



2021 **Ag** Times

Five steps to pass the farm to the next generation
Legumes improve pastures, grazing and profits
Evaluate your calving distribution this spring
Missouri trending wetter and warmer

PHOTOS BY DAVE MARNER



FOR MORE than 55 years, Duane Dailey wrote and photographed agricultural stories for University of Missouri Extension. Today marks one year since Dailey died in surgery for cancer. Conversations with him over the 35 years I'd known him brought about this edit of images from 2020. "Cattle are curious," Dailey would say. "Sometimes they'll all turn and look at you." "Sometimes, you wish there was a farmer still working at sunset. Then you realize it's a good deal he's home for supper. Where's the guy raking hay when you're out on a farm cruise? Be ready for the deer which bolts when you stop.

— DAVE MARNER

MARCH 10, 2021 PAGE 1B-28B

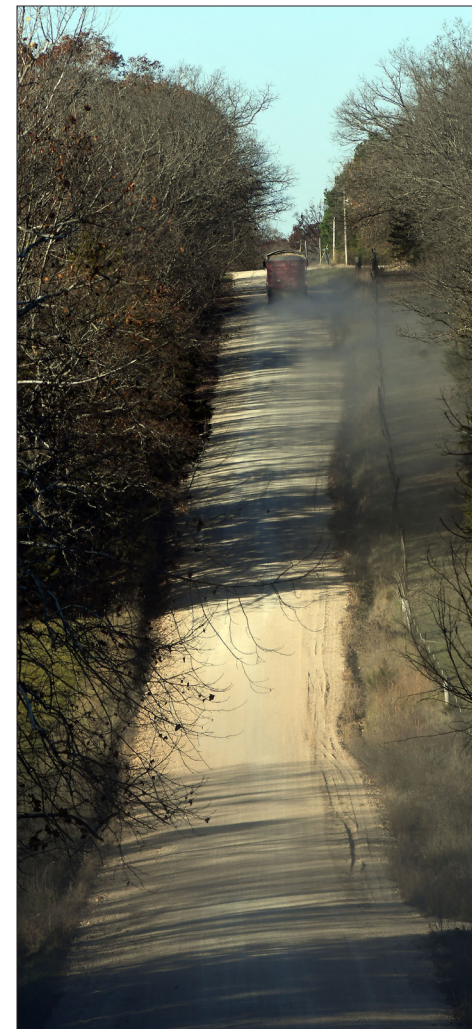
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PHOTOS BY DAVE MARNER

A GRAIN truck weighs in at the MFA Agri-Services facility (above) in Owensville during the fall 2020 corn harvest as another off-loads. **A FARMER** heads uphill on Blocks Branch Road to off-load his harvest in early November (right).



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Missouri Agriculture Photo Contest captures best of farm, rural life

JEFFERSON CITY — Missouri's Department of Agriculture this past week launched the 12th annual Focus on Missouri Agriculture photo contest to help kickoff National Thank a Farmer week.

The department is asking Missourians to share the unique stories and images of agriculture through photographs. The contest, which runs through June 11, is an opportunity for amateur photographers across the state to submit their best images of Missouri agriculture.

That image may take shape through a breathtaking farm landscape, an aerial shot of harvest, a farm tractor that has been in the family for years or a fun moment showcasing farm life.

"Our annual photo contest gives Missouri's farmers and ranchers a creative way to tell their stories," said Director of Agriculture Chris Chinn. "After another tough year for agriculture, being able to

showcase the legacy and variety of Missouri agriculture is a welcome breath of fresh air. We're excited to continue kicking off the contest as a way to celebrate National Thank a Farmer week."

The Focus on Missouri Agriculture Photo Contest is open to Missouri's amateur photographers of all ages. Participants may enter up to three photos in each of the five categories. The photo contest categories are: Beauty of the Farm, Faces of the Farm, The Farmer's Life and Pride of the Farm.

Children's Barnyard, a special category for budding photographers ages 12 and under, is back again this year.

Entries will be judged on visual impact, creativity, memorable content and image quality.

The contest offers prizes thanks to the Missouri Department of Agriculture's Missouri Grown program. The Best in

Show winner, along with the first-place winner in each category, will be invited to attend the 49th Missouri Governor's Conference on Agriculture to receive their prize along with a high quality canvas print of their photo.

Winners will be announced in early July and winning images will be displayed during the Missouri State Fair in the Agriculture Building, Aug. 12-22, 2021.

To submit your photos, go to Agri-

culture.Mo.Gov/focus and complete the online form. A complete list of rules and guidelines can be found on the same page. Photos submitted to the contest will be placed on the contest website and available on the department's Flickr stream. Photos must be submitted by June 11.

More information about the Missouri Department of Agriculture and its programs is available online at Agriculture.Mo.Gov.

The Center for Rural Affairs suggests spring is the time to review your business practices by asking:

- Do I have a well-defined purpose for my business?
- What major events in the past year have changed how I market and sell my product and/or service?
- Have my products and/or services changed since my last review?
- Has my target market changed? If so, how do I reach my new customers?
- Have there been any major personnel changes in my business

since my last review?

- Am I hitting my financial projections? If not, why?

How often you should review your business plan depends on the timeline of your goals. Newer businesses may have more short-term goals that may require quarterly reviews. With a more established business, you may only need to review your business plan yearly. Evaluating your plan is necessary whenever major changes to your business or industry occur, including leadership changes, significant revenue decreases, or adopting new technologies.

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Understanding inputs

BY JON FRANK

Imagine you started a business as a licensed fitness guru specializing in Olympic training. You spent four years getting a degree in human physiology. Then you earned an advanced degree studying the circadian rhythms of hormones, exertion, rest and recovery. Finally, you spent several years working with a firm specializing in nutrition and the biomechanics of movement to increase athletic performance, and you saw great success before moving on to start your own company.

In your first month in business you get a call from a young man looking to train for the Olympics next year. You assure him that you have the skills needed to hone him into an Olympic athlete and ask him to stop by your gym later in the day. He does, but to your shock and horror he is a 500-pound guy who can barely walk. "I'm ready to start training!" he sounds off with joy. After a moment of awkward silence, you finally mumble "That's great – but first we have some remedial work to tackle."

I paint this picture because this is exactly what I see with some soils. Soils generally fall into two basic patterns. The

first consists of those that have had way too many inputs applied and have become overloaded like our fat guy wanting to become an Olympic athlete. This usually occurs in smaller garden plots and with organic growers. The other pattern occurs when only a meager amount of inputs were applied and the soil is thus severely depleted. This is the default pattern on most large-scale farming acres and a lot of native soils – especially those in regions of high rainfall or the tropics. Both overloaded and depleted soils yield poor quality.

Agriculture is all about culturing life in order to produce outputs. These outputs become the inputs of higher life forms. Biology must have the building blocks needed to produce the outputs, especially minerals and carbon compounds. Minerals are important because they become charged up with electromagnetic energy. Carbon compounds are important because they are charged up with heat energy. Food or animal feed contain both energy sources ready to use.

Food or animal feed is in fact a carrier or conduit of energy. Let's take the example of alfalfa. When the Brix is high,

say 17, you will see outstanding milk yield and animal performance without any grain needed in the diet. Why? Because it is delivering a larger amount of heat and electromagnetic energy. This is easily translated into a gain of 10 pounds of milk per cow per day. If the cows are fed low-quality alfalfa, say 6 Brix, yield will drop precipitously and the cows will lose flesh on their ribs. Now you have to feed concentrates at high rates just to maintain body condition.

The difference between these two scenarios is determined by the type and amount of inputs applied over time on the alfalfa field. If you want quality, you have to meet nature's requirements to get it.

As stewards of the soil, it is our job to provide the right amount of inputs in order to optimize the delivery of energy to the consumers. When done correctly, this leads to profits for the farmer and health for consumers.

