

HIGHLIGHTING RESEARCH  
AND OUTREACH EFFORTS AT  
THE UNIVERSITY OF KENTUCKY

MARCH 2022  
ISSUE #0022

# EQUINE SCIENCE REVIEW

[CA.UKY.EDU/EQUINE](http://CA.UKY.EDU/EQUINE)  
[@UKAGEQUINE](#) ON FACEBOOK/TWITTER

**ETC EGG HATCH UNDERWAY! 3**  
Eastern tent caterpillars have begun to hatch.

**UNIVERSITY OF KENTUCKY STUDENT  
RESEARCHING CONNECTIONS BETWEEN  
WAGERING OPTIONS, 5**  
Historical, live horse racing in KY.

**GOEHRING NAMED AS OIE REFERENCE  
LABORATORIES EXPERT IN EHV-1, 6**  
OIE Reference Lab expert for equine rhinopneumonitis (EHV-1).

**SEARCH OPEN FOR UK DEPARTMENT OF  
VETERINARY SCIENCE CHAIR AND GLUCK  
CENTER DIRECTOR, 7**  
Applications due by May 20.



College of Agriculture,  
Food and Environment

## WRITER, EDITOR AND LAYOUT

**Holly Wiemers, MA, APR** communications and managing director; UK Ag Equine Programs | [holly.wiemers@uky.edu](mailto:holly.wiemers@uky.edu)

## EDITORIAL ADVISORY BOARD

**Emma Adam, DVM, PhD, DACVIM, DACVS**, assistant professor, research and industry liaison, Gluck Center

**Richard Coffey, PhD, chair**, Animal and Food Sciences

**Bob Coleman, PhD, PAS, Dip. ACAN**, associate professor and equine extension specialist, Animal and Food Sciences

**Dan Howe, PhD, acting chair**, Veterinary Science, acting director, Gluck Center

**Laurie Lawrence, PhD, professor**, Animal and Food Sciences

**Krista Lea, MS, coordinator**, UK Horse Pasture Evaluation Program, Plant and Soil Sciences

**James N. MacLeod, VMD, PhD, director**, UK Ag Equine Programs and John S. and Elizabeth A. Knight chair, Gluck Center

**Martin Nielsen, DVM, PhD, Dipl. ACVM, Schlaikjer** professor of Equine Infectious Disease, associate professor, Gluck Center

**Mick Peterson, PhD, professor**, Biosystems and Agricultural Engineering

**Ray Smith, PhD, extension professor**, Plant and Soil Sciences

**Jill Stowe, PhD, associate professor**, Agricultural Economics

## DESIGN

**Jordan Smith, marketing manager**, UK College of Agriculture, Food and Environment

*Equine Science Review is a monthly College of Agriculture, Food and Environment newsletter that highlights important equine work happening at the University of Kentucky.*



*Photo courtesy Dr. Jimmy Henning.*

# EASTERN TENT CATERPILLAR EGG HATCH NOW UNDERWAY FOR CENTRAL KENTUCKY

Eastern tent caterpillars have begun to hatch, with the first detections in Southern Kentucky last week. According to entomologists in the University of Kentucky College of Agriculture, Food and Environment, they are expected in Central Kentucky by this or next week and Northern Kentucky a few days to a week after that.

After spending about nine months as eggs in masses on twigs of wild cherry and related trees, the first tiny eastern tent caterpillars of the season are now leaving their eggs, said Jonathan Larson, PhD, UK extension entomologist. The egg hatch normally occurs at 50% bloom of forsythia, the interval between first and full bloom of the common spring-blooming plant. The larvae are among spring's first active insects and are well-equipped to cope with Kentucky's erratic temperature swings. Egg hatch occurs over several weeks in early spring. This increases the chance for survival in case of late freezes. The caterpillars grow and develop when the temperature is above 37 degrees F. Their preferred food plants are wild cherry, apple and crabapple, but they may appear on hawthorn, maple, cherry, peach, pear and plum as well.

When mature, the 2- to 2.5-inch long, hairy caterpillars have a habit of wandering from their host trees to seek protected areas to spin their cocoons, or to seek additional food if their natal tree becomes defoliated. At such times, they may crawl along fence lines and into pastures.

Consumption of large numbers of caterpillars by pregnant mares caused staggering foal losses in the Mare Reproductive Loss Syndrome outbreak of 1999-2001. MRLS can cause early- and late-



PHOTO COURTESY DR. JONATHAN LARSON.

term foal losses or weak foals. UK researchers conducted studies that revealed horses will inadvertently eat the caterpillars when present in pastures and feedstuffs. It is the caterpillar hairs, specifically the cuticles of those hairs, that embed into the lining of the horse's alimentary tract. Once that protective barrier is breached, normal alimentary tract bacteria may gain access to and reproduce in sites with reduced immunity, such as the fetus and placenta.

If practical, farm managers should move pregnant mares from areas where wild cherry trees are abundant to minimize the chance of caterpillar exposure. The threat is greatest when the mature caterpillars leave trees and wander to find places to pupate and transform to the moth stage.

Eastern tent caterpillars are also a nuisance to people living near heavily infested trees. The nests and defoliation are unsightly, and the caterpillars may wander hundreds of yards in search of protected sites to spin cocoons and pupate.

“Managing ETC in small

ornamental trees, such as flowering crabapples, is easy,” said Daniel Potter, PhD, UK entomology professor “Just wear a pair of grocery store plastic bags like mittens, climb a stepladder, pull out the tents, turn the bags inside out to ‘bag’ the caterpillars and stomp them. Pruning out nests in ornamental trees sounds great, but in reality, by the time they are noticed, they’re often in branch crotches where pruning will compromise the symmetry of the tree.

