35th Annual Southwest Missouri Spring Forage Conference

February 26, 2019
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Welcome to the 35th Annual Southwest Missouri Spring Forage Conference!

I want to personally welcome each and every one of you to the Southwest Missouri Spring Forage Conference. This wonderful conference is now in its 35th year, and what amazing information has been provided all of those years. This year is absolutely no exception! I hope you enjoy your day spent with us. This is a new location this year, and the committee and I hope you enjoy your experience at the Oasis Convention Center today.

When our committee met right at a year ago to start planning the conference that you are attending today, we started out by bouncing around ideas for topics for our main speaker and our breakout sessions. I had one committee member that kept talking about a topic that he really thought we needed to address. He was persistent, and I frankly didn't want to hear what he had to say. The topic that he kept bouncing around was a dirty word to me, and I just did not want to believe that we needed to discuss it. But his resilience powered through, and as a committee we pulled together and decided to address the topic of drought. While not every topic today is regarding drought, several sessions are geared toward drought survival.

Our farmers and livestock producers in southwest Missouri and neighboring areas are absolutely amazing people. When we were dealt the blow of the devastating drought of 2012, everyone came together to help out. Landowners and agency personnel worked together to get water to those in need. Floods devastated our areas shortly thereafter, and again, neighbors helping neighbors, we did prevail. When fires hit our neighbors to the south and west, our farmers thought of others and sent hay and necessary supplies to those in need. And now having just witnessed another drought in 2018, mother nature giving us a 1, 2 punch again. I have often said that if you don't like the weather here just wait a day or two and it will change. It is that type of change that I believe we need to adapt in our farming practices. The ability to take what Mother Nature throws at us and come out on the other side victorious.

The lineup of speakers today is fantastic. Our Keynote speaker, Dr. Pat Keyser, will introduce you to Native grasses. Dr. Keyser is a Professor and Director of the Center for Native Grasslands Management at the University of Tennessee. I encourage you to listen to Dr. Keyser and start the conversation back at your operation on how to incorporate a native grass stand at your farm. If you have ever seen a beautiful field of grass flourishing during the hottest and driest months around our area, you will understand and appreciate what native grasses can do to diversify your current operation. Dr. Keyser will be the lunch time keynote speaker and will have a session directly after lunch as well.

Our breakout sessions today are equally as important, and our lineup of speakers is very impressive. I truly hope you find the information presented helpful and applicable to your operation.

Again, this year we have a great line up of vendors and exhibitors to showcase a variety of products and services. Please take the time to visit with them and learn about their products, or perhaps reacquaint yourself with products you know and trust. The committee and I appreciate our vendors and sponsors; they help make this conference happen.

Should you have any questions or need assistance, please look for one of our committee members. Each of us will be wearing a tan shirt with a name badge and should be easily identified. Our committee is a partnership of the USDA Natural Resources Conservation Service, Soil and Water Conservation Districts of Southwest Missouri, University of Missouri Extension, USDA Farm Service Agency, Missouri State University—William H. Darr School of Agriculture, the Missouri Department of Conservation, and the Missouri Forage and Grassland Council/Grazing Lands Conservation Initiative. This committee is a great group of people, and I am honored to work beside them.

I sincerely hope that you enjoy your day, and if you have a chance to find me, I would enjoy meeting you all.

Best Wishes,

Jody Lawson

2019 Southwest Missouri Spring Forage Conference Committee Chair

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AGENDA

8:00—8:45 AM REGISTRATION AND VISIT TRADE SHOW

8:45—9:30 AM SESSION A		Room
A Better Way to Manage a Ranch: Controlling Depreciation	**Burke Teichert**	**Maui**
Intercropping Summer Annuals (Repeated at 2:45 PM)	**Dr. John Jennings**	**Fiji**
Retained Ownership, Timing and Other Marketing Considerations	**Dr. Derrell Peel**	**Cocoa**
Management-intensive Grazing 101: Back to the Basics	**Mark Kennedy**	**East Grand**

9:30—10:15 AM BREAK AND VISIT TRADE SHOW

10:15—11:00 AM SESSION B		
Costs and Benefits of Forage Renovation	**Joe Horner**	**Maui**
Fertilizing for Crop Removal Rates	**Dr. Will McClain**	**Fiji**
Proper Stocking Rates (Repeated at 2:45 PM)	**Hugh Aljoe**	**Cocoa**
Mitigation of Fescue Endophyte (Repeated at 2:45 PM)	**Dr. Ken Coffey**	**East Grand**

11:00—11:30 AM BREAK AND VISIT TRADE SHOW

11:30 AM LUNCHEON AND KEYNOTE ADDRESS

Master of Ceremonies	**Michael Squires**
Going Old School for Summer Forage Production—Can Native Grasses Work?	**Dr. Pat Keyser**

1:15—1:45 PM BREAK AND VISIT TRADE SHOW

1:45—2:30 PM SESSION C		
If It Wasn't Lightning or Grain Overload, What Killed the Cows?	**Dr. Tim Evans**	**Maui**
Forage Production Considerations Using Soil Type	**Drexel Atkisson**	**Fiji**
Minimizing Drought Impact on Pastures	**Dr. Gary Bates**	**Cocoa**
Establishing Native Grass Forages	**Dr. Pat Keyser**	**East Grand**

2:30—2:45 PM BREAK

2:45—3:30 PM SESSION D		
Letting Mother Nature Select Replacement Heifers	**Burke Teichert**	**Maui**
Intercropping Summer Annuals	**Dr. John Jennings**	**Fiji**
Proper Stocking Rates	**Hugh Aljoe**	**Cocoa**
Mitigation of Fescue Endophyte	**Dr. Ken Coffey**	**East Grand**

3:30 PM ADJOURN

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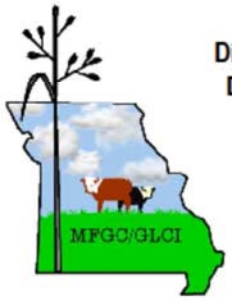

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35th Annual Southwest Missouri Spring Forage Conference

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Native of West Texas (born and raised on the border of Mexico… (Mexico/Texas/New Mexico)

BS from Texas Tech University – Range Management / Wildlife Biology

Raised in the Quarter Horse business

Married - Denise
One married Son, Active in US Air Force (currently at Lackland Air Force Base, San Antonio)
One married Daughter – ER Nurse at Cox South in Springfield
Four Grandchildren, ages 2, 4, 5, 6 (3 boys and one girl)

Hobbies include time with the grandkids, and a lot of time spent as a musician (fiddle and pedal steel) in and around the Branson/Springfield area

35th Annual Southwest Missouri Spring Forage Conference

KEYNOTE ADDRESS

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Dr. Pat Keyser is a Professor and Director for the Center for Native Grasslands Management at the University of Tennessee. In that role, Dr. Keyser provides regional and national leadership in the development and implementation of comprehensive research and outreach programs focused on the management of native grasslands. This includes work on use of native grasses in forage production systems for livestock, biofuels production, the integration of forage and biofuels, answering specific management questions for native grasses, restoration of natural grassland communities such as woodlands and savannahs, and wildlife responses to native grasslands management.

He has authored or co-authored 63 grants worth nearly $11 million in support of his research (more than 50 research projects to date) and outreach activities (including numerous on-farm demonstration projects) all leading to 300 publications including 80 articles in scientific journals. He has directed or co-directed 14 and mentored an additional 32 graduate students and made more than 400 presentations to a wide variety of audiences including students, scientists, and producers.

He and his wife of 36 years have been blessed with four children and three exceptionally good-looking grandchildren and make their home in East Tennessee.

DR. PAT KEYSER
Straight Talk on Native Grasses
Making Them Work for You

This material first appeared in Progressive Cattleman as a two-part series with the first article published in the September 2016 issue and Part 2 in the October 2016 issue. It is provided here courtesy of Progressive Publishing.

Through the years, you may have heard any number of things about native grasses and the role that they can play in a forage program. Some comments I have heard include, "they won't grow around here", "they are very low quality forages", or "they are about impossible to establish." On the other hand, I hear that they are "always better than non-native grasses", "produce 10 tons of forage per acre", or that "they should replace all of our other grasses." Between these very positive and very negative perceptions, what are the facts? Based on several years of research conducted at the University of Tennessee, here are some facts concerning what producers can expect from native grass forages.

<u>Adaptability</u>: Because they are native to most of the US east of the Rockies, species such as big bluestem, indiangrass, and switchgrass are well adapted to a wide variety of conditions in these areas. Some grow better in one kind of site than another – "lowland" varieties of switchgrass can grow in extremely wet sites, indiangrass and little bluestem can grow on very poor sites. If you take care to match the species/variety to the site, you can indeed grow native grasses about anywhere on your farm you can reasonably manage for forage (Figure 1; see also, Progressive Forage Grower article, February 2015, *Native warm-season grass species and cultivars*).

Figure 1 – Natives are adapted to a wide variety of conditions including very wet sites, such as where this stand of eastern gamagrass has been established (left) and very poor sites, such as big bluestem-indiangrass pasture on a reclaimed surface mine in eastern Kentucky (right).

DR. PAT KEYSER continued...

Keep in mind though, that despite this adaptability, natives will, like any other grass, produce better on good sites and worse on poor sites. In an ongoing study in Kentucky and Tennessee, big bluestem/ indiangrass pastures on reclaimed surface mines (very poor sites!) can carry only about 40% of the stocking of average pasture ground. Similarly, a UT study in West TN found that although switchgrass can grow on very wet sites, yield was depressed (about 75% of that on well-drained soils) on such sites. Nevertheless, natives typically can outperform many of our other options on these marginal sites.

<u>Establishment</u>: Are natives tough to establish? Yes and no. On the one hand, the ones we are mostly interested in from a forage production standpoint are perennials. Like all perennials, seeds are small, germination is slow, and seedling vigor is often low. And, like all perennials, successful establishment depends on good competition control – and timely rain! Where competition control is excellent, even just very good, and rainfall is adequate, very good stands of native grasses can be established with reasonably high reliability (Figure 2; see Progressive Forage Grower article, March 2013, *Establishing Native Grass Forages*).

Figure 2 – Native grasses have earned a reputation for being difficult to establish. However, with good advanced competition control and adequate rainfall, excellent stands can be established. Here, a big bluestem-indiangrass-little bluestem pasture was planted in late April, the photo was taken five months later in September.

In establishing more than 90 experimental pastures over the past decade, we have had a success rate on the first attempt of nearly 80% with equal proportions of failures due to excessive weed pressure and extreme drought. In planting over 5,000 acres of switchgrass over three years in East Tennessee, the success rate on first attempts was above 90%.

DR. PAT KEYSER continued...