Agribusinesses selling toxins, poisons and GMOs don't like this model because they want to sell rescue chemistry – not nutrition. It is more profitable to sell these expensive products. Why? Because they

have a captive audience. Farmers don't want to lose their crop. Conventional agronomy promotes poor and unbalanced nutrition in order to later sell highly profitable crop rescue "solutions." Of course, this type of crop does not deliver good nutrition to people or animals.

Instead of spending money on crop rescue products, farmers actually need to double their budget for nutritional inputs. But how much inputs should be applied? This is a very important question.


There are several approaches, most of which are promoted by various authors in the pages of AcresUSA Magazine. Just remember that a single acre will yield thousands of pounds of outputs, which equates to hundreds of pounds of actual minerals removed from the land.

One approach is to use no inputs, or almost none. In my opinion, this is a recipe for failure in high-output crops. Technically, no-input can provide some yield with certain tree crops, and low-input can work for pasture when hay is not removed. But this strategy does not deliver quality to the consumers over

See **Inputs**, Page 9B

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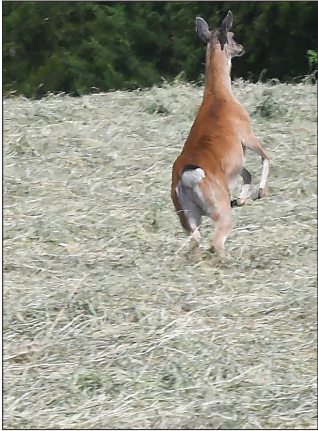
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PHOTOS BY DAVE MARNER
RURAL SCENES offer a variety of textures to photograph and the occasional wildlife bounding away from you (top) in a hayfield. **A FARMER** off of Brick Church Road collects old fence wire while brush-hogging off a field in the spring of 2020 (right). Wrapped bales of hay created this scene (below) along Highway 28 near Rosebud in 2020. **CORN STALKS** along a gravel lane off of Highway 19 created this tunnel-like scene in 2020 (bottom).



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SEVERAL SUBSTANTIAL Food drives were held in 2020 including one in Swiss with Food for America stocks. The early summer delivery include varieties of fresh vegetables which were not being consumed in restaurants due to COVID-19 closures.

Food Security Task Force proposed

BY CAITLIN R. KING, MISSOURI NEWS NETWORK

JEFFERSON CITY — A Senate committee heard testimony March 3 on SB 441 which would address issues of food insecurity and food deserts in Missouri. Sponsored by Sen. Anne Washington, D-Kansas City, the bill would establish the Missouri Food Security Task Force. The task force's job would be to "study food insecurity... identify those populations and identify the limits to accessibility to healthy food, and also determine how we can address that," Washington said. Research by Feeding America had projected that



HELPING HANDS Outreach Center holds monthly mobile markets (right) with stocks from St. Louis Area Food Bank.

50.4 million people, which includes 17 million children, would be food-insecure in 2020. That projection is a 13.2 million and 5.8 million increase from 2018, respectively. "We want to study the (long-term effects of) hunger because we know that when children are hungry, they grow up and they are less developed," Washington said. "They develop more chronic diseases and the last thing we need, and I can say that, as a new Grandma, is that they sometimes have behavioral problems. And so if we can get healthy food and get them access to healthy food, we can prevent some of those long term ills that happen in our community."



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Legumes improve pastures, grazing and profits

Right mix reduces cattle bloat, toxicosis.

BY PATRICK DAVIS

STOCKTON, Mo.-Add legumes to grazing pastures to improve cattle performance and forage production, says University of Missouri Extension regional livestock specialist Patrick Davis.

Frost-seed clovers and lespedeza now, Davis says. They grow well with cool-season grasses in Missouri and improve spring and summer pastures.

“Proper establishment is important to incorporation and persistence of these legumes,” he says. He urges producers to work with their local MU Extension agronomist when seeding legumes. The MU Extension publication “Seeding Rates, Dates and Depths for Common Missouri Forages” is available at extension.missouri.edu/g4652.

Clovers and lespedeza can be seeded by drill or broadcast. Davis prefers drilling because it improves seed-to-soil contact for better establishment.

“If you broadcast seed, use cattle hoof action as well as the freezing and thawing process to work the seed into the soil,” Davis says.

“Legumes improve year-round cattle

grazing opportunities when added to cool-season grass pastures,” he says. Clovers enhance grazing in the spring while lespedeza improves grazing during late spring and summer.

Proper grazing management of legumes improves persistence and cattle performance. Davis recommends rotational grazing to prevent overgrazing.

Graze pastures to 4-inch stubble height and then rest pastures three to four weeks to maintain mixtures of white clover, fescue and orchardgrass.

“The best time to graze red clover is when about half the plants are blooming,” Davis says. “At this point, the forage will yield a feeding value similar to alfalfa.”

Cattle bloat can result from grazing high-protein, highly digestible legumes. To reduce bloat, incorporate white clover in a mixed grass stand or slowly adapt cattle to very thick stands of clover. Another way to reduce cattle bloat is to provide supplemental poloxalene or bloat blocks to cattle, he says.

Lespedeza is a non-bloating legume that improves grazing in summer months, Davis says. Lespedeza is a drought-tolerant, warm-



season legume that provides summer grazing in cool-season mixed pastures.

Do not overfertilize pastures with lespedeza. Most fertilizer applications of more than 30 pounds of nitrogen per acre will reduce stands of lespedeza. Lespedeza is an annual but will come back each year if it reseeds.

Clovers and lespedeza also help to reduce fescue toxicosis in cattle by diluting fescue pastures, Davis says. Adding legumes results in better-quality forages, improved cattle

production and higher profits.

To learn more about fescue toxicosis in cattle, see the MU Extension publication “Tall Fescue Toxicosis” at extension.missouri.edu/g4669.

For more information, contact your local MU Extension agronomy or livestock specialist. Find more resources on improving grasslands from the NRCS+MU Grasslands Project at extension.missouri.edu/programs/nrcs-mu-grasslands-project.



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time.

Another approach is to calculate total soil needs based off a soil test and put it on all at once. What is wrong with this? First, it can be very expensive. More importantly, the application rates are not matched to the digestive capacity of the microbial system. The nutrients in rock powders and soil amendments must first undergo microbial digestion before they become plant available.

Another method of applying inputs is by guessing or listening to popular culture. The classic example is the overuse of compost on backyard gardens. When compost is applied at commonly suggested rates year after year, the phosphorous and potassium build to sky-high levels. This extreme nutrient buildup in soil guarantees that high quality is simply unattainable. It is sad when I have to tell gardeners that it would be best to abandon garden and start over with unamended soil.

The last approach, and the one I suggest, is to apply the full amount possible based on soil testing and digestive capacity. But only apply nutrients if they are needed. This is the approach that gets us to high-Brix, nutrient-dense crops the fastest. The key is to avoid the two extremes: an overloaded soil or a depleted soil.

Jon Frank is the founder of growyourownnutrition.com and can be reached for consultation at growyourownnutrition@gmail.com.

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Missouri land values continue to grow

COLUMBIA, Mo. — All classes of Missouri land values grew steadily in the past year, according to the University of Missouri Extension's annual survey of farmers, rural appraisers and agricultural lenders.

Ray Massey, MU Extension agricultural economics professor, heads the survey efforts.

No governmental or public agencies in Missouri require the reporting of land values, said Massey. Despite the limited number of responses, the survey gives the best available estimates for tracts larger than 40 acres in Missouri.

Low-interest rates and nonfarm recreational purchases pushed values upward in 2020. A couple of other factors brought new investors to the table.

Buyers of farmland near metropolitan areas said that expansion of broadband internet made these properties more attractive to investors.

COVID-19 also nudged some city dwellers to buy property in rural areas to build a house. Massey said this likely is a short-term phenomenon and should not factor into long-term land values in these areas.

Respondents gave estimates of land values as of July 2020 for three classes of cropland and pasture (good, average and poor), irrigated cropland, timberland and hunting/recreational land.

This year's respondents reported the statewide average value of good non-

irrigated cropland at \$5,555 per acre, \$134 or 2 percent above the 2019 value.