“Spraying the flowering fruit and decorative trees preferred by the caterpillars can be a bee hazard – and with some products, a label violation – because the trees are in bloom with bees visiting them at the same time eastern tent caterpillars are active,” he said.

According to Potter, caterpillar management around horse farm paddocks comes down to keeping pregnant mares away from infested trees and either removing or not planting preferred host trees near paddocks. Additionally, controlling the caterpillars with insecticides may be warranted in some settings. That may require treating tall trees

that are difficult to spray.

For the latter scenario, professional arborists treat via trunk injection. Products labeled for eastern tent caterpillar control include Tree-äge and TreeMec (emamectin benzoate), Inject-A-Cide B (Bidrin), Abacide 2 (abamectin) and Lepitect (acephate). Applicators should read and follow all label instructions. All of the aforementioned injectable products are labeled for use on horse farms. For farms that are interested in prevention over the winter months, Larson recommended farms search for and destroy egg masses before they hatch.

“Egg masses can be seen over the winter, they look like sparkly, pyrite gum wrapped around twigs and branches,” he said.

For more information about how to assess trees for egg masses, the UK Entomology publication, *Checking Eastern Tent Caterpillar Egg Masses*, is available at <https://entomology.ca.uky.edu/ef449>.

| *Holly Wiemers, MA, APR, is the communications and managing director for UK Ag Equine Programs.*



PHOTO COURTESY DR. JONATHAN LARSON.

## SPRING IS COMING ... SO IS ALFALFA WEEVIL!

The UK Ag Weather Center’s degree day (DD) model for alfalfa weevil indicates that many counties in Kentucky are likely to exceed 190 DD (used as a starting point to begin scouting) by the third week of March. Once temperature accumulations reach 190 DD, growers are advised to look at their alfalfa fields and begin alfalfa weevil larval counts. So far, degree day accumulations for this year are trending close to average for the last 10 years. For more information, visit the Kentucky Pest News article [here](#).

*Photo credit: <https://entomology.k-state.edu/extension/insect-information/crop-pests/alfalfa/alfalfa-weevil.html>*

# UNIVERSITY OF KENTUCKY STUDENT RESEARCHING CONNECTIONS BETWEEN WAGERING OPTIONS

A University of Kentucky student is conducting research to better understand the relationships between historical horse race wagering, live race wagering and purses at Kentucky racetracks.

Barrett Kerr is a junior at UK majoring in agricultural economics and is conducting research on the historical and live horse racing markets in Kentucky.

Historical horse wagering, also known as instant wagering, has grown in popularity in the past couple of years as more Kentucky racetracks have made that option available to consumers. However, the percentage of money going to purses differs across racetracks. Still, if the popularity of historical horse wagering continues to grow, it could impact purse sizes.

Being new to Kentucky and having never participated in horse wagering before, Kerr was intrigued to learn about the economics behind the industry. Kerr is analyzing data from the Kentucky Horse Racing Commission's monthly pari-mutuel wagering reports. He is breaking down how much money was wagered at eight racetracks in Kentucky from 2011-2021 and tracking purses over this same time period.

Kerr hopes his research helps industry stakeholders, Kentucky policymakers and decision-makers better understand the connections between historical horse wagering, live wagering and purses, which in turn can inform future policy decisions. Kerr will be using his research to write his master's thesis, undergraduate capstone and honors thesis while at UK.

Kerr has been conducting this research under the advisement of UK Professor Jill Stowe, PhD.

"I first met Barrett when he enrolled as a student in my AEC 503 class. As a University Schol-



WHILE IN IRELAND UK STUDENT BARRETT KERR IS CONTINUING TO STUDY HORSE RACE WAGERING AT MAYNOOTH UNIVERSITY. PHOTO PROVIDED.

ars Program student, he took the course for graduate credit," said Stowe, an agricultural economics professor in the UK College of Agriculture, Food and Environment. "I was impressed with his ability to perform at a high level; and in conversations after class, I came to learn that he is quite intellectually curious."

Currently, Kerr is studying abroad at Maynooth University in Co. Kildare, Ireland, but he continues to do his research and has gained an insight into horse race wagering's global impact.

"Ireland has a huge horse racing culture, and with that comes wagering on the races," Kerr said. "So, I guess it has just given me perspective into how large the industry truly is and how many people are a part of it, both nationally and internationally."

| *Whitley Lemons is a University of Kentucky student majoring in community and leadership development. Source, edited UK College of Agriculture, Food and Environment news release.*

# GOEHRING NAMED AS REPLACEMENT FOR TIMONEY AS OIE REFERENCE LABORATORIES EXPERT IN EHV-1



Lutz Goehring, PhD, Warren Wright, Sr. – Lucille Wright Markey Endowed Chair in Equine Infectious Diseases at the University of Kentucky’s Gluck Equine Research Center, will replace Peter Timoney MVB, PhD, FRCVS,

recently retired professor and Frederick Van Lennep Chair in Equine Veterinary Science at the Gluck Center, as OIE Reference Laboratories expert for equine rhinopneumonitis (EHV-1), according to an official communication from the OIE.

According to the organizations website, the need to fight animal diseases at global level led to the creation of the Office International des Epizooties through the international Agreement signed on Jan. 25, 1924. In May 2003, the office became the World Organization for Animal Health but kept its historical acronym OIE.