A comment about time for establishment is worth making here. With good moisture and weed control, you can expect to have a well-established stand the first summer. Do not graze or hay it that first growing season. The following spring, you can safely graze or take a single hay cutting. However, keep in mind that natives continue to develop their very deep root systems (8-12 feet!) throughout the second year, so it is very important not to push the stand too hard during the second year. A well established second-year stand of big bluestem and indiangrass will produce about 2.5 tons per acre of hay – a figure comparable to typical cool-season hayfields normal annual production in the Mid-South. In the third year, you can expect full production.

Longevity: So now that we have established a native grass stand, how long can we expect it to last? As with any grass, management will have a great deal to do with the answer to that question. With good management (not repeatedly overgrazing), it would not be unreasonable to expect a stand to last 15 or 20 years. I have known producers who have had switchgrass stands last as much as 20 years. Can they last longer? I do not know, but clearly native grasses have persisted in one form or another on this continent for millennia. On the other hand, continued close defoliation can mean a life span as short as 5 years.

Drought Tolerance: Like other summer grasses, native warm-season grasses have what is known as a C_4 metabolic pathway. What that means for you is greater water-use efficiency than what can be provided by cool-season species (C_3 metabolism) such as tall fescue and orchardgrass. So when it comes to surviving summer drought you *really* need to include a C_4 species in your program. Among warm-season options, annuals may not be a good choice since establishment may be a problem depending on when the dry weather sets in. Too, prussic acid and nitrate issues may be a concern with annuals. Fortunately, natives do not have those issues. Also, data from drought studies have demonstrated that natives have greater water use efficiency than bermudagrass, the other widely used perennial summer grass in the region. Thus, when it comes to putting yourself in a position to withstand tough summer drought, natives are one of the best tools available to cattlemen.

Yield: Yield for natives depends on what variety, species, and site you are dealing with. Some natives (e.g., 'Highlander' eastern gamagrass and 'Alamo' switchgrass) have very high yields, 5 – 6 tons per acre with about 60 units of N on average sites. On the other hand, on marginal sites, with no fertilizer (more on that in a later issue) species such as little bluestem may produce less than 2 tons per acre. Many studies conducted on native prairies in the Great Plains report fairly low yields relative to studies in the Southeast. Part of the explanation for those differences is that stands in the Plains are on sites unsuitable for row crop production – in other words, marginal sites. Furthermore, they are in areas with considerably lower rainfall than what we receive in the Southeast. By comparison, in the Southeast on typical sites and with precipitation greater than 40 inches annually, it is reasonable to expect an average of about 4 tons per acre for big bluestem and indiangrass, about 5 tons for lowland switchgrass and eastern gamagrass (Figure 3).

DR. PAT KEYSER continued...

Based on the facts above, it is clear that natives provide a long-lived, very drought tolerant, summer forage tool. They can be planted on a wide variety of sites and generally produce good yields. On the other hand, establishment requires good to excellent competition control and foregone production during the seedling year. Do they make sense for you? That is a decision each producer must evaluate, preferably based on good science and not simply opinions that may be based on no data or misinformation. In a subsequent issue, we will explore a number of additional important issues related to native grass forages including input requirements, animal performance, grazing management, winter forage production, and use of prescribed fire. You can also find see additional information regarding native grass forages at UT Extension (https://extension.tennessee.edu/publications/Pages/default.aspx), see series 'SP731'on native grass forages.

Figure 3 – In the eastern US, where rainfall typically exceeds 40 inches annually, native grasses on average sites can produce large volumes of forage. Here a big bluestem stand shows why yields of 4 – 5 tons per acre are possible.

Straight Talk on Native Grass Forages (Part 2)

<u>Input Requirements</u>: Native grasses are able to produce about 60% of their maximum potential yield with no nitrogen applications. By comparison, a widely used summer perennial, bermudagrass, may produce only about 20-30% of its potential yield when nitrogen amendments are not applied (Figure 1). Potash is also important for bermudagrass production. Conversely, natives have not shown consistent yield responses to either phosphorous or potassium. Finally, scientists at the University of Tennessee did not observe a yield response in switchgrass with pH above 5.0. While good soil stewardship dictates we should not "mine" nutrients (especially important in hay production), it is clear that native grasses can be productive with limited inputs. Optimum nitrogen recommendations are about 60 units per acre.

Why are natives so thrifty when it comes to fertilizer and lime inputs? The short answer is that we do not know. There is some speculation though, that mineralization of the large amounts of below-ground biomass these species produce may be a part of the explanation. Some studies have documented relationships with nitrogen-fixing soil microbes. Another possible explanation is that there may be mycorrhizal relationships with the native grasses that provide them with a competitive advantage.

DR. PAT KEYSER Continued...

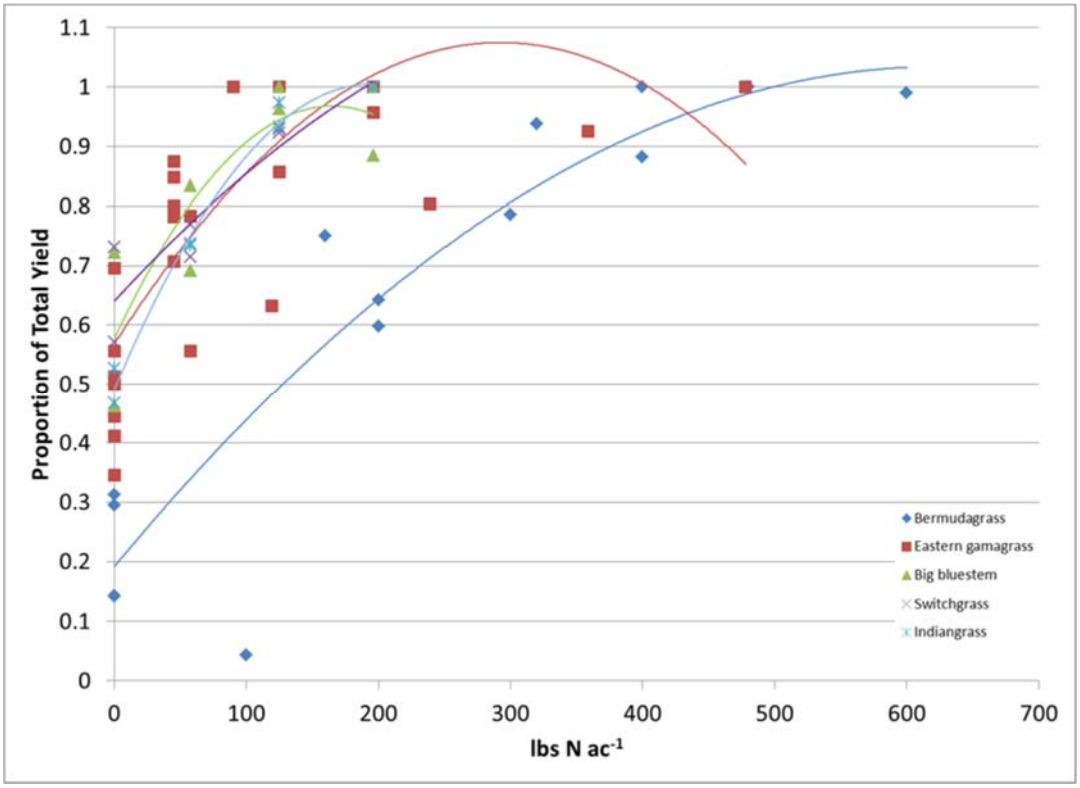

Figure 1. Yield response to nitrogen (N) fertilization for bermudagrass, eastern gamagrass, big bluestem, switchgrass, and indiangrass. Yield (vertical axis) is not expressed in the quantity of hay produced, but rather as a proportion of each species' total yield potential. The native grasses start (0 units N) at about 50-60% of their yield potential and reach their peak at about 100 units N. Eastern gamagrass peaks at about 300 units N per acre. This is in contrast with bermudagrass which starts at only 20% of its yield potential at 0 units N. Figure courtesy University of Tennessee Extension.

<u>Animal Performance</u>: I often hear people describe natives as "low quality" forages. In the case of over-mature, stemmy plants, or species such as broomsedge, that is not an unreasonable statement. On the other hand, when it comes to big and little bluestem, indiangrass, or even switchgrass, cattle perform very well (Table 1). Our results with steers on eastern gamagrass were more modest and typical of the rates of gain reported for bermudagrass. For summer-long (typically, 112-day trials) grazing, which has captured a wide range of temperature and rainfall conditions through the years, these are very solid gains. Indeed, these gains compare very favorably to those produced by bermudagrass (1.1 lb per day), many summer annuals (1.6 lb per day), or remaining on cool-season forages (0.8 lb per day) during summer. By any definition, these are not the kind of gains you would expect from "low quality" forages. For fescue-belt cattlemen, an added advantage of grazing native grasses is relief from the effects of fescue toxicosis during summer when the impact of those toxins is greatest.

DR. PAT KEYSER Continued...

Table 1. Summary of animal performance results from four University of Tennessee grazing trials with native warm-season grasses. Results for steers (6 cwt) and heifers (bred, 9 cwt) are presented separately. Note that no nitrogen was applied for any of the trials that included heifers. (Courtesy, Progressive Forage Grower, May, 2016.)

	Forage	ADG (lb per head)	Gain/ (lb per acre)	Graz-Season (days)
Steers	Switchgrass	1.74	435	112
	Big bluestem/ indiangrass	2.11	369	112
	Eastern gamagrass	1.06	247	112
Heifers	Switchgrass	1.54	180	61
	Big bluestem/ indiangrass	2.01	168	56
	Big bluestem/ indiangrass	1.64	148	105
	Eastern gamagrass	1.15	205	112

Grazing Management: Relative to endophyte-infected tall fescue and bermudagrass, both of which can tolerate a certain amount of close grazing, native grasses require better management. The key issue is that as tall-growing species, natives cannot tolerate persistent, close defoliation. Short-term overgrazing reduces production and increases weed pressure (something that is true for any forage crop), but rarely will create long-term problems for a native grass pasture. As a result, graziers must be prepared to monitor and adjust stocking on native pastures more often than what they may have been used to with some of our other common forage grasses.

Despite the need to monitor pasture condition more often, natives can really be pretty simple to graze. In our trials, we have used a simple, 3-paddock rotation, moving cattle every 3-10 days (a week is pretty typical) quite effectively. In this system, we normally enter a paddock at about a 24-inch canopy height and pull off at about 12 inches. If you prefer not to use a rotational system, continuous grazing for eastern gamagrass and a big bluestem/indiangrass blend has worked well in our trials. With a set stocking rate (we have used about 900 and 1,800 pounds per acre respectively, for these two forage options), we have been able to graze for 100-120 days (May-August) most years (Figure 2). Lowland switchgrass, because of a strong growth surge in late spring/early summer, may not lend itself as well to this type of continuous grazing.

DR. PAT KEYSER Continued...

When overgrazing does occur, providing a rest period of a few weeks is all that is normally needed to correct the situation. Stands that have been severely impacted require longer periods of rest to recover. For example, an eastern gamagrass stand that had been markedly weakened over a three-year period recovered fully following a season-long rest. The bottom line is that if you are willing to pay more attention to your pastures, native grasses are not difficult to manage.

