This is David Lamm, here at the East National Technology Support Center, in sunny Greensboro. Greensboro had a big ice storm last week, and disrupted service quite a bit, and we're just getting through our big thaw here. So I want to welcome everybody.

And I think today's-- I always get excited about folks talking about soil health. And today's presenter, Doug Peterson, is going to be another one in a fine line of presenters that we've had so far this year. Doug is the State Soil Health Specialist for the state of Missouri. And he formerly was their grazing specialist. And I think what makes Doug unique is not only does he know what we do as an agency, but he also practices many of the principles about mob grazing and high density grazing he'll be speaking on today on his own farming operation there in the Bootheels of Missouri.

So with that, Doug, I'll turn it over to you. Welcome.

OK. And David, and Doug, just for a second before we move on, I do want to express our thanks to Southern Regional Extension Forestry for partnering with us to host our events at the ConservationWebinars.net Science and Technology Training Library. So Doug, I'm getting ready to give you the presentation.

Thank you, ma'am. This technology stuff is pretty cool. But it's kind of challenging once in a while. So Dave, my operation is not in the Bootheel of Missouri, but I am today. I've actually got a place up on the north Missouri line, next to Iowa. And so a lot of the things that I'm going to talk about-- a lot of the experiences I'm going to talk about are from my operation, but from other operations around the country, as well.

High density grazing for soil health. A lot of our soils around the country are degraded. We know that. We understand that. At least I think we do now. In many cases, we've probably lost half of our soil organic matter in the time that we've been using them since European settlement.

So purchased amendments-- fertilizer, lime, that kind of thing-- I feel should be a capital investment, not an annual expense. It shouldn't be something that we should have to purchase year after year after year. So how can we improve our soils without that annual expense?

Here was a book that I read several years ago, and met this gentleman, Allan Savory. He came up with

a topic-- or a subject-- that he believed animal impact was a tool to heal the land. And he said that the only known tool to heal the land is animal impact. Now, I'm not sure it's the only tool. But I do believe that it is a very, very economical tool. And it's a very natural tool. And that's kind of what we're going to talk about is the tool of animal impact. And how we can use it to improve the land. And what it does to improve soil health.

Animal impact is everything that the livestock do to the land. It's not just how much of a plant they eat. It's the hoof action. It's the rubbing. It's the salivating. It's all the physical things they do, besides just how much grass do they eat. I believe it's probably the most powerful tool we have to manage our grassland resources. And even, now, our cropland resources, with cover crops. It does so many things.

How did nature-- how did that animal impact work? How did it take place in nature?

Here's a picture of a set of bison out in South Dakota on Phil Jerde's place. And you can see them. They're pretty well just standing there. They're not stressed. They're grazing their way across this hillside. They're at a fairly high stock density. But you can imagine, as they're walking across there slowly, their footsteps are-- they're placing their feet very carefully. They're walking very slow. There's not a lot of soil disturbance. There's not a lot of trampling going on. They're being fairly selective in what they're eating. They're picking and choosing what they want.

So one thing that these bison don't have, that the native bison-- or all herbivores, for that matter-- would have had that would have impacted how they interacted with their forage on the land was predators. Here's a shot of a small group of bison in Yellowstone. And if you think back, OK-- these predators-- they're not actually harassing these bison, but look at how much closer together the bison are. And think about the impact that their feet are going to have on the land.

They're much closer together, obviously. They're nervous. They're agitated. There's a couple tails in the air. So they're going to trample a lot more forage than the picture previously here of Phil's. OK?

So here's another picture. A lot more impact, isn't there? You can actually physically see the dust, the dirt flying up. So would this have happened all the time over the prairie? No. It wouldn't have. There's a lot of accounts of large herds of bison-- hundreds of thousands-- moving across the plains. Either being chased by predators, or not, just migrating. But they would trample virtually everything-- trample and eat virtually everything in their path, not returning for months.

