Section 2: Grazing Management Resources

The following articles are designed to introduce you to the different components of a grazing year. There are several publications that are available from local extension service or soil and water conservation districts that give the basics of plants, water systems, fencing systems. Many states have individuals in Natural Resources and Conservation Service with grazing expertise. Grazing Councils and Extension Service offer grazing schools through the year as well as grazing conferences. Publications for you to consider:
Watering Systems for Grazing Livestock by Great Lakes Basin Grazing Network and Michigan State University Extension
Understanding Grass Growth; The Key to profitable Livestock Production by Steven S. Waller, Lowell E. Moser, Patrick E. Reece (Trabon Printing Co)
GRASS*: The stockman's crop How to harvest more of it* by Harland E. Dietz
Understanding Forage Quality by Don Ball, Mike Collins, Garry Lacefield, Neal Martin, David Mertens, Ken Olson, Dan Putnam, Dan Undersander, Mike Wolf
Extending grazing and reducing stored feed needs by Don Ball, Ed Ballard, Mark Kennedy, Garry Lacefield, Dan Undersander
Grazing Recordbook A Field Guide for Range, Forage and Livestock Programs by Natural Resources Conservation Services & National Grazing Lands Conservation Isnitiative

Managing Grazing

During all of the weather challenges this spring I was reminded that pastures are often last on the list of management priorities on many farms. I have noticed a lot of fields overgrazed and yet many others were allowed to mature before grazing. This seems wrong because with proper management pastures can be used to reduce feed costs, improve animal performance, and boost farm income.

Managing grazing can have a greater effect on the pasture than any other part of pasture management. While working with beginning graziers I often find myself suggesting that they consider having more, smaller paddocks. This is based on three grazing management principles: allow the plants rest, keep grazing times short and use a high enough stocking density to harvest the forage.

Adequate rest periods

Grazing or removing leaves from forage plants is stressful. It eliminates photosynthesis, stops nutrient uptake from soil and in legumes it stops nitrogen fixation. Plants need rest to recover from this stress and to re-grow. We give the plants rest by removing the animals. By providing a rest period we allow the forages to recover and re-grow.

Overgrazing is a term used to describe inadequate rest periods, but many times it is misunderstood. Most think that having too many animals in a pasture causes overgrazing. Overgrazing is not having too many animals in a pasture; it is having animals in the pasture for too long.

What causes overgrazing? Allowing animals to re-graze plants before they are able to replace root reserves used for re-growth. When animals are turned into a new pasture they will select the plants they prefer. If kept in the same field long enough the plants grazed first will re-grow. For some reason new growth always seems to be preferred to old growth. These recovering plants with new growth must be protected. Overgrazing keeps these plants stressed. In the short term it can slow plant recovery. Long term it can lead to the loss of some plant species in the pasture and the loss of forage yield.

Rest periods will differ during the season. In spring the rest period needed may be less than half of the rest period needed for summer.

Short grazing periods

Along with rest periods, keeping the time animals are grazing a particular field short is important. The grazed plants will re-grow. Remove the animals before that happens. Growth rates change during the year, so the length of time before plants re-grow also changes. When plants are growing rapidly, it may be 2 days. During periods of slow growth it can be 7 days.

Besides, the longer animals stay in a paddock the poorer the quality of forage. As forage quality goes down animal intake declines. If intake goes down, performance drops. Short grazing periods increase the quality and quantity of grazed forages and improve animal performance.

Stocking density

If we keep the grazing times short then we need enough animals to harvest all the forage we want in a paddock. Stocking density is the number of animals in an area at a particular moment. High stocking density increases the uniformity of gazing. Animals selectively graze. They eat the best plants first. They also ruin part of the pasture with manure, urine and trampling forage.

Grazing management typically increases stocking density. Livestock are no longer spread over one large pasture but consolidated, for a point in time, into a smaller paddock. Increasing stocking density frequently improves grazing distribution and harvest efficiency. There is greater competition for the available forage. With heavy grazing pressure more forage is consumed by livestock and less is lost to such things as trampling, spoilage by animal wastes, and plant maturation and leaf death.