Figure 2 – This big bluestem/indiangrass/little bluestem pasture has been grazed continuously all summer (May – August) under a set stocking rate and is still providing good late summer forage (photo taken July 26) despite drought conditions (USDA D-2).

<u>Winter Forage Production</u>: Although native grasses offer desirable summer forage, they, like other warm-season perennials, do not produce during winter. Producers who need grazing during fall or early spring have two options. First, they can graze the dormant grasses. This is often done in range country, but will require a protein supplement. In an ongoing study at the University of Tennessee, heifers have been grazing dormant native grasses for 100 days (Jan – April) each winter plus a 0.4 lb/head/day protein supplement. Preliminary results reveal pregnancy rates comparable to those on stockpiled tall fescue.

A second option is to overseed winter annuals (brassicas or small grains) into the stand. Data on this approach are limited. However, preliminary trials suggest that establishing the annuals into native grass stands is not the concern. Rather, the timing of the removal of the winter annual is critical. Grazing the winter annuals down by early April leaves little competition for the emerging warm-season perennials. On the other hand, winter annuals that are still vigorous in late April create substantial competition, leading to reduced yield and stand vigor in the warm-season species. This is the same challenge faced by bermuda growers in the Southeast when they overseed with winter annuals.

DR. PAT KEYSER Continued...

<u>Prescribed Fire</u>: Native grasses respond very well to burning. Growth begins earlier (by about two weeks) following spring fires. Burning increases photosynthesis rates, shoot mass, tiller density, and leaf n-content (which means crude protein goes up). Cattle preferentially graze more recently burned pastures and many weeds are suppressed following burning. On the other hand, burning is *not* necessary for managing native grass pastures. Many pastures remain productive in the absence of fire for many years, even decades. Thus, if you are considering using native grasses in your forage program, you do not have to also plan to use prescribed fire to manage those pastures.

Recent research demonstrates that use of native grasses in forage programs of the eastern US can provide highly drought-tolerant, high quality forages with limited inputs. On the other hand, establishment includes lost production during the summer they are seeded and management requires closer monitoring of canopy conditions. Whether or not they are an advantage for your operation is a decision you must make. I hope some straight talk, based on university research, can help ensure that decision is the best one for you. You can find additional information regarding native grass forages at UT Extension (https://extension.tennessee.edu/publications/Pages/default.aspx), see series 'SP731'on native grass forages.

DR. PAT KEYSER
Establishing Native Grass Forages

This material first appeared in Progressive Forage Grower in the March 2013 issue and is provided here courtesy of Progressive Publishing.

The severe drought of 2012 has left many pastures in poor shape and needing to be reestablished. Rather than reseeding with the same forage species that were eliminated by the drought, native grasses, such as big bluestem, indiangrass, and switchgrass, should be considered as alternatives. All of these species have very good drought tolerance and may place you in a better position to support grazing in future droughts, especially on poorer sites.

Even if you are not reseeding in response to drought-damaged pastures but are planting new ground, replacing annuals, or simply ready to renovate, the time to prepare for this spring's planting has come. Many producers are not familiar with natives and how to best establish them. Therefore, key steps are that can help ensure successful establishment are provided below.

Attention to detail: First, it is important to recognize that successful establishment of native grasses will require attention to detail. Put another way, you will need to put good, basic agronomic principles into practice when you plant native grasses. Advanced competition control, quality seedbeds, proper planting depths, and good follow-up weed control are all important and should be attended to carefully. Let's consider each of these in turn.

Advanced competition control is important in establishing any perennial forage crop and natives are no exception. Remaining cool-season perennials such as tall fescue or orchardgrass can be controlled during early spring, but spraying is much more effective during the fall. Warm-season perennials such as dallisgrass and bermudagrass also are better treated the summer (August – September) before planting is planned, but can also be controlled in the spring. However, you will need to wait until those species are actively growing (May in Tennessee) and be prepared to do a follow-up spraying about 4 or 6 weeks later. This will delay planting until early to mid-June. As long as you have good soil moisture, there is no problem with planting that late.

Winter annuals are rarely a problem for establishing native grasses and can easily be treated in the spring when residual cool-season perennials are being controlled. Summer annuals, however, can be very troublesome, especially for switchgrass or eastern gamagrass. For big bluestem and indiangrass, on the other hand, there is an excellent pre-emergence herbicide (Plateau® or Panoramic®, active ingredient imazapic) that can be used for annual grass control. The limited options available for annual weed control stress the importance of ADVANCED weed control, especially for switchgrass and eastern gamagrass. Killing the first big flush of summer annual grasses (goosegrass, crabgrass, seedling johnsongrass, etc.) prior to seeding can be a good approach for reducing competition from these species.

DR. PAT KEYSER continued...

Seedbed preparation: Weed control can also be accomplished through conventional tillage where erosion is not a threat. However, for native grasses, it is critical to prepare a very fine, clean, and firm seedbed (think ladino clover or alfalfa). Be prepared to make several trips across the field with a disc or other tillage equipment and if needed, a cultipacker. Coarse textured, loose seedbeds or those with a good deal of thatch or other debris will lead to poor establishment success. Even with no-till practices, it is important to minimize thatch. Thick thatch will interfere with seed placement and even with good seed placement, can smother new seedlings. Accumulated growth that will result in heavy thatch should be removed by grazing, haying, or prescribed burning well ahead of your planned spraying date.

Planting depth: Switchgrass, indiangrass and the bluestems (big and little; both can be part of good forage blends) all require shallow seeding depths. At more than 300,000 seed per pound, switchgrass is a very small seed and should be planted at only about 1/8 – 1/4 inches deep. Although indiangrass and bluestems can be planted slightly deeper, shallow seeding is also critical for these species. When following the drill, you should be able to see some seed on the surface within the rows – perhaps 10 – 15% of the length of a row. Countless native grass plantings have failed simply because of excessive planting depths. Eastern gamagrass has much larger seed and is, therefore, more forgiving of variation in seeding depth. Ideally, eastern gamagrass should be planted at about 1 inch deep.

Follow-up weed control: Once you have planted, it is important to address subsequent weed problems in a timely manner. Native grasses are typically slow to germinate and will not emerge for 3 – 4 weeks after adequate rainfall. During this time, even with good advanced weed control, competition can become established and prevent your stand form being successful. Use of a pre-emergence material (1 – 1.5 oz a.i. of imazapic) on indiangrass and the bluestems should follow drilling as soon as possible. This chemical will do an excellent job providing a weed-free window of several weeks during which native grasses can germinate and grow. There are no labeled pre-emergence products that can be used effectively with switchgrass or eastern gamagrass, which is why advanced weed control is so critical. Many broadleaf formulations may be used on native grass seedlings once they are well-established (i.e., >5-leaf stage or preferably, after tillering has occurred).

However, regardless of what species of native grass(es) you may have planted, you can still provide some relief from competition with a rotary mower or even by taking a hay cutting. The key to either method is ensuring that your cutting height remains above small (<10") seedlings and minimizes the amount of leaf area removed on larger (12 – 18") seedlings. As long as the native grass seedlings remain above the weed canopy, they will continue to grow. It is critical though, that you DO NOT allow a weed canopy to overtop the seedlings. Multiple clippings may be necessary during the establishment year to prevent this from occurring.

DR. PAT KEYSER continued...

Planting dates: Native grasses should be planted at about the same time as corn or shortly thereafter. With adequate soil moisture and favorable weather patterns, natives can be seeded well into June. There will be fewer growing days and may be increased risk of drought with these later seeding dates. However, many excellent stands have been obtained with planting dates in late June and even early July where moisture is not limiting. Dormant-season plantings (February and March) have been successful with native grasses, but require precise timing for weed control during April. All residual winter annuals must be sprayed before soil temperatures reach 65° F or native grass seedlings will not emerge due to the heavy weed canopy or be killed following emergence by later spray dates. For planting rates, please refer to Table 1.

Table 1. Recommended seeding rates for native warm-season grasses established for forage production. All rates are expressed in PLS pounds per acre.

	Pure Stand		Blends (drilled)			
Species	Drilled	Sowed	Two-way	Two-way	Two-way	Three-way
Big bluestem	9	12	6	8	_	6
Little bluestem	7	10	_	1	1	1
Indiangrass	7	10	3	_	6	3
Switchgrass	6	8	nr	nr	nr	nr
Eastern gamagrass	12	nr[1]	nr	nr	nr	nr

[1] nr = not recommended. Blends of either eastern gamagrass or switchgrass with the other three species are not recommended due to differences in maturity dates and cattle grazing preferences.

Other issues: There are two other issues you should consider when planting native grasses. First, these species have low fertility requirements. With their small seedlings, there is little value for nitrogen during the seedling year. In fact, high N-levels will usually help the weeds more than the grass and are a detriment to successful establishment. Secondly, some native grasses (some varieties of switchgrass and all eastern gamagrass) can have high dormancy rates. You need to consider this when buying seed. Year old seed, stratified seed, or dormant-season planting are all strategies for dealing with this issue. Just be sure to check with your seed dealer when you are ordering seed to confirm dormancy rates for the lot of seed in question to avoid any problems.

What now? If you have paid attention to detail and followed the guidelines above, your chance of having a successful stand will be high. Of course, regardless of how good your agronomic practices are, adequate moisture following planting is essential to success. Do not be overly concerned about the size of the seedlings at the end of the first growing season. With early seeding dates, good weed control, and ample moisture, native grass seedlings can reach heights of 5 – 8 feet and produce seedheads the first year. At the other end of the spectrum, as long as seedlings are large enough to survive winter (>10") you should have a good stand.

DR. PAT KEYSER continued...

What is typically a bigger concern is plant population. With native grasses, a plant per square foot will provide an excellent forage stand. Densities of 1 plant per 2 square feet will still be fine. If stand density drops to 1 plant per 4 square feet, you should consider overseeding the stand the following spring.

An especially successful seeding of a big bluestem/indiangrass/little bluestem pasture completed during April 2012 on a high quality seedbed (top left, April 18) with strong advanced competition control. Well-established seedlings with minimal weed pressure on June 18 (top right) and stand before dormancy (bottom) on September 28th with abundant seedheads.

During the second growing season, native grasses continue to establish their deep (up to 10') root systems. Use of second-year stands for forage production is fine, but should be limited. A single hay cutting in early summer or about 60 or so grazing days should be fine as long as adequate time for resting is provided during late summer.

By following these guidelines, you should be able to provide yourself with a highly drought tolerant stand of perennial summer forage that can last for many years with proper management. And whenever that next summer drought comes around, that will be a good thing to have.

For more information get Establishing Native Warm-season Grasses for Livestock Forage in the Mid-South (SP 731-B) at https://utextension.tennessee.edu/publications/Pages/foragesLivestock.aspx.