The OIE is the intergovernmental organization responsible for improving animal health worldwide. It is recognized as a reference organization by the World Trade Organization (WTO) and has a total of 182 member countries. The OIE maintains permanent relations with nearly 75 other international and regional organizations and has regional and sub-regional offices on every continent.

One of OIE’s missions is to ensure transparency in and enhance knowledge of the worldwide animal health situation. Among the formal obligations of OIE member countries is the submission of information on the relevant animal disease situation – including on zoonoses present on their territory – in the most timely and transparent way. A single OIE list of notifiable terrestrial and aquatic animal diseases has been established for this purpose. Since 2005, to accomplish its mandate the OIE created and managed the World Animal Health Information System (WAHIS) which was coupled with WAHIS interface, providing information on 117 listed diseases for 2021.

| *Holly Wiemers, MA, APR, is the communications and managing director for UK Ag Equine Programs.*

## RENOVATING HAY AND PASTURE FIELDS

Renovate means to renew and improve. This publication discusses managing a pasture or hay field that has become less productive and renovating or “renewing” it so that it will become more productive. In Kentucky, this usually means adding lime and fertilizer, controlling weeds and planting an adapted legume such as red clover and/or ladino white clover. The primary benefits of renovation

come as a result of getting legumes established in grass-dominated fields.

Download at UK’s forage website [here](#).

| *Source: kyforagenews.*



# SEARCH OPEN FOR UK DEPARTMENT OF VETERINARY SCIENCE CHAIR AND GLUCK CENTER DIRECTOR

The University of Kentucky's College of Agriculture, Food and Environment has opened its search for chair of the Department of Veterinary Science and director of the Maxwell H. Gluck Equine Research Center.

The chair provides academic leadership for faculty members located in the Gluck Center and the UK Veterinary Diagnostic Laboratory. In addition, the position works collaboratively with the Gluck Equine Research Foundation and its board, as well as UK Ag Equine Programs, an interdisciplinary equine unit that serves as a front door to equine work in the College.

It is a tenure-eligible, 12-month appointment with an anticipated start date of Jan. 1, 2023. A PhD, DVM/VMD or equivalent is required, as is professional experience including instruction, peer-reviewed scholarship and extramural funding.

Applications should be submitted by May 20 for full consideration. The position will remain open until filled. The online application can be found at <https://ukjobs.uky.edu/postings/386871>. Applicants are asked to include a letter of interest outlining their approach to the position's qualifications, responsibilities and vision for innovating and impactful programs; research interests statement; public service statement; teaching portfolio; career CV; and names/contact information for at least three references.

The focus of the Gluck Center is the scientific discovery, education and dissemination of information for the health and wellbeing of the horse. The Gluck Center strives to be an international leader in equine research and to collabo-



PHOTO COURTESY UK COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT.

rate with the equine industry and veterinary community, as well as educating the next generation of researchers through its graduate program. The Gluck Center has seven areas of expertise, including infectious diseases, immunology, genetics and genomics, musculoskeletal science, parasitology, reproductive health and toxicology.

The director of the Gluck Center works closely with the UK Gluck Equine Research Foundation Board and the college administration to direct programmatic investment of the income from a current endowment(s) and provide leadership to ensure the continued success of the philanthropic program. The director of the Gluck Center is expected to sustain highly visible and exceptionally cooperative relationships with all sectors of the large and growing equine interests. Global relationships are an integral part of Kentucky's equine industry, and candidates with international experience are highly desirable.

The UKVDL is a nationally and internationally recognized

center for diagnostic excellence, serves the full breadth of animal industries and is fully accredited by the American Association of Veterinary Laboratory Diagnosticians. Located in the heart of the Thoroughbred breeding industry, with long-standing and productive collaborations with equine hospitals, farms and the Gluck Center, the UKVDL is uniquely situated to study all aspects of equine health and disease. The UKVDL houses faculty and staff members with specialization in pathology, ruminant extension, toxicology, microbiology, serology, clinical pathology and epidemiology. The UKVDL conducts collaborative research and participates in the cooperative teaching program with Lincoln Memorial University for senior DVM students.

| *Holly Wiemers, MA, APR, is communications and managing director for UK Ag Equine Programs.*

# LARGE JORO SPIDERS LIKELY WILL NOT IMPACT KENTUCKY

Joro spiders, which are the size of a human palm and can fall from great heights, should pose little concern for most Kentuckians. Jonathan Larson, PhD, University of Kentucky entomologist, does not expect the large spider to appear in the state this year.

“The Joro spider has attracted a lot national attention recently because of reports regarding its potential range expansion along the East Coast this summer and beyond,” said Larson, extension entomologist in the UK College of Agriculture, Food and Environment. “Its numbers have been growing since it was first found in 2014 in Georgia. Given the natural expansion rate of the spider, it is unlikely we will see it in the Bluegrass any time soon. Though, you never say never.”

A lot of the media attention regarding this spider has focused on their size and ability to “parachute” into new areas.

“It is a large spider, and their babies will ‘balloon’ into new areas, but this is true of how many of our native spider species disperse into new areas as well,” Larson said. “A big spider can’t float away on a silk strand. You won’t see spiders the size of a kid’s hand floating through the sky. It is just the ones that have emerged from eggs recently.”

While their size is imposing and may make some people shudder, Larson said the spiders are mostly harmless.

“Their venom is not considered medically important to people or pets, and like most spider species, they aren’t looking to bite things they can’t eat if they can help it,” he said. “Typically, the larger the spider, the less potent their venom.”