The average statewide value for irrigated cropland came in at \$6,335, up \$186 from the year before.

The greatest increases in average values were in pastureland and timber/hunting/recreation land. However, values varied greatly throughout the state, Massey said. "This underscores the need to use caution when valuing any one parcel of land or using individual districts."

Most respondents indicated that 60% of farmland buyers intend to farm the land themselves and 25% plan to rent the land to others. The remaining 12% bought the land for nonfarming purposes.

USDA estimates of cropland value are \$999 per acre lower than the MU Extension survey's estimate for average cropland. For pastureland, the USDA estimate is \$833 less than the survey's estimate.

Missouri farmland and building values have steadily appreciated 6% per year since 1950, Massey said. USDA reported Missouri land values have been slightly under trend for the past two years.

Missouri timberland was up \$251 to \$2,561 per acre. Hunting/recreation land was up \$125 to \$2,581 per acre.

"Missouri Farm Land Values Opinion Survey" (MU Extension publication G401) is available online and as a free PDF download at extension.missouri.edu/G401.

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Evaluate your calving distribution this spring

BY LINDA GEIST

MU Extension

COLUMBIA, Mo. – Record calf birthdates this calving season to track calving distribution.

“Evaluating a calving distribution takes very little time but can provide valuable insight into reproductive performance and productivity of the herd,” says University of Missouri Extension veterinarian Craig Payne.

Calving distribution is often expressed as the percentage of calves born at 21-day intervals, since 21 days is the average length of the estrous cycle in cattle.

Payne tracks calving distributions as part of a three-year project to help beef producers improve whole-herd record-keeping. This is important for two reasons, he says.

First, dams of early-born calves have more time to recover before the next breeding season. They will likely be cycling at the beginning of the breeding season and have a better chance of becoming pregnant.

Second, early-born calves have longer to gain weight. This gives the owner more

Day of calving season	2020 spring (142 calves)
1-21	66%
22-42	28%
43-63	6%
> 63	-

Day of calving season	2019 fall (44 calves)	2020 spring (66 calves)
1-21	45%	74%
22-42	34%	24%
43-63	16%	2%
> 63	5%	-

pounds of calf to sell and bigger profits at marketing time.

Payne says weaning weights collected from a northwestern Missouri operation in the fall of 2020 show that steer calves born in the first 21 days of the calving season averaged 47 pounds heavier at weaning than calves born during days 22-42 (537 pounds vs. 490 pounds).

While the number of calves in this group

is relatively small (47 steers born in the first 21 days and 12 born during days 22-42), Payne says other studies report similar weight differences.

Begin tracking calving distribution by establishing the date of the initial counting period. One option is to start the first period 283 days from bull turn-in or AI. If this information is not available, begin the first 21-day period when the third calf is born.

Both methods work, says Payne, but use the same method to be consistent.

Once you have the start date, count the number of calves born in the first 21 days of the calving season and divide that number by the total number of calves born, says Payne.

Repeat the process for days 22-42, days 43-63 and after day 63. Count all full-term calves born, dead or alive. Also include calves born before the beginning of the first 21-day period.

Finally, evaluate the calving distribution of first-calf heifers (2-year-old cows) separately from the mature herd. Their breeding season is often earlier or managed differently.

Once you know your herd’s distribution, compare it to the industry standard. Benchmarks for the first, second and third 21-day periods are 65%, 23% and 7%, respectively. The remaining 5% of calves are born later than 63 days.

The following is the calving distribution of 142 calves from a 2020 spring calving

See **Calving**, Page 11B

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herd in northwestern Missouri (also see table 1 at left):

Day of calving season and percentage: days 1-21, 66%; days 22-42, 28%; days 43-63, 6%; >63, none. Based on the calving distribution, this herd performed better than the industry standard.

To achieve the targets, all cows must cycle at the beginning of the breeding season and bulls must be fertile.

“If your distribution is unfavorable, meaning a higher percentage of calves are born later in the calving season, it could indicate one or more problems and will require more investigation,” says Payne.

Factors to consider are nutrition, bull power or fertility, disease or conditions that cause early embryonic loss or infertility, or a mismatch between herd genetics and environment. Also, look at the calving distribution by age category, pasture and other groupings to see if a specific group is responsible for differences.

The following distributions are from two groups of cows owned and managed by the same beef producer (also see table 2 previous page):

Day of calving and percentage for the 2019 fall calving group (44 calves): 1-22, 45%; 22-42, 34%; 43-63, 16%; >63, 5%.

Day of calving and percentage for the 2020 spring calving group (66 calves): 1-21, 74%; 22-42, 24%; 43-63, 2%; >63, none.

Notice the 2019 fall calving herd had an unfavorable distribution while the 2020 spring calving herd exceeded the benchmark. According to the producer, this difference can be explained by management intensity. The spring herd is intensely managed for reproductive success. The fall herd, however, is a mixture of purchased cows of unknown origin, late fall calving cows bought from another producer and cows carried over from the spring herd.

For more information on the record-keeping project, contact Payne at 573-882-8236, livestock specialist Shawn Deering at 660-726-5610, livestock specialist Jim Humphrey at 816-324-3147 or state beef nutritionist Eric Bailey at 573-884-7873.

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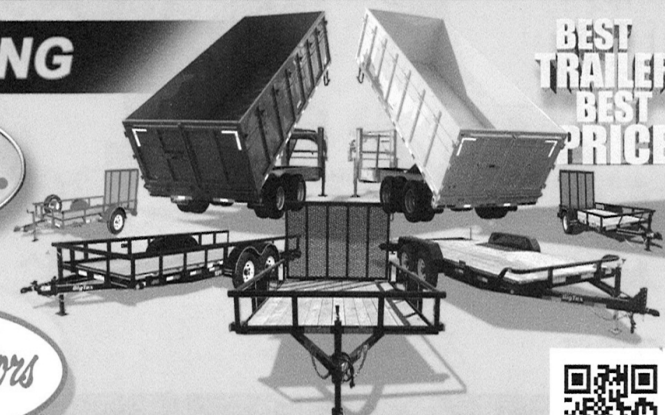
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SDS appearing in Missouri soybean fields

BY LINDA GEIST

MU Extension

COLUMBIA, Mo. – University of Missouri Extension agronomists reported during their weekly teleconference that sudden death syndrome (SDS) is showing up in soybean fields across the state.

MU Extension plant pathologist Kaitlyn Bissonnette says she is not surprised that the yield-robbing disease has reared its ugly head.

Fields showing symptoms now have had root infection for months, she says. SDS begins in wet springs like last year's, when the soilborne pathogen *Fusarium virguliforme* infects soybean roots. Rain during the reproductive growth stages allows the pathogen's toxins to move from the roots to the leaves. SDS appears in both upland and river bottom fields.

Because SDS is soilborne, it is important to monitor fields with a history of the disease. Foliar symptoms include yellow blotches between leaf veins that turn brown in the center. As the disease progresses, the leaves curl upward and may fall from the plant.

See **SDS**, Page 13B



PHOTOS BY DAVE MARNER

A HEALTHY soybean field begins to turn yellow during the late summer of 2020 at the conclusion of its growing season, leading up to the eventual harvest. The scene is on ground owned by Earl Farris along Route P north of Owensville.

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SDS • from page 12B

Stem canker and brown stem rot causes similar foliar symptoms, so it is important to scout and properly diagnose disease to form effective management strategies.

Damage ranges from trace losses up to 80 percent, depending on variety and when symptoms first appear. Yield losses of 5 to 15 percent are most common.

While there is no rescue treatment once SDS appears, producers can take preventive measures.

Keep a record of fields where SDS occurs. Consider planting resistant varieties and using seed treatments during the next season, Bissonnette says.

Foliar symptoms of SDS are sometimes worsened in fields infested with soybean cyst nematode (SCN). If you have never tested a field for SCN or it has been several years since your last SCN test, consider soil sampling this fall after harvest, she says.