BURKE TEICHERT

A BETTER WAY TO MANAGE A RANCH: CONTROLLING DEPRECIATION LETTING MOTHER NATURE SELECT REPLACEMENT HEIFERS

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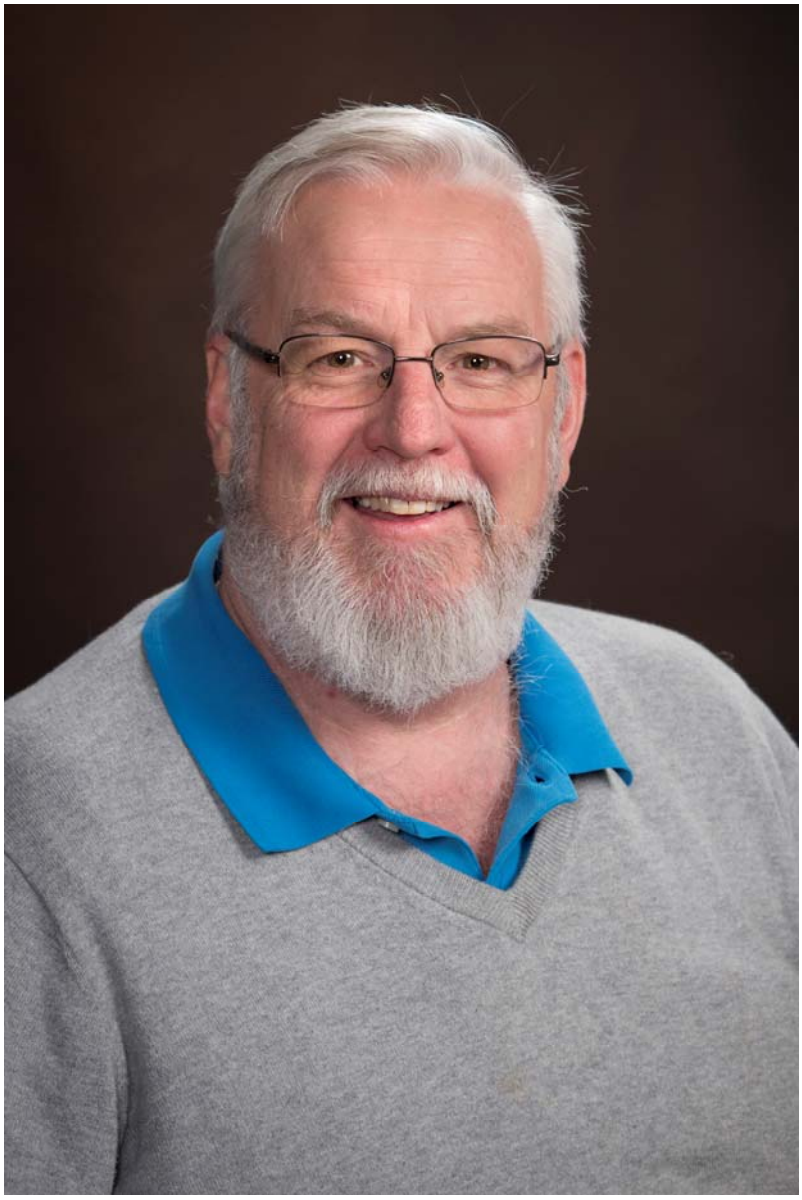


Derrell Peel is the Charles Breedlove Professor of Agribusiness in the Department of Agricultural Economics. He has served as the Extension Livestock Marketing Specialist since he came to Oklahoma State University in 1989. He has B.S. and M.S. degrees from Montana State University and a Ph.D. from the University of Illinois.

He previously served as the Superintendent of the Southeastern Colorado Range Research Station in Springfield, Colorado. His main program areas at Oklahoma State University include livestock market outlook and marketing/risk management education for livestock producers.

Derrell also works in the area of international livestock and meat trade with particular focus on Mexico and Canada and the North American livestock and meat industry. He lived in Mexico on sabbatical in 2001 and has developed an extensive knowledge of the Mexican cattle and beef industry and the economics of cattle and beef trade between the U.S. and Mexico.

DR. DERRELL PEEL
RETAINED OWNERSHIP, TIMING AND OTHER MARKETING CONSIDERATIONS

The biggest challenge for a cattle ranch is marketing forage to its highest value. For most ranches the majority of forage production is captured by the production and marketing of cattle. All aspects of cattle production and marketing contribute to the returns per acre or return on assets that are the most comprehensive measure of ranching. However, dynamic short and long term market conditions mean that cattle producers must be aware of and evaluate a range of production and marketing alternatives to maximize returns per acre. Several factors influencing cattle production and marketing are summarized below.

Seasonality

Like many agricultural markets, cattle prices (and production!) are very seasonal. Seasonal price patterns (Figure 1) and short term market conditions (i.e., are markets following seasonal patterns?) are important considerations for cattle marketing.

Retained Stockers

Cow-calf operations often have the alternative of marketing calves at weaning or retaining calves as stockers to add additional weight prior to sale. These choices reflect the changing value of forage sold as weaned calves versus through bigger feeder animals. The decision depends on numerous factors including forage conditions; cow-calf production system (spring or fall calving); size and condition of calves at weaning; seasonality; and value of gain. Price relationships in feeder cattle markets will reflect feedlot responses to cattle and feed market conditions and, in turn, will determine the value of gain signals for forage based stocker production.

Feedlot Retained Ownership

Retaining feeder cattle into the feedlot is an alternative that may offer increased returns. Moving cattle off the ranch into the feedlot shifts the emphasis away from returns to forage but is sometimes indicated under specific market conditions or in order to capture animal quality or program premiums.

Risk Management

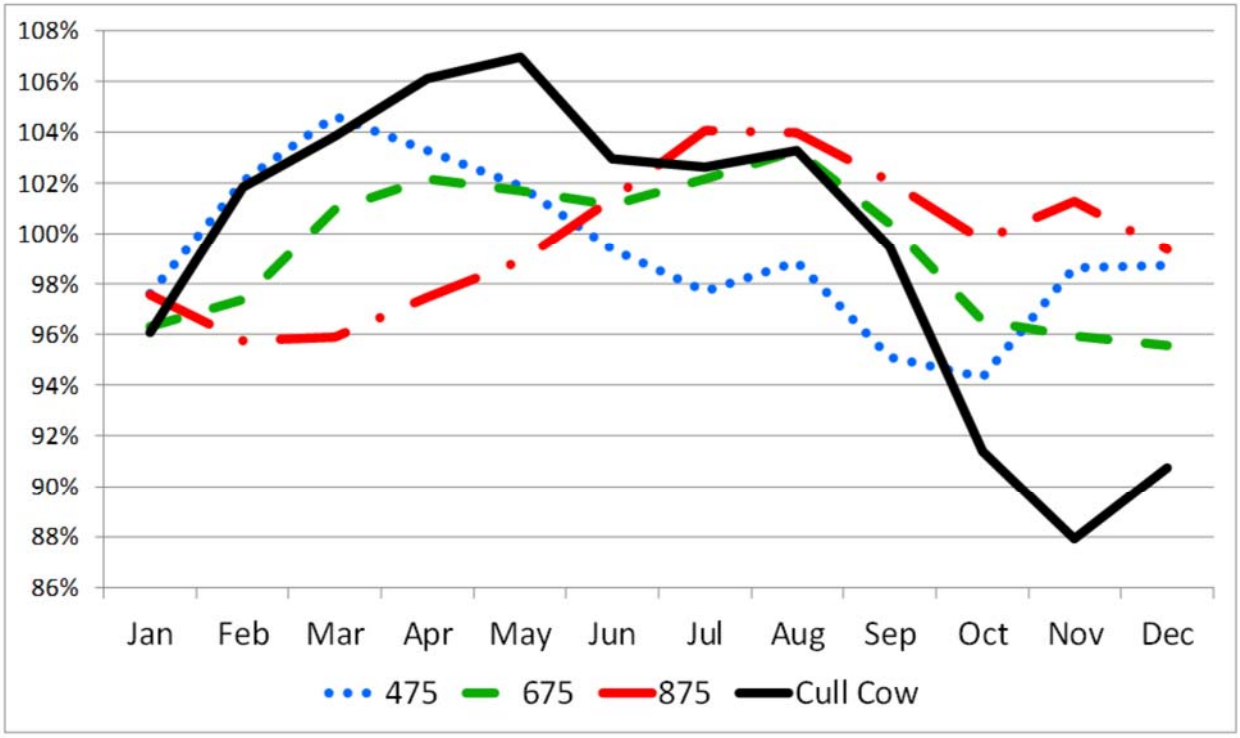
Risk management needs and considerations increase with retained ownership as producers are exposed to more market risk over time. Forward contracting or hedging with futures or options become more important considerations under many alternative cattle marketing possibilities.

DR. DERRELL PEEL Continued...

Marketing Cull Cows

Cull cows often receive little marketing attention in cow-calf operations. However, cull cows have a pronounced seasonal pattern (Figure 1) and offer significant potential for enhanced returns and utilization of lower quality forage resources.

Figure 1. Steer and Cull Cow Seasonal Price Indices, Oklahoma



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Mark was raised on a diversified family beef, dairy, and catfish farm in central Arkansas and received a BS degree in both animal science and forages from Arkansas State University in 1977.

He was employed by USDA – SCS/NRCS from September 1978 until January 3, 2014 when he retired. He served at various locations in Arkansas and Missouri. From 1995 until he retired, he was the State Grazingland Specialist for USDA-NRCS in Missouri, headquartered in Houston, Missouri.

He is a Certified Forage & Grassland Professional through the American Forage and Grassland Council. In 2004, he received the Missouri Forage and Grassland Council's Grasslander of the Year award. In 2006, he was awarded the NRCS National Pastureland Conservationist of the Year award.
He received the Merit Award from AFGC in 2011. He is a board member of the American Forage and Grassland Council and currently serves as its Past-President. Mark served on the AFGC board from 2006 – 2010 and again starting in 2015. He is currently on the steering committee of the National Grazing Lands Coalition representing AFGC. He has been very active with the Missouri Forage and Grassland Council/Grazing Lands Conservation Initiative. He helped re-organize the council in the early 1990's, later serving as a board member and President. He served as an ex-officio board member for over 20 years.

Throughout his career, Mark and his wife Anita, have owned and operated farms raising some combination of meat goats, beef cattle, and sheep. Currently they live on a small acreage near Reeds Spring, Missouri.

MARK KENNEDY
MANAGEMENT—INTENSIVE GRAZING: BACK TO BASICS

Ruminant animals have been grazing since the beginning of time. It's natural instinct. It is also natural for the grazing animal to select the most desirable plants and avoid others. By doing this, the composition of the diet they consume is higher than the composition of the total forage available. Selective grazing is essential to free roaming animals. It allows them to balance their diet to stay healthy and reproduce. With free roaming animals, once the desirable forage growth had been removed, the animals moved on to another area and give this area a period of rest. This period of non-use or rest was essential to the long term health and survival of the grazinglands.

