

# **MAXIMIZING COOL SEASON FORAGE PRODUCTION**

## **ON PASTURES**

### **Introduction**

The rate of growth of forages in a pasture is directly related to how well the pasture has been managed, not only in recent grazing periods, but also during the previous winter and back through the prior grazing season. Pastures that were managed poorly during the prior year will not respond as quickly and will not produce the optimum quantity of forage during the current year. All other factors being equal, the better a pasture is managed the more forage it will produce, up to the capability of the soils and the site conditions.

In addition to better pasture production, the soil, water, and wildlife resources will be greatly enhanced by a managed grazing system. A greater percentage of rainfall will infiltrate into the soil instead of leaving the pasture as runoff. Any runoff that does occur will be cleaner, carrying little, if any, sediment. Soil erosion will be greatly reduced and you may have a net building of the soil. Habitat for wildlife, especially song birds, will be enhanced through diversification of cover type, height, and stage of maturity.

The management strategies discussed below can be tailored to your pasture situation, relating directly to the forages that are currently growing and to those desired in the future, and considering the kind and class of livestock utilizing the pastures.

### **Identify and Manage Sensitive Areas**

Many pastures are used for grazing because there are severe environmental limitations precluding the use of the area for cropland. Some of these limitations include wetness, droughtiness, steep slope, stoniness, and south/southwest slope exposure.

The following sensitive areas are commonly found and delineated:

- Wooded areas, including savannas
- Native prairie remnants
- Steep slopes
- Shallow or thin soils
- Organic soils
- Springs or seeps
- Riparian areas
- Wetlands, ponds, lakes
- Streams, rivers
- Areas that commonly flood
- Conservation structures
- Areas with threatened or endangered species
- Areas with archeological significance

Livestock will often overutilize sensitive areas when they are included in a larger pasture. Heavy utilization in the spring may reduce forage growth in these areas during drier times of the grazing season. This results in a much lower forage yield on the sensitive areas than if grazing had been controlled and allowed only within the limitations of the site. Allowing grazing only when the forages are at the proper stage of growth will improve and maintain forage health and vigor, resulting in a higher seasonal yield.

The basic management strategy for sensitive areas within grazing systems is to fence them as separate paddocks. This gives the farmer control of how many livestock will use the area (intensity), when it will be utilized (timing), and for how long they will be allowed to stay on the site (duration). If sensitive areas are combined with other areas that are dissimilar, uneven grazing will take place. The livestock will overutilize forages on part of the paddock and underutilize forage on other areas. The sensitive areas may be damaged from excessive livestock impact.

Another basic strategy is to know what the area should look like when it is in optimum condition. Grazing needs to be managed to maintain the desired plant community on each site, or to prevent damage to the soil or water resources on the site. Other “tools”, such as fire, mowing, or harvesting hay may be necessary in the overall management strategy.

### **Subdividing Pastures**

The most important step to take in improving the yield of pastures is to subdivide the pasture into several paddocks. This has the effect of allowing for a rest period for the forages on the majority of the pasture, while improving the efficiency of harvest for the area being grazed.

A continuously grazed pasture is at a disadvantage for forage production. With continuous grazing, forages that have been grazed do not have an opportunity to recover before being grazed again. Photosynthetic activity is diminished by the lack of leaf area, so internal production of sugars is reduced. New regrowth is done at the expense of any stored root reserves. When this occurs several times during the growing season a significant percentage of the root mass dies. This restricts the ability of the plant to draw nutrients and water from the soil, slowing plant growth, and reducing the production of usable forage for livestock.

Subdividing the pastures allows the operator to control the area that is available to the livestock for grazing, reduces waste by trampling, and reduces spot grazing. The most significant improvement is that containing the livestock on relatively small paddocks allows for rest periods for the forages on the other paddocks. This rest period allows for the regeneration of the leafy area of the forage plants and for regeneration of the root reserves. Plants are healthier, more vigorous, and more productive.

To provide an adequate rest period for forages that have been grazed, a minimum of six paddocks is required for each herd.

Two common methods of subdividing pastures are “strip grazing”, and “set paddocks”.