While it is worrisome that the non-native Joro spiders’ range is predicted to expand, little is known about how it will behave in new

environments.

“It’s true that a potentially invasive species expanding its range like this is a cause for concern,” he said. “However, we’re still not 100% sure of the ecological impact of the Joro spider when it moves into new areas.”

One of the biggest annoyances reported by people living in areas where the spider is already established is the size of their webs. Joro spiders’ webs can be meters long and are stronger than the webs of native spiders. People may accidentally run into them and find them more annoying to untangle from.

Kentucky is home to several spiders that are similar to the Joro spiders in size and color. These

include the banded garden spider, black and yellow garden spider and the golden silk orb weaver. Each of these spiders will have different colorations and leg fuzziness than the Joro spider. These spiders are also harmless to people and pets.

UK entomologists want to hear from those who suspect they have found a Joro spider in Kentucky so they can help identify the possible suspect. Individuals can submit spider photos for identification to UK entomology’s Kentucky Bugs Facebook page @kentuckybugs.

| *Katie Pratt is an agricultural communications specialist within the UK College of Agriculture, Food and Environment.*



THE JORO SPIDER, TOP LEFT, HAS MANY SIMILARITIES TO SPIDERS ALREADY IN KENTUCKY BUT ALSO SOME DISTINCT DIFFERENCES. PHOTOS COURTESY OF BUGWOOD.ORG.



# EXHAUSTION IN HORSES

Exhausted horse syndrome refers to a range of metabolic and physiologic conditions that may occur when horses become fatigued. Affected horses may display a decrease in energy, appetite or appear stiff and weak. In serious cases, cardiac arrhythmias, shock, muscle damage, colic and diarrhea may develop. Horses that are under-conditioned, performing in endurance events or exercised in hot or humid environments are at higher risk for exhaustion. If exercise is not immediately halted and treatment initiated, then life-threatening complications may occur.

Exhaustion may develop with any prolonged period of exercise such as endurance rides, three-day events and extended trail rides. Many factors contribute to the potential for exhaustion. Different breeds are better suited to prolonged exercise while others excel at shorter, more high intensity work. The animal's training and fitness ideally should be suited for the event they are participating in, although even highly prepared animals may develop exhaustion. Any underlying disease, including lameness, anemia and respiratory disease will increase the risk of fatigue.

Exhaustion is a multifactorial condition. Heat, electrolyte imbalance and energy stores may contribute. A large amount of heat is produced while exercising. Heat needs to be appropriately regulated and removed from an exercising animal via sweat and air movement. If heat is not removed, then the core body temperature steadily increases. Approximately 65% of heat is lost via sweat, 25% via respiratory evaporation and the remaining 10% via other mechanisms. This is made more difficult when the conditions include

high heat and humidity or when the animal is dehydrated. Sweat contains important electrolytes such as sodium, potassium, calcium and chloride, which are lost as the horse sweats. If electrolyte imbalances are not corrected, then serious derangements occur leading to shifts in blood pH and cellular stability. The primary energy source for muscles is stored glycogen, which is a finite resource. Glycogen stores can be increased with training and exercise, but once depleted the muscle lacks a primary energy source and exercise will slow or stop.

Horses with exhaustion will have an increased heart rate, temperature and respiratory rate. They may appear depressed, unwilling to eat and drink, and, in some cases, develop colic, shock or laminitis. Horses that move with a stiff gait may have significant muscle damage and/or laminitis. These animals should not be forced to move if treatment can be provided on site. Affected horses are typically dehydrated and blood work shows evidence of stress and electrolyte imbalances. Muscle enzyme values will be increased and often continue to increase as muscle damage continues. Kidney values, which reflect both dehydration and renal damage, may be elevated and urine may be significantly decreased in volume and dark brown/red in color. Genetic testing, muscle biopsy or other diagnostic testing may be needed to determine an underlying cause in cases of repeated myopathy or suspected exhaustion.

Treatment includes immediately stopping exercise and initiating assisted cooling. This can be done with electric fans and running large volumes of cold water over the entire body. Intravenous fluids can be given to restore hydration and electrolyte status. Once there is

evidence that the intestinal tract is functioning, then oral fluids may be added to aid hydration; however, these should not be administered until the horse has good gut sounds and no signs of colic. Horses should not be transported following exhaustion until cleared by their medical team.

Exhaustion is best prevented by acclimatization, proper training, nutrition and supplementation of electrolytes. Electrolyte products require adequate water intake to be effective. Horses given concentrated electrolytes without appropriate water consumption will actually increase dehydration. Acclimatization to a climate with excessive heat, altitude or humidity may take up to two weeks. Conditioning will create larger muscle glycogen stores, improve efficiency of heat elimination and train horses to eat and drink during prolonged work. It is also important to allow horses enough time to recover and rehydrate from Event organizers will assess the safety associated with heat and humidity, and events may need to be cancelled if environmental conditions are considered dangerous. A rider may be the first to recognize that their horse is displaying abnormal behavior or unwillingness to work, which is often an early sign of exhaustion. Vet checks throughout endurance events are designed to identify horses showing early signs of fatigue. These checks may require horses be rested or removed from competition before serious complications occur.

| *Rebecca Ruby, MSc, BVSc, Dipl. AVCP, assistant professor and veterinary pathologist at the UK Veterinary Diagnostic Laboratory. Source: October 2021 Equine Disease Quarterly.*