As populations on earth increased, and man took control of more of the surface of earth, nature's grazing system was interrupted. Man built fences to keep animals in and invaders out. Once the fences went up, animals were no longer free to roam but were confined to a specific area for whatever time period the owner or manager decided. Any type of grazing management must focus on animal requirements, forage available, area and time. How managers decide to use these variables will affect the efficiency of the whole forage system.

There are several types of grazing management available: continuous, switchback, rotational, deferred rotational, short duration, high intensity-low frequency, controlled rotational and what we call management intensive grazing. Continuous grazing is the most widely practiced form by far. It's easy and requires very little thought or management. With continuous grazing one pasture is used throughout the year by a herd of animals. The area is stocked at level to consume the forage produced in that growing season. The pasture may be over or under stocked from year to year due to variations in growth and availability of forage. In continuous grazing, animals can selectively graze the more desirable plants and leave others to mature. As these other plants mature they become less desirable and are repeatedly skipped in preference to new growth coming on plants that have been heavily grazed. As this process continues, the grazed plants become overgrazed and the other areas are undergrazed. The overgrazed areas become weakened and begin to thin and die. Desirable forage plants are replaced by lower quality less desirable species such as weeds.

The alternative to continuous grazing is some form of managed grazing, whereby animals are moved from one pasture to another allowing each pasture to rest before being regrazed. This type of system tries to mimic nature's system. The main reason for implementing any type of grazing management system is to give plants a chance to rest and regrow so that the pasture stays healthy and productive. Management of a grazing system revolves around the rest period. The length of the rest period depends on how fast the plants are recovering and producing new growth and how hard or low the pasture was grazed earlier. If sufficient residual is left, the pasture will recover faster and produce more growth. However, if the pastures are allowed to rest too long, forages will become more mature, less desirable and less nutritious for the grazing animal.

MARK KENNEDY Continued...

Management intensive grazing is becoming increasingly popular because of the need for graziers to become more competitive in the cost of production. To stay in business, producers must find ways to improve production efficiency to cover the rising costs of land, labor and operating expenses. One way to improve production efficiency is to manage grazing in such a way as to increase the harvesting efficiency of the forages produced. With continuous grazing harvesting efficiency is somewhere between 25 and 35%. This means that 65 to 75% of our production is lost or wasted. With management intensive grazing harvesting efficiencies will run from 50 to 70% due to higher stock densities and more even utilization of pastures. The quicker a group of animals can evenly graze an area down to the desired level the higher the harvesting efficiency will be. Conversely, the longer animals stay in a particular area the lower the harvesting efficiency will be. This is due to losses from fouling by manure and urine, trampling and refusal due to lower quality. Again the time factor enters in. While controlling the time of the rest period is crucial for the long term health and survival of the pasture, controlling the time of the grazing period is crucial to efficiency and economic sustainability. Management intensive grazing places emphasis on controlling both time periods with the need of the grazing animal in mind in order to reach an optimum level of economic efficiency and environmental sustainability.

The greater control we have of rest periods, grazing periods and stock density, the more efficient we become. To gain control means reducing the size and time of the grazing period by fencing into several paddocks. The number of paddocks you use will be determined by the level of efficiency you want to achieve, and the time, labor and capital resources you have available to build and manage the system. If time and money are a limiting factor, then start small and build up, increasing the intensity of the system over time. Where to start? To take advantage of grazing management, a minimum of 8 pastures are needed to gain control over the time factor. The higher number of paddocks you have, if they are stocked properly, the more efficient you will be and the higher the returns to management. The most profitable forage management system will match livestock nutritional needs to forage availability and harvest for optimum quality and utilization.

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Much of Ken's research both in Arkansas for 22 years, and for the 10 years he worked in southeastern Kansas, focused on tall fescue toxicosis.

His early work in Kansas focused on management effects including legume overseeding and how the impacts of those management practices carried over into a subsequent feedlot period. His work in Arkansas has focused more on the cow-calf side of production. His latest fescue research focused on the impacts of calving season and the use of non-toxic, endophyte infected fescue in cow-calf production.

Ken received a BS degree from the University of Tennessee, a MS degree from the University of Kentucky, and a PhD degree from the University of Missouri.

He, his wife Linda (from Westphalia, MO), and his family have lived in Arkansas for 22 years and own and operate a small ruminant operation.

DR. KEN COFFEY
MITIGATION OF FESCUE ENDOPHYTE

Summary

Much of the tall fescue in the United States contains a fungus inside the plant that produces toxins. These toxins affect livestock negatively and are estimated to cost US livestock producers in excess $1 billion annually. Many of us enjoy the benefits that the fungus gives to the plant in terms of persistence and simply live with the toxicity or do not actually realize how much tall fescue toxicosis is costing us. This presentation will deal with the different ways that tall fescue toxicosis costs livestock producers and how different management practices might or might not reduce the impacts. It is safe to say that fescue toxicosis costs us money whether we realize it or not. The losses may be as great as substantially reduced calving rates or as simply as reduced body weight gains. The severity of these effects vary substantially among different animals, even within the same herd, from farm to farm, season to season, and year to year, making it a difficult problem to overcome and to target. The presentation will conclude with where we are at currently in our goal to overcome tall fescue toxicosis.

Introduction

A number of very good review papers have been written about tall fescue toxicosis. If our fescue is the "good old KY31" infected with the wild-type indwelling fungus (endophyte) it costs us losses in production whether we see it or not. Maybe we are getting our cows bred, but our calving season is extended; maybe we are weaning acceptable calves, but we could be doing better; maybe we had to move our calving season away from classic spring calving in order to get our cows bred; maybe our cows simply changed the calving season for us; or maybe we are spending extra money on one of a number of mineral or feed additives that "cure" tall fescue toxicosis. In any case, there are costs associated with any of these. Symptoms of tall fescue toxicosis were observed in the 1950's and a number of excellent scientists, a number of them at the University of Missouri, have worked on the problem since then. The overall objective of this presentation is to provide information about the complex problem of tall fescue toxicosis, to review practices that have been tried in an attempt to reduce the impacts, and to offer possible management options to reduce the impacts of tall fescue toxicosis. The information presented will be based on actual research studies and personal observations gathered over the past 30+ years of conducting tall fescue grazing studies. Personal opinions will be noted where used.

The problem

Problematic symptoms in cattle consuming toxic, fungus-infected tall fescue (E+) were first reported as early as the 1950's. A number of scientists across the world have been working on the issue since then, with strong efforts by universities and USDA locations in the southeastern and lower Midwestern US. The problem was eventually attributed to toxins produced by a fungus (*Neotyphodium coenophialum*) that lives within the fescue plant. These toxins are similar to compounds produced by the grain fungus ergot. Basically, cattle consuming E+ exhibit reduced weight gain and milk production, reproductive problems in both males and females, symptoms of excessive heat stress including excessive salivation, and long, discolored hair in the summer. Poor circulation to the extremities can also lead to a syndrome called fescue foot in which the foot can actually fall off, or other abnormalities such as losing parts of the ear or tail from poor circulation.

DR. KEN COFFEY Continued...

In total, some estimate that the production losses to livestock in the US total greater than $1 billion annually. When averaged across a number of stocker steer studies, the gain differential between calves grazing E+ and those grazing tall fescue without the fungus was 0.7 lb/day. While the range around this mean was considerable, it does give us a good idea of how much potential loss occurs when calves graze toxic fescue. Fewer studied have evaluated performance by the cow-calf sector. However, a review paper published by Paterson and colleagues in 1995 reported a 26 % unit reduction in calving rates, a 0.45 lb/day reduction in calf daily gain, and a 69 lb lower weaning weights by cow-calf pairs grazing E+ compared with those grazing non-toxic forages. Cow-calf studies since that review have further validated those figures or in some instances, showed even greater production losses.

There is considerable seasonality in both the toxin concentrations and in performance by cattle grazing E+. From an evaluation of 7 years of seasonal weight gain data, two periods appear to be the most critical; between mid-May and mid-June, and the fall grazing period. Based on this information, management plans can be developed to reduce the impacts of tall fescue toxicosis. However, there are a number of complicating factors that must be considered including the time required for the toxins to clear the body. Graphs depicting seasonal weight changes and toxin concentrations will be presented.

Possible solutions

There is a very long list of management options and practices that have been tried in an attempt to reduce or eliminate tall fescue toxicosis. At the top of the list is dilution with other forages. Dilution with clovers has proven successful in a number of studies but this is not a complete solution. The first question that producers have to ask is can they maintain an acceptable stand of legumes in their pastures. For acceptable dilution, the diluting forage must be present and in sufficient quantity and tonnage to actually dilute the toxins. Another thing producers need to recognize is that although the toxins are diluted out, they are still present and having some influence on our animals. A good example happened a number of years ago when the summer weather was cooler and wetter than normal. The clover growth was great and the cattle gained better than normal. However, the cattle grazing the toxic fescue-clover pastures had long, discolored hair and were standing by the water trough slobbering. This means that physiologically, the cattle were still suffering from fescue toxicosis even though their gains were better than normal.

Dilution with other forages, particularly warm season forages might be an acceptable alternative. However, availability of those forages by mid-May for breeding spring-calving cows might be limited. Work in Arkansas reported that even 50% dilution of E+ with bermudagrass did not improve performance of cow-calf pairs compared with that of non-toxic fescue or orchardgrass that was mixed with bermudagrass.

DR. KEN COFFEY Continued...

Forage management to reduce seedhead production has been proposed as an option to reduce toxicity since the seedheads accumulate the fungus and therefore are highly toxic. We conducted a study where we clipped the seedheads at different times but this had no effect on gains. Chemical seedhead suppression with the broadleaf herbicide Chaparral improved animal performance beyond what would be expected due to improvements in forage quality. However, this herbicide will have severe detrimental effects on any legumes in the pastures. Also, the authors of that work pointed out that sprayed pastures had a significant increase in KY bluegrass, which may have contributed to the improved performance. A Tennessee study looked at using high stocking rates to reduce seedhead formation. This practice not only reduced animal gains because of reduced available forage, but also increased pasture toxicity because overgrazing killed the lower-tolerant non-toxic plants within the stand, thereby increasing the percentage of toxic plants.

A number of mineral supplements have been developed to combat tall fescue toxicosis. Based on a number of studies, it appears that cattle consuming E+ will more likely become copper deficient than those grazing non-toxic forages. This deficiency could lead to problems with the animals' immune function and reproductive performance. However, supplementation to correct this deficiency did not improve animal performance. I could find no other studies that definitively show that certain minerals or mineral supplements will reduce the toxicity of tall fescue. Certain mineral supplements may help correct some of the mineral deficiency issues associated with consuming E+, but they will not offset the toxicity. The same statement could be made for different vitamin treatments that have been tried.