The real trick is harvesting high quality forage, by keeping the grazing periods short while maintaining adequate rests. Usually that means decreasing the size of paddock and increasing the number of paddocks.

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Want to Improve Your Pasture Yield?

Many producers are looking for ways to improve their pasture yields. The good news is that there are several things that can be done. You can improve pasture fertility. You could plant improved forage varieties. You can manage the grazing of a pasture by removing the livestock before the grazed plants regrow. When you remove the livestock you make sure half of the leaf area is left. You can manage to give the plants plenty of time to recover before grazing again. You can also work to keep the plants vegetative. The biggest task for the month of May is keeping the plants vegetative.

In fact most experienced graziers I know get pretty fanatical about keeping their pastures vegetative. This task is simple; to keep the plants vegetative you have to remove the reproductive tillers before they produce seed. In other words do not let your pasture plants have sex.

You do not want to see reproductive tillers because letting the grass plants produce seed will decrease yield. Reproductive tillers reduce yields in two ways. First, reproductive tillers elongate above the other tillers on the plant and shade out the vegetative tillers. Competition for sunlight means the other vegetative tillers are growing less. Less sunlight reaching the crowns of the grass plants also means that fewer vegetative buds on the crown will develop into tillers.

The second way reproductive tillers reduce yield, is by producing hormones as the seeds mature that retard or inhibit the development of other vegetative tillers. The grass plant will not produce more vegetative growth until the seeds completely mature or the reproductive tiller is removed. Remember, the plant's priority is to put its resources into the development of a mature seed, not to grow high quality vegetative material.

Yield in pastures is heavily influenced by the density of the pasture. In pastures a greater number of tillers contribute more to yield than taller plants.

When should you remove the reproductive tillers? To keep our pastures vegetative, reproductive tillers should be removed between boot and flowering. Each grass plant has multiple tillers. Initially in the spring all the tillers produce vegetative growth. For each grass there is a range of light to dark time where those tillers induced to flowering when they were developed last fall, switch from vegetative growth to reproductive growth. The reproductive tiller elongates and stem formation begins. The seed head develops and is pushed up and out of the tiller. Boot stage

is when the seed head is just about ready to emerge from the last elongated node area and is still wrapped in a leaf sheath. After the seed head emerges from the leaf sheath the reproduction continues with flowering, seed development, seed growth and seed maturation.

Unlike vegetative tillers that have the growing point near the soil surface, the growing point in a reproductive tiller is generally found just below the last completed node. This growing point is vulnerable to grazing or clipping. If the growing point is removed then re-growth will come from the development of new tillers.

One caution, there can be more than one reproductive tiller on a plant. Even though our cool season grasses produce seed heads in the spring, those tillers were actually developed during the preceding fall. Once reproductive growth is initiated in the spring, one reproductive tiller will dominate. If reproductive tillers are removed and light conditions are still right to initiate reproductive growth another tiller initiated last fall will start reproductive growth. I have seen orchardgrass three inches tall with a flowering seed head.

Because of this some producers may want to wait until most of the reproductive tillers have developed seed heads before clipping later in the grazing season. You could wait but you will lose yield. Two of my colleagues have said that clipping after flowering is either cosmetic or for revenge, not to stimulate vegetative growth.

Every tiller on a grass plant is not a reproductive tiller. Only those tillers induced the preceding fall have the capacity to produce a stem and seed head; the new tillers developed in the early spring will not produce a seed head. Eventually the light conditions will change, no longer initiating reproductive growth, and all the growth for the rest of the year will be vegetative.

Removing reproductive tillers can be accomplished with grazing livestock or mowing. Livestock can best do this with high stocking densities and moving livestock quickly from one paddock to the next. The goal is to use the livestock to just graze the top couple of inches of the grass. To effectively do this a heavy stocking density and small paddock size is needed. If the grass is not grazed uniformly enough to avoid seed head formation, then some mechanical clipping will be needed.

