

Agronomy #31

Date: July 2014

Subject: FORAGE MANAGEMENT IN A PASTURE GRAZING SYSTEM

This technical note provides basic information on managing forages in a Pastured livestock grazing system. [Pasture](#) — Grazing lands composed of introduced or domesticated native forage species that are used primarily for the production of domestic livestock. They receive periodic renovation or cultural treatments, such as tillage, fertilization, mowing, weed control, and may be irrigated. They are not in rotation with crops. It reviews required Minimum Forage Heights, Leaf Area, and the relationship between root growth and forage heights.

Pasture grazing systems are a combination of prescribed grazing (management), fences and a livestock watering system along with other conservation practices as needed. Pastured grazing system are focused on maximizing utilization of the forages to produce the maximum amount of meat, milk, wool, hair or other product while maintaining or improving soil and plant health. Proper management of the forage in the system requires appropriate: graze/rest cycles, forage species in the system, kind/class of livestock for the environment and adequate infrastructure for safety, management and protection of humans, livestock and wildlife.

Soil is the foundation upon which success is built. Maintaining or improving soil health can significantly boost biomass production by ensuring nutrients in the soil are available and not chemically bound or deficient. Conducting a soils test at least every four (4) to five (5) years and managing for organic matter and soil biotic life are important to keeping or developing a sustainable grazing system.

Selecting the proper diversity of plant species or adding to the existing species composition can also affect both the quality and quantity of biomass available for grazing animals. Read the Iowa Agronomy Technical Note #34, Forage and Biomass Planting, for recommendations of species and amounts to plant. Wetness, soil texture, aspect, inherent fertility and many factors affect the choice of plants to use for forage.

This technical note reviews the following topics: Minimum Forage Heights, Leaf Area, Grazing and Rest Periods.

Minimum Forage Heights

85% of the weight of plants comes from sunlight and air if all water is removed.

Plants use their leaves to capture the sunlight and conduct photosynthesis. The plant uses this process to feed itself. Carbohydrates produced during photosynthesis are used by the plant for growth, maintenance, reproduction and storage of reserves. Forages grazed to minimum forage heights or higher will result in the plant being able to re-grow its leaves mostly through the photosynthesis process. When plants are grazed below the minimum forage height, the plant will need to use too many of the carbohydrates stored in its root system to re-grow and will eventually die. When leaves of most pasture plants are at minimum heights they are also at the point where livestock must work harder to achieve gut fill which can begin to reduce average daily gains, milk production or other primary goals for livestock production. Minimum stubble height will usually provide 100% leaf canopy so that raindrops are intercepted by leaves and infiltration of rain into soil is maximized and runoff is lessened.

Primary functions of the roots are to anchor the plant in the soil and to absorb water and minerals in addition to storing surplus food. Excess removal of leaves depletes the root system and makes the plant more vulnerable to other stresses such as drought and competition from other plant species. Table 1 provides guidance to minimum forage heights of the more common plant species utilized in Iowa grazing systems.

Table 1. Grazing Management

	Begin Grazing		End Grazing
	Minimum Height Vegetative Growth <u>2/ 5/ 6/</u>	Minimum Stubble Height	Minimum Regrowth Before Killing Frost <u>3/ 4/</u>
Forage <u>1/</u>	Inches	Inches	Inches
Alfalfa <u>4/</u> (1 st grazing)	10	3	--
Alfalfa <u>4/</u> (2 nd and 3 rd grazing)	6-10	3	10
Annual Crabgrass	8	3	6
Birdsfoot Trefoil	6-10	4	6
Big Bluestem	10-16	6	6
Brassicas (Turnips, Radishes, Kale, etc... Fall)	6-8	4	NA
Brome grass, Smooth	6-12	4	6
Chicory	6	2	6
Crownvetch	8-10	3	6
Eastern Gamma Grass	10-16	12	8
Festulolium	6-10	4	6
Indiangrass	12-16	6	6
Korean Lespedeza	8	4	5/
Orchardgrass	6-10	4	6
Pearl Millet	18-20	4-6	NA
Reed Canarygrass	8-10	4	6
Red clover (1 st grazing)	8-10	3	--
Sorghum-Sudangrass	18-24	8-10	NA
Switchgrass	16-20	6	6
Tall Fescue or Meadow Fescue	6-10	4	6
Timothy	6-10	3	5
White Clover (Ladino, Alice)	8	4	4