There are other accounts of family units of 50, 60 maybe 80 head of bison living on a burned area. And even those small herds would have occasionally been harassed by predators. And it's that harassment that would have achieved a certain level of impact to the land, besides just grazing. It would have trampled some of the plants down to speed mineralization-- to feed biology-- and that's what we're going to talk about today.

How do we measure? As humans, we always have to put a number to stuff. So how do we put a number on animal impact?

Let's just say-- here in Missouri, our herd sizes are pretty small. But let's just say we've got 40 head of 1,250-pound cows. That's 50,000 pounds of animal live weight on the hoof. And if we put that 50,000 pounds of animal live weight on these three different-sized pastures-- 10 acres, one acre, or a quarter-acre.

The math-- If we do the math on that 10-acre one, 50,000 spread out over 10 acres is only 5,000 pounds of live weight on a per acre basis. Now, we know that they're not going to be spread uniformly over that 10 acres. But that's kind of what the math tells us-- that there's approximately 5,000 pounds spread out over that.

As you step on down to the 50,000 on a quarter of an acre, that's the equivalent of 200,000 pounds of animal live weight on a per acre basis. There's no doubt that that difference in stock density-- that the difference in the size of the area that those animals are on-- is going to play a huge impact. On not only the plants they eat-- how much of those plants they eat. We're not going to be able to leave those animals on those three areas for the same length of time.

So the number of stock density-- the pounds of stock density really has nothing to do with the time. It's simply a way of putting a numerical number on how compressed we have that livestock on a given area. And we're going to refer to that number as we go through here. So I just wanted to touch on that.

What density is what? There's a lot of names. Mob grazing, high stock density, MIG, rotational. You can call any of them what you want. And I've seen mob grazing at that 10,000 stock density, and I've seen mob grazing at a million pounds of stock density. So these are just kind of three categories that I tend to lump stuff into. There's no hard and fast rule. It's just kind of where I tend to.

I know that-- up to 50,000 pounds-- I kind of know what impact the land is going to have-- that livestock are going to have to the land. And as we get over 250,000, then that's a whole different type of impact to the land. So those are just kind of three categories that I lump stuff into.

As we talk about the high stock density, these are typically some characteristics of high stock density. Typically, you could have an infinite number of paddocks. Because as forages change-- people's goals change throughout the year-- I know people that move six or eight times a day part of the year, and once a day part of the year.

So you can have an infinite number of paddocks. The grazing period can be anywhere from minutes to maybe up to a day. Typically, if you get longer than a day, then your spot densities are probably going to be down into the less than 50,000 pounds, and then that's probably going to drop you into MIG-- what I would consider more of a MIG standpoint. The rest period can be months to years. And we'll talk a lot more on rest periods.

Stock density-- you can see there. Utilization varies greatly depending on the goals of the specific livestock operation. It does, most of the time, lower selectivity of the animals. And we'll talk about that.

So just to give you an idea of what we're looking at from a visual standpoint, here's a set of cows at about 80,000 pounds of stock density. And just-- you can look at the spacing on them. They have been moved from the foreground of the picture to the background of the picture. The area that they're on now is about five or six acres, and there's 200 pair there. So that's just visually-- you can see that's about 80,000 pounds of stock density.

Here's a set of cows at about 240,000 pounds of stock density. The area that the cattle are on is essentially the entire area that they have access to. So they are spread almost perfectly uniformly across that field-- across that area.

Here's-- as we step it up in stock density, here's a set of-- two pictures on a set of steers out of Texas. Obviously this is some irrigated annuals. But, as you can see here, pretty high stock density. Utilization is pretty high on these annuals. It's going to be a once-over, obviously. And those two photos are on about a 30-minute time delay. So from one photo to the next is 30 minutes. Obviously, they were moving multiple times a day.

Then many people know Neil Dennis in Canada. This a shot that Terry Gompert took from Neil's place.

And it's about a million pounds of stock density. Again, very easy to see the difference in spacing between the cattle.

