UK Forage News

Keeping Forage-Livestock Producers in Kentucky Informed
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June 2025

Jim Gerrish's Seminar Now Online

When Jim Gerrish received the UK Plant and Soil Sciences distinguished alumni award on April 4 he also gave a seminar entitled "Seven Things I Have Learned About Profitable Ranching Over The Last 45 Years." Chris has now uploaded this seminar to the UK Forage YouTube channel. In addition to the seminar and recognition, Jim also led a forum for leaders in the forage industry in KY the morning of April 4. The article below gives key highlights or "Words of Wisdom" from this forum.

Jim Gerrish holding his award and (left to right) Jimmy Henning, Jim Chuck Doughtery (Jim's MSc advisor), Chris Teutsch, and Ray Smith.

Forage Timely Tips: June

- ✓ Continue hay harvests. Minimize storage losses by storing hay under cover.
- ✓ Clip pastures for weeds and seedheads as needed.
- ✓ Start to slow grazing rotations allowing for a longer recovery period.
- ✓ Use portable fencing to decrease paddock size and increase paddock number.
- ✓ Do NOT graze below the minimum desired residual height.
- ✓ If present, johnsongrass can provide high quality summer forage when grazed or cut at a vegetative stage.
- ✓ Crabgrass, a warm-season annual grass, can provide high quality summer grazing. If desired, remember crabgrass needs some annual soil disturbance to keep coming back.
- ✓ Begin grazing native warm-season grasses. Start at 18-20" and stop at 8-10".

Words of Wisdom from Jim Gerrish
-summarized by Nat Colten

Grazing Management

Jim emphasized that, in the grazing business, animal rate of gain per acre is generally more important than the rate of gain per animal. Expenses can be kept lower when livestock do the harvesting. The carrying capacity of a farm is not directly related to the number of livestock, but rather the farm's ability to generate feed. Stocking rate is simply the number of animals put on pasture to harvest feed over a given period. It is important to not let stocking rate overrule the carrying capacity of your farm.

Managing grazing height is key to maintaining productive pastures. In a field study at the University of Missouri's Linneus Experiment Station, Jim found that grazing to 4 inches resulted in 60% greater seasonal forage dry matter yield than grazing to 2 inches. Through intensive grazing management, Jim was able to decrease the composition of tall fescue in pastures from 90% to 30%. Planting species like red clover and crabgrass is another way that he mitigated the effects of fescue toxicity.

Soil and Water Management

Fertilizer and lime are valuable tools for improving soil quality. Jim recalled the widely recognized 3-legged stool that supports soil quality (biological, physical and chemical properties), and pointed out that grazing management alone can also be a valuable tool improve soil quality, but he emphasized that a cost-benefit analysis can be helpful when considering whether to amend soils. In Missouri he observed degraded soils achieving 200 animal unit days/acre (AUD/ac) in 2-3 years with the use of fertilizer and grazing and with grazing alone the same soils achieved 130 AUD/ac in 10 years.

Jim highlighted that managing grassland soil organic carbon has benefits on and off the farm. Productive grasslands can mitigate changing climatic conditions by sequestering carbon in the form of usable plant and soil microbial biomass. Greater soil organic carbon results in greater water and nutrient storage capacity, which can decrease recurring fertilizer input costs and mitigate drought risk. Managing soil organic carbon in grasslands goes hand-in-hand with maintaining productive pastures: adequate rest and residual plant material are paramount.

<u>Annual Forages:</u>

Annual forages can be cost effective in grazing systems if the crop results in getting more animal grazing days. In Jim's experience, cool season annuals (like oats and ryegrass) planted in the fall into dormant warm season perennials like bermudagrass are worthwhile, but warm season annuals (like sorghum-sudangrass and pearl millet) planted in semi-dormant cool season perennials in the summer are generally not. However, he found great utility in crabgrass as an emergency forage crop and as a means of diluting toxic tall fescue pastures. In any annual forage scenario, Jim recommended waiting until three new leaves have grown before grazing again. Growth recovery periods are critical for all forage plants – not just annuals.

<u>Summer Stockpiling:</u>

In Missouri, Jim utilized summer stockpiling of cool season perennial forages to hedge against droughts. Though cool season forages may be of lesser quality in the summer, they are typically adequate to meet cow maintenance requirements and a taller canopy height has a direct impact on lower soil surface temperatures and therefore less soil water evaporation. Summer stockpiling areas can be moved around the farm from year-to-year to distribute the positive impacts. In Jim's experience, the strategy of summer stockpiling can also be employed to naturally re-seeding of pastures with legumes.