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Don’t Use It All Up: Weather Impact

Wow talk about a contrast. Pasture growth this summer and pasture growth the last two summers, so far, seem to be on different ends of the spectrum. The lack of timely rain and the early heat have slowed forage re-growth.

The management of grazing is challenging. The grazier has to be aware of, and adjust to, many things. So far, the biggest adjustment this year is the weather. Experienced graziers have noticed this difference and adjusted their management to compensate.

Working with farmers as they face this challenge, I am reminded of a quote by the American poet, John Allston. “The only thing you take with you when you're gone is what you leave behind”.

Most people relate this quote to the death of a loved one. I relate it to what is left when animals are removed from a paddock. What is left behind in the paddock is just as important as the other aspects of grazing management.

Residual is the term most often used for the amount of forage left after grazing. Animals leave a lot of plant material after grazing. The key is the amount of green leafy material. Residual is an important aspect of managing grazing. In a dry year it becomes even more critical. The amount of residual has an effect on many things.

The amount of residual affects root growth. Everyone who has attended a grazing school has seen the data from the classic study by F.J. Crider that was published in 1955. This data showed that at 50% leaf removal only 2% of the roots stopped growing. At 60% leaf removal 50% of the roots stopped growing. All of the roots stopped growing at 80% leaf removal.

A healthy root system helps the plants survive the dry times. If more than 50% of the leaf area is removed then root growth stops. Root growth is used to capture more water and nutrients. At the very least this slows re-growth.

The amount of residual affects re-growth. Green leaves are needed to capture sunlight for photosynthesis. This creates the non-structural carbohydrates needed to fuel re-growth. Without enough leaf area the forages must fuel re-growth from their stored reserves. Growth fueled by the root reserves is slower than growth fueled from active photosynthesis.

The downside is that too much residual can also slow re-growth. Grasses with high leaf density low in the canopy require less residual than grasses with low leaf density. Maximum re-growth for most of our cool-season grasses occur at about 12-1500 lb/acre or 2-3 inches residual. More residual than this means dead leaves accumulate, slowing re-growth.

The amount of residual affects water absorption by the soil. Grazing below 2-3” will allow most of the rain that does come to run off and not be absorbed by the soil. Another classic set of data shared at grazing schools was conducted in Nebraska during the 1930's. The data shows the runoff results from a 10% slope where three inches of rain was applied through a sprinkler system over 90 minutes. Pasture grazed to 95% cover experienced a little over 10% runoff. Overgrazed pasture, 50% ground cover, lost 75% of the rain that was applied.

More leaf area means less water runoff. The more vegetative material you have will shade the soil and slow the movement of rain allowing the water to be absorbed by the soil.

When we consider grazing management during dry times remember that without rain pastures will grow slower, and close grazing will compound the problem. Slow growth means the rest between grazing needs to be longer. Do not take more residual to allow for this rest.

Graziers need to protect their pasture resource. Do not over-graze. Over-grazing is basically grazing more of the pasture than it can recover from with normal rest. Visually you would describe it as grazing the pasture to the ground. Over-grazing can have long-term effects. It should only be considered an option for grazing management if the field will be replanted.

Many people have observed that graziers who protect their pasture resource during dry or slow growth times have pastures that recover faster and produce more forage when weather conditions improve.

To adapt to the current weather you will need to give your pasture more rest. You could pull the animals off pasture and feed them. But there are other options available. Start looking around. Are there any unused pastures in your area that you could rent? Could you graze hay fields? Either of these options would protect your pasture and be cheaper than feeding.

I am also reminded of something Jim Gerrish, a grazing consultant, said “Use it all up and you’ll go broke.” The current weather means pasture will need more rest. Don’t sacrifice your residual when you adjust your rotation. You could be paying for that decision long after the rains return.

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When To Start Grazing Cool-Season Forages

Not too early, and not too late.

When is the best time to start grazing cool-season forages? "Ideally, when the plants are about 3 inches tall and the soil is dry enough to support the animals without damaging the plants," says Darrell Emmick, NRCS Grasslands Specialist.

