University of Kentucky

Bluegrass Equine DIGEST

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Initial Results From UK Indoor Horse Arena Survey Released

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Researchers asked owners, managers, and riders about arena construction characteristics, air quality, arena footing, and associated health outcomes in horses and humans.

When University of Kentucky College of Agriculture, Food and Environment graduate student Staci McGill set out to learn more about the air quality of indoor horse arenas last year, she was surprised to discover there wasn't any existing research available. So she forged the way with first-of-its-kind research, melding her passion for riding with her academic interests.

In May 2018 she launched a survey about indoor arenas in partnership with UK's College of Public Health and facility design experts within the College of Agriculture, Food and Environment. With the survey she aimed to gather information on arena design and construction, footing, maintenance, and the arena environment. It asked owners, managers, and riders about arena construction characteristics, air quality, arena footing, and associated health outcomes in horses and humans.

The online survey garnered more than 450 respondents, and initial findings indicate that 77% of respondents are concerned about dust, moisture levels, and/or the lack of air movement.

"It's mind-blowing that this hasn't been done before," said McGill, a graduate student in the Department of Biosystems and Agricultural Engineering. "We know these issues exist, but no one has ever documented the concerns."

"This amazing team is an important collaboration," said Kimberly Tumlin, PhD, MS, MPH, assistant professor in the Department of Preventive Medicine and Environmental Health, College of Public Health. "Together we can positively impact horse and human health by establishing conditions that are health protective. We know that horse-human interactions have many positive outcomes. This research helps define environments and potential exposures that may affect the quality of these interactions."

McGill's team is releasing some of the initial findings in an infographic and expects the study to generate several areas of additional research.

The facility design and use information shows trends in arena age and construction costs. An example of changing trends is lighting. The use of LEDs has increased, while the use of metal halide lights has decreased dramatically. LEDs look to be surpassing even fluorescents in newly built arenas. The size of the

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INDOOR HORSE ARENA SURVEY

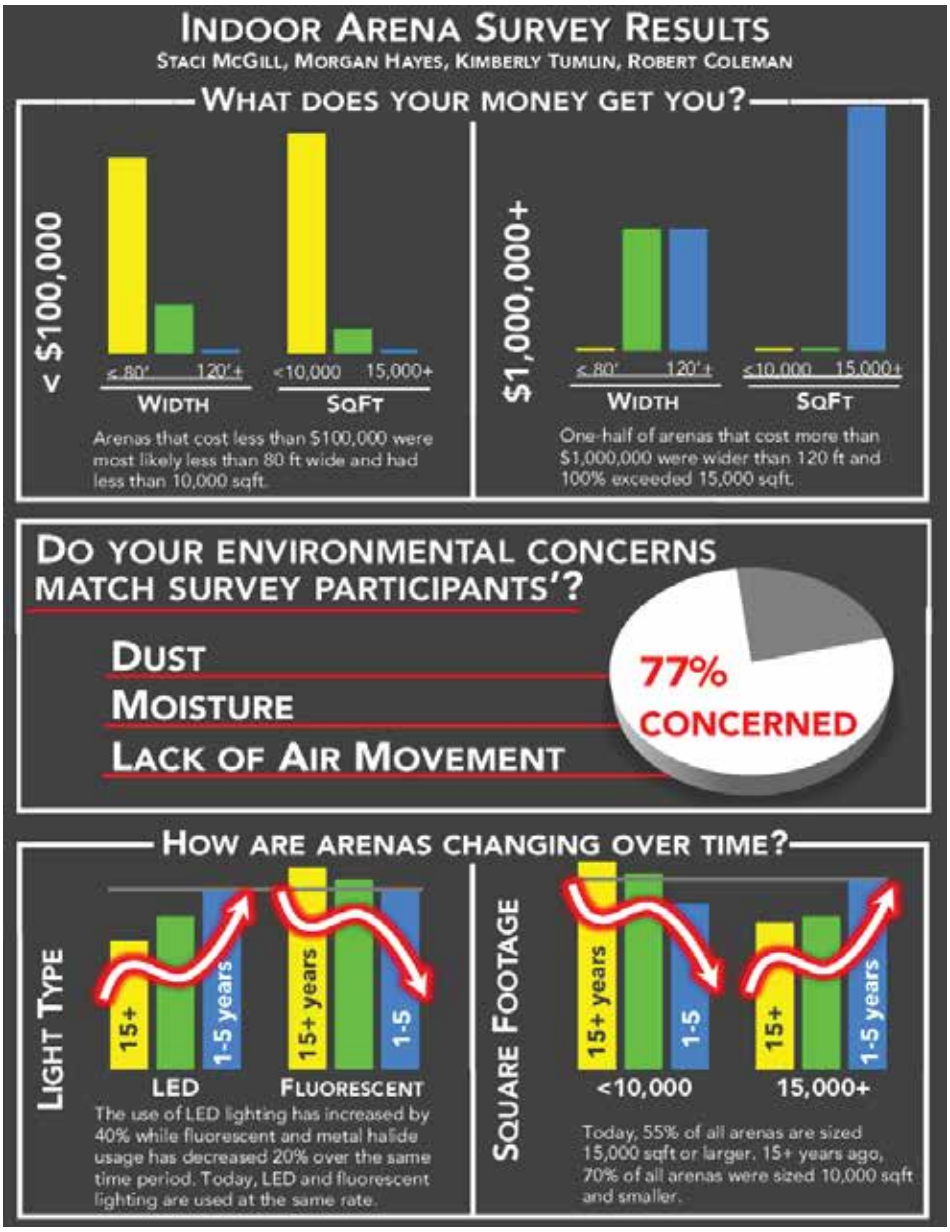
arenas has shifted to greater square footages in newer arenas and, as expected, larger arenas tend to be more expensive to build.

The definition of an indoor arena varies by where respondents live and how their climate impacts horse sport participation. Primary riding disciplines, wall and window configuration, and footing materials, such as the presence of fiber, varied by region, as well.

The major finding is that the arena is a complex environment. Facility design, management, footing, usage, and amount of horse activity within the space all interact to affect the environment in an indoor arena.

McGill said next steps include tackling the three big issues of dust, moisture, and lack of air movement using a systems approach. A multidisciplinary team is critical to providing solutions and guidance that will work for the equine industry. She is also interested in conducting site visits to facilities of all breeds and disciplines as part of this research. Facilities interested in a site visit or people who have questions about the research should reach out to her directly at staci.mcgill@uky.edu. UK

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



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Using Drylots to Conserve Pastures and Reduce Pollution Potential

Managing horses can be a rewarding experience, but it can also be challenging. Improper pasture management of horses during the winter and early spring can adversely affect pasture quality and the environment.