*Set Paddocks:*

In this type of system the pasture is split into several paddocks by permanent fences. The size of each paddock is “set”, or defined by the fence, and does not change. Paddock size should be determined by forage production, so the size will vary based upon the productivity of the soils and sites. Management of the grazing is done by increasing or decreasing the length of the time period that the livestock have in a paddock, or by increasing or decreasing the number of head of livestock in the paddock for the desired grazing period. Set paddocks can be subdivided by using temporary fences (step-in posts and polywire or polytape) to redefine the desired size of paddock.

*Strip Grazing:*

With strip grazing the pasture is subdivided into long narrow strips using permanent fences. These strips are commonly from 100 feet to 300 feet wide. Livestock are controlled by temporary front and back fences to keep them contained in the area allocated to them for the grazing period. As the livestock are moved through the system the temporary fences are moved with them. Water tanks are usually portable and are moved with the herd, although permanent tanks can be adapted to this system.

This is a very flexible system in that the size of the forage allocation can be easily changed as the herd size changes or as the productivity of the forages changes through the grazing season.

If plans are to make hay from some of the pasture, strip grazing allows for easier harvest because, even though the field may be rather narrow, it is long and constant turning of equipment is minimized.

Of utmost importance to a well managed grazing system is control of where the livestock are and where they are grazing next. You, as the operator of the system, must control the livestock, their movement, and their duration on any location. Good fences are essential.

## **When to Initiate Grazing on Cool Season Pastures**

*Early Spring*

In the early spring the forages in the pasture will normally grow at a much faster rate than at any other time of the year. Grazing must be initiated at shorter grass heights than later in the growing season or the grass will get ahead of the livestock. Because the

grass is shorter there is not as much available dry matter for the livestock, so they should be moved from paddock to paddock at a relatively fast pace, usually every day or two days. This helps to keep the forages in a vegetative stage for a longer period of time. As forage growth slows, normally by June 1<sup>st</sup>, the rotation of the livestock should be slowed to the planned grazing period for each paddock.

If initiation of grazing begins too late in the early spring, by the time the livestock have been moved through all of the paddocks the forage will be too mature to provide high quality feed.

### **Late Spring Through Fall**

As the grazing season progresses into late spring the livestock should be kept on each paddock for a longer period of time, up to the planned length of the grazing period. The grazing period may even be extended beyond the length of the planned number of days if there is adequate forage remaining above the desired residue stubble height. However, the grazing period should not exceed 6 days.

## **When to Terminate Grazing**

Grazing below a specified residual stubble height (4 inches for tall cool season grasses, and 2 inches for short cool season grasses) will remove active growing points, which will cause the grasses to regrow from buds on the roots. This requires an extra 7-10 days of growing time and weakens the root by drawing upon stored food reserves for this regrowth. In addition, the removal of leaf material below the recommended residual stubble height will significantly reduce the leaf area, causing a reduced ability by the plant to capture sunlight needed to drive the growth process.

For many forage species the quality of the plant parts below the above residual stubble height are of poorer feed quality. Overutilization of the forage plants will lead to a reduction in livestock performance as expressed in lower weight gain or less milk production. It is better from a production standpoint to move the livestock to better forages than force them to eat the material below the minimum residual stubble height.

The above residual stubble heights apply to late fall grazing, also. Leaving this stubble on the pastures will modify the microclimate at the soil surface for better survival of the forages through the winter. Snow trapping will be more effective which helps to insulate the soil surface and provide some moisture in the spring. The plant residues also supply a raw source of organic material for living organisms in the soil in the early spring.

In some instances there are reasons to allow grazing below these residual stubble heights. These include:

- a.) When preparing to interseed an existing pasture, it is recommended to overgraze the pasture for the prior grazing season to weaken the existing stand.

This offers the new seedlings a better opportunity to become established because of reduced competition.

b.) When using a paddock or a portion of a paddock as a sacrificial area you will expect the forages on the site to be overutilized. The need for a sacrificial area may be the result of excessively wet weather, drought conditions, shortage of forage resulting from overstocking, or from using the site as an overwintering area.