Don't wait until forage is at the ideal grazing height (about 6 inches for most grasses and clovers in New York) to get your stock out on pasture. If you do, the forage will quickly get ahead of you and lose quality, and you won't get the staggered regrowth needed to make the second round of grazing go smoothly.

Don't start grazing too early either, or you risk reducing yields on subsequent grazings or even killing the stand, cautions Emmick. When temperatures reach 40 F and forages break dormancy,

their carbohydrate root reserves may be dangerously low, often just enough to fuel two to three days of growth. Most of the reserves have been used up keeping the plants alive over winter. "If you cut off those first `solar collectors,' the plants may not have enough energy left to send up any more," he explains.

With our usually wet springs, the soil is often too moist to support the animals when the forage is ready to graze. In that case, Emmick suggests waiting until the plants are about 6 inches tall. The thicker growth will help support the animals. Also, graze stock for short periods, and only allow them to top the stand down to 3 to 4 inches. Similarly, if forage growth gets beyond the ideal stage before you can start grazing, offer the animals larger areas for shorter periods. "They'll pick out the best and leave the rest," says Emmick.

In either of these cases, plan to closely clip these paddocks, or allow them to grow some more and harvest them mechanically. If you don't, they will often bounce back quickly and forage quality will suffer before you are ready to graze them again.

Clipping will force the grass to tiller, thickening the stand for later grazings, and reduce it's early competition with clovers. This can improve forage quality when these paddocks come back into the rotation. Let clippings wilt for a day and you can turn in dry cows and heifers to clean them up.

Plan to graze well-drained, accessible paddocks first. But if soil conditions are less than ideal, you may want to start grazing in a "sacrifice area." Chose a paddock that's thin and in need of renovation, anyway. Broadcast grass or clover seed (or perhaps rely on the bank of seeds that may already be in the soil), then turn in the stock for a quick grazing. Their hoof action may damage the stand that's there, but simultaneously will plant the broadcasted seed or germinate the seed that's already there.

Keep in mind, however, that the seed bank may not be what you had in mind. Be prepared to have the area come back to burdock or other weeds which may require a full renovation to eradicate, warns Emmick.

Winter Cold Stress on Cattle

Steve Boyles, OSU Beef Extension Specialist
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Factors that create stress during the winter months are cold, wind, snow, rain and mud. The primary effect on animals is due to temperature. All these factors alter the maintenance energy requirement of livestock. Maintenance requirement can be defined, as the nutrients required for keeping an animal in a state of balance so that body substance is neither gainer or lost.

Some published sources contain nutrient requirtents for beef cattle that include guidelines for adjusting rations during winter weather. Even without published source, competent livestock producers realize the need for more feed during cold weather. Make sure that water is available. If water is not supplied, cattle will reduce feed intake.

Daily dry matter intake of beef cows with respect to temperature							
Temp, F	<5	5-22	22-41	41-59	59-77	77-95	>95
Intake, % change	1.16	1.07	1.05	1.03	1.02	0.90	0.65

The metabolic response to the stimulus of cold involves practically all the systems of the body. The striated muscles shiver, the heart beats faster, breathing becomes deeper, urine flow is increased and the sympathetic and pituitary controlled systems are activated so to elevate biological oxidations (energy expenditure or heat production) in all tissues. The result is an increase in the cow's requirements for energy.

Spring calving cows, and particularly heifers, in poor body condition are at risk for calving problems. The result may be lighter, weaker calves at birth, which can lead to a higher death loss, and more susceptibility to things such as scours.

Animals in poor condition before calving, provide inferior colostrum and lower milk production. This can lead to lighter weaning weights or fewer pounds of calf to sell. Females that are in less than desirable body condition at calving are slower to return to estrus. Therefore body condition at calving affects the current calf crop (milk production) and next year's calving date (rebreeding date).

In most years hay and stockpiled forage can adequately provide the needed nutrients, but it can very widely and should be tested to make sure it is adequate. OSU Extension has a fact sheet on Forage Testing, ANR-2-98, that describes the proper sampling techniques for various forages and explains the results. Your local Extension Office may also have a test probe and can help with submitting the sample to a laboratory.