Horse owners can elect to use drylots during increased rain or drought periods, when pastures need protection. Drylots are designed as permanent heavy traffic/use areas and are often used on cattle farms. They keep animals in a confined area to prevent them from damaging the entire pasture. A typical drylot would contain water sources, feeders, and mineral supplements. The area can be used for wintering animals, handling animals for medical treatments, reducing calorie intake for obese horses, and more.

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Drylots are designed as permanent heavy traffic/use areas and keep animals in a confined area to prevent them from damaging the entire pasture.

Justification for a Drylot

Congregating horses around feeding and watering areas can create mud, increase soil compaction, eliminate desired vegetation, and lead to weed infestations. Simply put, overgrazing and wintering horses on pastures can be problematic in Kentucky because of the weather.

One reason is the relationship between precipitation and evapotranspiration (ET), the process of losing water from wet surfaces and vegetation due to evaporation and transpiration (water movement through plants). In early summer, plants survive by using their roots to remove water and nutrients from the soil. An intense rainfall event can produce runoff when the amount of rain exceeds the infiltration rate (speed at which water enters the soil), but this can be filtered by the existing vegetation. In late fall, precipitation begins to exceed ET, and the soil water becomes recharged.

By winter, ET has diminished, but precipitation is still occurring. The soil's surface remains wet for longer periods, preventing it from storing more water and increasing the potential for runoff. These wet conditions reduce soil strength and allow mud to develop if the vegetation is severely grazed, trampled, or removed. Grazing too many horses on a limited area over long periods during these wet seasons creates muddy conditions for farm owners.

More important, increased traffic during wet periods increases the bulk density and reduces soil aeration, making root growth and water infiltration even more difficult.

While wintertime water movement is occurring and mud is accumulating, caretakers should supplement horses in pastures with additional feed to make up for the decrease in actively growing vegetation.

However, horses don't stop feeding on the remaining forage. There is limited vegetation to reduce surface runoff, allowing sediment, manure, pathogens, and nutrients to flow off the soil surface and travel off-site. At this point, increased soil compaction is probably preventing absorption of water and nutrients into the soil. Meanwhile, streams are reaching the tops of their banks and removing water and contaminants from the watershed. Soil erosion, if allowed to go unchecked, can lead to environmental impacts such as the removal of soil and nutrients.

Benefits of Drylots

Drylots can:

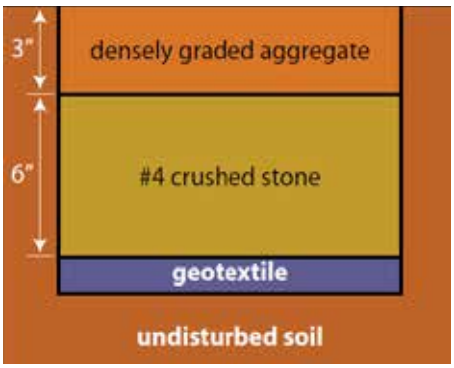
- Maintain forage and reduce mud on a larger pasture scale, thereby controlling the amount an animal consumes. (Controlling the amount of forage consumed is especially important for older animals that require weight control.)
- Prevent erosion around the fence line, gates, waterer, and other high-traffic areas.
- Reduce the need for vegetation maintenance. (Unlike pasture, any vegetation that does emerge is a weed and can be sprayed with a broad-spectrum herbicide according to manufacturers' recommendations.)
- Function as central locations for watering and supplemental feeding for several pastures.
- Provide shade.
- Reduce the need to renovate pastures.
- Act as outdoor facilities for managing animals.
- Allow other pastures to be rested and fertilized to provide additional yield for the following year.

DRYLOTS

By spring, the once-green pasture is mostly bare with compacted soil. Weeds, which are very efficient at converting nutrients and sunlight into vegetative mass, now propagate in the bare areas. In the spaces used for feeding hay, a thick mat of uneaten material may have smothered the soil and vegetation. The area now holds moisture and has kept the soil temperatures cooler, preventing desired vegetative cover from re-establishing. The end results are fields with soil and nutrient losses that will require more management and money to eliminate weeds and re-establish grass.

How to Construct a Drylot

You can set up a drylot in a larger pasture area using a fenced boundary, or you can create a drylot as a hub for a series of paddocks. In either situation, horses are allowed access to the drylot through one or two gates that lead from the existing pasture or pastures. They use the area year-round to access water and supplements, as well as during the winter and early spring as a confined feeding area.



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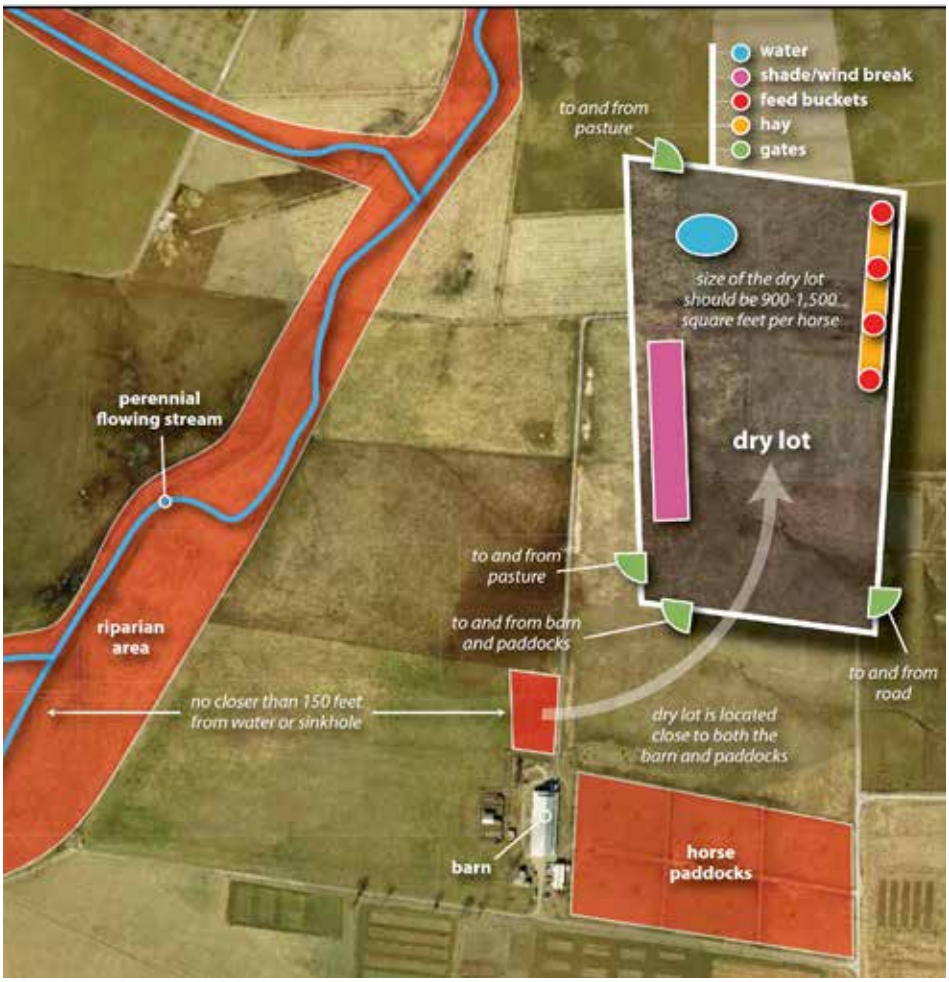
Construction details for high-traffic area pads