### **Management Prior to a Killing Frost**

Allowing the forages to regrow some prior to a killing frost is an extremely important pasture management strategy. New buds, which will be next years' grass shoot, are developed during the fall of the year. Continuing to graze the forages during this time will not allow adequate bud development for optimum growth in the spring. In addition, root reserves will not be allowed to accumulate as they should, which will reduce winter survival of the roots and buds.

Uncontrolled grazing in the fall will require the livestock to graze the area several times. This will cause compaction of the soil, which in turn will reduce the ability of the soil to absorb rainfall and will interfere with the exchange of air between the soil and the atmosphere. These factors limit growth and forage production by reducing water available to the growing plants, by limiting root growth, and by reducing oxygen for the organisms in the soil.

Pastures that are allowed to rest for 30 days prior to a killing frost will emerge from winter dormancy 7-10 days earlier in the spring. This represents a significant extension of the grazing season.

The growth that accumulates should not be considered to be wasted. After the soil freezes it can be grazed to a 4 inch residual stubble height. This provides adequate forage for livestock on maintenance rations, such as dry cows, ewes, or horses, while it still leaves an adequate cover to buffer the effects of the winter environment.

Because it is unlikely that the entire herd will be taken from the pasture at this time of the grazing season, it is recommended that 25-30% of the pasture receive this treatment each year, with the treatment being rotated to different paddocks each year. Within a 3-4 year period the entire area of the pasture will be given this extended fall rest period. Livestock can continue to rotationally graze the remaining 75% of the pasture as long as there is adequate forage for them to graze. If there is not, then move the livestock from the pasture to a winter feeding area.

## **Wet Weather Conditions**

At some times during the grazing season the weather may be wet enough so that livestock traffic will cause “pugging” which could cause damage to the soil in terms of compaction, and to the forage in terms of damage to the roots and crowns of the plants.

The extent of the damage that can be done is dependent upon the soil in the paddock. Organic soils will be easily damaged, as will very sandy soils. Another consideration is the species of forage on the site. Kentucky bluegrass, quackgrass, or tall fescue have very dense root systems that will stand up to some severe hoof action. Species such as timothy and perennial ryegrass are more easily damaged by livestock traffic.

If livestock traffic appears to be damaging to the forages or the soil, the livestock should be moved to a feedlot or to a sacrificial paddock and fed emergency feed until the pastures dry out to the point that a normal rotation can again be initiated.

## **Dry Weather Conditions**

At some times during the grazing season the weather may become dry enough so that forage growth will be very slow. Continued grazing of the forages below the minimum residual stubble heights will reduce the ability of the forages to resume their growth once the weather conditions return to normal. Excess livestock traffic will cause compaction of the soil and possible physical damage to the forage roots and crowns. Removal of the residual stubble of forage removes the protective cover that helps to buffer the soil and forages from temperature extremes.

If the forages are grazed to the proper residual stubble height and there is not adequate growth in any of the other paddocks in the grazing system, then it is time to move the livestock to a sacrificial paddock or to a feedlot. Provide emergency feed until the weather conditions improve, forage growth resumes, and a normal rotation of the livestock through the paddocks can resume.

## **Sacrificial Paddock Use and Management**

A sacrificial paddock is a portion of one of the paddocks that will intentionally be utilized for a holding area while the remainder of the paddocks rest. This takes place when soil conditions are very wet, very dry, or when the forage production has diminished and no paddock is ready to graze.

Areas used as regular calving or lambing paddocks are also considered to be sacrificial paddocks. These normally tend to get heavy use during the spring, or in the fall with fall calving operations.

Areas that are used to overwinter the livestock when a feedlot is not used are considered sacrificial paddocks. Their treatment is covered in the fact sheet entitled “Overwintering”.

Sacrificial paddocks should be selected with care. Sensitive areas should not be used for sacrificial paddocks, nor should areas that are prone to erosion, areas that would be very difficult to rejuvenate, or areas that are difficult to get to with feed equipment. In addition, water for the livestock needs to be available.

Using an area as a sacrificial paddock will almost always reduce the forage yield for the season, resulting in reduced grazing days on the site. Proper treatment of the sacrificial area will bring it back to a full level of production in a reasonable time period.