There is a range of temperature where cattle are neither too hot nor too cold and their performance is optimal. This temperature range is called the thermoneutral zone. It is the temperature range where the fewest nutrients are needed to maintain bodily functions. For cattle the lower temperatures of the thermoneutral zone are shown in Table 1. All of the critical temperatures listed are effective ambient temperatures, which basically means the wind chill temperature is used if the cattle are not sheltered. The critical temperatures also take into consideration the insulating ability of the cattle, as shown by the change between a wet and dry coat.

Table 1. Estimated Lower Critical Temperatures for Beef Cattle *

Coat Description	Critical Temperature

Summer Coat or Wet	60 degrees F
Dry Fall Coat	45 degrees F
Dry Winter Coat	32 degrees F
Dry Heavy Winter Coat	19 degrees F

* From Browsen, R. & Ames D."Winter Stress in Beef Cattle" Cattle Producer's Library. CL760.

If we have a choice snow is preferred to a cold rain. We lose what is called “air insulation” in cattle that get wet versus those that are out in the snow. The air pockets between hair fibers are a source of insulation. We lose this insulation when hair gets matted down in a cold rain. The result is that the Dry Winter Coat goes from having a critical temperature of 32 degrees F to about 59-60 degrees F.

From several studies it is estimated that for every one degree below the critical temperature a cow’s energy requirement (TDN) increases 1 percent. It is also estimated that for every ten degrees below the critical temperature the digestibility of the ration decreases by 1 percent. This means that when the temperature drops below the critical temperature the cattle need to be fed better. It may be that more or better hay needs to be fed

Example of Effect of Temperature on Energy Needs

Effective Temperature	Extra TDN Needed	Extra Hay Needed (lbs./cow/day)	(or) Extra Grain Needed, (lbs/cow/day)
50 F	0	0	0
30 F	0	0	0
10 F	20%	3.5-4 lbs	2-2.5 lbs
-10 F	40%	7-8 lbs	4-6 lbs.

Besides cold weather effecting cattle performance producers have another thing to consider during winter, mud. It is less clear what effect mud has on a cow's energy requirements but it is estimated that it can increase the maintenance requirement from 7-30%. If cattle have to deal with mud then their ration should also be improved, to help avoid the consequences listed above.

Another tool producers have to help determine if what they are feeding is adequate, besides forage testing, is Body Condition Scoring (BCS). In the last trimester of pregnancy a cow should have a score of 5,6 or 7 on a 1-9 scale. If a cow is going down in BCS then the ration is inadequate and should be improved.

Here are some additional sources of information:

Winter Supplementation of Beef Cows http://ohioline.osu.edu/as-fact/0001.html

Maximizing Fall and Winter Grazing of Beef Cows and Stocker Cattle
http://ohioline.osu.edu/b872/index.html

Scoring Cows Can Improve Profits,L-292 **http://ohioline.osu.edu/l292/index.html**

Rotate your stock through paddocks in early spring until the ones they grazed early have regrown to about 6 inches. Then rotate stock back to those paddocks, and plan to mechanically harvest any they haven't yet grazed. "Don't keep pushing ahead and let those first paddocks grow too tall before regrazing or you'll be chasing poor-quality forage for the rest of the season," says Emmick. "Once you get cows used to grazing high-quality feed, why would you want to turn back?"

Water, the most limiting factor in managed grazing systems.

Over the years working with graziers I have come to a realization. The most limiting factor in managed grazing systems is water. No, not rainfall, we can not control the weather. I am talking about water for livestock.

It is funny, one of the first things we teach children about raising animals is that they need plenty of clean fresh water at all times. But as adults managing grazing, water is one of the last things we consider in the system.

Earlier this spring I visited with a young producer who wanted to mange his livestock grazing. He had many questions about what forages to plant, types of fencing, and the schedule for moving the livestock. In a nutshell I suggested he manage what was there, use portable electric initially, and to move based on forage growth. Then I asked about water. From the conversation that ensued he had not even thought about how to supply water to his livestock on pasture.