So what are we trying to achieve with this? Well, we're trying to achieve some of the effects that the bison, when they were harassed by the predators on the prairie-- the trampling-- that's some of the things that we're trying to mimic. But yet without the stress from the predators, obviously. We don't want that physical stress, but yet we're trying to mimic the effects, somewhat.

So how does high stock density improve soil health? What exactly does it do? Here's a shot. Many of you have seen something similar to this before. It's a little spot of clover growing out in a field. What causes it? Well, you fed a bale of hay there.

What did feeding that bale of hay do to that part of the field that caused all of that clover to grow? It added a little fertility. I'll give you that. There was no clover seed in the clover plant. But it did cover the soil. It added thatch to the soil. It probably changed the pH at the surface of the soil a little bit. Organic matter has the ability to raise a low pH and lower a high pH. So it probably changed the pH right at the surface where that clover was.

So if I wanted to do that on a large scale, I could go out and I could spread hay on an entire field, but boy, that would be very expensive. So how can we get that same soil health benefit without spreading hay on everything?

Here was a field that we actually took over in our operation in '07. This photo is from '08. It had been continuously grazed for 30 or 40 years. It was probably 30 or 40% bare ground, and a tremendous number of annuals, as you can see. We came in and grazed it twice in '07, and then let it rest the entire growing season of 2008.

This photo's from August. And we came in in August and grazed it at fairly high stock density, on a 12-hour graze period. And trampled a large portion of this material down. Again, this was the second year we had done this. So we had done it previously twice, and then we came in the third time and did it.

And now the next photo that I'm going to show you is 10 days post-grazing. 10 days after we grazed it and trampled a large portion of those annuals down. You can see all the trampled material for sure. But then what do you also see? You also see clover everywhere. No clover was spread. No lime was spread. No fertilizer was spread. The two years of trampling altered the pH at the surface of this soil.

I'm under no illusions. It did not change the pH at depth. But it created a habitat. It created environment right at that surface for biologic activity that made more minerals available, that changed the pH slightly, that allowed clover seed-- that was in the soil-- the opportunity to germinate.

So that succession taking place through the use of animal impact. We went from annuals now here to a nitrogen-fixing biennial. And then, as we moved on down the line, we went to perennials. So we can have a huge impact with the livestock, using them as a tool. And we're going to go on through that.

So I want to touch on the four principles. Everybody should know and understand our four principles of soil health. Less disturbance, keep a living root to feed soil livestock, keep the soil covered, and then add diversity as well. So I'm going to run through these four things real quick as we talk about it.

And I'd also say, if anybody's got a question at any time, jump in and send that in right away, so we don't get too far from the subject you're wanting to ask a question about.

OK. Yeah, Doug, actually I did have a couple questions. One, is there a minimum amount of pounds per acre to achieve the benefits that you kind of described there earlier, to mimic those things? Is it 50,000? Is it 100,000?

Dave, it really depends on your environment. It depends on where you're at. And it depends on what you're trying to do. If you're trying to trample down material like I showed right there-- in the East, typically, east of the Mississippi River, and even in Missouri-- east of the Missouri River-- in our environment, the more humid environments, we can do a lot with 100,000 and 150,000 stock density. Which you'll be-- on about two moves a day, typically, depending on your forage availability, two moves a day will probably put you in that 100,000 to 150,000, 160,000 stock density. And that will achieve a lot of things in the more humid areas.

As you get into areas where maybe you have more woodies, or farther west, you're probably going to have to have a little higher stock density. Which is harder to do in the West, because obviously less forage. To achieve-- if you're not getting the impact to the land that you want, then you have to go to a higher stock density. If you have less forage like they do in the West, then that means a lot more moves a day to make sure that you get enough intake on those animals. And I think we'll have some pictures will show that a little bit more.

I was going to ask, are you going to talk about how you can judge whether you're getting the impact-- how you can gauge whether you're being successful with the impact as you go through your presentation?