<u>What's the best grass?</u>

Jim's ideal grass for Kentucky would be a soft-leafed tall fescue accompanied by red clover. However, he emphasizes that plant diversity is good.

Kentucky Forage Survey
-summarized by Caroline Roper

Following the April 4th forum with Jim Gerrish, a survey was distributed to attendees to capture their thoughts and opinions on the future of forage Extension at the University of Kentucky. Here are a few excerpts:

- Respondents were mainly cow-calf producers, with small ruminant producers being the second-largest group.
- Respondents identified the cost of infrastructure, time and labor, and cost of inputs, such as seeds and fertilizer, as the largest barriers in implementing improved grazing management.
- Respondents indicated interest in attending field demonstrations, pasture walks and regenerative agricultural conferences to learn new and innovative practices.

Additionally, the Kentucky Forage and Grassland Council has identified five priority areas, and respondents were asked to identify which they felt were the most important of the five, as well as identify key topics associated with each priority area.

1. Respondents ranked "low-cost grazing systems" as the most important priority area identified by KFGC. Respondents ranked the following subjects associated with this topic in order of importance: reducing hay feeding and extending grazing time; regenerative grazing; matching cattle genetics to forage resources; and frost seeding clovers.
2. The second-most important priority area was "nutrient management and cycling." Respondents ranked the following subjects associated with this topic in order of importance: winter feeding strategies to build soil fertility; reducing erosion and runoff; manure management; soil testing and grid sampling; and soil fertility for hay production.
3. The third most important priority area was "conserved forage production." Respondents ranked the following subjects associated with this topic in order of importance: soil fertility; storage and feeding; harvest timing and testing; hay and silage production; and variety selection.
4. The two remaining priority areas, technology use and integrated weed management, were found to be important but not as important as the other three subjects.

We look forward to reviewing the survey results more in depth and developing an action plan to help guide the future of on-farm forage management and forage research in the state of Kentucky.

see blue.

After A Big Rain: N Loss, Erosion, and Other Things

As we write this article, it is still raining – towards an unknown but large amount of rainfall (Fig.1). Credit for stimulating this piece goes to Andy Mills (Meade County ANR agent) and Chris Teutsch, who started the conversation around Andy's question about potential loss of fertilizer nitrogen (N) from recently fertilized hay and pasture fields. We hope to help folks understand what we do and don't know about what happens in these unusual situations. The story has been expanded a bit to cover some other questions that are asked after events like this. Many forage producers also have fertilized fields intended for corn production, so both grasslands and potential corn fields are discussed here.

Factors impacting N loss in grasslands. With heavy rain like this, fertilizer N loss from fertilized grass sods depends on several factors: 1) the length of time between the rainfall event and the fertilization event; 2) the ability of the sod to take up the applied N (is sod actively growing and dense enough both above and belowground (and rooted deep enough belowground); and 3) the amount of N applied. The Kentucky grasslands that have been fertilized are made up of cool-season grasses that take up nutrients at air/soil temps above 40 °F and are actively growing at 55 °F. Stronger (thicker, denser, and deep rooted) sods took up more fertilizer N each day before this heavy rain began. That said, there will be a larger amount of unused fertilizer N when the number of days between fertilization and rainfall were fewer and/or with a larger rate of N application relative to N uptake by the grass. More N will be lost when 80 lb N/acre was applied 4 days before this rainy period to an overgrazed pasture that is thin above ground and not deeply rooted than when 50 lb N/acre was applied 12 days ago to a hay field with a thick stand and well-developed root system. As the crop is perennial, a grassland field's N nutritional status can be adjusted later in the season, in anticipation of future harvests.

Figure 1. Ponded water in a Caldwell County wheat field (Edwin Ritchey).

Factors impacting N loss in fields intended for corn. At this time, N losses are probably more important in N fertilized fields intended for corn than in hay or pasture fields. There may be some living plant cover (either weeds or cover crops) that could take up fertilizer N in these fields, and the same considerations as indicated for a living grass sod would apply, though the root system under most winter weeds and cover crops tends to be less extensive/deep. However, in western Kentucky many weeds and cover crops have already been terminated with herbicide and pre-plant N fertilization rates can be large (Fig. 2). The terminated plant cover remains important to controlling another big driver of N loss from these corn fields – soil erosion. Any surface tillage, even vertical tillage, loosens the soil, breaks up residues and accelerates both soil erosion and crusting (which causes even lower infiltration and more runoff). Even if surface applied fertilizer has dissolved and moved into soil aggregates, out of the reach of leaching and before denitrification has started, heavy rainfall can exceed soil infiltration rates, causing runoff to erode nutrient-rich topsoil.