Management options include variety selection, improving drainage, avoiding continuous soybeans and managing SCN. Seed treatments labeled for SDS may provide additional early season protection.

For more information, the MU Extension publication “Soybean Diseases” (IPM1002) is available for free download at extension.missouri.edu/ipm1002.



Fescue renovation school scheduled for March 23

BY LINDA GEIST
MU Extension

MOUNT VERNON, Mo. — Forage producers can learn to improve pastures, beef herds and profits at upcoming schools hosted by University of Missouri Extension.

MU Extension specialists will join other experts from across the country to tell how to renovate Kentucky 31 toxic tall fescue pastures at an in-person school in Mount Vernon.

The one-day school is 8:45 a.m.-4:30 p.m. Tuesday, March 23, at the MU Southwest Research Center at Mount Vernon.

MU Extension state forage specialist Craig Roberts bills the Mount Vernon workshop as a “must attend” for Missouri beef and forage producers who are serious about ending losses in cows and calves.

“Beef and forage producers will learn how to renovate pastures for healthier and more profitable herds,” says Roberts. “Renovation pays.”

Participants will leave with an understanding of why they should renovate K-31 pastures and the knowledge to do it, he says.

The event is sponsored by the Alliance

for Grassland Renewal, whose partners include universities, government, industries and nonprofit groups.

Sessions focus on toxic fescue, management of novel tall fescue, establishment techniques and a panel discussion on the economics of converting toxic tall fescue fields to nontoxic tall fescue. In addition to classroom training, there will be sessions on drill calibration and tours of Southwest Center’s research plots.

Speakers include leading forage and beef experts from MU, Virginia Tech, Noble Research Institute, North Carolina State University, Clemson University, USDA Natural Resources Conservation Service and private industry.

Participants will receive lunch and a notebook with information from presentations. Space is limited due to social distancing measures.

For those who cannot attend, there also will be an in-person workshop March 25 in Lexington, Kentucky.

Register for the in-person workshop in Mount Vernon at TallFescueMO2021.eventbrite.com by March 21.

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A 2020 harvest afternoon for Jamie Decker concluded with this sunset and purple sky as he off-loaded a combine hopper of shelled corn along Route Y outside of Owensville. Decker s...

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PHOTO BY DAVE MARNER

aid the corn harvest for the prairie ground was one of the better he's had in recent years.



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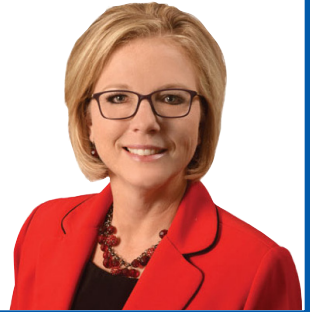
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Missouri trending wetter and warmer

BY LINDA GEIST
MU Extension

COLUMBIA — Missouri’s seasons are getting warmer and wetter, especially winter and spring.

For farmers, this means a longer growing season, wetter fields and potential for more plant diseases and insects.

Four of the five warmest winters in Missouri on record have occurred since the early 1990s, says University of Missouri Extension climatologist Pat Guinan. The five warmest springs on record have taken place since 1977.

Guinan says Missouri has witnessed a trend of “unprecedented” annual warming over the past couple decades.

“There have been only five years since 1998 that were cooler than average,” he says. “We’ve also seen a trend of higher nighttime temperatures in all four seasons.”

Missouri’s five warmest years, in descending order, are 2012, 1921, 2016, 1938 and 1931/1998 (tie).

Missouri has broken seven all-time monthly high temperature records during
See **Trending**, Page 17B



LILLIES BLOOM on a pond west of Owensville during the summer of 2020. This cow walked around the pond and went into the water to cool off (next page, bottom left) and to get a drink. **PHOTOS BY DAVE MARNER**

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Trending • from page 16B

the past 22 years. Of these, most occurred during the cold season. In 19 of the past 22 years, the annual minimum temperature in Missouri has been above average, according to the National Oceanic and Atmospheric Administration.

However, summer days with extreme heat are less common, Guinan says. There are fewer 90-degree days, but summer nights are warmer and more uncomfortable, with more days when temperatures do not fall below 70 degrees.

These trends are due in part to water vapor content, which has been increasing in Missouri over the past several decades, he says.

One way to express atmospheric moisture is through dew point, the temperature at which the air becomes saturated. Higher dew points elevate minimum air temperatures and suppress maximum temperatures, a phenomenon that has become most pronounced during the growing season. These higher nighttime temperatures create a humid environment ripe for plant diseases.

Another change with significant consequences for agriculture: Compared to the long-term average, over the past 20 years the median date of the last spring frost is about six days earlier and the first fall frost is generally five days later. That extends the growing season by 11 days.

Missouri is also experiencing an unprecedented wet period, Guinan says. Twenty-four of the last 39 years have had above-normal precipitation. Missouri saw its seventh-wettest year on record in 2019.

While long-term (1895-2010) average annual precipitation in the state is 40.86 inches, since 1973 annual precipitation has exceeded 50 inches nine times, with fewer dry periods compared to the first seven decades of the 20th century.

Not only is there more rain, heavy rain is happening more often, leading to more flooding and wetter cropland. Missouri has seen a 35 percent increase in 3-inch daily rain events over the past couple decades compared to the long-term average. Missouri has also broken four all-time monthly records since 2015.

But weather can change quickly, as shown by the drought of 2012, Guinan says. Missouri has had multiyear droughts and extreme summer heat, particularly in the 1930s and 1950s. In 1936 there were more than 60 days of triple-digit temperatures in Lamar, peaking at a brutal 118 degrees on July 19, 1936. The following month saw 21 consecutive days with temperatures of 100 degrees or higher. Since 2013, Lamar has recorded no triple-digit temperatures.

Conversely, the last time an all-time monthly average low temperature record was broken in Missouri was December 1983, when a weather observer near Hamilton recorded 13 days with subzero temperatures. The coldest day was Dec. 22, when it was minus 23. A high temperature of minus 12 was reported on Christmas Day.

Through the years, Missouri farmers have learned to adapt and be resilient when weather changes quickly, Guinan says.



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The importance of farming: This past, coming year

BY RALPH VOSS

This past year will be remembered primarily for the damage caused worldwide by the Wuhan Virus, which actually began in 2019 in the Wuhan area of China. But while Covid has dominated the news, much has happened on the farm front in the past 12 months.

In the early stages of the virus, farmers were hit hard because their meat and dairy products could not be processed in a timely fashion. Some milk was dumped.

Some of the large meat processors were forced to close because the virus infected a large number of their workers and there was no place to market beef and pork. This put a severe burden on small, local processors to handle the cattle and pork that area farmers wanted to be able to sell to customers. Today, a year after we first started to feel the impact of the virus, there is still a long line of people waiting to get their cattle and hogs into a plant to be processed. What we see locally is a problem faced by people all over the country. One result of this increased demand

is that new facilities and expansions are on the drawing board in much of the nation. Hopefully, in the long term this will help livestock producers and create investment and job opportunities as well.

Three years ago at this time, cattle producers were in a bind. We still had time remaining on the winter of 2017-18. When that winter would end, we didn't know, but we did know it couldn't come any too soon. As it turned out, we fed hay in our operation until almost the end of April. In most years we can turn out on grass by April 1. Many of us had already fed a lot of hay and local supplies were running short. If you could buy hay, it might cost \$100 a bale or even more. A lot of folks sold out that winter, rather than buy the high-priced hay. Many wished they would have sold. But things got better and hay prices have returned to a more normal level, but still higher than it was five years ago. I can't imagine hay selling for those pre-2017 prices again, because hay simply costs too much to produce to sell at give-away prices.

Hay is the unpleasant part of the cattle business. It's expensive and it's also a pain to feed. The pleasant part of raising cattle is

grazing them...at least if there is anything close to normal rainfall. When Covid started to get serious last year, we all but moved to the farm on a full-time basis. There was no reason to stay in town.