Make sure the drylot is large enough to space out gates, feed, and water and limit overcrowding that may expose horses and handlers to risk. Use farm gates to allow horses the freedom to move from the drylot to the pasture or as a means of limiting access to the larger pasture area.



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A drylot placed away from environmentally sensitive areas but close to horse operations

Location

You can easily determine the location of your drylot depending on your paddock's layout. Consider topography and environmentally sensitive areas when planning the location. It should be a well-drained area that is relatively flat and does not have a drainage swale or ditch running through or across it.

The logical location of the drylot would be around an area with a water source. An ideal location is on a summit or flat area on top of a hill, as long as it has some protection (structure, trees, etc.) from the wind. A summit location usually provides a long distance for any runoff to travel before it reaches a stream or waterway. Don't place a drylot near a stream or where the drainage to a stream or sinkhole is less than 150 feet away. If a stream is nearby, consider installing a riparian area (dense vegetation along a body of water) to protect water quality.

Place the drylot away from environmentally sensitive areas but close to the horse operation. Areas near barns might already suffer from high traffic and could have heavy traffic areas installed to reduce mud. Ideally, the drylot would be placed on a summit and not adjacent to a barn, because roof runoff can have an adverse effect if allowed to flow through any part of the drylot. However, having the drylot close to the farm operations can help save time on chores. Drainage water should move off the area as sheet flow and drain into a buffer strip. Clean water should be diverted from the drylot.

Size

When determining drylot size, make sure you're providing adequate space for the planned number of animals to move around freely to eat, drink, and socialize. An area of at least 900 to 1,500 square feet per horse is recommended. The size depends on the age, type, size, number, and temperament of the horses as well as the area available for enclosure. Keep in mind that most equine facility owners that have constructed pads regret not making the sites bigger. If you have other uses planned for the pad, adjust the size of the area accordingly.

Construction

Individuals skeptical of the benefits of having horses on gravel instead of mud can opt to create an area that is only partially graveled. Construction can begin once the drylot has been justified, located, and sized. You'll need to excavate

the topsoil to construct the heavy-use traffic pad. Remove the topsoil down to a soil horizon with a higher clay content and more stable surface. Producers have used track and skidsteer loaders to excavate the soil down to a clay layer. Some producers have used plows to till the soil and make it easier for skidsteer loaders to remove it. Producers installing these areas should strongly consider where to place the spoils. They might even consider selling the topsoil removed from these areas.

After excavation, lay geotextile fabric down over the exposed soil to prevent rock from sinking into the ground and soil from moving up through the matrix. The National Resources Conservation Service (NRCS) recommends placing a nonwoven, nonheat-bonded, and needle-punched geotextile fabric under all treatment areas unless the foundation is rock or the surface treatment is concrete. The fabric should have the minimum material requirements as specified in **Table 1**.

A weight for the geotextile fabric is usually not specified, because the specific material features differ from one manufacturer to another. The fabric should be at least a 6 ounces/square yard weight fabric to meet the requirements listed above. Your local agriculture and natural resources extension agent, NRCS district conservationist, agricultural supply store, concrete supply store, etc., might be able to advise you on where to buy geotextile fabric.

Lay a base layer of large rock (i.e., #2 or #4) on top of the fabric, to a depth of at least 6 inches. Take caution when spreading the base layer so as not to disturb the geotextile fabric. After the base layer, spread a top layer of at least 3 inches of dense grade aggregate (DGA) over the area. This will provide a solid, stable surface for feeding in the winter. You might also want to extend the geotextile fabric and rock out past the gates into the pasture, as these areas will see heavy traffic, especially if only one entrance to the pad exists.

Fences and Gates

A wide range of fencing options exists, depending on your desires and needs. However, drylots are permanent structures and should not be constructed using temporary or electric tape materials. In a situation where the animals are crowded, it is very important to think of horse and handler safety. Avoid corners and metal T-posts. Ideally, the drylot will have a gated access from a farm road or farmstead. Gates and fences should be designed to accommodate truck and tractor access to facilitate feeding and cleaning. There should also be at least one gated access from the drylot to the remaining pasture.

Costs

The cost of installing a high-traffic area pad for a drylot will be approximately $0.80/square foot; a concrete pad would cost about $4.00/square foot.

You can reduce project costs by excavating the site yourself and possibly selling the topsoil. You can justify the costs of the project because you're saving the money you'd typically spend renovating lost pasture and replacing lost forage. You can reduce forage losses by 25 to 50% when feeding on a drylot surface or from hay feeders placed on a drylot surface rather than from muddy surfaces. Horses placed on drylots might also lose fewer shoes in the mud, which is another savings.

Table 1. Minimum Requirements for Nonwoven Geotextile

Property	Test Method	Value
Tensile Strength (pounds)[1]	ASTM D 4632 Grab Test	150 min
Bursting Strength (psi)[1]	ASTM D 3786 Diaphragm Tester	320 min
Elongation @ Failure (percent)[1]	ASTM D 4632 Grab Test	> 50
Puncture (pounds)[1]	ASTM D 4833	80 min
Ultraviolet Light (% residual tensile strength)	ASTM D 4755 150 hours exp.	70 min
Apparent Opening Size - AOS	ASTM D 4751	# 40 max[2]
Permittivity (1/sec)	ASTM D 4491	0.70 min

1. Minimum average roll value (weakest principal direction)
2. U.S. standard sieve size
Source: NRCS Conservation Practice Standard, Heavy Use Area Protection Code 561.