Figure 2. Ponded water in a Caldwell County row-crop field where the cover crop has been terminated (Edwin Ritchey).

Runoff and erosion drive N losses in fields intended for corn. At present, runoff and eroded soil nutrient losses are less likely in grassland fields because the soil is covered with living plants. Runoff water from small watersheds located in Kentucky row-crop farm fields is being collected and analyzed for nutrient amounts and forms (Table 1). The particulate/organic forms of these nutrients are entirely due to erosion of mineral particles and organic matter while the dissolved nutrients are more directly derived from fertilizers. From 40 to 50% of runoff-borne N and P results from erosion. Potassium (K) loss patterns would likely be similar.

Table 1. Nitrogen (N) and phosphorus (P) losses over one crop cycle (2 years) from small watersheds under corn/full season soybean or corn/wheat/double crop soybean rotations.[3]

Cropping System	Monitoring Stations	Nutrient	Total Loss	Particulate or Organic	Dissolved Inorganic
			lb/acre	--- % of Total Loss ---	
Corn – Soybean	10	N	38 ± 19	53	47
		P	9 ± 4	44	56
Corn – Wheat – Soybean	8	N	36 ± 21	41	59
		P	6 ± 2	49	51

[3]Blue Water Farms on-farm project research results. Supported by five row-crop landowners/producers; USDA-NRCS-EQIP program; KY Soybean Promotion Board; KY Ag Development Board; University of KY Ag Experiment Stn; and KY Geological Survey.

Remaining fertilizer N susceptible to leaching and denitrification. The fertilizer N that remains is vulnerable to either leaching or denitrification. Those two modes of N loss are driven by other factors. These include the: 1) amount and rate of rainfall; 2) soil infiltration rate and duration; 3) soil drainage; 4) soil texture and structure; and again 5) length of time between the rainfall and fertilization events. Nitrogen fertilizers are very soluble and quickly dissolve into the pore water contained in moist soils - at this time of the year all Kentucky soils are moist. The dissolved N, whether urea (urea is soluble in water – is used in UAN: urea-ammonium nitrate solutions) or nitrate-N, diffuses throughout the pore water found both in and outside soil aggregates. The longer it is between N application and heavy rainfall, the more time for diffusion to carry dissolved N into aggregates.

Leaching losses of N. When the soil infiltration rate is above average and the rainfall rate and/or rainfall quantity are high, the moving percolating water strips away (leaches) dissolved N that lies in pore water outside the soil aggregates. The percolating water moves especially well through larger pores (macropores) in well and moderately well drained soils. But the pore water found inside the aggregates is 'bypassed' by the macropore flow and the dissolved N therein is not leached. Tile drainage can increase macropore flow, soil water percolation rate and nitrate-N leaching, especially when fertilizer N application was only a few days before the heavy rain.

Denitrification N loss more important than leaching N loss in Kentucky. Denitrification is the biological conversion of nitrate-N to dinitrogen (N_2) or nitrous oxide (N_2O), both gases. Although leaching is more immediate than denitrification because the latter is biologically driven and takes 2-3 days to get going, in Kentucky denitrification N losses are more important because of the large number of acres with restrictive layers (e.g. fragipans) and poor drainage (both somewhat poorly and poorly drained) that impede water percolation, causing soil saturation and water ponding.

Nitrogen source can impact N loss. Fertilizer N source can impact N loss potential after heavy rain (Table 2). Both leaching and denitrification losses start with nitrate-N. Applied UAN and ammonium nitrate are 25 and 50% nitrate-N at the outset, respectively, and losses can be more immediate than if urea was used.

Injected anhydrous ammonia suppresses soil biology and biological N transformation in the injection volume for a time, remaining longer as ammonium-N. Use of a nitrification inhibitor (nitrapyrin/N Serve, dicyandiamide/DCD or pronitridine/ Centuro) further delays nitrate-N formation and N loss. Well and moderately well drained (including tile drained) upland soils wet from a series of rains probably are more likely to have some leaching loss - will not experience much denitrification prior to draining. Soil in lower landscape positions that stays saturated longer will likely lose N to denitrification. Losses can be calculated by estimating 3 to 4 percent loss of fertilizer NO3-N for each day of saturation.