Implanting stocker steers has shown promise. Particularly, implanting calves grazing E+ with the strict estrogenic implants has shown performance improvement responses much greater than from the same implant for calves grazing non-toxic forages. This is exactly the response we are looking for to indicate that the actual toxicity is being modified. However, these implants cannot be used in cows.

Certain dewormers appeared to have the ability to reduce the toxic response of E+. However, in subsequent studies, these responses were not validated. A number of drugs or pharmaceutical agents have also been tried. However, these do not appear to be an option now or in the foreseeable future. First of all, the toxins in E+ affect a number of physiological systems in the body making it highly unlikely that one drug would be effective for all of the symptoms. Secondly, companies are not willing to allow their human drugs to be used for this problem. Thirdly, drugs that may be effective may have severe side effects if the fescue toxins are not present for the drugs to affect. Finally, the toxicity varies substantially throughout the year and from year to year, making it difficult to quantitate a remedy.

DR. KEN COFFEY Continued...

Various toxin binders have been tried in an attempt to simply bind the ergot alkaloids in the digestive system and prevent them from actually being absorbed by the animal. This principle is used effectively in non-ruminant species to bind compounds like aflatoxins. However, there are a number of issues that must be overcome before a toxin binder will be successful for tall fescue toxicosis. First of all, the binder should be specific for the tall fescue toxins. Otherwise, the rumen environment provides enough other compounds to fill the binding sites before the fescue toxins can be bound. Secondly, the decision has to be made as to how much toxin binder to provide the animals. Since the concentrations of toxic compounds varies substantially throughout the growing season and from pasture to pasture, it is difficult to establish a target dose. In short, a number of toxin binders evaluated have shown promise, but have eventually disappeared from the market.

A number of years ago, the decision was made at one of the University of Arkansas farms to convert part of the cow herd to a fall-calving herd. These cows were used on a number of studies where they grazed E+ with consistent > 90% calving rates. The spring-calving herd would typically have much lower calving rates but the head-to-head comparison of fall vs. spring calving had not been done at that station. A previous study in southern Illinois compared spring vs. fall-calving cows grazing E+ fescue, but this study was never published, so we conducted a study comparing spring and fall-calving cows in the same study with similar management for both herds. In our study, fall-calving cows grazing E+ pastures had a calving rate of 89% whereas spring-calving cows grazing E+ pastures had a calving rate of 44% across 3 years. Weaning weights were also 37 lb heavier from fall-born calves vs. spring-born calves grazing E+ pastures. Fall calving also has the advantage of selling weaned calves on the spring market. Therefore, changing to a fall-calving herd has promise for those who have limited forage options beyond E+.

Many have observed that within a herd, some cows seem to tolerate E+ better than others, giving hope that genetic selection can be used to select animals that are more tolerant of E+ toxins. Researchers at both Missouri and Arkansas have explored this with successful initial results. However, this kind of information requires many more cattle evaluations than have been conducted to date. More heat-tolerant breeds may offer hope for improvement in the summer, but those same breeds may be more susceptible to problems in the winter. They also often have other issues that might prevent their widespread use. It is likely that producers that have practiced aggressive culling of open cows from E+ have already been selecting for tolerance to fescue toxins.

Another option that has been proposed is that producers can completely replace E+ with other non-toxic forages. The first problem that was observed was that forages that do not have the indwelling fungus are not as persistent as E+. In some situations, this resulted in a considerable loss of forage and capital. Incorporation of new or novel fungi that do not produce toxins into tall fescue plants appears to be a viable solution. The addition of these fungi improve persistence while still maintaining a non-toxic forage. Multiple cultivars of non-toxic, fungus infected tall fescue (NE+) are available on the market today. However, the seed is expensive and renovation costs are high.

DR. KEN COFFEY Continued...

In an Arkansas study, reproductive rates were improved to levels observed in cows grazing non-toxic fescue year round by moving cows from E+ to NE+ for 1 month prior to breeding and leaving them on the NE+ pastures for the first 3 to 4 weeks of the breeding season. This was accomplished by converting 25% of the E+ acreage to NE+. However, calf gains did not benefit by converting this low amount of the total pasture area to NE+ since the majority of the pasture the calves grazed throughout their pre-weaning development was E+. An economic analysis of this data revealed that it would pay producers with spring-calving cows to renovate the first 25% of their acreage to NE+ but that the improvements gained by further renovation would not be cost effective. However, it should be noted that the substantial improvement in calving rates was driving the economic benefits.

Carryover effects

Toxins from E+ appear to be stored in fat deposits in the animal. This means that they are available for long-term storage and can be liberated to affect the animal when fat is mobilized, such as when they lose weight. Performance by animals after removal from E+ has been highly variable. However, there are possible generalities that can be made from evaluation of the environmental conditions of the studies conducted, the age of the cattle, etc. This discussion is provided to help producers make informed decisions about what to do with their cattle after exposure to E+.

Numerous studies have been conducted where subsequent feedlot performance was evaluated after stocker cattle grazed E+ or non-toxic fescue. Based on review of the research and on personal observations, the subsequent performance by yearling stocker cattle appears to be greatly influenced by season of the year. Yearling cattle removed from E+ in the late fall (November) regained a considerable amount of the weight differential that was lost compared with cattle grazing non-toxic fescue. Much of this gain was achieved early in the finishing period indicating that carryover effects were minimal. However, yearling cattle removed from E+ in June typically retained their long hair, and growth was sub-par for a minimum of 60 days in the feedlot.

Limited work is published about how exposure to E+ before weaning affects subsequent post-weaning performance. In those studies, the weight difference at weaning between calves weaned from E+ and those weaned from non-toxic fescue were maintained throughout the entire life of steers without compensation or further increases in the weight difference. There are numerous testimonials about greater death losses from E+ calves, but I am not aware of any definitive research to verify or refute this. In one Arkansas study, heifers weaned from E+ had lower subsequent pregnancy rates than those weaned from non-toxic fescue, but this reduction was not observed in a subsequent study. Therefore, it appears that subsequent performance will not be hindered by grazing E+ prior to weaning, which means that "fescue calves" should not receive the discounts that they typically get at the auction market.

DR. KEN COFFEY Continued...

Management options

Based on the discussion above, producers have options to improve performance of cows grazing E+ pastures. However, it is likely that producers will need to adopt a number of practices to improve performance.

Convert E+ to NE+. This option is expensive and the economic returns are highly dependent on improvements in calving rates. However, few of us can convert all of our acreage to NE+. Therefore, one could start by converting a small acreage such as 20 to 25% of the total acreage to NE+. This field should be used only at strategic times such as to enhance breeding of the cows. It should never be overgrazed though to protect the large investment.

Move to a fall-calving cow herd. If producers run defined calving seasons, adding the bull back with the spring calving cows at the proper time will catch many of the cows that were open from the spring-breeding season. As fall numbers increase, keep adding replacements to the fall herd rather than the spring herd.

Overseed legumes after soil tests confirm that soil pH is sufficiently high to support legume establishment. Improved grazing management should be used to maintain the legume stands in the pasture. Use of legumes that contain tannins but that cattle will consume may have promise here.

Overseed some of the pasture area with warm-season forages to allow removal of the cows from E+ in the summer. However, understand that these may not be available in a timely manner around breeding dates.

Implant stocker steers with estrogenic implants.

Plan for the peak times for E+ toxins and performance reductions. Move cattle to other pastures during these times to reduce the maximum negative impacts.

Summary and Conclusions

As of today, there are no magic, low cost solutions to the problem of tall fescue toxicosis. The forage is already established and is providing acceptable tonnage of forage in places that otherwise would not be productive. However, much of the tall fescue in the US is toxic to livestock. These toxicities cause varied symptoms and the effects vary widely from farm to farm and even within a particular cow herd. While we may never have a complete solution to tall fescue toxicosis that is acceptable to all producers, using the above management strategies and having a greater understanding of the problems of tall fescue toxicosis will help us reduce the negative impacts of tall fescue toxicosis on cow herds.

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HUGH ALJOE
PROPER STOCKING RATES

Stocking rate is a critical management variable for any livestock operation. It is probably the most important decision a manager makes within his operation. However there are several variables that have to be taken into consideration to begin to determine stocking rate with one being able to estimate carrying capacity relatively accurately.

<u>Stocking rate and carrying capacity</u>

Stocking rate and carrying capacity are two terms that are often used interchangeably although the terms have different meanings. Stocking rate has a different connotation than carrying capacity. Stocking rate is a measure of forage demand by grazing livestock expressed in terms of an animal unit value. There are many different terms to communicate stocking rate: number of animals (head) on a given area of land; number of acres per head; animal units (AU), AUM (animal unit months) or AUD (animal unit days); and occasionally pounds of live weight per acre. At the root of its meaning, stocking rate represents the amount of forage required for a number of livestock at a described live weight for a specified period of time – the amount of forage that has to be delivered to the group or herd of livestock in some form over the course of a season or year. Stocking rate is entirely influenced by management as the decision is made by management.

Carrying capacity is a measure of forage production on a given piece of land over the course of time, usually expressed in terms of total dry matter production or pounds per acre over a growing season or year. Carrying capacity can be applied to both annual and perennial pasture types; in the case of introduced forages and grazing forage crops, it can be manipulated by management inputs like fertilizer. Carrying capacity is largely a function of rainfall, temperatures, forage types and soil types, as well as historical and current management. With long-term good management, carrying capacity for a given property will be greater than the same resources under extended poor management; therefore, management has some influence on carrying capacity.

As an observation, management may exert some effort to influence the potential carrying capacity as much as possible, but management seldom exerts enough influence on stocking rate to reflect or mitigate the effects of the variability in weather and climate. Both stocking rate and carrying capacity, to the extent possible, should be managed for optimum outcomes to the land, ecology and economics of the operation.

<u>Simple assessment of determining if over-stocked</u>

There are several aspects that can be covered when discussing stocking rate – what it is and how to define it, how to figure or estimate stocking rate, how to proactively manage stocking rate, how to know if one is overstocked – but most producers don't spend much time considering stocking rate once it has been established. Unfortunately, once a stocking rate is set, it is used as a goal or target to be reached/maintained and not as a metric to be adjusted based on the outcome of management inputs, climatic conditions and weather. As Allan Savory has stated in his book, "Holistic Resource Management," stocking rate is the most misapplied tool of grazing management. As a result, our grazing land resources have suffered.

HUGH ALJOE Continued...

How do you know if you are overstocked or not? There are several ways to make that determination, but intuitively, a land manager usually knows if the operation is stocked properly or overstocked based on experiences and observation. There are several indicators of being properly stocked. Typically, in a temperate to high rainfall climate, there should never be bare soil. There should always be plant and litter cover, even at the end of winter. Residual heights of grazed plants at the end of the grazing season should be three to four inches for introduced perennial pastures like bermudagrass and fescue, and six to eight inches for native tall grass pastures. Mature cattle should easily maintain a body condition score of 5.5 or better for most of the growing or grazing season. Cow herds should have conception rates of greater than 85 percent with most of the calves being born in the first half of the calving season. These are all indicators that stocking rate is not in excess of carrying capacity.