Table 2. High-traffic area pad costs

Item	Cost (sq ft)
Geotextile Filter Fabric	$0.06
Rock Base (No. 4 Crushed Limestone)	$0.25
Densely Graded Aggregate	$0.14
Total Materials	$0.45
Labor/Grading Work	$0.35
TOTAL COST	**$0.80**

Drylot Management

A drylot is typically designed to keep horses off a pasture to prevent them from harming the vegetation. When managed in this manner, the animals receive supplemental feed (hay) on the drylot until the conditions change. However, more management is required to prevent the animals from eating too much grass after being fed hay, because it could lead to colic, founder, and possibly death. Horses don't need to spend all their time in the drylot during the winter. A good time to allow the horses to have pasture access is when the field is frozen, because they might still be able to graze without harming the paddock's surface. Getting the horses off a gravel surface is also a good management practice when the gravel is frozen. During these times, the gravel can act as an abrasive surface that could wear and damage hooves. The chances of this occurring depend on the amount of manure and forage residue cushioning the gravel surface as well as whether the horses are wearing shoes. Drylots have been used as locations to provide lighting

for open mares. Usually the horses are brought up from a pasture and placed under the lights before evening. This method has been used as an alternative to housing the mares in stalls through the night.

You can also use drylots to prevent or restrict horses that are overweight or susceptible to founder from eating pasture grass during certain times. On average, in Kentucky, these animals would be held off pasture from the time grass begins to grow vigorously (April) until it begins to slow (June) and then again when the forage begins growing in the fall. During the remaining times, the horses can be on pasture without a significant chance of overeating. Another approach to managing a drylot is to allow the horses to move freely from the drylot area to a pasture through an open gate year-round. Ideally, the drylot would be set up as a hub for several pastures to provide a rotational grazing system. In this case, the drylot is used more as a heavy-traffic area pad for feeding and watering the horses. Although not considered a normal drylot, it is a useful area for managing horses and controlling mud.

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Overgrazing and wintering horses on pasture can create mud, increase soil compaction, and eliminate desired vegetation.

Maintaining the Drylot

Drylot maintenance should include scraping up manure and unused hay on an "as needed" basis. Clean the pad periodically to prevent manure buildup and the possible mixing of manure with the rock surface. How often you need to clean the pad depends on several factors, including the number of horses, the size of the pad, how long the horses are on the pad, the amount of feeding and wasted hay, etc. When removing manure and wasted forage, try to remove as little rock from the surface as possible. Clean the areas with the highest concentration of manure and wasted forage on a regular basis. Typically, this does not involve cleaning the entire pad. If possible, store the manure in a covered structure until you can dispose of it properly. One of the best methods is land application to cropland or pasture based on crop removal rates and soil test fertility levels. Manure applications should be preceded by soil test results. All manure applications should follow the NRCS Code 590 Nutrient Management Recommendations. You can also compost the manure prior to land application. Through proper operation and maintenance, your drylot can provide a stable and secure area for winter feeding and year-round watering for many years without needing significant repairs or additions. Maintenance may include periodically top-dressing with DGA, applying moisture, and compacting the area. UK

>Steve Higgins, PhD, Director of Environmental Compliance for the Agricultural Experiment Station with UK's Department of Biosystems and Agricultural Engineering, and Roberta Dwyer, Roberta Dwyer, DVM, MS, DACVPM, Director of the UK Preveterinary Advising Program in UK's Animal and Food Sciences Department, provided this information.

Prepurchase Exam Tips for OTTB Buyers

On Friday, Oct. 4, between competition days at the 2019 Thoroughbred Makeover, trainers and attendees shifted their focus to horse health and owner education. The Retired Racehorse Project hosted a series of afternoon seminars, including one on prepurchase exams (PPEs) for off-track Thoroughbreds, sponsored by University of Kentucky Ag Equine Programs.

Emma Adam, DVM, PhD, Dipl. ACVIM, ACVS, assistant professor at the Gluck Equine Research Center, joined Hagyard Equine Medical Institute's Liz Barrett, DVM, Dipl. ACVS, and The Ohio State University's Shannon Reed, DVM, MS, Dipl. ACVS-LA, to answer audience questions about PPEs. Here are some take-homes from the 90-minute session.

Off-track Thoroughbreds (OTTBs) are unique in that you can acquire them right after they retire from racing for relatively small price tags; however, many of these young athletes have already had full careers, with substantial wear and tear on their bodies. The panelists agreed that it can be difficult to justify a full prepurchase with $3,500 worth of radiographs on a $1,000 horse, but some degree of PPE (or even post-purchase exam, said Reed) can pay dividends both now and years into the future of the horse's second career.

"We all have an idea of what we want to do with our horses, but if those circumstances change or those plans include selling the horse later on, we need to know what we can communicate in a transparent fashion with the next person," said Adam. "Things that I would be quite happy to accept might not be something a prospective purchaser would be able to tolerate."

Further, if you plan to sell the OTTB after he's transformed into a successful

PREPURCHASE EXAM TIPS

sport horse that's worth much more money, you must be prepared for the buyer's veterinarian to do an in-depth prepurchase exam.

"If you're considering buying a $1,000 horse and planning to sell it for $30,000, you're going to need to vet the horse to the extent that someone with a $30,000 budget would," said Reed.

Having the knowledge a PPE provides can also dictate how you retrain the horse. "If you know what's going on with that horse," said Adam, "you might actually change how you start out with him—whether you can hit the ground running or need to nurse them along or teach them a certain way of going. It's being able to approach it better."

Prepurchase exam prices and packages obviously vary. "Ask the practitioner what the basic prepurchase exam entails, and find out what options you should add on to that," Reed suggested. "I will say that a veterinarian simply doing a physical exam in a pointed way—running their hands down their legs, taking their temperature/pulse/respiration, listening to their airways, and watching them jog—is going to catch 75% of the problems that are going to bother an amateur rider."

The panelists agreed that hoof issues—which are common in OTTBs—don't typically scare them off a horse. "There's not much that worries me about the feet, because they're just the most amazing, resilient things," said Adam. "That hoof capsule can be remodeled, and you can end up with some really good feet."

Hoof radiographs during a PPE are useful simply for knowing what's going on in the foot and how to trim, shoe, and manage it properly. "The assumption is there that they're going to have some issues, some are going to be better than others, and it's going to take a year for the foot to grow out from top to bottom," said Reed.

Similarly, it's not unusual to find signs of some degree of arthritis in OTTB joints, but this condition can be managed, depending on your goals for the horse.

"One of the things that's really cool to remember about these horses is they're young," said Adam. "These horses are still in an age where they still have some growth factors in their cartilage. They're not going to grow new cartilage, but it's going to bounce back a lot better after the things these horses have done than if they were 15 years old."