Yeah a little bit, as we go through. Just to run through disturbance. We've got chemical and physical disturbances. We're not going to touch much on the chemical disturbances, other than to say that we really need to understand those. And be careful on what we're doing, even on pastures.

Most of us think of physical disturbance as tillage, obviously. Fire is a disturbance as well. But what's the biggest disturbance in grassland? I believe that it's haying. Haying is an incredibly, incredibly harmful disturbance, and I think that needs to be something that we really need to focus on.

We're going to really hit on grazing as we go through here. So we're going to skip those a little bit.

Grazing is a disturbance that set succession back. There's no doubt about that. As we lengthen our rest periods, then it typically will mean less grazing events per year. So we want to have succession-- in a forage environment-- we want to have succession advanced as far as possible away from the annuals and toward the perennials. But yet have a system that is maintained in a herbaceous vegetation. Or herbaceous with a few shrubs. We don't want to allow succession to advance so far that it becomes totally woody.

So lengthening those rest periods out is going to mean less grazing events per year. So that will allow succession to mature slightly. And that's what we're looking for. Many times in our grazing systems, we keep succession too close to the annual side of things. Too low serial.

So how do we lengthen rest periods? Everybody says, well, you know, boy, but if I lengthen my rest periods, it's going to take a lot more acres. So how do I lengthen my rest period, but maintain my same stocking rate?

So one of the ways that we do that is by utilizing plants that are growing out there that, in a less-intensive grazing system, the cows wouldn't have eaten. So here's a picture of Mark Brownlee's down in south Missouri. Where he went to two-a-day moves. And he's got some sumac. He had a lot of sumac, and some other woodies. Some shrub-type woodies. Typically the cows wouldn't eat that.

As he went to two-a-day moves, he began to notice that the cows were eating this sumac. At first, he

was worried that he was actually starving his cows, and they were eating it because there was nothing else to eat. But then he realized that-- as he began watching-- they would go through the strip, and they would eat some sumac, then they would walk on down, eat some grass, and then they would come back and eat more sumac.

So maybe initially-- maybe the first day or two-- we were requiring those cows to eat part of the forage sward that they wouldn't have eaten if they wouldn't have been required to. But as we get farther down the road, we teach those cows, hey, you know, I can eat anything out there. And so they begin to eat a lot more of that-- the plants that they wouldn't have eaten before. So that gives us, essentially, more forage in a sward. That's what it looks like afterward.

Here's another example of the same thing, basically, with ironweed. Ironweed was taking over this field. So instead of ignoring it and letting it take over, we begin to use it as a forage. Raised stock density to a level that required them to eat a portion of it. And we didn't want to hurt performance. There's still plenty of forage there. You can see a lot of green. It is grazed fairly uniformly, that's for sure. But we'll talk about performance more as we go.

Living roots feed soil livestock. How do we get more roots in the soil? This is the picture that many of you have seen many times, I'm sure. If we think of those roots as a food source-- those roots are the primary food source for organisms in the soil. We have to think of those roots as a feed trough. So how do we get a bigger feed trough for our organisms in the soil?

Well, obviously we have to have a longer rest period. Longer rest periods mean more roots. Now, how long is that going to be in your environment? It's hard to say. I realize we've got people from all over the country here. In my environment, where I'm really focusing on building soil, if I'm going to make an error on the length of my rest period, my error is going to be too long. I can deal with a rest period that's too long. But I but if I have a rest period that's too short-- a recovery period that too short-- that will hurt my soil health. Me again.

So how long is that going to be in your particular area? I can't say. You're going to have to decide that and look at that. I know for us, we went to two to three grazing events per year. And have seen some tremendous benefits in diversity-- tremendous benefits in soil health. We have a thatch of material on the surface of the soil. Litter that's approaching-- decomposed litter that's approaching an inch thick. Makes a huge difference on infiltration, on soil temperatures. And we'll talk more about that as we go.

So those exudates that those plants give off, that's the food source. The plants really are in control. And that's why we have to make sure that we have a lot of plant material-- a lot of roots- to feed those organisms in the soil.