However if overstocked, there is a simple method to determine how much over carrying capacity your stocking rate might be. Most producers are intentional about their winter feeding and grazing. For example, there may be a goal of feeding three months of hay if the operation is predominantly introduced perennial grasses like fescue and bermudagrass. If records indicate the hay feeding period is actually closer to five months, then they are stocked heavier than their management and resource allows – stocking rate is definitely in excess of carrying capacity. The question is, how much? For every month of hay feeding over planned or intended, the producer is at least 8.3 percent overstocked, which is equivalent to one-twelfth of a year in this case. Therefore, if the operation is feeding two months of hay over planned or intended, then two months times 8.3 percent equals 16.6 percent, or about 17 percent overstocked.

This example can be applied to those grazing native range pastures during winter, but with a different measure. Adequate residual is desired to protect and insulate the plants during the winter. It provides for a healthy, more vigorous plant community for the following growing season. Grazing more than the leaf matter during winter depletes much of the residual needed to maintain the native grass communities. The leaf matter is the most digestible and nutritious portion of the plant. Grazing plant materials such as the reproductive and basal structures during the winter than the leaf matter is referred to as "hustling," forcing the cattle to "hustle." For every month that a producer forces the cattle to hustle and consume plant material other than the leaves, the pasture is overstocked by 8.3 percent. In an example where the producer has observed that the cattle have to hustle and graze into the residual matter the last 1.5 months of winter, the producer is about 12 to 13 percent overstocked (8.3 percent x 1.5 months = 12.45 percent).

<u>Process of estimating stocking rate</u>

To determine a stocking rate, a producer must be able to estimate the carrying capacity of a property. There are a few guidelines one must follow to attain a reasonable estimate, which may require some assistance from a pasture and range professional like the NRCS grazing lands specialists. The basic information is readily available for a producer to begin the process. First, the producer needs to have a good map of their property with acres indicated for each pasture.

HUGH ALJOE Continued...

For simplicity, use an Excel spreadsheet to develop a table of information. If it is a cow-calf operation, the columns would be as follows: pasture name, total acres, grazing acres, forage type, estimated production per acre, units of nitrogen applied, total production per acre with nitrogen, utilization percentage, total available for grazing, total animal units, animal unit equivalents and total mature cows. A spreadsheet used by the Noble Research Institute consultants is pictured below.

								% of Carrying Capacity			100%	Cows	1st Calf Heifers
								Hay Requirements			AUE	1.2	1.1
								29.6	Tons		Months	10	10
Pasture	Total Acres	Grazeable Acres	Forage	For. Prod. Lbs/ac	Lbs N	Total Production	% Util.	Useable Production	# AU's	Alloc. Cows	Alloc. Steers	# Cows ?? - ??	# Steers ?? - ??
1W	233	50	RG/BG	2000	0	100,000	65%	65,000	6.8	0%	100%	0.0	7.5
1S	240	40	RG/BG	2000	0	80,000	65%	52,000	5.5	0%	100%	0.0	6.0
2	38	25	RG/BG	4000	0	100,000	65%	65,000	6.8	0%	100%	0.0	7.5
3	59	45	BG	3500	0	157,500	65%	102,375	10.8	0%	100%	0.0	11.8
4	64	50	BG	3000	0	150,000	65%	97,500	10.3	0%	100%	0.0	11.2
5	14	12	RG/BG	3000	0	36,000	65%	23,400	2.5	0%	100%	0.0	2.7
6	35	25	RG/BG	3000	0	75,000	65%	48,750	5.1	0%	100%	0.0	5.6
7	69	60	BG	3000	0	180,000	65%	117,000	12.3	0%	100%	0.0	13.4
8	286	200	BG/FE	3000	0	600,000	65%	390,000	41.1	0%	100%	0.0	44.8
9	85	40	BG	3000	0	120,000	65%	78,000	8.2	0%	100%	0.0	9.0
10	142	35	BG	3000	0	105,000	65%	68,250	7.2	100%	0%	7.2	0.0
11	44	15	BG	3000	0	45,000	65%	29,250	3.1	100%	0%	3.1	0.0
12	127	110	BG/FE	3000	0	330,000	65%	214,500	22.6	100%	0%	22.6	0.0
Total	1436	707				2,078,500		1,351,025	142.4			32.9	119.4

Reviewing this table, a producer can get an idea of the information and considerations required to calculate estimated carrying capacity and convert to a stocking rate. The estimated production information is acquired from the soil survey information, such as can be found on the Web Soil Survey. If one can find their property on the Web Soil Survey, they can outline the property and move to the tab titled, "*Soil Date Explorer*" and the "*Suitabilities and limitations for use*" option will appear. From there, select the "*Vegetative production"* sub-tab and a list of options will appear.

For forage production estimates under the "Vegetative production" subtab, the "rangeland" (normal, favorable, unfavorable conditions) and "yields of non-irrigated crops" options are the primary options used. The "rangeland" categories provide an estimate of total production in units of pounds per acre. The "non-irrigated crops" tab will list a number of forage crops and other crops. The forage crops, those used for grazing, have production expressed in terms of animal unit months (AUMs), which equals about 780 pounds of utilized production under a well-managed system and implies fertility management (although the amount of nitrogen typically used is not specified). Then, it is a matter of capturing the appropriate data, making the conversions, tabulating and making calculations.

HUGH ALJOE Continued...

Other considerations that need decisions are the utilization percentage and the amount of hay to be procured off-site if any. The utilization percentage varies with pasture type. Native range should only be utilized at a 25 percent use rating to allow for nutrient cycling to occur in the natural system. Introduced pastures can be utilized more aggressively with proper fertility at 50 percent utilization if continuously grazed and 65 percent in a well-managed rotational grazing program. If hay if procured off-site, there is more forage produced on-site that can be allocated toward grazing and thus increase stocking rate although at an additional cost.

Converting carrying capacity to stocking rate

There are a few aspects of converting carrying capacity to stocking rate worthy of consideration. First consideration is the size of the cattle. Most mature cows are larger than 1,000 pounds which is considered 1 animal unit (AU). Most are 1,200 to 1,400 pounds which means each cow is valued at 1.2 to 1.4 AUs. Cattle consume about 2.6 percent to 3 percent of their body weight per day, assuming adequate quality. Therefore, it is important to account for size in determining the stocking rate. Second, determining if hay for winter feeding is produced on site or will be purchased (off-site) impacts carrying capacity of operation. Lastly, a producer needs to consider how aggressively to stock to property – at carrying capacity or perhaps more conservatively. Carrying capacity is highly dependent on rainfall and rainfall is highly variable. If stocking at carrying capacity for the average year, the operation is overstocked 50 percent of the years. If one looks at the long-term average and determines to stock at 90 percent of carrying capacity, the operation would be overstocked about one in three years. If stocked at 80 percent of carrying capacity, it would be overstocked one in six to eight years, depending on if annual rainfall is 30 inches per year or 40 inches, respectively. Being stocked conservatively with a primary herd also allows opportunities to allocate excess forage to additional enterprises such as retained ownership of raised calves, strategic purchases of cattle that could be marketed advantageously at a later date, or grading up if the right cattle were made available for purchase.

Concluding remarks

Stocking rate is one of the most important decisions a livestock producer has to make for their respective operations, and it should not be a static decision nor should it be made without due consideration for the variability in weather and management. Since stocking rate should be a direct result of carrying capacity, and carrying capacity is very dynamic from season-to-season and year-to-year, stocking rate should be an active (preferably proactive) process that should be under constant consideration. The key concept of stocking rate is it should be optimized and not maximized, and it requires proper management of the land resources and the livestock to optimize the operation. Stocking rate is one of the most critical decisions a producer has to make continually about their operation, and the lack of a dynamic decision-making process is a decision.

DR. WILL MCCLAIN
FERTILIZING FOR CROP REMOVAL RATES

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He attended Missouri State University and received a B.S. in Horticulture/Agronomy before working at a private country club as the head horticulturist and heavy equipment operator for several years. He then returned to Missouri State University and obtained a M.S. in Plant Sciences followed by a couple of years teaching soil and plant science courses in the Agriculture Department. After being convinced by Dr. Anson Elliott to pursue a PhD, he started at the University of Missouri under the advisement of Dr. Dale Blevins. His research projects covered many aspects of tall fescue production including stockpiling, seed production, and nutrient dynamics.

After completing his PhD, he worked as a senior research specialist for Dr. Robert Sharp on a drought project looking at changes in root architecture and depth of several soybean cultivars. Will worked for University of Missouri Extension as Regional Agronomy Specialist from 2007 until 2015. In the fall of 2015, he returned to his alma mater and accepted an Assistant Professor position in the Environmental Plant Science and Natural Resources Department of the William H. Darr College of Agriculture at Missouri State University. Will is married to Julie and has three children – Madison 21, Gwenyth 17, and Cole 14. When not at work, spending time with his family or asleep on the couch, you can usually find Will fishing any one of the great creeks or rivers in south central Missouri.

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J0E HORNER
COSTS AND BENEFITS OF FORAGE RENOVATION

Calculating Payback from Fescue Renovation
Cattle producers in fescue areas have known for decades that the fungus infecting their K31 fescue pastures costs them money. Considering the costs and hassle of renovating, however, most producers have chosen to live with the toxic fescue they have rather than renovate to one of the novel endophyte fescues.

Recent work at the University of Missouri examines fescue renovation costs and benefits and finds a fast payback on renovation. Payback is fastest on herds with higher stocking rates.

Research from multiple universities is clear. Toxins from the fungus associated with K31 fescue reduces conception rates, lowers weaning weights, can lead to lameness and creates other observable health and appearance problems in beef cattle.

To accurately estimate the payback for replacing K31 fescue pastures with novel endophyte fescue one must first examine all the costs, hidden and explicit. These costs include preparing the land, reseeding pastures with novel endophyte fescue, and accounting for the lost productivity of pastures during the time it takes to renovate.

Preparing pasture land for fescue renovation is more involved than seeding open cropland. First, the existing pasture has to be killed and wiped as clean as possible of K31 fescue seeds and seedlings. This cleanup is accomplished by some variation of a spray/smother crop/spray routine that can spread over multiple calendar years.

The smother crops are an expense but also provide forage. Smother crops would typically include sudangrass or millet in summer or a cereal grain planted as a winter annual in the fall.

After the pastures are cleaned of the old fescue then the costs of replanting is considered, (field operations, seed, fertilizer, lime). Finally lost productivity during the time the pasture was out of production during renovation which has to be considered.

J0E HORNER Continued...

Table 1. details the costs of renovating a typical Missouri cattle farm, using custom rates for field service and average 2018 seed and fertility costs.