Don't rely too heavily on flexion test results, which are often subjective, during the PPE. "Flexion tests are a small piece of a big puzzle when you're assessing an OTTB," said Adam. "They're incredibly useful, but you have to consider them in the context of the horse's history, recent works, surface you're on, environment, etc. How the horse behaves during that flexion test is also very telling."

Barrett said she almost always recommends doing an upper airway scope on horses coming off the track due to the number of respiratory conditions they're prone to. Issues the panelists said you might encounter when assessing an OTTB include a history of exercise-induced pulmonary hemorrhage (EIPH, aka bleeding), which is a manageable small airway inflammatory condition, and laryngeal hemiplegia (roaring).

"With a roarer," said Reed, "consider what discipline you want to do. Can you tolerate noise? Has the horse had surgery?"

With time, knowledge, and good care, many issues that show up on an OTTB's prepurchase exam can improve. Based on a survey Reed recently conducted on OTTB owners' satisfaction with their horses, 96.6% of the problems they had encountered in the first year of ownership had resolved to their satisfaction.

In summary, said Barrett, "Every horse has a job he can do, and the prepurchase can tell you what's realistic and equip you with useful information for managing the OTTB." UK

COURTESY MELISSA BAUER-HERZOG

Prepurchase exam panelists (L to R) Drs. Liz Barrett, Emma Adam, and Shannon Reed

> **"Flexion tests are a small piece of a big puzzle when you're assessing an OTTB."**
>
> DR. EMMA ADAM

>Alexandra Beckstett is the managing editor of *The Horse*.


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Running Hot and Cold: Caring for Horses During Weather Changes

In October 2013 South Dakota livestock and farmers were experiencing balmy 70- and 80-degree temperatures when a storm moved in from the Rockies and a cold front from Canada. The collision of the air masses created heavy rain, winds up to 70 mph, and a dangerous blizzard. Many cattle drifted with the storm, piling up against fences, getting covered with snow, and freezing to death because they were soaked with rain before the snow and cold temperatures set in. Though there were some equine losses, outdoor horses generally fared better than cattle because they're more adept at finding windbreak and shelter. But horses with no reprieve from the elements likely suffered cold stress and frostbite.

Similarly, albeit not so drastically, horses might have a tough time adjusting to the elements when moving from a cold climate to a hot one (or vice versa) or when body-clipped during a serious cold snap.

When horses have a chance to adjust gradually to seasons changing, they typically tolerate heat and cold well, says Bob Coleman, PhD, PAS, associate professor and equine extension specialist at the University of Kentucky, in Lexington. It's the combination of temperature extremes and swings that can be stressful. Here's how to help your horse handle these conditions and battle cold or heat stress.

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Horses with a good hair coat and body condition don't lose much body heat in the cold.

When the Going Gets Cold

Temperature fluctuations in early fall or late spring—when the horse hasn't grown his winter hair coat yet or has already shed out—can be harder on horses than prolonged summer heat or winter cold.

To protect horses from severe weather changes in winter, "we just need to provide a good windbreak or open-faced shed they can go into if they choose," says Bruce Connally, DVM, owner of Wyoming Equine, in Berthoud, Colorado. "These precautions can moderate temperature swings, as long as the horse is healthy and has adequate nutrition. The best 'blanket' we can put on them is a little fat, for insulation. With a good hair coat and a layer of fat under the skin, they don't lose much body heat."

A thin, undernourished, sick, or stressed horse can't handle sudden cold, especially if he doesn't have or isn't consuming enough forage; the fermentation of fiber helps him generate body heat. But as for healthy horses, "they know how to regulate their own comfort," Connally says. "When we restrict them and either lock them in or out, we make it harder for them to do their own thermoregulation. They generally prefer to be outside."

Kent Allen, DVM, FEI veterinary delegate and owner of Virginia Equine Imaging, in Middleburg, agrees, explaining

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A healthy horse with a good winter coat can handle even a blizzard well.

RUNNING HOT AND COLD

that horses evolved to handle cold. "You see horses at pasture on a very cold day, with their 2-inch hair coat sticking straight out, and they are happy as clams," he says. "Horse owners tend to anthropomorphize. If we are chilled and uncomfortable, we think the horses are, too."

A healthy horse with a good winter coat can handle even a blizzard well. "A spring storm can be worse, at warmer temperatures, because the rain or snow is so wet," Connally says.

He explains that hair's natural oil has a waterproofing effect, causing moisture to slide off before it reaches the skin. Prolonged rain or wet snow, however, eventually soaks through, causing the hair to lose its insulating quality.

ALEXANDRA BECKSTETT/THE HORSE

Make sure horses have a good windbreak or an open-faced shed they can access in winter as needed.

But if your horse is fully clipped, he will need appropriate shelter and blankets well into early spring, says Carey Williams, PhD, associate professor and extension specialist in equine management at Rutgers, the State University of New Jersey, in New Brunswick. She also recommends riding him with a quarter sheet during warmup and cool-down.

Your horse's ability to adapt to cold snaps might depend on his breed. "A Shetland pony or a Norwegian Fjord is more comfortable in cold weather than a Thoroughbred with thinner skin and less hair," Connally says.

If you anticipate a temperature swing toward freezing, a few simple diet changes can help your horse stay warmer.

"He needs as much high-fiber hay as he wants," says Connally. "He also needs plenty of water that's not too cold. If he doesn't drink enough because the water is cold or frozen, he won't eat enough and won't have the calories needed to keep warm."

In these cases you might need to fill water buckets more frequently to keep the water from becoming too cold to drink, says Coleman.

The temperature below which a horse starts to expend additional energy to warm himself is called critical temperature. "As a general rule, a 1% increase in energy ... is needed (to replace what's lost from the cold) for each degree the temperature falls below a horse's critical temperature," says Williams.

Critical temperature for individual horses varies based on differences in fat cover, hair thickness, acclimatization to cold, hair coat wetness, and windchill. "Clipped horses have a much higher critical temperature and must be blanketed," she says, adding that shivering can be an indication the horse is too cold and needs shelter or blanketing.

To help horses lower their critical temperature (so it won't take as much energy to stay warm) and help them adapt to colder temperatures, owners need to provide extra fat for energy and insulation heading into winter.

"If seasons are changing you can make

slight adjustments, making sure the horse gets a little extra hay as you go into winter," says Coleman. "It's not wise to make major dietary changes just because the temperature changed today. We create problems for horses when we make changes faster than we should or need to. It helps to plan ahead so we can make some gradual changes."

Sudden Heat Stresses

During periods of extreme heat horses need shade and airflow to stay cool and promote sweat evaporation, says Coleman.