This is not a slide meant to say this is the perfect soil. But it's a slide to show that we have livestock in the soil. We have pounds of livestock in the soil. We need to do-- with purpose and with thought, we need to feed our soil livestock.

We always have a plan for our cows in the winter. We have to have a certain number of hay bales. We have to have a certain number of acres to feed our cows or our sheep every year. Do you, with purpose and with thought, plan on feeding your soil livestock? Do you plan on giving them a mulch on the surface of the soil? Do you plan on giving them a diverse mixture of roots? Do you plan on keeping a living root in the soil all year long?

Keeping the soil covered. And I guess I'd stop here. You got any more questions, Dave?

Yeah, I had a question. You were referring to effect on pH. And they were just wondering what the typical pH would be in your soil that you're dealing with in your area there.

It can vary quite a bit, depending on how eroded the area is, and how much it's been farmed historically. We've got some in the mid fours, high fours. Typically that field-- that particular field that I showed with the clover-- was in the low fives. 5.1, 5.2, that was pretty typical.

We have a few others. And I'm not opposed to putting on lime. I had not applied any to that farm. That was the second year of a rental farm-- of a leased farm. I have applied some lime on owned land. And I think that's probably a very cost-effective application of that tool. But I also know that-- in many situations-- we can alter those pHs significantly. At the surface, not throughout this whole soil profile. But at that surface, which will change the species composition quite a bit. Good question. Anything else?

One more-- well, one more before you move on. You talked a little bit about behavioral characteristics of the cattle. And they were wondering if you've found any breed differences-- that some breeds tend to graze better than others in this kind of a situation?

I wouldn't say that I've found any breeds that graze different, because the grazing is something that we

really control. How much they eat, what they eat, that's what we really control.

I will say that I've found differences in the pressure-- in the level of stock density that animals can take. We take in contract cows every year. And I got a set of contract cows two years ago that came from Texas. And I would have to guess they'd probably only seen humans about twice in their whole life. Because they would not take the pressure. They could not-- the highest stock density we could get with them was 80,000 or 90,000. Maybe 100,000. As we tried to confine them into smaller areas, invariably, there'd just be several of them out. And it wasn't because they weren't trained to electric fence, because they were. It was because they physically couldn't take being that close to all their neighbors.

So there are some things there. Generally, though, all it takes is about a week or two to train virtually any type of animal, any breed of animal. We get a different set of cows in almost every year. Not quite, but-- and all it takes is a period of a week or two weeks to train them to this method of grazing. It's not [INAUDIBLE]. So is that it?

Yeah, why don't we keep going.

OK. The next thing here is keep the soil covered. Obviously, that's another one of our basic soil health tenets. So how does the high density grazing play into that? Well, the trampling that we've talked about a couple of times is the biggest part of it. That trampling-- In a very low density grazing style, similar to what you saw with the bison and on Phil Jerde's, there would be very little trampling that would occur. The animals we would place their feet and select where they were going. And there really wouldn't be much trampling.

Here's a picture. You can see quite a bit of trampling, quite a bit of plant material laid down. There's still plenty of green grass left upright to carry on photosynthesis. But that mulch on the surface-- taking that plant material and putting it on the surface just does a whole variety of things.

For one thing, you know, here's a question for you. If I graze at a light stock density, and I graze the parts of the plants that meet my cows' nutritional needs when I go through there, in a fairly light stocking rate, if I take off half of the plants, when I come back around the next time-- as I make my entire rotation, and I come back to that field next time. The parts of the plant that I left last time-- when I come back the next time, are they going to be better quality, or are they going to be lower quality? In almost all instances, if they've had that extra-long period, they're going to be lower quality.

So why do I want to leave them? I want to leave some of them there to carry on photosynthesis, for sure. But if they're not good enough for my animals to eat the last time they were there, there's no way they're going to be good enough for my animals to eat the next time. So let's get a portion of that trampled down so that the organisms can begin the process of decomposition and mineralization, and grow new plants with that material. Instead of tying it up, let's start growing some new material with it.