# EQUINE EQUIPMENT FIELD DAY

## WHEN

**Saturday, April 2, 2022**  
**10:00 am—1:30 pm**

## WHERE

**Flying Cross Farm**  
9220 West U.S. Highway 42, Goshen, KY 40026

**FEATURING • Tractors & Equipment from local dealers on display**

**AUDIENCE • Targeted to farms with 25 acres or less**

## FIELD DAY TALKS

- ⇒ **Selecting a New or Used Tractor - Morgan Hayes, UK Biosystems & Ag Engineering**
- ⇒ **Selecting Equipment - Josh Jackson, UK Biosystems & Ag Engineering**

***Registration is needed to reserve lunch by calling Oldham County Extension (502) 222-9453***

Cooperative Extension Service  
Agriculture and Natural Resources  
Family and Consumer Sciences  
4-H Youth Development  
Community and Economic Development

Educational programs of Kentucky Cooperative Extension serve all people regardless of economic or social status and will not discriminate on the basis of race, color, ethnic origin, national origin, creed, religion, political belief, sex, sexual orientation, gender identity, gender expression, pregnancy, marital status, genetic information, age, veteran status, or physical or mental disability. University of Kentucky, Kentucky State University, U.S. Department of Agriculture, and Kentucky Counties, Cooperating.  
LEXINGTON, KY 40546



 Disabilities accommodated with prior notification.

 University of  
Kentucky

Ag Equine Programs  
College of Agriculture, Food and Environment

## CONFIRMED EXHIBITORS:

**Andersons' Sales & Service**

6159 KY-146  
Crestwood, KY 40014

Phone: (502) 241-7222

**Henry County Supply**

1497 Campbellsburg Rd.  
New Castle, KY 40050

Phone: (502) 845-5620

**Skylight Supply**

2906 Axton Lane  
Goshen, KY 40026

Phone: (502) 228-0070

**Wayne's Polaris**

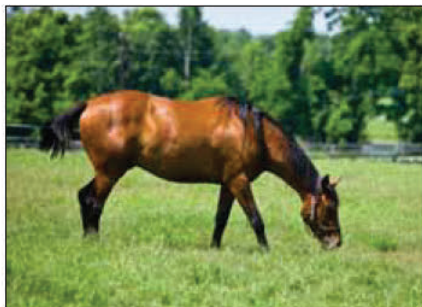
1707 E Jefferson St.  
La Grange, KY 40031

Phone: (502) 222-1564

**Wright Implement**

600 Gordon Lane  
Shelbyville, KY 40065

Phone: (502) 633-1515



# Soil Sampling and Nutrient Management in Horse Pastures

*G.J. Schwab and M.W. Piersawl, Plant and Soil Sciences*

Horse pastures are fertilized to ensure a reliable supply of energy, protein, and other nutrients for a long season of grazing. Management of plant nutrients maintains a balance of improved grasses and legumes and suppresses many pasture weeds. Properly fertilized pastures look good and harm neither animals nor the environment.

The most important part of obtaining fertilizer recommendations is collecting a representative soil sample to send to the lab. Soil test results and fertilizer recommendations are based solely on a few ounces of soil submitted to the lab for analysis, which are assumed to represent several million pounds of soil in the field. If this sample does not reflect actual soil conditions, the results can be misleading and result in costly over- or under-fertilization.

## Timing

You can collect soil samples throughout much of the year, although fall (September through December) or spring (February through April) are the best times. With fall sampling, lab results and nutrient recommendations may be returned more quickly because fewer samples are submitted to the lab at this time. Fall sampling will also allow you to apply the fertilizer when prices are generally lower and soils are drier, making them less likely to be compacted by traffic. However, very dry fall conditions can cause erroneously low soil test potassium (K) levels. If possible, do not collect soil samples during a drought. In any case, a field should always be resampled at the same time of the year so you can make historical comparisons.

Fields should be sampled every two years. If you apply horse muck and other manures to your fields, you should sample annually, because manures rapidly raise soil phosphorus, potassium and zinc levels.

## Tools

A soil probe, auger, or spade are the tools needed to take the individual cores that make up the field sample. The spade sample should be trimmed with a knife. (Figure 1). You will also need a clean, dry plastic bucket in which to collect and mix the sample cores. Be sure not to use galvanized or rubber buckets; they will contaminate the sample with zinc. Information forms and soil sample boxes/bags for submitting samples are available at all county extension offices.



**Figure 1.** A soil probe, auger, or spade should be used in sampling soils. The spade sample (shown in the center of the picture) should be trimmed as shown with a knife.

## Note to Horse Owners

In 1994, the Kentucky General Assembly passed The Kentucky Agriculture Water Quality Act (AWQA). The AWQA (KRS 224.71-100 through 224.71-140) states that landowners of 10 acres or more who conduct or allow agriculture or silviculture (forestry) production on their land were to be required to develop and implement a water quality plan as of October 23, 2001.

These individual water quality plans should be based upon guidance found in the Kentucky Agriculture Water Quality Plan.

One of the six sections that make up the Kentucky Agriculture Water Quality Plan is Pesticides and Fertilizers (Section 2). This section requires routine soil sampling and appropriate fertilizer/manure applications. A website designed to help landowners write water quality plans can be found at [www.ca.uky.edu/awqa](http://www.ca.uky.edu/awqa).