Water is important. It makes up around 60 to 70 percent of an animal's live weight. In the body water performs many functions. A few that come to mind include:

Water consumption will have an affect on dry matter intake. Dry matter intake is highly correlated with milk production or gain. Ruminants on a high forage diet produce enough saliva to fill the rumen each day. Water is needed for saliva production.

Water is needed in milk production. Dairy producers have reported increases in milk production when cows have easy access to water. Typically two to five pounds of additional milk per cow, per day is observed.

Water is used in temperature regulation. Sometime this summer I will be asked about the need for shade in pasture. My first response will be to ask, do the livestock have plenty of clean fresh water? For the animals temperature regulation this is more important than shade. If the answer is yes, then we can talk about shade.

Water has a huge influence on where animals graze. Have you ever walked through a paddock where the livestock were just removed? The next time start at the watering point and walk away from it. You may notice that the residual height of the forage gets taller the further you are from the water source. Pasture utilization can be greatly enhanced when animals do not have to travel far for water.

Research backs up this observation. One study from Wyoming showed cattle do 77 percent of their grazing within 1,200 feet of their water source. In this study, approximately 65 percent of the pasture was more than 2,400 feet from water, but supported only 12 percent of the grazing usage. Having water close greatly influenced where the cows grazed.

Researchers in Missouri concluded that for the humid, temperate zone, like Ohio, water sources should be closer than the rangeland conditions found in Wyoming. For optimal forage utilization water should be within 600 to 800 feet of all grazed areas. Their study on 160 acres showed that pasture carrying capacity could be increased an additional 14 percent by simply keeping livestock within 800 feet of water.

Where animals spend their time also influences manure distribution. Grazing livestock return a high percentage of the nitrogen (N), phosphorus (P) and potassium (K) they eat to the pasture through manure and urine. If allowed, livestock will move those nutrients from the pasture to shaded areas or around water tanks. Have you ever seen a grid map of soil test values from a crop field that had been a pasture field? If you have, it should not take long to pinpoint where the watering point was located. It is not unusual to see significantly higher P and K values in those areas.

Another study from Missouri tested P and K levels in relationship to water placement. Soil test levels were uniform in the paddocks when water was less than 500 feet from any part of the pasture. When stock had to travel 1,100 feet to water, changes in soil P and K were much greater nearer the water.

Water systems are expensive. Some quotes I have heard equal fence cost. Are they worth it? Let me share a recent example. I have worked with a beef producer for several years who does a good job managing grazing. He has a herd of fall calving cows and weans the calves in the spring. Those weaned calves he treats as stockers and grazes them till fall or until the grass runs out.

This beef producer uses a 25 acre field to graze these 50 stockers. The field had two distant water sources away from either end of the field. On farm visits this producer would ask what could be done to improve the operation. Over the years, several people suggested putting water in the paddocks with the calves.

This field is on top of a hill. To get water there efficiently would mean drilling a well and piping it up to the field. Last year he finally did it. It cost around $6,000 for a well, pump, buried pipe and hydrants. The EQIP program through NRCS cost shared the project so his cost was less. Last year he estimates that it translated into 50 lbs extra per calf or 2500 lbs for the group. Was it worth it? He thinks so.

Providing water close to where you want the animals to graze can have a big influence on the success of the grazing system. For assistance in setting up a water system contact your local Extension, SWCD or NRCS office or check out the Ohio Integrated Forage Management Team's webpage at http://forages.osu.edu.

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Fall Grazing Management (Jeff McCutcheon)

Fall grazing management is important because fall is when the grass plant needs to build up carbohydrate root reserves. The grass plants in the pasture are perennial plants, which means that they survive from year to year. Although seed production is one way that a perennial plant can survive from year to year, in pastures the more important way that plants survive is regrowth from buds located at the crown of the plant. It is during the short day, long night periods in the fall of the year that flower buds are formed/initiated on the crown of the plant. In the spring new growth comes from these buds that draw upon carbohydrate reserves stored in the roots, rhizomes, stolens and/or stem bases of the plants.