"Often the horse just wants a little shade for his head," he says. "Run-in sheds are great, but horses don't like to go clear into them for shade because a shed is too sealed up for much air flow and it's hot inside." They prefer a breeze, even if that means standing out in full sun to get it.

Take care when exercising horses in hot conditions. "During exercise, heat production in the horse's body will increase up to 50%," says Williams. "In response to heat, the horse will sweat more, move a large portion of the blood flow to capillaries under the skin, and increase respiration rate to help the cooling process. Always cool horses properly after exercise, allowing plenty of time and ventilation, and avoid riding in extreme heat and humidity."

A high resting heart rate can be a sign of heat stress. "At rest, normal range of heartbeats per minute is between 24 and 40. In a heat-stressed horse it can be over 50," says Williams. "Internal rectal temperature will also be elevated to 104 degrees F or higher."

One way to help prevent heat stress in hot weather is to make sure horses drink enough and to provide electrolytes if horses are training hard and sweating profusely. You might also want to make dietary adjustments, such as feeding more fat and less protein.

Connally says horse owners shouldn't feed a lot of fiber in hot climates because of the heat it generates. "You walk a fine line," though, he says, "because if you get the fiber too low you create other problems, including colic, because the digestive tract needs a certain amount of fiber to function normally."

Rich alfalfa hay or any high-protein diet can also be counterproductive for hard-working horses in hot conditions because the protein-metabolizing process likewise produces heat, along with increasing water requirements. Adjust the diet to fit the conditions your horse is working in.

If a horse does suffer from heat stress or exhaustion, he probably needs a veterinarian to administer intravenous fluids, says Connally. "This is the quickest way to replace what he's lost and prevent severe dehydration," he says. "If you are out on the trail and this is not an option, simply stop, take off all tack, and cool him with water over his body as best you can. If you have access to (rubbing) alcohol, pouring it over the body (or adding some to the water you put on the horse) will aid evaporation and speed the cooling effect."

Handling Temperature Swings

Again, left to their own devices, horses can usually handle temperature changes. It's when we alter their natural condition and confine them that they tend to have trouble.

"If you are bringing a horse from Florida to Mid-Atlantic or northeastern states in winter, he will need help to stay warm," says Williams. "When taking a horse the other direction, it will be hard to handle the heat, and he may need to be clipped. Then if there's a cold snap, he must be blanketed."

For this reason Coleman says he'd rather transport horses from hot to cold climates than from cold to hot. "It takes the horse longer to adjust and acclimate to heat," he says. "When you go south, make sure the horse can sweat adequately. Some don't acclimate very well and may not sweat enough, and some may develop anhidrosis (the inability to sweat). If your horse is not sweating normally, suffering heat stress, consult your veterinarian for help."

Blanketing Best Practices

If your horse is body-clipped or facing a stretch of cold, wet weather, he might benefit from wearing a blanket. Here are some tips to keep in mind:

If your horse is low in the pecking order and other horses don't allow him to come into the shelter, you might provide him with a blanket, especially in freezing rain, says Carey Williams, PhD, associate professor and extension specialist in equine management at Rutgers, the State University of New Jersey, in New Brunswick.

Practice good blanket hygiene. "A wet or dirty blanket isn't healthy," says Bruce Connally, DVM, owner of Wyoming Equine, in Berthoud, Colorado. "You need several, so you can change and wash them, and may need heavy blankets and light blankets for different conditions."

Select a blanket appropriate for the conditions the horse is facing. "If the horse is outside in wet weather, the blanket should be at least water-repellent and lined with material that will wick moisture away from the skin," says Williams. "A wet horse that has been blanketed (improperly) will be colder than an unblanketed horse with a thick hair coat that can naturally dry out."

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If horses are ridden and sweating, let them stand in the barn and dry before putting a blanket on. "If you don't let them dry off first, they won't get dry under the blanket," says Bob Coleman, PhD, PAS, associate professor and equine extension specialist at the University of Kentucky, in Lexington. "Then you have a wet horse and a wet blanket. He is uncomfortable and could chill."

Check blanketed horses daily. "If a horse sweats under the blanket, especially if the hair coat is dirty, this can contribute to skin irritation and infections," says Williams. "Make sure the blanket fits the horse. Many horses develop rubs or sores on points of the shoulders, withers, and where straps secure the blanket. The blanket should be removed at least once a day to check for rub marks or infections and monitor for weight gain or loss."

RUNNING HOT AND COLD

You might have to keep the horse that's adapting to sudden heat indoors and out of the sun. "Some of the well-built barns in hot climates can keep horses cool—they're designed to take advantage of all the natural ventilation possible," says Coleman.

Fans, misting fans, or air-conditioning can also help.

"Fans create enough air movement to help promote a little more evaporation—to cool the body," says Connally. Another bonus is they can deter insects, which can be both a nuisance and a disease threat, exposing horses to insect-borne pathogens they might not have encountered previously. While you should already be using core vaccines for mosquito-borne diseases such as West Nile virus and Eastern and Western encephalomyelitis, work with your veterinarian to find out if he or she recommends a booster before going to a warm climate.

"In a cold climate a horse may only need boosters once a year, but there may be mosquitoes year-round in the warm climate, and his immunities may be inadequate," says Allen.

As for riding horses that have moved from cold to hot weather, Connally says to pay close attention during work and recognize they might not be able to exercise during the heat of the day.

"Exercise adaptation (coming from a hot climate to a cold one) is actually pretty easy for the horse," adds Allen. "The reverse is more complex—taking a horse from a cool climate to a hot one. It's much harder for the horse to adjust."

In addition to the heat and insects, he says the horse must acclimate to other changes, as well, such as different-tasting water that might get warmer than the horse likes and new bedding.

Your biggest concern when going from south to north in winter, on the other hand, is whether your horse has an adequate hair coat.

"His body has been coping with heat (with the blood vessels beneath the skin dissipating body heat rather than conserving it), and it takes a while to adjust," says Connally, adding that these horses probably won't grow hefty hair coats and truly thrive until they've experienced the full transition from fall to winter.

Extreme temperature fluctuations (50 degrees or more between daytime and nighttime extremes) any time of year, however, can be hard on horses. "Temperature swings are a stress, especially for foals," says Connally. "It can lead to scours (diarrhea) or pneumonia in young foals, but is not as hard on adults," he says. Multiple stresses combined—such as if a horse is undernourished, traveling, and working hard—can add to the burden of weather changes.