The following agencies can provide more information about the Kentucky Agriculture Water Quality Act:

- Your county office of the Kentucky Cooperative Extension Service (which can also provide infor-

mation about Ky-A-Syst publications that apply to your land)

- Kentucky Division of Conservation
- Kentucky Division of Water, regional office
- USDA Natural Resources Conservation Service
- USDA Farm Service Agency
- Kentucky Division of Forestry, district office
- Your local soil and water conservation district office
- Your county health department
- Kentucky Farm Bureau Federation

## Collecting Field Samples

An individual sample should represent no more than 20 acres unless your soils, past management, and cropping history are uniform. You can obtain the most representative sample from a large field by sampling smaller areas that vary by soil type, cropping history, topography, and erosion/ past management practices (Figure 2). For example, manure may have been applied recently to one part of a field but not the other. Phosphorus and potassium levels likely will be higher in areas where you have applied manure. If you sample that field as one unit, the soil test will result in the no-manure part of the field being under-fertilized. It is much better to collect separate samples from areas that differ because their nutrient requirements are likely quite different. Grid soil sampling, sampling smaller defined areas (grid cells) within larger fields, and prescription fertilizer applications could result in more accurate recommendations and lead to greater fertilizer efficiency. However, such intensive sampling is costly, and to date Kentucky research has not shown an economic benefit. See University of Kentucky Cooperative Extension publication *Taking Soil Test Samples* (AGR-16), for specific details on recommended grid sampling methods.

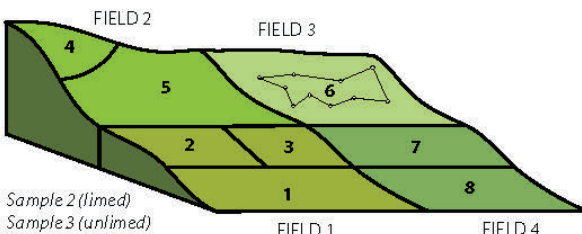
You can also use soil sampling to troubleshoot areas of the field that are visually different or are consistently low yielding when compared to the rest of the field. Take a sample both from the poor-growth area and adjacent, good-growth areas. A handheld GPS unit may be useful in locating sampling sites. Keep good records of where each sample was taken.

Collect at least 10 soil cores for small areas and up to 30 cores for larger fields. Randomly take the soil cores throughout the sampling area and place them in the bucket.

Do not sample:

- dung piles
- old fencerows or under trees
- areas used for manure or hay storage
- livestock feeding areas where lime was previously stockpiled

**Figure 2.** This figure shows how four fields might require the analysis of one to three composite samples for determining fertility needs. Each composite must contain 10 or more cores, as shown for sample 6 in field 3.



## Depth

Sampling at a depth that will give accurate test results is commonly overlooked. Previously applied broadcast fertilizer and surface decomposition of plant residue cause most plant nutrients to accumulate at the soil surface, so soil test values will usually decrease as the sample depth increases. To obtain accurate results that are consistent from year to year, horse pasture samples should be taken to a depth of 4 inches.

## Sample Preparation

After all cores for an individual sample are collected and placed in the bucket, crush the soil and mix the sample thoroughly (Figure 3). Allow the sample to air-dry in an open space free from contamination. Do not dry the sample in an oven or at an abnormally high temperature. When the sample is dry, fill the sample container with soil (Figure 4).

Sampling and preparing the soil for submission is only half of the process. The other equally important part is filling out a sample information sheet so that the soil analyst can consider desired crop, tillage, and other information when making the fertilizer recommendation (Figure 4). The form contains all the information needed to provide accurate lime and fertilizer recommendations. Sample information sheets for the University of Kentucky soil testing laboratories can be found on the web at <http://soils.rs.uky.edu/forms/sampleforms.php>. Use the agricultural form when submitting samples from horse pastures or hay fields. Staff at your local county extension office can help you complete the form and will send it with the sample to the UK soil testing laboratory. Results and recommendations will be e-mailed to the county office, usually within one to two weeks, and returned to you.

Thoroughly mix the air dried sample, fill the sample bag or box, mark it as an agricultural soil sample, fill out the information sheet, and take the form and the sample to your county extension office.



**Figure 3.** Break up clods while the sample is moist, and spread the sample out to air-dry in a clean area.



**Figure 4.**

## Nutrient and Fertilizer Management

When you get back your soil test results, you should lime and fertilize pastures with phosphorus (P) and potassium (K) according to soil test recommendations so desired forages will grow vigorously and compete against undesirable weeds (Table 1). Maintain soil acidity (pH) in horse pastures between pH 6.0 and pH 6.5 by applying agricultural limestone every four to five years according to test recommendations—typically 2 to 3 tons per acre every four to five years. Soil acidity in this range ensures optimum availability of plant nutrients for pasture growth. Different formulations of P and K fertilizers vary little in performance and availability of plant nutrients; choose the one with the least cost per unit weight, but factor in how easy it is to apply (for example, prill size).

Remember that pasture fertilization is not a sound approach to alleviate macronutrient and micronutrient deficiencies of horses. These problems may be better addressed more directly, by feeding mineral supplements, for example.

## Broadcasting Nitrogen on Cool-Season Grass Pastures

The need to topdress nitrogen (N) on horse pastures in Kentucky is often less than that for cattle pastures. This difference is because the goal with mature horses is weight/condition maintenance, while the goal on most beef cattle pastures is maximum weight gain. Nitrogen fertilizer is not recommended if the pasture contains more than 25% clover in the stand, since the N needs for the grass will be supplied by the clover. Table 2 and 3 give N fertilization guidelines based on the stocking rates of horses in a cool-season grass pasture.