- 1/ Grass and legume mixture should be grazed in a manner that favor the dominant or desired species.
- 2/ Height is average height when leaves are lifted in vertical position.
- 3/ At end of growing season, minimum regrowth is the critical factor that determines end of grazing except on pastures grazed only in fall and winter. When a grazing period ends, there should be photosynthetic residual remaining adequate to support vigorous regrowth. Less regrowth may be beneficial if frost seeding or interseeding will be accomplished prior to the next grazing season.
- 4/ The last harvest of alfalfa, for pasture or hayland, should be made 35 to 45 days prior to the time when the first freeze normally occurs.
- 5/ In a rotational grazing system, spring grazing can be initiated when cool season forages have approximately 75% of their height as shown above. Livestock will need to be moved more rapidly until they are in a paddock where forage has grown to the desired height.
- 6/ If forages are exceeding the "Begin Grazing" heights consideration should be given to making hay or mowing these paddocks.

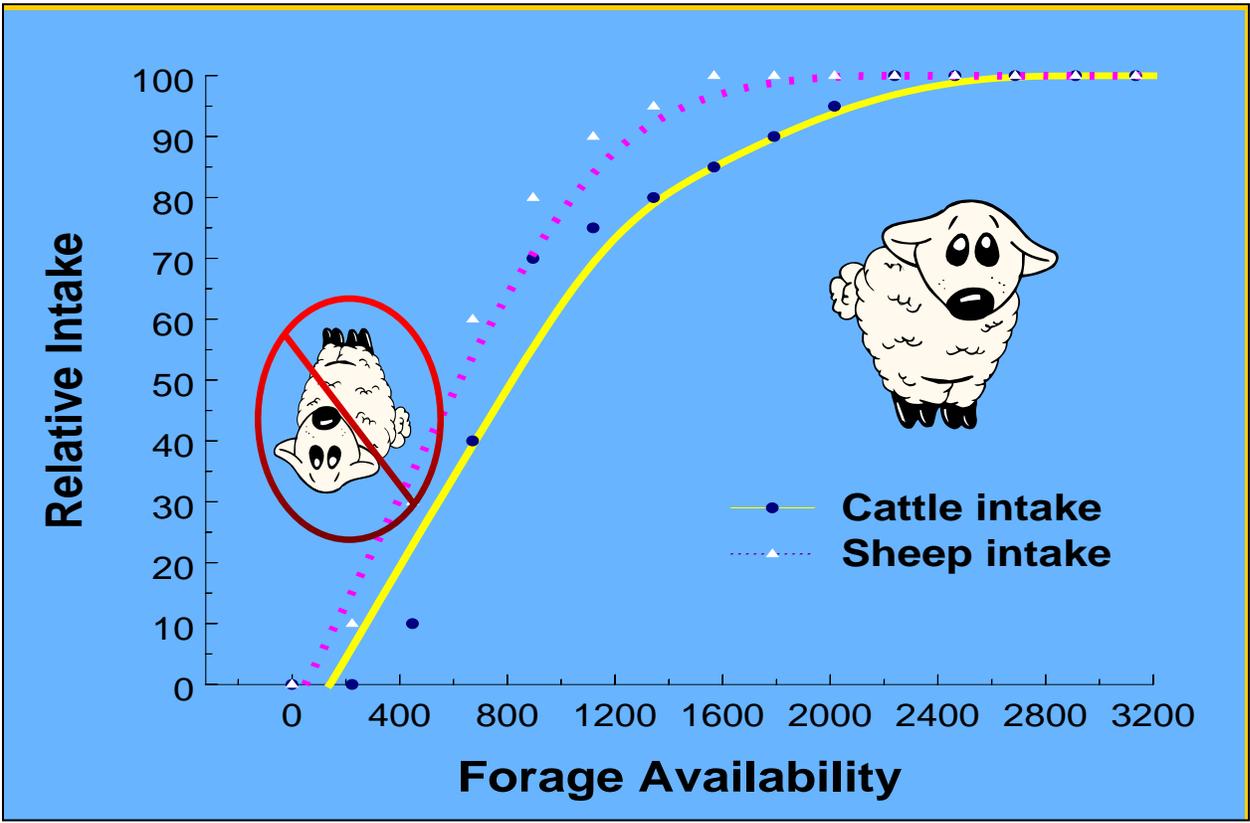
A common grazing strategy is to "take half leave half". In other words remove half of the leaves or less in a grazing cycle and leave half of the leaves. This concept keeps the factory running and will cause minimal root growth stoppage to the plant. Table 2 illustrates this concept.