Our grandkids' sports activities were eliminated for the most part, but that was really an opportunity. We had the grandkids to the farm to help do things that should have been done years ago.

Living at the farm was great because we saw a lot of the grandkids and I could spend as much time with the cattle as I wanted. Moving cattle from one paddock to another is delightful. The weather couldn't have been much better.

Moisture was almost perfect. The result was the best clover I'd ever had at the farm and probably the best I'd ever seen. I wish I could say the great clover was a result of my management skills. If that were the case, I'd have great clover every year. Unfortunately, management didn't have much to do with it. Throughout central Missouri, the clover crop was magnificent. While I thought this was great, my cattle were even more pleased, as our cows literally gained tons of weight.

Between the time we preg tested in the

fall of 2019 and this past fall, not a single cow lost weight. Five gained less than 100 pounds; 32 gained between 100 and 200; 17 gained between 200 and 300; and four gained over 300 pounds. Why did they make such dramatic gains? The amount of white clover in 2020 was remarkable, but it was probably more than that. Years ago, I frequently measured our grass for brix levels, but I seldom do that anymore. Brix is the measure of sugar in plants. A high brix reading is good. On two occasions last spring I measured the brix of the clover. On June 24 at 4 p.m. (which is the time of day to get the best reading), the brix of the clover measured 30. A brix of 30 is remarkably high. A top-of-the-line Napa Valley red grape will probably not reach that level. Why was the clover so high in brix? I don't know for sure, but one month earlier I had sprayed that field with two gallons of raw milk per acre. Whether the milk was responsible for the brix level, I cannot say for certain, but I think that's the case.

What I am certain about is that there is a direct correlation between brix level and animal performance. High-brix feed will result in milk cows producing more and

See **Farming**, Page 19B

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Farming • from page 18B

it will also put weight on beef cattle. The reason I cannot be certain the milk raised the brix level is that – to my knowledge – there have been no studies to verify this fact. The University of Nebraska at Lincoln is the only university I'm aware of that has conducted a thorough test of the impact of milk. That study, which is more than 10 years old, showed that raw milk increased the growth of grass and greatly decreased the compaction of soil. That test did not look into brix levels. In 2010 when we used milk on much of our farm, we also saw the increased growth in grass and the reduction in compaction, and in addition we noted two other things: Several months after we sprayed the milk, the brix levels of our grass increased and it was also apparent that where we sprayed milk there were fewer weeds. No one knows for sure why these things took place, but we have always assumed the milk thickened the stand of grass and the added competition from the grass slowed the weed growth. We don't know why the brix levels went up, but we are convinced the milk is what did it. The 30-brix clover from last June leaves us even more confident of that conclusion.

I told you we took two brix readings last summer. Exactly two weeks after we got the reading of 30, we took another sample and

that clover tested 15. Why did the brix drop in half in two weeks? I can't tell you that either. We have always guessed that the first application of milk might impact the grass for only a limited period of time. We know that a farmer from the Panhandle of Texas in 2010 used raw milk in a center pivot and got a tremendous bump in brix levels, but to keep his levels high, he had to spray milk every three weeks. Based on that experience we feel it may be necessary to spray a number of times each growing season to keep the brix at an elevated level. Why did the Panhandle farmer have to spray every three weeks to keep his brix levels up, while it was not until after several months in 2010 that we saw our brix levels increase? I don't have the answer.

Afternoon paddock change

We did one thing different this past year that may have made a difference in the performance of our cow herd. In the past we normally moved our cows in the morning. Last year we tried to move our herd in the early afternoon, when the brix level of the grass is considerably higher. Once again, I know of no studies that show increased performance from afternoon paddock changes. However, if higher-brix feed results in better animal performance, it makes sense that an afternoon move would be better than a morning move.

Raw milk is far from the only management practice that will improve grass quality and quantity. Rotational grazing can definitely result in more and better grass. Greg Judy from Clark, Mo., just north of Columbia, has been moving his cattle on a regular basis for more than 20 years. He has done this with such passion, he has developed into a recognized authority on grazing practices. He does a great deal of consulting work and also speaks all over the country and in some foreign countries. For years he has offered a three-day school at his farm. He and other experts – some from outside the U.S. – teach classes that will draw hundreds of people in a year. His school is quite noteworthy, but his latest development is even more remarkable.

Just over a year ago Judy started putting his homemade videos on YouTube.

Five days a week – Tuesday, Wednesday, Thursday, Saturday and Sunday – he posts new videos and they are becoming wildly popular. As of this week he has 62,000 subscribers. In the month of February there were 429,000 views of his posted videos, which during the month were watched a total of 2.6 million minutes. Judy is really having an impact on how our nation's soils are being managed.

Judy is one of many doing yeoman work. For years North Dakota farmer Gabe Brown

has been improving his farm's bottom line – while also improving his soils. Brown uses cover crops to do this. A cover crop is one that is grown primarily for the benefit of soil, rather than for yielding grain. Brown plants a mixture of grasses and legumes that will improve his soil by adding fertility. He incorporates this crop into his soil by grazing it off and is left with livestock to sell. He can then follow the cover crop with a grain crop that will produce a good yield with little or no fertilizer or herbicide. The result is that Brown can produce grain for a much lower cost than neighboring farmers. This practice also bumps up the organic matter, which improves the soil's ability to hold moisture and release nutrients to plants. Each year his land becomes more productive.

The above is an oversimplification. If you want some details, Brown has written a fascinating book, *Dirt to Soil*.

A variation of cover crops is practiced by many livestock producers. Alabama resident John Lyons each year plants cover crops similar to those used by Gabe Brown. The difference is the men's goals. Brown uses cover crops to fertilize his soil for the time he intends to plant a grain crop for harvest. He harvests his fertilizer crop with animals and his grain crop with a combine. Lyons

See **Farming**, Page 20B



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Farming • from page 18B

does not plant a grain crop. He does all of his harvesting with cows.

Both Brown and Lyons have been highly successful. Brown took a conventional farm and greatly improved the soil, bumping up the organic matter and the crop yields. Lyons took an old cotton farm that had literally been abandoned and cleared the fields with a brush hog and chainsaw. By rotationally grazing and use of cover crops, Lyons has some of his fields with an organic matter of 6-1/2 percent, an exceptionally high level considering where he started and the very high rainfall of Alabama, which tends to leach soil of nutrients.

There are many other things people can do to improve their soils. A man named Jon Frank wrote three articles last year in Acres USA magazine on how to make soils more productive. Some of Frank's ideas are very fascinating. Two stories are in this section. Our thanks to Acres for allowing us to reprint the articles.

In those articles Frank talks about brix, organic matter and many other items that should be of interest to farmers. One thing in particular got the attention of Harry Cope, a Montgomery County farmer who pointed

it out to me. Frank talks about "ramial wood chips." We all know what wood chips are, but ramial chips are special. They are made from trees and tree limbs that are less than three inches in diameter. Why does the diameter matter? The difference between ramial chips and chips made from the trunk and large branches is the carbon content. The ramial chips have less carbon and more nitrogen than the regular chips. This means they can be used to feed the soil without tying up the soil's nitrogen. The chips make a wonderful and long-lasting plant food for grass and garden plants.

The problem with using ramial chips is that they take a lot of labor to produce. A small chipper might be enough to make ramial chips for a garden, but to produce an amount sufficient to fertilize a 20-acre field would be a monumental task. Cope is looking into using a tub grinder to increase his ramial chip supply to a scale that would help him. Please stay tuned.

Cope and another friend, Fred Thoenen of Frankenstein, have talked to me long enough that I took a step this past year that I hope will make a difference in our pastures. Both men have for years talked about the benefits of gamagrass. I'm a little slow, but at the age of 79 I figured it was about time to act or forget it. So, I planted between 30 and 40

acres with a no-till corn planter. About 10 acres is in a river bottom field and is meant to be a full stand and I'm prepared to take whatever steps I need to get it to go – and that includes herbicides, which I hate.