Carbohydrate root reserves are accumulated when the plant is in positive photosynthetic balance. In other words, when the plant is producing more food than it is using. In order for this to happen, the plant obviously needs a good quantity of healthy leaf tissue. For cool season grasses like orchardgrass and fescue that probably means a plant height in the 6 to 8 inch range. It is critical that the plant not be overgrazed during the fall period. Overgrazing severely restricts the photosynthetic process in the plant. The overgrazed plant actually has to use carbohydrate reserves from the roots to try to grow leaf tissue. In a worst case scenario the plant does not grow enough leaf tissue to reach a positive photosynthetic balance before it is either grazed again, or the growing season comes to an end. The grazing principle of take half, leave half should be practiced throughout the fall period. This will insure that there is sufficient leaf tissue to keep photosynthesizing and growing new leaf tissue without drawing on carbohydrate root reserves.

While the leaf tissue dies during the winter, the buds and roots of the plant remain as living tissues over the winter and continue to respire and burn energy. If root reserves are insufficient the plant may die over the winter. If the plant survives but root reserves are low, spring re-growth and vigor of the plant is reduced. Last years drought provided a good example of how overgrazing can damage pastures. Overgrazed pastures that went into the winter with low carbohydrate reserves were very slow to green up in the spring and exhibited slow growth rates once they did green up.

I sometimes get asked, at what point in the fall can grasses be grazed to soil level without harming the plant? This has to be once top growth has ceased and when soil temperature falls below 40 degrees F. Depending upon the year, that is likely in late November or even into early December in our area.

Fall is not the time to relax grazing management. It is a critical time for the plant to build carbohydrate reserves. Good grazing management in the fall is the first step to better grazing conditions next spring.

Fall Fertilization of Forage Crops - Dr. Doug Beegle, Penn State University Extension

This year many areas of the state have been reporting excellent forage yields. As a result, we can expect that nutrient removal by the crop may be up significantly too. This combined with increasing fertilizer prices, especially for potassium (K) has raised questions about the need for fall fertilization of forage stands.

The principal nutrients of concern for legume forages are P and K. An alfalfa crop, for example, removes approximately 15# P_2O_5 and 50# K_2O per ton of yield and at a typical yield of 5 ton it will remove/require a total of 75 lbs and 250 lbs, respectively. This removal is built into the soil test recommendations. However, if yields are higher than anticipated when the soil test was run, even if the recommended nutrients have been applied earlier in the year, additional maintenance applications of P and K may need to be made to replace the higher removal. Fall is an excellent time to make this adjustment. In the late summer and fall, K especially becomes a nutrient of agronomic concern. Potash in the plant is largely found in the sap serving as a regulator of numerous metabolic processes. A major benefit of sufficient K in the soil is winter hardiness provided it is available in time for uptake by the crop before dormancy occurs. Thus if soil test levels are in the low optimum or below optimum range, K should be applied in the fall because this should help to improve winter survival for the long term benefit of the stand.

Legumes are not generally considered to be a good place for manure application mainly because the N in the manure is wasted on legumes, which reduces the economic return to the manure application. Also there are concerns with stand injury and the possibility of increased weed pressure. However, if it is necessary to apply manure to legume fields, fall is the best time to do it. This is a way to supply the additional nutrients that might be required, there is less chance of stimulating weeds, and there is good cover in these fields in the fall, over the winter and early spring to minimize nutrient losses to the environment. Usually we give priority to older stands for manure application because they are often more depleted in nutrients and if there are some negative effects from the manure application, there will be less long term impact on a stand that will soon be rotated compared to a new seeding.

Agronomists want to make sure that producers replace the higher removal of K if needed, but not overdo it because alfalfa is a luxury consumer of K. This means that if there is extra K available because soils are already high in K or unnecessary K applications are made, the crop will take it up whether is needs it or not. This can result in unnecessary fertilizer expense, high K levels in the forage, and less K available for future uptake.