Table 2. Proportion of applied fertilizer N converted to nitrate-N at 0, 3 and 6 weeks after application.[4]

Fertilizer N Source	--------Weeks After Fertilizer N Application--------		
	0	3	6
	------------% of fertilizer N as nitrate-N--------------		
Anhydrous ammonia (AA, 82-0-0)	0	20	65
AA with nitrification inhibitor	0	10	50
Urea (46-0-0)	0	50	75
Urea with nitrification inhibitor	0	30	70
UAN[5] (28, 30, 32-0-0)	25	60	80
Ammonium Nitrate (34-0-0)	50	80	90

[4]Table data compiled by Lloyd Murdock.
[5]UAN = urea-ammonium nitrate solutions.

An example situation: Farmer has applied 200 lb N/acre as urea to an 'intended for corn' field made up of somewhat poorly drained soils 3 weeks before the rain began. Because of the series of heavy rains, the field was saturated for ten days. How much N was lost? *Note: It is common that only portions of the field are saturated, and that the ponded field area decreases with time. This means that this calculation could be done to represent the best case, average, or worst case for the field.*

Step 1: Calculate the amount of applied N that was in the nitrate-N form when saturation began. According to Table 2, 50% of the urea-N was in the nitrate-N form three weeks after application and: 200 lb N/acre x (50%/100%) = 100 lb nitrate-N/acre.

Step 2: Calculate the amount of N loss. Conservatively, only two days are needed for soil biology to begin the denitrification process, so the field denitrification losses occurred over the remaining eight days of saturation. Again, conservatively, assuming 4% was lost each day for eight days, then 32% of the nitrate-N would have been lost.

100 lb nitrate-N/acre x (32%/100%) = 32 lb nitrate-N/acre was lost. 200 – 32 = 168 lb fertilizer N/acre would remain. *The N loss calculated in this example is not as high as many people would assume.*

Soil nitrate testing. A soil nitrate-N test can help verify the calculated estimate of nitrate-N remaining in the field. Each soil sample should consist of about 15 cores taken to a depth of 12 inches, hand crushed and well mixed before filling a soil sample bag with the appropriate amount of soil and shipping immediately to a soil test lab (several labs, including Waters Ag Labs in Owensboro and Waypoint Analytical in Memphis, perform the test). Separate samples should be taken for upper and lower landscape positions, for well, moderately well, somewhat poorly and poorly drained soils, for fragipan and no-fragipan soils; and/or for undrained and tile drained field areas. Test results can be used to decide whether more N, and if yes, how much, is needed.

Other things of note. Unattached crop residue tends to float, and wind will push it across ponded waters, leaving piles of residue at the water's edge as it drains away. Minimize loose residue with appropriate combine settings during harvest and by avoiding post-harvest residue mowing or tillage. Implementing these BMPs helps maintain a larger proportion of soil-attached residues that serve to limit floating residue movement and piling if ponded water is shallow. Figure 3 illustrates the consequences of depending on crop residue for erosion control.

Figure 3. Soil erosion in a no-till field covered with residue but lacking a good cover crop (Brad Lee).

Ending on the positive, soil compaction due to the weight of water over soil during ponding is truly not a problem. Soil scientists get asked about this regularly. Soil pores are filled with water (soil air is expelled) as ponding begins and water-filled soil can't be further compressed by the weight of water above.

~This article was written by Drs. John Grove, Chris Teutsch, Edwin Ritchey, Brad Lee, and Glynn Beck. All the authors are Extension/Research Faculty at UK except for Glynn who is a Hydrogeologist with the KY Geological Survey.

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Forage News

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Upcoming Events (see Forage website for details and to register, click on EVENTS)

Jan. 12-14, 2025- AFGC Conference, Orlando, FL
June 23 – Equine Field Day, Midway, KY
July 22 – UK Princeton Research Station Field Day, Princeton, KY
Aug. 9 – Cost Share Opportunities on KY Horse Farms, Versailles, KY
Sept. 24-25 – Intermediate Grazing School, Versailles, KY
Oct. 28 – KY Grazing Conf. East, Winchester, KY
Oct. 29 – KY Grazing Conf. West, Leitchfield, KY
Jan. 11-13, 2026 – AFGC Annual Conf, Asheville, NC

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