Table 2. Take half leave half

Percent leaf volume removed	Results In	Percent root growth stoppage
10% - 40%		0%
50%		2-4%
60%		50%
70%		78%
>80%		100%

There are situations where management strategies encourage grazing forages to a level shorter than shown in Table 1. To interseed forages into an existing stand it is beneficial to graze existing forage below the minimum forage heights to prepare the field for interseeding. This "overgrazing" will damage the existing forage stand so that competition with the new seedlings is reduced. An adequate rest period for both the seedlings and the existing forage is needed to maintain a healthy pasture. This suppression by grazing should be done no more often than every 3 to 5 years.

This might be very appropriate on Conservation Reserve Program (CRP) acres utilized for managed grazing. It can also be utilized to help control undesirable vegetation in sites with wildlife as a primary objective.



Research has shown that pastures in good condition will produce between 300 and 400 pounds of dry matter per inch. Once pasture reach a height of 4 inches or less (1200 to 1600 pounds/acre) it is difficult for livestock to get full and they do not gain as expected. Another reason for stopping grazing at the minimum stubble height and moving livestock to a rested pasture.

Leaf Area

The previous section discussed the importance of maintaining minimum forage heights. This is the critical parameter in pasture management where regrowth is possible and desirable. It also discussed how the management of forage heights can influence the composition of the forage in the grazing system. In either scenario the amount of leaf available to capture the sunlight directly affects the growth of the plant. This is the one factor a producer can control without substantial outside inputs.

Leaf area is the amount of leaf necessary to intercept enough sunlight to maintain maximum photosynthetic activity. Different forages require different residual heights to maintain adequate leaf area to intercept full sunlight. Bluegrass can attain this at 2 inches but brome grass needs 4 inches. When the stored carbohydrates needed for initial growth have been replaced, the leaf area exceeds what is needed for production and the pasture is ready for grazing. This occurs when the “begin grazing” forage heights shown in Table 1 have been achieved for the specified forage. As the forage height decreases, due to livestock grazing, the forage height is reduced back towards the “end grazing” height as shown in Table 1, and the leaf area also decreases. The plant has provided the forage for the grazing animal in excess of what was needed for the photosynthetic process for regrowth. But at the minimum grazing height, grazing

needs to stop so that there is adequate leaf area to begin the plant's regrowth cycle. In a continuously grazed system, more leaf area needs to be available because the plants do not get an opportunity to rest.

Grazing and Rest Periods

The art of maintaining minimum forage heights and having a good leaf area is the combination of grazing and rest periods. The livestock should not begin grazing until the forage has met the forage height as shown in Table 1. The livestock need to be removed at or before the forage has gotten to the minimum forage height to end the grazing cycle. This process will maintain a good leaf area.

An exception to the beginning grazing height is in the early spring as the grazing season is initiated. For those who have the management time to move livestock rapidly, then beginning grazing at 75% of the maximum beginning stubble height is acceptable but livestock must be rotated on at or before the minimum stubble height is reached.

Table 3 provides some estimates of rest periods needed depending upon whether the forage is cool season grass, cool season grass and legume, or warm season grass for those with set acreage paddocks. Table 3 can be used as a guide, but decisions on length of grazing and rest periods need to be based upon the minimum stubble height in Table 1.