If your forage fields have not been soil tested recently, this would be an excellent time to take a sample. Sampling now will indicate whether the higher yields have reduced soil K levels to the point where a fall fertilizer application is necessary. On the other hand, regardless of higher yield, if the soil reserves are still adequate the soil test can help reduce the cost of an unnecessary fertilizer application.

Do we really need to baby forage seedings? (Jeff McCutcheon)

Forage producers understand that the stage of growth determines when to harvest. For example, to optimize both yield and quality grasses should be harvested in the boot to early seed head emergence time period and legumes should be harvested in the bud stage. But is this also important in the seeding year? Since we spent so much time and money to plant the forage shouldn't we treat it carefully, take fewer grazings/cuttings, to give it a chance to establish? To answer these questions let's review grass and legume growth.

There are three basic growth stages in grasses that producers should be able to recognize, they are: 1) vegetative; 2) elongation; and 3) reproductive.

The vegetative stage is leaf growth. The growing point is compact and near the soil surface. Grazing/cutting at this time typically only removes older parts of the leaves. Each tiller will sustain a critical number of leaves. Newer leaves shade older leaves. Generally older and lower leaves die at the same rate as new leaf growth. Shading by growing leaves at this stage can cause small, non-flowering tillers to die.

Elongation, as its name implies, is the stage where the stem lengthens. Some call it jointing. Steams elongate in response to changing day length and temperature. The growing point is elevated and can be removed by grazing/clipping. If the active growing point is removed, then leafy growth will develop from dormant basal buds as new tillers. Most cool season grasses produce reproductive stems only in the spring after a period of short days/long nights and cold weather, which means after removing the seed stems; only leafy vegetative growth will be present for the remainder of the growing season.

When the developing seed head is in the uppermost leaf sheath, the plant has reached boot stage. This is the start of the reproductive stage. This stage is when the seed head develops, pollination occurs, and seed develops. As the seed heads develop, they produce plant hormones which retard the development of basal buds. This "apical dominance" reduces forage re-growth. Removing seed heads soon after they emerge will reduce tiller death due to shading and reduce the length of time that new tillers are suppressed by dominant reproductive tiller.

Legume growth is classified a little differently 1) vegetative, 2) bud, and 3) flowering. These stages are controlled by day length and temperature. Reproductive development will occur during each growth cycle. Legumes have many potential growth points. These are located at the stem tip, leaf-stem junction and most legume species also have dormant buds at the crown. These crown buds will produce new, leafy growth when growing stems are grazed or clipped.

The location of the growing points determines the legume's response to grazing/clipping. The growing points on alfalfa, red clover, and birdsfoot trefoil are susceptible to removal by grazing/clipping. Re-growth will come from dormant crown buds and lower stem branches when the growing stems are grazed or cut. White clover's growing points are on stolons and are too low to be removed by grazing, but can be damaged by trampling.

Principles that apply to established stands also apply to new seedings. Most cool season grasses need a cold period to induce flowering. New seedings will not show reproductive development during the seeding year. These could be harvested when leaves are fully elongated but before leaf death occurs. To encourage tillering grazing or clipping when grasses reach 6-8 inches would be beneficial. Grazing should be done on firm soils and with a high stocking density and short duration. In other words, use enough livestock to reach your target residual in 3-5 days. Over grazing should be avoided.

Won't grazing/cutting early effect root development? Remember the "take half, leave half" rule? Everyone who has attended a grazing school has seen the data from the classic study by F.J. Crider that was published in 1955. This data showed that in grasses if you removed 40% of the leaf volume you would not stop root growth. Removing 50% of the leaf volume only stopped 2% of the roots growing. At 60% leaf removal 50% of the roots stopped growing. All of the roots stopped growing at 80% leaf removal. If anything err on the side of leaving just over half of the leaf area as residual with a new seeding.

Spring seeding of alfalfa should be harvested in the bud stage to optimize both yield and quality. Depending on the weather this could happen 60-70 days after emergence. If seeded with a companion crop then it should be harvested as hay when the companion crop is in the boot stage. After the first cutting follow a normal cutting schedule. Lots of data suggest that with a new alfalfa seeding you should avoid a late cutting after the first week of September in Ohio.