Once used, the sacrificial paddock will likely need rejuvenation. This can be in the form of an extended rest period, or the area can be seeded to bring the stand back to condition for grazing in the regular rotation. A judgment should be made as to the possibility of the area becoming predominantly weeds, and if this is the case reseeding is the best option.

### **Extended Rest**

Extended rest periods provide an opportunity for forages to develop from seedlings through maturity without interruption by the grazing process. This benefits the forage plants by allowing maximum root growth and development. With an enhanced root system, the forage plants are better able to draw nutrients and water from the soil.

Extended rest periods can be for a full growing season or for a portion of the growing season. To be of the most benefit this period of time should be at least 3 months.

The major benefit of this management technique is development of the root mass of the forage base, resulting in increased forage yields in the near future. Additional benefits include:

- improved wildlife habitat, especially for song birds and ground nesting game birds.
- increased soil porosity because of reduced livestock traffic.
- increased soil organic matter.
- an emergency source of feed in the event of drought.

To provide this kind of extended rest period requires planning ahead. Obviously the area given extended rest will not be available for grazing, so the forage balance for the season must take this into account.

Some areas that are good candidates for this treatment include sensitive areas that need additional rest to benefit the desired plant community, sacrificial areas, areas of pasture that were overutilized and need the extra time to recover.

## **Fertilization and Nutrient Management**

Proper fertilization of pastures will increase yields of forages. This is especially noticeable when the pastures are already in poor condition, with the forage plants stressed from overutilization. Proper fertilization improves the vigor of the forages, allowing them to compete with weeds.

Unless hay is removed from a pasture, most of the nutrients in a pasture are recycled within the pasture. Any feed brought into the pasture adds nutrients. This should be accounted for when determining if additional nutrients need to be applied. Soil tests should be the basis for the application of any nutrients to pastures. Soil tests can be taken every 4-5 years.

Prior to applying fertilizers or liming materials, a cost analysis should be done to determine if applying these soil amendments is cost effective.

### **Manure Management**

The most important factor to consider in fertility management in pastures is the management of the herd using rotational grazing concepts. This provides for more uniform manure distribution across the entire pasture. In contrast, in a continually grazed pasture the manure tends to be deposited in a few areas such as watering facilities, feeders, and shade.

### **P and K**

Phosphorus and potassium levels are rather stable in pastures. These elements are important for legume survival. The levels of these nutrients should be in the optimum to high range so the legumes can successfully compete with the grass species. Once the levels are built up in the soil there should not be a need for additional applications for quite some time.

### **Nitrogen**

Nitrogen can easily be supplied by commercial fertilizers, especially if the desire of the operator is to maintain a grass forage base. The amount to apply is based upon the predicted forage yield. Split applications are desirable, with applications done in May and late August for cool season grasses. Use the following chart to determine the quantity of actual N to apply.

Expected dry matter yield (T)	2	3	4	4+
N to apply (lb/acre)	60	90	120	150

Another method of providing nitrogen to the forages is by introducing legumes such as alfalfa, clovers, or birdsfoot trefoil to the forage stand. This will improve the dry matter yield, while providing feed with higher crude protein content than straight grass forage will provide. With at least 30% legumes in the stand (by weight) there is adequate nitrogen produced by the legume to provide the needs of the stand.

Selection of legume to use depends upon the site conditions and the objectives of the producer. If the site is wet or the soils are acidic, clovers or birdsfoot trefoil are the best choice. If the operator wants to make hay on the pasture, then alfalfa is the better choice.

### **Soil pH**

Soil pH should be kept as close to neutral as practical to enhance nutrient availability and microbial activity in the soil. To maintain alfalfa in the stand, soil pH needs to be maintained at 6.5 or greater. Clovers and birdsfoot trefoil can tolerate lower pH values, down to 5.5. Liming materials will take a long time to react, so if interseeding is planned, be sure to apply required liming materials well in advance, at least one year.

### **Managing Forage Balance**

The most difficult aspect of managing grazing systems is dealing with the variable rate of forage growth. Cool season forages have a rapid growth rate in the spring, dramatically slower growth in the summer months, and a renewed growth period in the fall. Warm season forages grow slower in the spring and fall, but have a rapid rate of growth in the summer months.