Cool-season grasses, such as Kentucky bluegrass, orchardgrass, timothy, and tall fescue, grow most vigorously from early spring into early summer and then again in the fall into early winter. When soil moisture, pH (more than 6.0), and soil test levels of P and K (P more than 30, K more than 200) are adequate, fertilizer N will stimulate cool-season grass growth during these peak production periods. The use of N should depend on what is expected from the pasture. Nitrogen fertilization can help increase total production

and protein content, extend spring grass growth into the early summer, and extend fall pasture production into early winter. However, unless the increased pasture yield is used, the added N expense yields no return.

Nitrogen fertilization in horse pastures has several disadvantages. Stimulating grass growth in the spring can be helpful in maintaining a high stocking rate, but frequent clipping will be required to maintain pasture quality in a lightly stocked horse pasture. Late spring N application may have the unintended result of promoting the growth of summer weeds, such as crabgrass, yellow foxtail, nimblewill, and common ragweed. In addition, you'll need to be extra cautious when broodmares are on pastures that contain tall fescue. In these pastures, spring N has been known to increase levels of ergot alkaloids, leading to an increased likelihood of symptoms of fescue toxicity (prolonged gestation, difficult birth, and lack of milk production). Fortunately, the potential for fescue toxicity is an issue only with broodmares, since toxicity symptoms related to tall fescue are not known to occur in other classes of horses.

Excessive N applications may result merely in wasted forage. At low stocking rates (more than 2 acres per mature horse) on soils with good productivity, N should be broadcast only in the fall (Table 2). Fall applications stimulate tillering of individual grass plants and produce a denser grass stand, which can suppress weed growth. Fall applications also lengthen the period of active photosynthesis, which promotes root growth and winter survival. If the primary goal is a denser grass stand, one late fall application, between late October and early November, is sufficient. If fall pasture growth is important, also apply N between mid-August and mid-September.

At higher stocking rates (less than 2 acres per mature horse) on soils with good productivity, fertilizer N may be broadcast on cool-season grasses throughout much of the growing season (Table 3). A late winter application will stimulate a growth flush in early spring. An N application in May will help extend the pasture into the early summer, and an application in August will stimulate cool-season pasture grass production in the fall and early winter. The major limitation to summer N fertilization is its stimulation of the growth of summer weeds.

**Table 1.** Phosphate and potash recommendations (lb/A) for cool-season grass horse pastures when applying annual fertilizer applications.

Category	Test Result: P	P <sub>2</sub> O <sub>5</sub> Needed	Test Result: K	K <sub>2</sub> O Needed
<b>Very high</b>			>420	0
<b>High</b>	>60	0	321 - 420 301 - 320	0 0
<b>Medium</b>	46 - 60	30	267 - 300	30
	41 - 45	40	240 - 266	30
	37 - 40	50	213 - 239	30
	33 - 36	60	187 - 212	40
	28 - 32	70		
<b>Low</b>	23 - 27	80	159 - 186	50
	19 - 22	90	132 - 158	60
	14 - 18	100	104 - 131	70
	9 - 13	110		
<b>Very low</b>	<9	120	<104	80

**Table 2.** Topdressing nitrogen (lb/A) on cool-season horse pastures when maintained at low stocking rates (more than 2 acres/horse).

Date	N per Application <sup>1</sup>
Aug. 15 – Sept. 15	30 - 40
Oct. 15 – Nov. 15	30 - 60

<sup>1</sup> Total amount of N to topdress depends on desired result. No N is recommended if clover makes up more than 25% of the pasture. If primary goal is increased tillering for a denser grass stand in winter, then one late fall application is sufficient. If fall pasture growth is important then also apply N in late August-early September. Suggested dates and rates for topdressing with N are shown above.

**Table 3.** Topdressing nitrogen (lb/A) on cool-season horse pastures when maintained at high stocking rates (less than 2 acres/horse).

Date	N per Application <sup>1</sup>
Feb. 15 – Mar. 15	up to 40 - 80
May 1-15	up to 30 - 40
Aug. 15-30	up to 40 - 80

<sup>1</sup> Total amount of N to topdress should depend on how much additional production is needed. Late spring N applications may have the unintended effect of stimulating unwanted summer weeds. Little or no N is recommended if clover makes up more than 25% of the pasture. Suggested dates and rates for topdressing with N are shown above.

The stocking rates are estimates for Kentucky soils of average productivity. The soils of highest productivity in Kentucky will support one mature horse on 2 acres or less, while those with the lowest productivity (often with significant slopes) require 10 or more acres per horse. It is important to determine the recommended stocking rate for your soil type. See your county extension agent for the average stocking rates for the soil types found in your area. Or, go to USDA's Web Soil Survey at <http://websoilsurvey.nrcs.usda.gov>.

Often, stocking rate information in soil surveys is given in animal unit months (AUM). To convert animal unit months to recommended acres per horse, use the following formula:

$$(12 \div \text{AUM}) \times (\text{wt of horse} \div 1000) = \text{acres required per horse}$$

## Nitrogen Sources

Kentucky research has shown that in late fall, late winter, and early spring, little difference exists among the N sources commonly used for topdressing cool-season grasses. After May 1, risk increases that broadcast urea will not be as effective as other N sources. Average efficiency values for urea N applied after early May ranged from 51% to 78% of that observed for ammonium nitrate, depending largely on the length of time between urea application and the next rainfall. When a urease inhibitor is used along with urea, the urea efficiency is comparable to that of ammonium nitrate. For urea without an inhibitor applied after early May to be an economical substitute for ammonium nitrate, the cost per pound of nitrogen probably would need to be 15% to 20% less than that for ammonium nitrate-nitrogen.