The other acres are at about five pounds of seed per acre, which is considered half a stand. Some is in the bottom and part on the hills. This grass – for the most part – is going to have to make it on its own. I'm not going to spray it and while I will protect it somewhat from grazing pressure, the cows will have considerable access to it. If I end up with a one or two percent survival rate on my 36,000 pounds of seed per acre, I will be delighted. I have a small field of gamagrass in one place that volunteered after we cleared a patch of cedars. That patch has been going about five years and keeps spreading. What excites me about gamagrass is that it has a root system that goes down six to eight feet in soil such as ours and much deeper in higher-quality soils. With roots like that, gamagrass will go deep into the soil to bring up both nutrients and moisture for other plants that can't go that deep.

The last article I will bring to your attention is one written by a true professional, Frankenstein's own Dr. Bob Kremer, a microbiologist who for years was a researcher with the USDA's Agricultural Research

Service and currently is an adjunct professor at the University of Missouri at Columbia. Dr. Kremer's story, which begins on Page 21, features the importance of deep-rooted plants. The photos he uses at the outset of the story tell it all, except the role of the buffalo.

The federal government appears ready to embark on a multi-trillion dollar "Green New Deal." It will be a disaster, I assure you. And I'll explain that in my column in the next few weeks. But what I'd like for you to do is search the internet for a three-minute video that shows the importance of crops. If all farmers cover-cropped, there would be no excess CO2. The video is "NASA: A year in the Life of Earth's CO2." You'll see in the video that improved farming practices provide the answer to what the federal government sees as a crisis.

The solution will be provided by people such as Greg Judy, Gabe Brown, John Frank, Harry Cope, Fred Thoenen and Dr. Bob Kremer, not the federal government.

In the coming year, I hope to spend more time with my faith, family, friends and farm and watch as the good guys show the folks in the swamp that they don't know what the hell they're doing. But the bad guys will still manage to squander trillions of our dollars.

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Prairie soil health

Understanding the microbial diversity and functional capabilities of soil in prairie ecosystems can be used to guide and monitor prairie reconstruction efforts and assess the health of agricultural land.

BY ROBERT J. KREMER

Native prairies are natural ecosystems on landscapes dominated by perennial grasses and broad-leaved herbaceous plants (forbs). Nelson (2005) reveals the tremendous native plant diversity of a prairie by describing a high-quality upland tract in Missouri as typically supporting at least 200 native vascular plant species.

Of the total living biomass constituting the prairie ecosystem, nearly two-thirds is located beneath the soil surface, occupied by the extensive root systems of the plant community (see Figure 1). These root systems support the most diverse soil microbial communities found in any terrestrial ecosystem on earth, largely due to continuous inputs of organic substances. These substances originate from fixation of carbon dioxide by photosynthesis and are released through roots into soil, a process known as rhizodeposition. Rhizodeposition supports metabolic and functional activities of the various soil microorganisms.

Understanding the microbial diversity and functional capabilities of soil in prairie ecosystems can be used to guide and monitor prairie reconstruction efforts. Further, such

information is important for developing land management practices effective in restoring key ecosystem functions of sustainable nutrient cycling, which reduces the need for synthetic chemical inputs, improves soil structure, and increases soil carbon sequestration, all of which are strongly controlled by soil microbial communities.

Also, characterizing the soil microbial community structure of prairies, which represent a pre-agricultural system, could be used to quantify the extent of degradation incurred on prairie soils during and after conversion to cultivated agro-ecosystems. A means of accumulating information on soil functioning within prairie and other terrestrial ecosystems is the use of soil quality or soil health assessment.

The concept of soil quality was introduced in the late 1970s as a means to improve land use based on the functional capacity of soil to meet defined human needs; thus, soil quality assessment focused primarily on management of agricultural ecosystems with an emphasis on agronomic productivity goals. Soil quality assessment evolved over time to soil health, which considered the soil as a vital and dynamic living system for sustaining biological productivity, maintaining

the quality of air and water, and promoting plant, animal, and human health.

The soil health concept may be applied inclusively to all terrestrial ecosystems including prairies and grasslands to illustrate how soils in natural settings function under conditions when all processes—chemical, physical, and biological—are in balance within a given landscape. Often, when agricultural sites are assessed for soil health, an adjacent natural area, if available, is also assessed to provide a proper baseline or reference point to document effects of management practices on the function of soils over time.

Organic Matter Content of Soil (SOM)

One of the most important indicators of soil health is the organic matter content of soil (SOM), generally measured as the concentration of soil organic carbon (SOC), which comprises about 50 percent of the SOM. Increases in SOM, particularly in biologically-available forms of SOM, are intimately linked to the activity and composition (diversity) of the soil microbial community, effective cycling and retention of nutrients, improved aggregation, and increased water-holding capacity.

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THE EXPANSIVE ROOT system of prairie grass growing on Mexico silt loam in mid-Missouri extending past 60-cm (24 inches) depth into the profile.

in a prairie ecosystem, the balanced interactions of a diverse microbial community in SOM mediate two ecological processes: mineralization of carbon (C), nitrogen (N), phosphorus (P), and sulfur (S) in SOM for uptake by plants essential for growth and vigor; and sequestration of C and N in SOM

See **Prairie Soil**, Page 25B



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Unleash soil energy

BY JON FRANK

Soil degradation is all around us, almost everywhere we look. It is happening in the tropics, in the deserts, and even on productive land.

Numerous practices have been listed as the cause of soil degradation, including lack of carbon, destructive fertilizers such as anhydrous ammonia and potassium chloride, using soluble fertilizers that damage biology and humus, toxic pesticides, improper management, and many more.

But have you considered that a primary cause is a loss of energy? Specifically, endogenous energy. Say what? A way to look at energy is by source. Exogenous energy is energy from the outside, such as sunlight and ambient heat. Endogenous energy is energy from within the soil system.

Let's take a dive into how to provide and increase endogenous soil energy in order to build soil. But first let's give credit to the early pioneer. Most of this article comes from the work and research of professor Gilles Lemieux and his associates, who documented the value of chipped hardwood branches, i.e. ramial chips.

I have confirmed many amazing benefits

Learn to Tap Into the Power of Ramial Chips

when using chipped hardwood branches including softer soil, higher Brix, less need for nutrient drenches, and better plant growth. Let's dig into the amazing value these ramial chips provide and the science behind their effectiveness at building soil. As a definition, ramial chips are finely chipped and shredded twigs and branches less than 3 inches in diameter derived from deciduous trees and shrubs.

Some of the best soils are created on the floor of hardwood forests that do not have excessive precipitation. Eastern and tropical soils, because of their high rainfall, have a leaching problem. This creates a calcium deficiency in the upper soil layers, that hinders microbial life, resulting in a suboptimum soil.

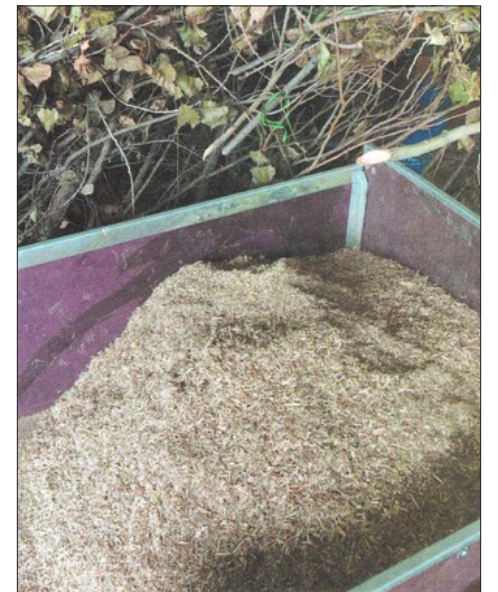
But when precipitation is somewhere around 30 inches per year deciduous hardwood forests create topsoil with beautiful texture and structure. Soils beneath conifers are notoriously poor and deficient. Throughout history we find this same pattern. Land originally taken from hardwood forests has been the placenta that raised up the great

civilization of the past. While land taken from conifer forests has proven so unproductive that civilizations do not thrive and the land reverts back to... that's right... conifers. Why such a big difference?