Most grazing systems in Minnesota rely upon cool season forages. In most of these systems there is an abundance of forage in the spring and a shortage in the months of July and August. Even September is a difficult month to manage because the grasses are not growing nearly as fast as in the spring and there is no normally carryover of available forage from the summer months.

To even out the forage balance on a monthly basis, the following strategies are often used:

- Using a rotational grazing system will reduce the depth of the midsummer slump, and it will delay the onset of the slump in forage production. When livestock do not have access to all the growing forage at one time, growth is allowed to accumulate for use at a later date. In addition, the grazing efficiency is increased by a well operated managed rotational grazing system so the livestock actually consume a larger percentage of the forage that is available.
- Utilize warm season grasses to fill in the slump that normally occurs in mid summer for cool season forage based systems. In practical terms, one should not plan on meeting all of the forage requirements in July and August with warm season grasses. Instead, have some area of warm season grasses to utilize, allowing for a longer rest period for the cool season grasses. A good rule of

thumb to use is to have approximately 20% of the pasture planted to warm season grasses to meet the need to extend rest periods for the cool season component. Because warm season grasses are difficult to establish (usually 3 years), and because they generally have a lower dry matter yield, it may not pay to plant warm season grasses as pasture. However, if they are already established and available (native prairie remnants or old CRP fields) it is a good idea to manage them to retain the warm season component and utilize them to augment the grazing system in the summer months.

- Use an annually seeded crop as forage during the summer. Examples of these include oats, rape, winter rye, winter wheat, and various brassicas. These crops make excellent forage. The cost of tillage and planting each year need to be considered when utilizing annually planted crops.
- Hay fields that have been harvested for the first crop can be used for grazing instead of taking a second crop. These fields will normally be ready for grazing at the time when the permanent pastures are slowing in growth and the forages need the extra length of time to their rest period.
- Some of the paddocks can be harvested as hay in the spring during the time of rapid forage growth. The regrowth will be ready for grazing at a time when the growth rate of the forages is slowing. Utilizing pasture acres for hay is recommended only if there is a rather large excess of forage on the pasture. Once it is cut for hay there will be a period of 25-30 days before it can be grazed. Prior to harvesting pasture as a hay crop look to the extended weather forecast. If droughty conditions are predicted it may be best to leave the extra forage stand for grazing instead of cutting it for hay.

## **Overwintering**

Livestock need to be placed somewhere during the winter months. Obviously forages are not growing in the pastures, so grazing of growing forages is not possible at that time. The most common methods of keeping livestock through the winter are:

- Place them in a feedlot.
- Feed them stored feed on a portion of the pasture.
- In some cases the livestock are transported to another location and overwintering is not an issue on the site with the pasture.

Feeding livestock on the pasture during the winter months is a concept that has several advantages for farmers. Labor costs are often lower and livestock health may actually be improved by not confining them in close quarters, especially in buildings. Typically, grazing livestock are able to withstand the climate of Minnesota winters without shelter other than that provided by the landscape. Shelter can be provided, if needed, by temporarily moving the herd to a sheltered area during times of extreme cold, by locating overwinter sites in sheltered areas, or by using portable winter shelters.

The basic structure of this overwintering method is to place round bales of hay in a pattern on the area that is used for the overwinter site. Temporary electric fence is used

to allow livestock to have access to a predetermined number of bales at any one time. As the bales are consumed, the temporary fence is moved to allow access to additional bales. The livestock are allowed to have continued access to the residue piles left behind as the fences are moved forward.

The stock density of this system is about 10 head per acre for mature cattle. This figure should be adjusted for other kinds and classes of livestock.

Water must be provided to the livestock, but they can walk fairly long distances to get it, up to one half mile. This forces the livestock to move around and is better for the health of the herd. This traffic will have negligible impact on the trail they use because the ground will be frozen.

The overwinter site will look in very poor condition in the spring when snow melts and prior to the time the livestock can be put into a regular rotation. In most cases this area can be given an extended rest, normally into July, and then be put grazed as part of the rotation with the other paddocks.