Research indicates that efficiency of liquid urea-ammonium nitrate (UAN) applied after early May is more efficient than urea but less efficient than ammonium nitrate. A urease inhibitor

can also be used along with UAN. See University of Kentucky Cooperative Extension publication *Nitrogen Transformation Inhibitors and Controlled Release Urea* (AGR-185) for specific information on products designed to reduce N loss.

To avoid burning symptoms on leaves of grasses, apply any granular N source when the leaf surface is dry. Also, avoid leaving piles of granular N in the field, either from misapplication or improper equipment operation. Ingestion of significant amounts of N fertilizer can be toxic to horses.

## Phosphorus Fertilization in Central Kentucky

Most soil in the Inner and Outer Bluegrass Region of Kentucky has been formed from limestone that is naturally high in phosphorus. Plant-available phosphorus is high (often exceeding 200 lb/acre), and these fields may never have a need for phosphorus fertilization. Adding fertilizer phosphorus in these high-phosphorus fields simply increases the chances for eutrophication—algae-like blooms that may cause fish kills (Figure 5) and can diminish the uptake of other essential plant nutrients like zinc. Since fertilizer analysis is given in N%-P<sub>2</sub>O<sub>5</sub>%-K<sub>2</sub>O%, make certain that the center number in a fertilizer product is 0 (example 23-0-30) when soils are already high in phosphorus.

## Conclusion

Conducting routine soil sampling and applying appropriate rates of fertilizer are the best steps in achieving your long-term goals for productivity in your horse pasture. Applying excessive rates of fertilizers is expensive and can cause undesirable weed growth and micronutrient deficiencies and could negatively impact the environment. Further advice on fertilizing your horse pastures is available from your county cooperative extension agent. To locate your extension office go to [www.ca.uky.edu/county](http://www.ca.uky.edu/county).



**Figure 5.** Excessive phosphorus in surface water bodies (ponds and streams) can cause eutrophication (algae-like blooms that may cause fish kills).

Educational programs of Kentucky Cooperative Extension serve all people regardless of race, color, age, sex, religion, disability, or national origin. Issued in furtherance of Cooperative Extension work Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, M. Scott Smith, Director, Land Grant Programs, University of Kentucky College of Agriculture, Lexington, and Kentucky State University, Frankfort. Copyright © 2010 for materials developed by University of Kentucky Cooperative Extension. This publication may be reproduced in portions or its entirety for educational or nonprofit purposes only. Permitted users shall give credit to the author(s) and include this copyright notice. Publications are also available on the World Wide Web at [www.ca.uky.edu](http://www.ca.uky.edu).  
Issued 7-2010

# Sampling for the Tall Fescue Endophyte in Pasture or Hay Stands

*P. Vincelli, Plant Pathology, S.R. Smith, Plant and Soil Sciences; and Tina Tillery, Regulatory Services*

Most of the tall fescue growing in Kentucky is colonized by the tall fescue endophyte, a fungus which causes disorders in livestock that feed on the infected grass. The animal disease syndrome is called fescue toxicosis, which some researchers estimate may cost Kentucky producers over \$200 million yearly. This problem can be greatly reduced by identifying the infected fields and replacing them with endophyte-free or novel endophyte tall fescue varieties or by managing them in a way to minimize the impact of the endophyte on herd productivity. One of the simplest ways to reduce toxicity symptoms in cattle is add red and white clover to existing tall fescue stands.

## Endophyte Testing in Kentucky

The best ways to determine the level of infection within a stand is to examine individual tall fescue tillers sampled from the field microscopically for evidence of the fungus or to use a recently developed immunoblot laboratory procedure. In Kentucky, the Division of Regulatory Services, located at the University of Kentucky, offers a service to test tall fescue infection level. To obtain useful information samples must be collected in accordance with the guidelines given here.



**Figure 1.** Tillers must be cut at the soil surface.

## Selecting Stands to be Sampled

Only fields of the same seeding date and management unit should be included under the same field designation. The fungus is spread through seed, and since fescue seed can be moved in many different ways, the variation in endophyte level between fields can be great. However, before spending money on sampling, farmers should consider that most fields will be highly infested. Several extensive surveys conducted by UK researchers found that in more than 50 percent of the stands in Kentucky 80 percent of the plants are infected. Only about 7 percent of the stands in Kentucky have fewer than 25 percent of the plants infected. **Note:** New tall fescue varieties such as MaxQ contain a novel or non-toxic endophyte that cannot be distinguished from other infected stands using currently available commercial laboratory procedures. Therefore, fields planted to novel endophyte fescue should not be sampled.

## When to Sample

Specimens must be collected during periods when the fungus is most likely to be present in the tillers. Specimens should be collected when plants have been growing well for at least a month, for best assurance of finding the endophyte. The optimum collection times in Kentucky appear to be late April to early June and October through November, based on University of Kentucky tests. Specimens collected at other times can give erratic results. Check with the local county extension office before sampling the site.

## Collecting the Specimens

A sample consists of tillers (stems) of plants that have been cut with a razor blade or sharp knife at the soil surface. **(Note:** It is very important to cut the tiller at the soil surface! See Figure 1.) Avoid taking stems that have seed heads on them, but do not take small or immature tillers either; tillers with stems ¼-inch thick or thicker work best. Take about 10 to 20 more tillers than necessary to ensure a good working sample for the laboratory. Measure up about 4 inches from the base of the stem and cut the remaining plant tissue distant from the stem base. Save the stem bases but discard the tissue containing the leaves. Place the stem pieces into a plastic zip lock bag. Put a damp (not wet) paper towel in the bag to prevent drying of the tissues.