Take-Home Message

Horses are very adaptable and typically can handle significant temperature swings. It's when we alter their natural condition and confine them (or don't provide them with a windbreak) or haul them from one climate to another that they tend to struggle. It's up to us as responsible horse owners to help them adjust. UK

>Heather Smith Thomas ranches with her husband near Salmon, Idaho, raising cattle and a few horses. She has raised and trained horses for 50 years and has been writing freelance articles and books nearly that long, publishing 20 books and more than 9,000 articles for horse and livestock publications.

Body-Clipping Considerations

If you've body-clipped your horse to keep him cool in anticipation of traveling to a hot climate, keep an eye out for skin issues. "When you clip, you abrade the skin," says Kent Allen, DVM, FEI veterinary delegate and owner of Virginia Equine Imaging, in Middleburg. "The horse will also get more sun (which he's not accustomed to) and may sunburn. He will encounter bacteria in the new environment that he hasn't been introduced to before. He'll also have new bedding and potential allergic reactions, and more skin problems, when going to a new place."

Using Web Soil Survey to Estimate Cool-Season Pastures' Carrying Capacity

The stocking rate of livestock on a pasture has a significant impact on an operation's forage productivity and financial profitability. Too many animals in a field results in overgrazing and the need to provide costly supplemental feed while too few animals results in underutilized forages and, therefore, lost income. While several factors influence how many animals a farm can carry, soil type has a major influence and should be considered when purchasing, leasing, planning, or managing livestock on pastures.

"Carrying capacity" is the number of animals the environment can sustain indefinitely given its food, habitat, water, and other available necessities. For livestock, this is how many animals a farm or pasture can carry throughout the year without negative environmental impacts. Carrying capacity is based on the soil type and slope of the land, characteristics that take thousands of years or more to change. The productive capacity will dictate what that land is most useful for.

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Soil type has a significant impact on a pasture's productivity and limitations.

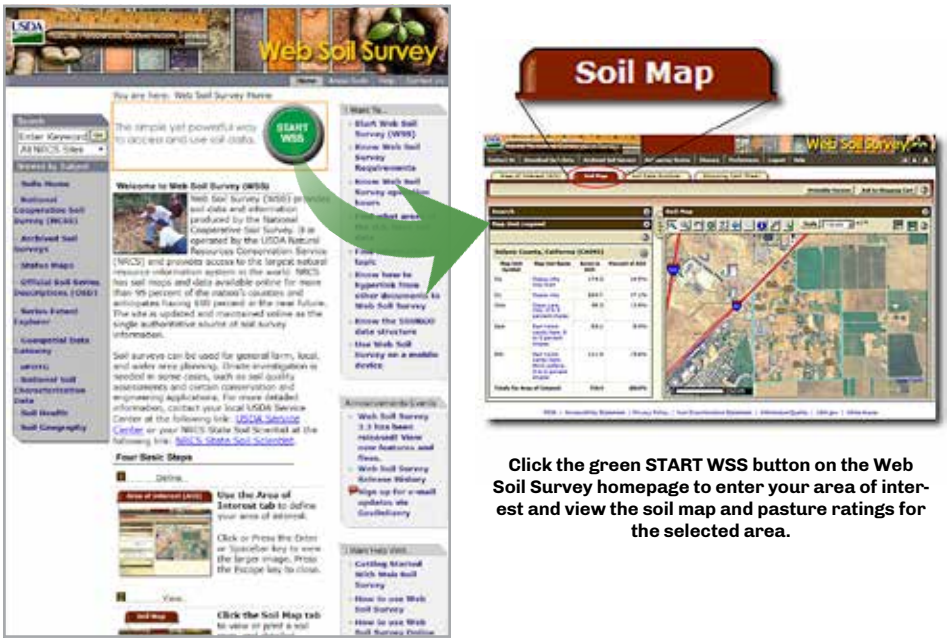
WEB SOIL SURVEY

National Cooperative Soil Survey

The National Cooperative Soil Survey (NCSS) program began in 1896 as an attempt to survey and map soils in the United States. The program started small, surveying only 2.8 million acres in Connecticut, Maryland, New Mexico, and Utah. Today, soil survey data is available online for the entire country as the Web Soil Survey (WSS) and is maintained by the United States Department of Agriculture Natural Resource Conservation Service (USDA-NRCS).

Using Web Soil Survey

Web Soil Survey has a tremendous wealth of information both in and out of agriculture. This publication will focus on using Web Soil Survey to calculate the livestock carrying capacity on cool-season pastures.



Click the green START WSS button on the Web Soil Survey homepage to enter your area of interest and view the soil map and pasture ratings for the selected area.

- Navigate to the Web Soil Survey homepage, and click the green "START WSS" button.
- Enter the address of the property in question, and click "view" to display the land area. The area of interest can also be located by other means, such as latitude and longitude.
- Find the property using the tools at the top of the satellite photo. Use the "+" magnifying glass to zoom in, the "-" magnifying glass to zoom out, and the "hand tool" to move the map left, right, up, or down.
- Outline the "Area of Interest" (AOI) using the AOI rectangle or polygon buttons on the right. Double click on the last point to complete the area. When finished, the total acres selected will appear on the left. This step can take a few seconds to a couple of minutes depending on connection speeds, so be patient.
- To view the soil map for the selected area, click the "Soil Map" tab at the very top (above the map). Click "Printable Version" on the right to view these documents in a PDF form (be sure you've disabled your browser pop-up blockers).
- To retrieve the pasture ratings, click "Soil Data Explorer," then the dropdown arrows for "Vegetative productivity." Click "Yields of Non-Irrigated Crops (Map Unit)" and select "Pasture" from the dropdown menu under "Basic Options." Finally, click "View Rating." Click "Printable Version" in the right corner to view as a PDF.

Table 1. Acres Per Animal

Animal	Size (lbs/animal)	AUM Rating	Acres per Animal
Sheep	300	9.5	0.4
Sheep	300	6.0	0.6
Cow	1,000	9.5	1.3
Cow	1,000	6.0	2.0
Horse	1,200	9.5	1.5
Horse	1,200	6.0	2.4

Interpreting Soil Ratings

Soil ratings range from 1 to 9.5 Animal Unit Months (AUM). AUM is how many months one acre of land can carry one 1,000-pound animal (1,000 pounds = 1 animal unit). Acres per Animal (A/A) is an easier unit to work with and easy to calculate. To convert the AUM to animals per acre, you must first calculate an animal adjustment factor by dividing the average weight of your animals by 1,000 (because not all livestock are 1,000 pounds), which provides the number of animal units per animal. Next, divide the AUM rating provided by Web Soil Survey by the animal adjustment factor. Finally, divide 12 (for months in a year) by the adjusted AUM rating to convert to acres per animal.