Areas of the pasture used for feeding the livestock become covered with manure and feed/hay residues. This has the effect of increasing the organic matter content of the soil, improving the fertility, and even introducing new seed to the site. In many cases these areas tend to be some of the best pasture in future years, with the effects of the nutrients, organic matter, and seed being evident for up to 5 years.

Consider planting shelterbelts in strategic locations within the grazing system to extend the area available for overwintering livestock.

Refer to the section entitled “**Overwintering**” for recommendations for rejuvenation of the overwintering site.

## **Livestock Watering System**

Adequate quantities of water are important to the herd health and performance. Watering facilities that are inadequate, placed improperly in the grazing system, or just not provided will have an adverse impact on the management of the forages as well.

Livestock that are deprived of adequate water will not gain weight or produce milk as well as they could. Adequate water helps to keep the livestock cool during periods of hot weather. Forage consumption is greater when livestock can freely drink water as they desire it.

Each paddock in the grazing system should have water available within a reasonable distance. For sheep and cattle, this is within 800 feet. For bison and elk, water should be within 1320 feet of the area they are grazing.

Whenever possible, watering facilities should be placed at high points in the landscape, avoiding steep sidehills and areas where runoff can concentrate.

## **Monitoring**

### **Minimum Residual Grazing Heights**

As the livestock graze in a paddock, the extent to which they have defoliated the forages must be monitored to assure that they are moved to the next paddock before graze below the minimum residual stubble heights for the kind of forage present.

### **Growth and Regrowth of Forages**

It is important to know the rates of forage growth and regrowth in paddocks that are resting so that you can know where to move the livestock when they finish grazing their present paddock.

This rate of growth/regrowth will change throughout the grazing season depending upon moisture conditions, soil type, forage species/characteristics, and prior impact by the grazing livestock. This is why constant monitoring is necessary through the grazing season.

### **Grassland Condition and Trend**

Over a period of time the forages on a paddock will change to reflect those species that can survive the impact of the grazing livestock. Managers of grazing systems can affect the outcomes of livestock impact by manipulating the timing, intensity, and duration of grazing of a paddock. Proper manipulation can enhance the forage profile of a paddock, while improper management will have a negative effect on the quality or quantity of forages harvested by the livestock.

A “Grassland Condition and Trend Worksheet” is a valuable tool for determining, over a period of time, for use in monitoring the changes in species composition and condition of the forages, and soil resources in a grazing system.

### **Sensitive Areas**

The condition and species composition of the plant communities in sensitive areas is important to monitor. In planning a grazing system, the desired plant community and condition of the water and soil resources should be established. Monitoring the conditions of these resources will reveal the level of success of the grazing plan.

## Erosion

A well managed grazing system will control erosion, or even allow for “soil building”. Evidence of erosion indicates an adjustment that needs to be made in system layout or system management.

Proper forage management will control sheet and rill soil erosion, and will reduce the severity of gully erosion by reducing runoff.

The most likely erosion in grazing systems occurs from trailing as livestock move from one location to another. This kind of erosion is caused by improper location of travel lanes, improper location of watering facilities, or by very heavy use of lanes and watering facilities by livestock. Adjustments to the system are necessary when these problems persist.

## Yield

The yield of the pasture system is an indication of the quality of the plan and the quality of the management (implementation) of the plan. Yield can be measured in the following ways:

### Yield of Forage

Yield of the forages can be easily measured by tracking the number of animal unit grazing days on individual paddocks or the entire pasture. This requires keeping records, on a paddock by paddock basis, of the number of head, average weight, and the number of days of grazing. To maintain consistency and to compare equivalent values, for this purpose an animal unit is equal to 1000 pounds of herd weight.

### Pounds of Livestock Gain

Tracking the number of pounds of beef, lamb, ect., will give an indication of the quality of management or forages.

In determining yield it is important to realize that several factors combine to determine results. If significant changes in the herd genetics or management take place, they must be factored in. If there is a significant difference in weather conditions, such as amount and distribution of rainfall, this also must be factored in. Because of this, the yield information is only useful for relative comparisons.