And it does a variety of things. It keeps the soil cool so that soil organisms can remain alive and working. It also provides a food source for earthworms. It's not necessarily a food source for earthworms. The earthworms use it more like bait. They use all that mulch as an attractant. They drag it back to their holes and use it as an attractant for bacteria and fungi. And then they eat the residues given off by them.

So as we move on, here, obviously, is another reason to keep a thatch of material on the soil. Soil temperature is huge. Not only to biological activity, but to moisture evaporation. Here's a slide here. At 70 degrees, 100% of that soil moisture is used for plant growth. As we move on up, 100 degrees, only 15% is used for growth. So keeping that soil cool makes more efficient use of our water. We have to keep that soil cool. It helps improve water infiltration.

Here's a slide showing a rainfall simulator. We've been doing these all over the state of Missouri the last year or so. And I tell you what, the tray with the very short canopy of grass-- even if it has a 100% ground cover, the tray with the shot canopy of grass always gets a lot of oohs and aahs because of the amount of runoff that occurs.

Most of us in the grass world-- we've always thought, well, even if I've got short grass, it's going to be so much better than that bare-tilled soil that the row crop guys have-- I'm going to be OK. But I think we're really beginning to see, with this rainfall simulator, just incredibly how much water runs off. Ground cover is important, but, boy, canopy height is critical as well. Those front three jars you can see are runoff. The back three are infiltration. So the canopy height-- leaving as much of my farm as tall as possible, as much of the year as possible, is crucial to ensuring I get as much infiltration as possible. It doesn't matter if it rains and rains and rains. If we don't capture it, we've lost a lot, right there.

Well, Doug, is this a function of just lack of canopy, or is there some action that the hoof has, and sealing that off, much like you would on a crusting in a crop field, or what is causing that increased

runoff?

It's a variety of things, Dave. One is the continuous hoof action. The compaction that's caused by the livestock is a little bit. But compaction is not a function of the pounds of animals on it. It's a function of how long they're there. In that short canopy situation, they're going to be there all the time. It never gets a chance for biologic activity, for earthworms to loosen that soil back up, to help alleviate some of that compaction.

That tall canopy also gives a-- has a lot better root structure. So the more root structure we have, the better that acts as a suspension mechanism for those animals. High density also improves the livestock mineral efficiency at which it's spread.

This is a study out of NU. They looked at one pasture of a three-pasture rotation, one pasture of a 24-pasture rotation, and counted the manure piles on every 500 square feet. The darker it is, the more effectively the manure was spread out. So they took that data and came up with this table. In a continuous grazing situation, it'll take 27 years to get one manure pile every square yard. In a two-day rotation, they'll get manure pile every square yard in two years.

What about if we're moving once a day? What about if we're moving them multiple times a day? What's that going to do for manure distribution? Here's a shot from one of ours. Look how close the manure piles are. Effectively, they're probably one manure pile on every square yard. Now couple that with the fact that for every manure pile, there's five to seven urine patches. How much of that field was spread with manure and urine? You'd have to say probably close to 100%.

Diversity of plants. What does diversity do? And how's it impacted by high density? Well, we've got the four plant types. Everybody understands that. Cool and warm, grass and broadleaf. That's our primary species. Soil organisms are just like livestock, or you and me, for that matter. They require a balanced diet to attain high performance.

Here's even a study that shows-- the more groups you have-- the more functional groups you have, the more potential you have for plant biomass. Because you have cool season plants that grow in the spring, and warm season plants that grow in the summer. Deep tap-rooted plants and shallow fibrous-rooted plants. Here's a slide that shows that very thing.

So even those deep tap-rooted plants-- even if my cows never graze them, they have a place in that

grazing ecosystem. They bring up minerals and moisture that my shallow fibrous-rooted plants-- my grass plants-- you just can't get. So we really have to try to mimic the prairies from that standpoint.