Table 1. Costs of Renovating fescue pasture under three different strategies for wiping out old fescue			
Table 1	**Spray/summer smother/spray**	**Spray/winter smother/spray**	**Spray/no smother/ spray**
	$/ Acre	**$/Acre**	**$/Acre**
Preparing the Land	**$101.29**	**140.29**	**$19.50**
Planting Novel Endo-phyte Fescue	**$125.50**	**$125.50**	**$125.50**
Not loss in produc-tivity during renova-tion	**$3.50**	**$99.50**	**$131.00**
Total Renovation Costs	**$230.29**	**365.29**	**$276.00**

Benefits include improved reproduction, improved weaning weights, and avoided costs like extra feeds and minerals bought to try to alleviate the symptoms from the fungus in the old fescue. These benefits are expected to last for decades.

Table 2, depicts the annual productivity benefits of using novel endophyte fescue, based upon 2018 Missouri prices, on a per cow basis, using a stocking rate of four acres per cow. This list of benefits considers a conservative approach assuming no cost share is available and the only benefits come from improved reproduction and weaning weights.

Table 2. Annual Benefits of Renovating Fescue $/Cow, 4 acre per cow stocking rate	
Improved calf crop	**$105.81**
Weaning weight improvement	**$52.99**
Total annual benefits per cow	**$158.81**

J0E HORNER Continued...

Payback can be measured in years to return investment or as a rate of return on investment. In table 3, payback is calculated using both measures. The Rate of Return is an internal rate of return calculation. One can think of the rate of return calculation as what interest rate the "Fescue Bank" is paying you to invest in renovation.

Table 3. Payback under Spray/Summer Smother/Spray Strategy with different stocking rates

	3 acres per cow	4 acres per cow	5 acres per cow
Years to Payback	4.4	5.8	7.3
Rate of Return on Investment	23%	16%	12%

Payback is fastest for those producers with higher stocking rates. This makes sense because renovation costs the same per acre so the costs of renovation on a per cow basis rises as the acres needed per cow rises. Benefits are on a per cow basis which doesn't change with stocking rates.

This analysis assumed a cow calf operation selling feeder calves. Farms and ranches with stocker operations would also see increased performance from growing cattle on novel endophyte pastures.

When examining payback, cattlemen are sometimes reluctant to invest in things that take years to recover the investment. In this analysis, using conservative cost and benefit calculations, the payback from renovation is clearly very competitive with other outside investments.

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Dr. Gary E. Bates is a Professor in the Department of Plant Sciences. Has a seventy-five percent appointment with The University of Tennessee Extension as the Forage Crop Specialist. He is responsible for developing and maintaining a statewide educational program in the area of forage crop establishment and production.
He has been primarily involved in teaching agricultural professionals and others in non-classroom settings.
Philosophy on teaching is to provide clientele the information needed for them to be as profitable and sustainable as possible. This means using sound, unbiased research information in an educational program. His goal is to develop his educational program in such a way that it provides critical information to producers ahead of when it is needed. As new research studies are published, new species or varieties are released, or new chemicals/techniques for management are developed, extends this information to Extension agents and producers to help them be as prepared as possible for decision making.

Part of the forage educational program is focused on conducting applied research that can help Extension agents answer questions from producers in their county. He works cooperatively with other UTIA faculty to design and conduct projects in the area of weed control, species selection, fertilization and management.

Dr. Bates has a 25 percent administrative appointment, serving as the director of the UT Beef and Forage Center. Responsibilities include facilitating educational and research programs to benefit beef and forage producers across the state and the Southeast.

DR. GARY BATES
MINIMIZING DROUGHT IMPACT ON PASTURES

This time of the year most of us are beginning to enjoy warmer temperatures and green pastures. Very few people woke up this morning thinking about drought. That topic won't enter our minds for another few months. By that time, however, drought might become one of the dominant topics on everyone's mind. The problem is that if we wait until June or July to start thinking about how to deal with a drought, we have missed out on several management tools to reduce the impact of a summer drought.

A drought during the summer will always be a threat. In fact, I could argue that summer drought is normal. The only variation will be in the length and intensity of the drought. In order to reduce the impact of these droughts, there are several things we can focus on over the next few months.

Correct soil fertility issues. In order to survive periods of limited moisture, plants need to be vigorous with a healthy root system. If plant nutrients are limiting, or soil pH is low, there is the potential for plant growth to be reduced, limiting the plant's ability to survive drought. Often producers think that hayfield stands last longer because they aren't grazed. That is partially true, but it is often also due to higher soil fertility in hayfields versus pastures. Go ahead and soil test your fields now, so that you can have results in time to fertilize. If the results don't arrive in time, it provides information needed to topdress with additional nutrients if needed.

Improve your grazing management. Often we think about our grazing management during the drought, trying to not overgraze and kill the plants. We have all seen fields that have to be replanted because they were grazed too hard during a drought. But preventing overgrazing during the spring when plant growth is good is just as important for drought survival.

As mentioned above, root growth is important in a plant's ability to survive drought. Research has shown that overgrazing has a dramatic impact on grass root development. If you graze a plant, root growth will stop for a few days. The more and longer you overgraze, the more dramatic the impact. In fact, if you continuously overgraze a pasture, root growth will essentially stop until you let the plants have a chance to regrow and restore some of their reserve carbohydrates.

DR. GARY BATES Continued...

The best way to graze a field is to remove all of the forage, then rotate cattle to another field and let the forage regrow. This will create a situation in which the plants can recover both above and below ground. How fast to remove the forage and how long to let the field regrow will depend on your resources and goals. But during spring, a goal should be to graze a field for 4-7 days, then allow 21-28 days to recover. If you have to graze a field longer or have less days for regrowth, it doesn't mean all is lost. Anything you can do to allow more days for rest will help root regrowth and reduce summer drought impact.

Plant warm-season species to supplement cool-season pasture. Let's say you have tall fescue pastures that you have tried to manage well during the spring. But a drought hits and you yourself in a no-win situation. You don't want to overgraze during the drought, but you don't have any pasture growth, so there is no way to prevent overgrazing. How can you manage this? By planting a few acres of some warm-season forage species. It might be bermudagrass, crabgrass, sorghum x sudangrass, or one of the native grasses. But the point is to plant a forage species that is more adapted to summer temperatures and more efficient with its water use. These species have a photosynthetic pathway that allows them to conserve water while maintaining productivity. You should be able to continue to graze much longer into a drought using one of these species compared to using tall fescue.

The appropriate species will depend on several things, such as your location, soils, and goals. We might not be able to list the pros and cons of each of the various warm-season grasses in this article. But we can say you should plan now to determine which species you want to use to provide grazing during the summer.

Conclusion. Often times we act as if droughts are unusual and abnormal. In reality, droughts should be expected and planned for. We can't particularly eliminate droughts, but we can reduce their impact. Don't wait until the drought hits to start the planning. Now is the time to develop your drought strategy.

DR. TIM EVANS
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Dr. Tim Evans is an Associate Professor in the Department of Veterinary Pathobiology and the Toxicology Section Head at the Veterinary Medical Diagnostic Laboratory in the College of Veterinary Medicine at the University of Missouri.

He received his DVM from the University of California, Davis in 1982, and he earned both his MS (1996) and PhD (2002) from MIZZOU.

Dr. Evans is board-certified in both Theriogenology (animal reproduction) and Veterinary Toxicology. Equipped with a flashing glove which does absolutely nothing and a calculator, Dr. Evans' alter ego, THE ANTIDOTE, is the enemy of ALL things toxic.

DR. TIM EVANS
IF IT WASN'T LIGHTNING OR GRAIN OVERLOAD, WHAT KILLED THE COWS?

All cattlemen know that two major potential causes of death in their cattle include lightning and grain overload. However, how do we prove if either of these are the cause of death, and what do we do if they are clearly not?

It also seems that once lightning and grain overload have been ruled out that EVERYONE has SOMEONE who dislikes them enough to harm their animals!!! With respect to cattle, if it isn't an arch enemy, a former in-law, or a fierce competitor, it simply has to be the feed company or the vaccine or dewormer manufacturers, who are out to harm their bovine companions.

The purpose of this talk is to provide an overview of a basic diagnostic approach for suspected intoxications, especially when there are legal or significant financial ramifications for confirming the exact cause of death.

In addition, some of the more common toxic culprits in bovine illness and death in Missouri will be reviewed, along with suggested best practices for confirming or ruling out these intoxications.

DREXEL ATKISSON
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Drexel Atkisson was raised on a beef farm in Dade County, Missouri, where he and his family continue to operate a beef operation.

After receiving a degree in Agronomy, Drexel began work with the Natural Resources Conservation Service in 1992.

In 2010, a Soil Health workshop sparked a new passion that has grown ever since. Drexel began to work with producers to change the way they operated their land. Believing that we must produce food and fiber with less inputs in a more sustainable way, it has become his mission to help others adopt the key principles of soil health.

As the Area Soil Health Specialist with the Natural Resources Conservation Service, he has been able to focus his efforts doing just that. Drexel has a sincere passion to work with Missouri's farmers and ranchers to improve soil health in Southwest Missouri.

DREXEL ATKISSON
FORAGE PRODUCTION CONSIDERATIONS USING SOIL TYPE

Getting Acquainted With Your Soils

Many of us attend various workshops and conferences and return home with great ideas on improving our farm. When those ideas include anything that sits on or grows out of the ground we must consider the soil underneath. With all the talk about soil health these days, we must not overlook the important physical properties of our various soil types. Educating ourselves about the soils on our individual farms can not only save us many headaches but also much money.

Each soil is unique in its physical properties and abilities to support buildings, conservation practices and various types of forages. Most of us have been involved in digging post holes on our farms. This gives us some insight to where we need a rock bar or just the hole diggers. Perhaps we know of a few areas that require a drilling machine or dynamite! Without having to dig holes all over the farm to get this information, let's focus on some established tools that can offer guidance on each soil's ability to provide support for our good ideas.

Each county has a published soil survey that defines the approximate boundary of the various soil types in any given location. Your farm may only have a couple of soils or you may be blessed with several. Printed paper copies of this may still be available at your NRCS office, however electronic versions have become the new norm. Web Soil Survey is the fastest way to access your soil map and information for each of those types. Once in Web Soil Survey you simply navigate to your location and begin to investigate the information for your soils. A handout has been provided.

Once you get acquainted with the soils on your operation, you can make better decisions about where to locate your good ideas. Often, we see producers who want to plant a better forage such as warm season grasses. More times than not the desired location is one that does not have an existing good stand of grass. When the soils information is explored we see that the soils do not support a very good stand of grass. This will also be the case for the new forage that is planted. Warm season grasses have the capability to put roots down more than 10 feet and be very drought resistant. Planting on shallow soils will not allow for this trait to express itself and many of the known benefits of such grasses will not be realized.

We can change a soil's chemical and biological characteristics but are stuck with the physical properties. Now more than ever with the price of land, it is important to get the most return out of every acre. Knowing in advance expected performance of conservation practices is a huge advantage that should be used.

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Southwest Missouri RC&D

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We welcome your suggestions and feedback.

We look forward to seeing you in 2020!