Table 3. Set Acreage Paddocks

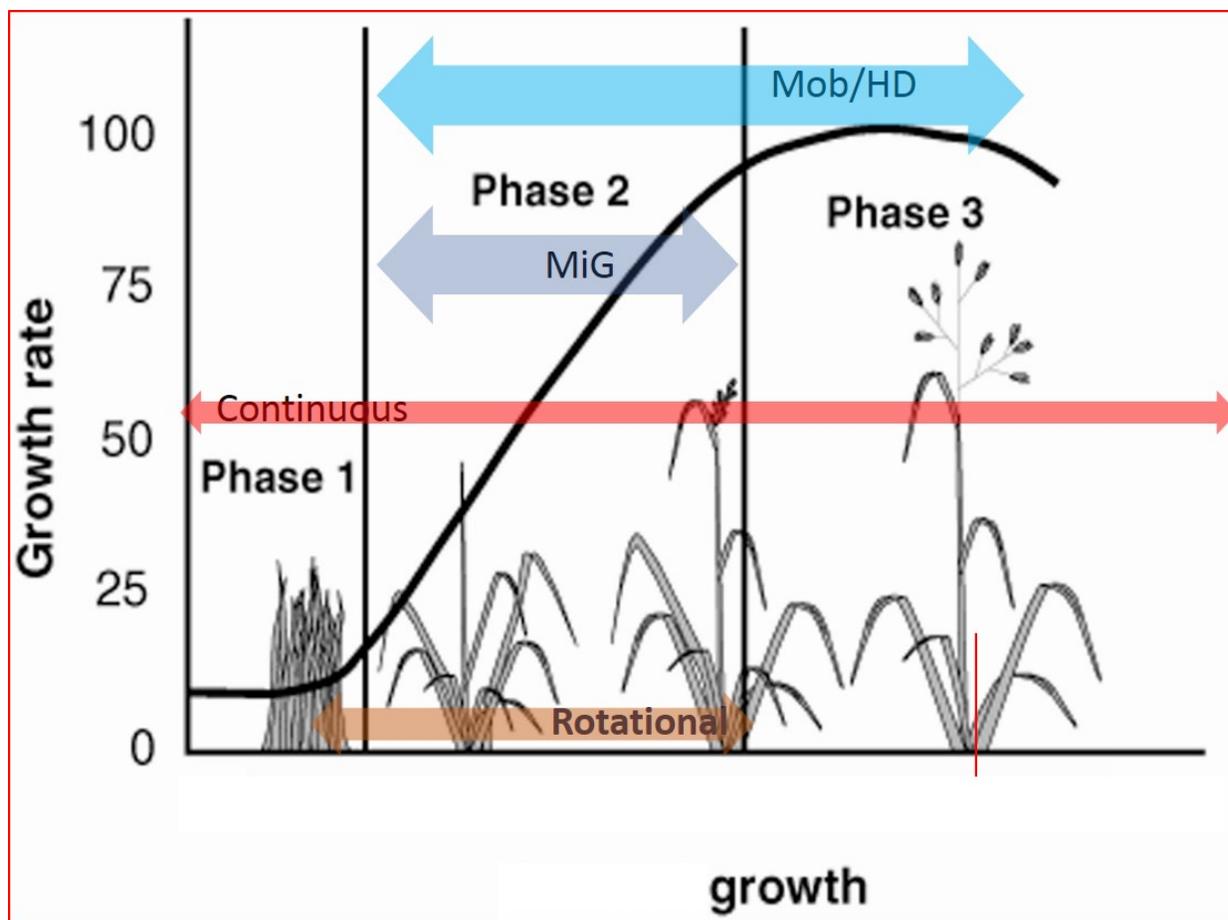
Grass and legumes need recovery time after being grazed. The following are some guidelines:	
Cool Season Grass	14 – 16 days during the first rotation (April)
	20 – 35 days during fast growth (May – mid June)
	35 – 90 days during slow growth (summer or cold)
	20 – 35 days during fall
Legumes	24 – 32 days throughout the growing season
	45 – 60+ days for seed production
Warm Season Grass	28 – 45 days during normal growing conditions
	45 – 60 days during slower growth

Table 4. Set Graze Length Paddocks

Set graze length paddocks use temporary fences to vary paddock acreage based on how fast or slow the forage is growing. In these cases the forage management is based upon Table 1 Minimum Stubble Height Requirements with many or all paddocks exceeding the begin grazing height suggestions. The Chart Below gives a pictorial idea of pasture forage management using differing grazing system management methods. Continuous grazing results in plants being grazed repeatedly and kept at a low yielding and immature stage while other plants may never be grazed. Rotational grazing tries to manage so that plants are grazed at the end of phase 2 or before and returned to phase 1 to begin regrowth. Management intensive grazing seeks to begin grazing at the end of phase 2 or slightly before and return plants to the beginning of

phase 2. High Density grazing systems will begin grazing sometime between the last

quarter of phase to the end of phase 3 and return plants to the beginning of phase 1.



In addition to publications previously cited, information from the following publications was used. *Pasture Management Guide for Northern Missouri 1998*; *1996 Missouri Grazing Manual*; *Creating a Prescribed Grazing Plan - Arkansas NRCS Technical Note September 2006*; *Pasture Management Guide for Livestock Producers 2005, Iowa State University*.