And there's great reasons to. We have a lot of fertility at depth. Here's some information from a typical pedon of soil in Missouri. And it shows that we have a tremendous amount of fertility at depth. If we don't have roots that will go down at depth, we're given up $1,000 worth of fertility.

Our grazing periods and our rest periods really determine the species composition. Here's a pasture that has had a fairly long recovery period every year. And you can see all the broadleaves in it. Most people would say, oh, those are weeds. But if you'll notice on the left side of the slide there, there's no white flowers. But yet in the strip where the cows are at, there's a tremendous number of white flowers. White heath aster is what it is. Those animals were selecting for that very intensively. At this point in the fall, when our cool season grasses are very high protein, we need an energy source to go along with that. And that's what those flowers were providing.

If we had a short rest period all the time-- if we only had a 30 or 40 day rest period-- and maybe if we threw a bush-hogging in there to clip all the plants off, we would never have that much diversity in a field like that.

Tim Kelley, a friend that is really focused on diversity-- you saw this picture just a minute ago. We've got big bluestem and fescue over on the right there, clover in the middle, some lespedeza on the left, warm season, cool season, grass, and broadleaf-- all from the same field. Just at different times during the year.

Average production across north Missouri is about 8,000 pounds per acre. On that diverse field, with high density, Tim has produced a measured 18,000 pounds of forage in a year. More than double the average production. With no added fertility in seven or eight years.

So getting plant diversity, and then using high stock density to effectively utilize it, is the real key to improving our productivity-- and our profitability.

And then the last thing I want to talk about here-- as we get ready to wrap up-- is animal performance. Because this is an issue. And I've seen problems with this before. If it's managed properly. It's really good. Typically, in the East, our pastures are very high protein, low energy-- our cool season grasses. An easy way to allow our-- to help improve that energy to protein ratio is to allow our cool season

grasses to get a little bit more mature. That will really help with that problem.

The tricky part is allowing enough livestock selectivity to maintain performance, but yet at the same time, controlling livestock selectivity to ensure that they eat the portions of the plant-- or the species of plants-- that we want them to. So it's a pretty fine line.

The biggest mistake that I see that people make is what I'm going to call scorched earth grazing. When you put animals at a stock density that is very high, you can make them do anything you want. I can make them eat the thatch off the ground if I want to. It'll kill them, over time, but I can make them do it. Because they become very, very aggressive grazers.

Here's a shot that has a mixed herd, obviously, cow-calf pairs. Multiple moves a day. The lack of residue behind them-- this is a very wet environment, and the lack of residue behind doesn't bother me quite as much, because you can see in the foreground-- it it's recovering very quickly. The problem in a mixed herd like this, of cow-calf pairs-- by the time calves are about 90 days old, they're getting more of their nutrition from grazing than from milk. And in this situation, there's a lot of calves that are not grazing.

Now maybe that's because on multiple moves, they already had their fill, but I'm guessing not. I'm guessing in this instance, he's actually reducing performance on the calves because they can't get in and fight these cows. So if you have a mixed herd, you have to make sure that the weakest animals in the mixed herd have the opportunity to graze adequately.

The goal should only be to have them eat the parts of the plant that meet their nutritional needs. Generally, that's going to probably be 60% or less utilization by the livestock. There will be times when you'll want to take more of it. But a lot of times, we'll only take 30 or 40% utilization-- intake by the livestock. Now, they'll be quite a bit trampled. But that's to feed the soil livestock. So we really have to pay attention to that. And that's something that I want to make sure people understand, and be very aware of.

The soil is the basis of everything. I believe the soil is the most important thing we have to take care of. However, we have to consider the whole when making those management decisions. We have to understand the animal performance goals that our specific classes of livestock have. We cannot expect a dairy cow to be able to eat the same type of forage that a dry beef cow can.

We have to understand our financial goals. As well as our personal goals. I know some people that move cows twice a day and don't want to do it any more than that. I know other people that are perfectly happy to go out and move cows six or eight times a day. So everything has to have consideration. Animal performance, finances, the land, as well as our personal goals.

