Range covers low management (thin, unfertilized, unmanaged stands) to high management (thick, fertilized stands with rapid growth and high yield).

[/3] Attainable annual production for medium to high level management.

[/4] Use higher value in range for more vigorous regrowth.

Table 2. % Crude Protein and % TDN Requirement Estimates by Animal Class		
Animal Class	**% Crude Protein**	**% TDN**
Growing beef steer		
450 lb (1.5 lb/day gain)	11-13	65
650 lb (1.7 lb/day gain)	10-11	68
Beef cow		
Lactating	10-12	60
Dry, pregnant	7-8	50
Dairy cow		
Lactating	16	65-70
Dry	<15	55-61
Sheep		
Lamb (finishing)	12	70-77
Ewe (lactating)	13-15	65
Ewe (maintenance)	10-12	57-68
Goats		
Bucks	11	60
Doe (lactating)	11-14	60-65
Doe (maintenance)	10-11	55-60
Weanling	14	68
Yearling	12	65
Horses		
Maintenance	10-11	70

Table 4. Daily Dry Matter Intake Estimates as a % of Body Weight	
Animal Class	**Intake %**
Beef stocker or replacement heifer	2.5-3.0
Bull	1.5-2.0
Beef cow	
Lactating	2.0-3.0
Dry, pregnant	1.5-2.0
Average Annual Intake	2.6
Dairy cow	
Lactating	3.0 +
Dry	2.0
Sheep and Goats	3.5
Horse	2.0-2.5

Table 3. % Crude Protein and %TDN Estimates by Forage Species (Typical ranges, expect variations)		
Forage Species	**% Crude Protein**	**% TDN**
Grasses		
Bahiagrass	6-12	45-60
Bermudagrass, common	6-12	45-60
Bermudagrass, hybrid	6-14	45-60
Big Bluestem	8-16	50-69
Crabgrass	10-15	50-65
Dallisgrass	6-14	50-58
Eastern Gamagrass	8-16	50-69
Indiangrass	6-14	50-67
Johnsongrass	8-12	50-65
Pearl Millet	6-16	50-65
Orchardgrass	8-16	56-66
Annual Ryegrass	8-16	59-68
Small Grains	8-16	59-68
Sorghum-Sudan hybrids	8-12	50-58
Switchgrass	6-14	50-67
Tall Fescue	8-16	56-66
Mixed Grass	6-15	45-65
Legumes		
Alfalfa	9-26	50-67
Clover, arrowleaf or crimson	6-21	55-65
Clover, red	6-21	59-70
Clover, white	9-25	60-80
Mixed Grass/Legume	6-17	50-60
Grazed Forest / Browse		
Mixed Browse	3-17	50-80

Table 5. Forage Utilization / Grazing Efficiency Estimates Based on Stocking Method	
Stocking Method	**% Utilization**
Continuous	35
Slow rotation (3-4 pastures)	50
Moderate rotation (5-7 pastures)	55
Fast rotation (8-12 pastures)	60
Daily rotation	65
Strip grazing	70