Calculations from **Table 1** indicate you'd need 0.4 acres to house sheep on well-rated soils (9.5) and slightly more for poorer soils. Two acres would be needed for a 1,000-pound cow on low rated soil and almost 2.5 acres for a 1,200-pound horse on similar land.

Comparing Productive Capacities

For the purposes of this publication, we've compared two tracts of land. Farm A contains just over 1,000 acres in Fayette County currently used for horse pasture, while Farm B includes around 950 acres in Owen County currently used for beef production.

Farm A is dominated by Bluegrass-Maury silt loam with a 2 to 6% slope (uBlmB) and has a rating of 9.5. This is one of the highest ratings in Kentucky for pasture and could sustain a 1,000-pound cow on 1.3 acres or a 1,200-pound horse on 1.5 acres. Another soil type, Maury-Bluegrass silt loam with a 6 to 12% slope is similar but has a slightly lower rating of 9, mainly due to the increased slope. Water will run off sloped land more quickly, increasing erosion and decreasing water available for pasture plants.

Farm B is dominated by Eden flaggy silty clay with 20 to 30% slope and is severely eroded (EfE3) with a rating of 4.8. Farm B will need to allocate 2.5 acres for a 1,000-pound cow or 3 acres for a 1,200-pound horse. While this soil may not have the highest rating, it can still be productive and profitable when managed correctly and not overgrazed.

Uses and Limitations

Understanding the soil types available on a piece of property is valuable in many ways, especially when considering a piece of land's production potential before renting or purchasing. You can use carrying capacity to estimate the land's profitability and, ultimately, value, based on the number of animals it might carry. In addition, understanding soil properties can help you develop a strategy to locate buildings, roads, and fencing on marginal soils and use the best soils for pasture. Fundamentally, a clear understanding of your soils and how they are located will help you to better manage your land base.

To maximize your soils' production potential and maintain optimum soil fertility, collect soil samples routinely and follow laboratory fertilizer recommendations. Because permanent pastures benefit from recycled nutrients in manure and urine, you only need to soil sample pastures every three years. Cutting hay from pastures removes many more nutrients; therefore, you should soil sample hay fields every year. When doing so, take multiple soil cores (10-20) with a soil probe and mix them together to form one sample for lab analysis. Soil samples should represent the top 3-4 inches of soil in untilled fields such as pastures. Generally, each sample submitted should represent no more than 20 acres. Submit separate samples for areas within a pasture that have major differences in soil properties or historic management (for example, if there was previously a tobacco patch in a pasture). Finally, apply fertilizer and lime according to laboratory recommendations. You can find more information on fertilizer and lime recommendations in AGR-1 "Lime and Nutrient Recommendations."

When rating soil types, Web Soil Survey makes a few key assumptions. The rating assumes good pasture management. This includes maintaining good grass cover, managing weeds, rotational grazing, and maintaining soil fertility. Web Soil Survey also assumes average weather conditions. Events such as a late spring, hard winter, or dry summer will all impact the carrying capacity. Keep in mind that these are yearlong averages; in most years there will be excessive pasture growth in the spring that may not be utilized and hay feeding will be needed in the winter. Year-round grazing is possible in some areas but requires intensive management. Finally, most farms will also have roads, barns, and common areas that are not included in pasture. Remember to account for these nonproductive areas when determining a farm's total carrying capacity.

Summary

Soil type has a significant impact on a pasture's productivity and limitations. Web Soil Survey provides farm managers and owners with valuable information they can use to calculate their farm's carrying capacity. Proper pasture management is essential to reaching maximum utilization without overgrazing and damaging pastures. Find more information and soil sampling resources by contacting your local county Cooperative Extension agent; visit www.ca.uky.edu/county to locate your extension office. UK

>Ray Smith, PhD, professor and forage extension specialist within UK's Department of Plant and Soil Sciences, and Krista Lea, MS, research analyst and coordinator of UK's Horse Pasture Evaluation Program within the Department of Plant and Soil Sciences provided this information.

UK Ag Equine Programs to Host 9th Annual Equine Showcase

University of Kentucky Ag Equine Programs will host the 9th annual UK Equine Showcase Jan. 24-25, 2019, at the Fayette County Extension Office, 1140 Harry Sykes Way, in Lexington.

The event will highlight the university's equine programs and relevant industry findings with an emphasis on the foal, from birth to weaning. The event will span two days: Friday, Jan. 24 from 12:30 to 5 p.m., followed by a networking happy hour, and Saturday, Jan. 25, from 8:30 a.m. to 3:30 p.m. with lunch provided.

Topics for the showcase include epidemiology and diagnostics, infectious disease, immunology and parasitology, nutrition, musculoskeletal issues, genetics, and economics.

"This is a unique and special outreach event. The purpose is to 'showcase' some of what is happening at the University of Kentucky in terms of scientific discovery and service efforts relevant to young foals,"

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The Equine Showcase will highlight the university's equine programs and relevant industry findings with an emphasis on the foal, from birth to weaning.

EQUINE SHOWCASE

said James MacLeod, VMD, PhD, director of UK Ag Equine Programs and the John S. and Elizabeth A. Knight Chair within the Maxwell H. Gluck Equine Research Center. "Attendees will hopefully gain new information they can apply to their programs, but importantly also a greater appreciation for some of the critical questions being addressed at UK, why these issues are important, and where the cutting edge of research is on a number of very interesting topics."

The UK Equine Showcase is open to veterinarians, owners, and managers of all horse breeds or anyone with an interest in learning more about foals and horse management. The cost to attend is $80 until the early bird registration deadline of Jan. 13. After that date, the cost will be $100. Those prices are discounted to $70 for early bird or $90 for regular registration if two of more people from the same organization register. There are a limited amount of discounted tickets available for students who are interested in attending. Register at eventbrite.com/e/9th-annual-uk-equine-showcase-tickets-79577962829. Contact equine@uky.edu with questions about the event or to register as a student.

Continuing education credit for veterinarians and veterinary technicians is pending approval by the Kentucky Board of Veterinary Examiners.

UK is also accepting sponsor participation for the showcase. Display opportunities are available to participating organizations. Email equine@uky.edu for details. UK

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

Upcoming Events

December 5

Master Horseman: Facilities Management & Basic Equipment
Location: Henry County, Kentucky, Extension Office, 6-8:00 p.m.
afs.ca.uky.edu/event/master-horseman-0

January 16

UK VetCE
Location: UK Veterinary Diagnostic Laboratory, gluck.ca.uky.edu

January 24-25

UK Equine Showcase
Location: Fayette County Extension Office
For more information or to register:
eventbrite.com/e/9th-annual-uk-equine-showcase-tickets-79577962829