Do an experiment sometime: Take a walk through a hardwood forest and count all the plant species you encounter. Now do the same through a thick conifer forest. What is the difference? You literally couldn't count all the species in a hardwood forest while species under a blanket of conifer needles are few and far between. Why do hardwoods promote biodiversity while conifers vigorously suppress it? And what does that have to do with building soil? Keep reading.

Let's go back to the hardwood forest. What do we see? Understory shrubs and taller trees. On the floor is a layer of leaves from last fall along with twigs and fallen branches everywhere. As these decompose brand new soil is formed.

A deer comes along. Does it eat only the leaves or does it also eat some of the green twigs? It eats leaves and twigs. Goats will do the same thing. Why? Because twigs



and leaves are the growing point of trees and shrubs. They are biochemically active and contain a whole host of phytonutrients including protein, minerals, phenols, essential oils, terpenes and amino acids. They

See **Soil**, Page 25B

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Crops face danger of BMSB damage

BY LINDA GEIST
MU Extension

COLUMBIA, Mo. — A flurry of calls and emails from homeowners about the brown marmorated stink bug to University of Missouri Extension specialists sounds a warning of what is to come in in the next two years.

MU Extension field crop entomologist Kevin Rice says BMSB is infiltrating homes, looking for warm quarters in winter. If it follows the pattern of other states, it will become a major pest in field, fruit and vegetable crops, reducing yields and causing economic losses.

“BMSB adults typically overwinter in deciduous woods but are also attracted to human-made shelters such as homes and sheds,” Rice says. “They have a strong dispersal from crop systems towards overwintering sites after the fall equinox.”

This invasive insect species established populations in Missouri several years ago and is now present throughout the state, he says. As the name indicates, it is brown and stinks. It can be distinguished from native stink bugs by white bands on their antennae.

In soybean, BMSB scars seeds and flattens pods. In large numbers, it delays senescence in soybean, resulting in “stay

green syndrome,” causing additional losses at harvest. In corn, it reduces kernel quality and increases disease susceptibility.

BMSB is an “edge species,” with higher populations along field borders. Rice says those with questions about chemical control in field, fruit and vegetable crops should contact their county MU Extension center.

For homeowners, Rice recommends a video from Virginia Tech researchers on managing BMSB without toxic chemicals. The brief video shows how to make inexpensive stink bug traps from simple household items at youtu.be/DNjzdH45XT4.

A new MU Extension publication, “Brown Marmorated Stink Bug in Midwest Field Crops,” is available for free download at extension.missouri.edu/g7413.



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Success Starts Here.

MU research looks at technology to kill weeds

BY LINDA GEIST
MU Extension

COLUMBIA, Mo. — If it's a weed, spray it. That's the mindset that most in the agriculture industry held for years.

That thinking no longer works as more weeds become resistant to herbicides, says Kevin Bradley, University of Missouri Extension weed scientist.

Bradley uses waterhemp as an example. Waterhemp is one of 14 herbicide-resistant weed species in Missouri. It is a prolific producer of seeds, and Bradley considers it Missouri's most worrisome weed.

"It's clear that we need a new approach," he says.

MU Extension researchers are looking at how to remove weeds without herbicides. One nonchemical method is electrocution. The Weed Zapper, made in Sedalia, Mo., is used mostly in organic operations, but it may also work in conventional pasture and row crops. Mizzou has used the Weed Zapper on test plots and saw 98.6 percent effectiveness in waterhemp destruction.

The Weed Zapper's copper boom attaches to the front of a tractor and hits

weeds with 15,000 volts of electricity from a 110,000-watt generator on the back of the tractor.

Bradley notes that the Weed Zapper can be dangerous because of its voltage. It also can have negative effect on soybean yield if a lot of the foliage is contacted by the boom in later growth stages.

Its effects are immediate and deadly, especially on larger weeds. It works best when used at seven-day intervals rather than in a single pass.

It is most effective on waterhemp, ragweeds, horseweeds and cocklebur. It is less effective on foxtail and barnyardgrass.

"It's not a silver bullet, but it is very effective on several of our most trouble-



some weed species," Bradley says.

Another option is the Seed Terminator. This seed control tool attaches to the back of a combine. Its dual hammer mills crush the chaff through stationary and rotating bars to make it nonviable.

Bradley says there is a need for more research to understand how new technologies can best reduce weeds in U.S. soybean. Seed destruction is popular in Australia but not widely used in the U.S.

Weeds such as waterhemp, Missouri's No. 1 weed, can exit the combine in areas such as the header and grain tank. In fact, Bradley says about two-thirds of the seed goes out the back of the combine. Multistate

studies are underway to look at how to reduce the number of seeds making it to the soil.

It might take several seasons of use to see substantial reductions, Bradley says.

Most seed that goes through the combine, even pinhead sized waterhemp and palmer amaranth seeds, becomes nonviable.

Increased engine load on the combine raises fuel consumption an average of 4.1 gallons per hour.

Funding for this research project comes from the Seed Terminator, Mizzou Weed Science, United Soybean Board, Missouri Soybeans and Case IH Agriculture.

Graduate students Travis Winans and Haylee Schreier work with Bradley on the research.

Watch a Mizzou Weed Science demonstration of the Weed Terminator at ipm.missouri.edu/IPCM/2020/7/fieldDayVideo5-MB.

Learn more about MU Weed Science research at weeds.missouri.edu, on Facebook at [weeds.missouri](https://www.facebook.com/weeds.missouri) or @ShowMeWeeds on Twitter.

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Soil • from page 22B

also contain simple sugars, carbohydrates, cellulose, hemicellulose and lignin.

Lignin is what confers strength to cell walls. It starts out as monolignols, which are then chained together to make lignin. Monomer lignin can bind to identical lignin chains to make polymer lignins. When only a few monomers are joined together it is referred to as oligomer lignins. When many monomer lignins are joined together it becomes highly polymerized. Think of lignin in three cases:

Monomer: The stiffness of a fresh blade of grass

Oligomer: The stiffness of a slender green twig

Polymer: The stiffness of a 2 x 4 board

Deer and goats eat tender twigs because they are digestible to the microbial system in their rumen. Why? Because lignin is only slightly polymerized. The energy supporting the rumen bacteria is undoubtedly coming from the cellulose and other sugars but access to that energy is determined by the degree of polymerization. In order words, just because there is energy in wood doesn't mean we feed our goats sawdust from a lumber mill. The energy is there, but the lignin locks the door.

But what if we took these twigs and branches and processed them into ramial chips and worked it into the soil? Certain fungal organisms will begin breaking down the crosslinked lignin through their internal system of enzymatic reactions. This process is called depolymerization. As the wood

chips are depolymerized it frees up the cellulose and other carbons that were bound by the lignin.

The sugars, carbohydrates, cellulose and hemicellulose freed up from the lignin matrix now feeds the microbial system in the soil. Not all at once, but rather a slow unwinding of stored energy. As one life form feeds on another it transfers energy, minerals, moisture, etc. This eventually reaches the plant resulting in the benefits I listed at the beginning of this article.

Depolymerization of oligomer lignin from hardwood twigs and small branches is the starting point that leads to a steady supply of endogenous soil energy. This process happens automatically in hardwood forest soils but in commercial fields this energy source has been exhausted a long time ago. Without an endogenous source of energy, we must rely on exogenous inputs such as nitrogen, soluble nutrients, and hopefully some added carbohydrates.

Ramial chips are the perfect food supply to the microbial system in soils. It is very much like an all-you-can-eat buffet for soil life. Most soils don't have this energy source and consequently do not support a healthy microbial community. Instead they must rely on plant root exudate and sloughed off root hairs for the needed carbohydrates, and that is typically a boom/bust affair.

A great benefit of using an endogenous source of energy from depolymerized lignin is that nitrogen transfers through the trophic chain to the plant as amino acids/proteins. When soil biology is given a source of energy, they always find a way to get the nitrogen they need to live and reproduce.

Earlier I mentioned the conifer branches should be avoided when making ramial chips. The reason is because pines and conifers create a monolignol that is very suppressive of other life forms except for the conifers themselves. In my opinion, conifers are best used to make lumber and biochar.

So how do we establish an endogenous energy source within soil? Copy what

nature does in the forest with fallen twigs and branches. Use about 1/4 to 1/2 inch of ramial chips for a 1-3 year energy supply.

Jon Frank is the founder of growyourownnutrition.com and can be reached for consultation at growyourownnutrition@gmail.com.

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When price is right, wheat middlings are good cattle feed

BY LINDA GEIST

MU Extension

COLUMBIA, Mo. – At the right price, wheat middlings are a good source of protein, fiber and phosphorus for livestock, says University of Missouri Extension livestock specialist Kendra Graham.

Wheat middlings, or midds, are lightweight feeds used in mixes. The middlings are a byproduct of the wheat milling industry that is not flour. Flaky and loose, they are inconvenient to store and transport. They are best suited to being made into pellets, which are denser and less prone to spoilage, bridging and absorbing moisture.

Rich in protein, wheat middlings also offer high levels of energy. Cattle find

mids easy to digest, and weaning calves do well with them. They are high in fiber, low in starch and they produce little bloat or acidosis when fed in the right amount. On the other hand, wheat middlings are low in calcium.

Wheat midds serve as a good high-protein, high-fiber calf creep and beef cow supplement during drought. Price depends on seasonal demand and may be lower in April, May and June, Graham says.

Northwestern Missouri producers may find it to be an inexpensive feed due to lower transportation costs from Kansas, the nation's largest producer of wheat. Barges also deliver them at St. Louis docks on the Mississippi River.

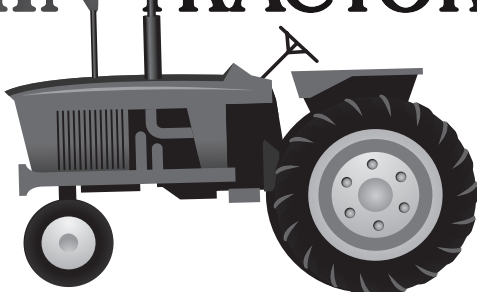
Prairie Soil • from page 21B

pools for long-term maintenance of soil health, including structure and fertility.

Unlike agro-ecosystems that are often subject to tillage and other imposed management practices, natural ecosystems are relatively free of extensive human disturbance, thereby allowing formation of and processes mediated by SOM to function properly. However, the historical contribution to overall soil health by herds of bison and other grazers as integral components of the prairie ecosystem must be acknowledged. Herding behavior is believed to significantly impact SOM formation and accumulation due to stimulated release of C from roots of growing plants due to grazing, trampling of vegetative residues causing intimate contact with soil and the microbial decomposers, and deposits of digested materials at the grazing site before moving on to new areas.

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Five steps to pass the farm to the next generation

BY LINDA GEIST
MU Extension

COLUMBIA — Farm succession planning should not begin when the head of the family dies, says Wesley Tucker, University of Missouri Extension agricultural economist and succession planning coordinator.

Too often, planning starts the day after the funeral, Tucker says. In addition to straining family relationships, this also increases the likelihood that the next generation will fail.

U.S. Small Business Administration data shows that transitions of existing businesses to family members succeed only 30 percent of the time, compared to 70 percent for transitions to people outside the family. Third-generation success rates are even more dismal — about 15 percent.

USDA data shows that two-thirds of U.S. farmland is owned or leased by someone over 55. Control of a third of that land will change hands in the next 10 to 15 years.

Since 1974, younger people have owned less and less farmland and fewer small businesses, the fabric that holds rural communities together. This emphasizes the need for succession planning, Tucker says.

Successful transfer of farm ownership and management begins with open communication and good documentation, Tucker says. Tell both on- and off-farm family members how the farm will pass to the next generation.

“The biggest mistake in succession planning is keeping secrets,” he says. “Family members can accept difficult decisions when clear and open communication exists and they understand the ‘why’ behind the decisions.”

Sometimes the older generation holds onto ownership and management of the farm until their deaths or when the next generation is also aged. This too reduces the chance of future success. Family members who work on the farm may do so for decades with no clear plan for transfer.

One common pitfall of generational farming is that compensation ties loosely to contributions made by younger family members. With ambiguous verbal promises such as, “You’ll be taken care of when we’re gone,” younger family members may step into roles without clear assurances of future pay or inheritance.

In partnership with the Missouri Small Business Development Centers, one-on-one, personalized assistance is available to help owners make confident decisions to plan and prepare for their farm succession.

Assistance from MU Extension

MU uses these core guidelines when providing assistance with succession planning:

1. Encourage the successor to gain experience and education off-farm. Expose that person to other farms or businesses and memberships in professional groups.

2. Have a trial work period. At the end, do an honest evaluation of all parties. Keep family and business relationships separate. “Being flesh and blood does not guarantee success,” Tucker says.

3. Begin the path to management and ownership early. Those who come back to the farm should not sign up for a life of servitude without clear expectations of future rewards.

4. Involve the younger generation in financial decision-making. Finances are usually the last part of the business transferred and often does not happen until the day after the funeral, when the checkbook is seen for the first time, Tucker says.

5. Plan for the next generation to become the majority owner and manager. Let the senior family member pass the reins to the next generation and bring in the next generation.

Finally, if you are the owner, pat yourself on the back for preparing to pass on the farm and its legacy in a timely fashion to ensure its continued success, Tucker says.

Ready to make a plan?

Succession planning assistance is available from MU Extension. To schedule a free consultation, contact Tucker at tuckerw@missouri.edu or 417-326-4916.



STANLEY SHOEMAKER heads to the machine shed along Shoemaker Road south of Owensville with his combine (above) at the end of his 2020 harvest season. **KATHY SHOEMAKER** tends to her grandsons, Brody (in her lap) and Luke Gerlemann as her husband, Stanley, puts away his combine for the 2020 harvest season. The couple has their holdings in a trust and their children will have the opportunity to divide their farm acreage up or keep it together by exercising the right of first refusal to buy out the others if that’s what they wish to do.

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Without forage test, hay by any other name is just hay

BY LINDA GEIST
MU Extension

COLUMBIA — Mature hay is hay. It may be brome hay, prairie hay or any other type of hay. But in the end, it's just hay until it's been tested.

Forage tests tell the tale of whether hay is of good quality and nutrient-rich, says University of Missouri Extension livestock specialist Gene Schmitz.

Nutrient content of hay, haylage or silage directly relates to its stage of maturity at harvest. As plants mature, they lose digestibility and nutrients. "This is true across all plant species," Schmitz says.

A hay test sifts the good from the bad and tells the buyer what the eye cannot. At a minimum, forage tests measure moisture, crude protein and acid detergent fiber. With this information, the energy value or TDN (total digestible nutrient) value can be determined.

Forage tests run about \$20 to \$30. Schmitz says they are worth the cost.

"For many years, I've summarized forage quality values from the forage tests I receive in my office," Schmitz says. "Extreme variation is always present."

Schmitz points to hay test data from 2018 to illustrate this point. "For cool-season grass hay samples, the average crude protein content was 11.5 percent. That is really good, but the range was 6.5 percent to 19.9 percent. For TDN, the average was 54 percent, but the range was from 47 to 67 percent. With those extremes, average or even book values really become meaningless numbers."

Hay tests help producers develop cost-effective feeding programs to meet animal production and performance goals. A minimal investment in hay testing allows producers to manage feed costs that directly affect the bottom line.

Visit the NRCS + MU Grasslands Project website at extension.missouri.edu/programs/nrcs-mu-grasslands-project.a



RON LANG bales hay during the summer of 2020 on ground overlooking the Owensville Walmart store.

PHOTO BY DAVE MARNER



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