So with that, I will end and answer any final questions, Dave.

OK, good. And then we have several questions. I just want to remind folks-- if you have a question you wanted to ask directly of Doug just type it in the notes section, and I'll read them off as we go along. But I had a couple here. I'm trying to catch up there with you, Doug. Someone wants to know-- can you kind of explain the difference between, maybe, high rotational grazing versus what you've been talking about, which sounds to be a little more intense, and its impact on this-- the rotational grazing's impact on soil health, versus the mob grazing or high intensity grazing that you've been talking about?

Well, it was kind of like I showed. I typically consider anything up to about 50,000 as MIG. And that's not to say that 200,000 pounds of stock density management is not management-intensive, because it's very intensive. But generally, the higher the stock density, the longer the recovery periods are going to be. Not always. I've seen some people on a fairly high density with a fairly quick recovery period. It depends on how much forage they take. Just because you're at high stock density-- you could be at 100,000 pounds of stock density and only take 20% of the plant and come back fairly quickly, or you can take 40 or 50% and extend that period a little bit.

There's really not a lot of difference between a very high level of what some people call management-intensive grazing, or MIG grazing, and the lower end of high density grazing. I tend not to hardly ever use the term mob grazing because I just-- I don't know what it means. It's very subjective.

OK, that's excellent, Doug. And have you had any experience with other livestock? Sheep, what have you-- as far as this type of approach to grazing-- does it work?

Sure. You know, sheep-- I know several folks that use sheep in a fairly high density rotation. Obviously, they don't have quite as much weight as cows do, so if you have plants that are a little more stemmy, they tend not to trample quite as much. But their selectivity is a lot different than cows.

Some of the best situations are mixed herds-- or at least mixed operations-- of sheep and cattle. The

cattle and the sheep will eat a little bit different things. They have a little different impact on the land as well. I've also seen operations that had dairies, and then had a beef herd on the side. They would use the dairy cows to really cream the quality grass, and then use beef cows as a follow-up to manipulate that forage in whatever manner they desired.

Again, getting back to the idea, Doug, of-- you've gone out and you're trying to evaluate whether the grazing that we're looking for has been achieved? What do you look for? Do you have two or three tips you might give that would calibrate their eyes, so to speak?

It depends on your goals. In my case, the places that we had taken over or purchased-- boy, they were very low in organic matter. We had very low plant diversity. So I wanted to-- my goal initially was to put as much thatch on the surface of the soil as I could . So to do that-- to put plant material down-- to put lignified plant material down on the soil surface-- man, I had to let those plants get pretty mature. Because green unlignified grass-- boy, if you trample it down, it's just going to pop right back up.

So for me, that meant fairly long rest periods. Let those plants-- or the annuals, as you saw on that one picture-- let those annuals get pretty big. Let them get slightly lignified. And then use the livestock to eat the part of that that met the nutritional needs. But then trample the rest of it down to begin that process of healing-- that's putting a thatch on that surface of the soil.

Too many times I think that's the thing that we're missing in many of our pastures-- is that thatch layer at the surface of the soil. It's a composite of roots and dead and decaying plant material. If you can reach down through your plants and feel solid soil before you hit a thatch layer, you, we've got to solve that right off the bat. So it depends on their goal-- what they're trying to achieve.

OK. A couple more questions. As far as productivity, do you find that you can get more pounds per acre on this type of a more intense system than you can just a loose rotational system?

Early on, we can achieve essentially the same number of grazing days, generally, as a MIG system. The benefit comes from the improvement long-term. There are times when we will-- if we have some yearlings, or if we have a set of heifers that need a lot higher nutrition-- there are times when we'll come back through in a much quicker rotation, and take some of that fairly lush vegetative material.

I guess I kind of I think it's similar to the stock market. You hear them talk about on the radio, when they're talking about it-- well, today was a profit-taking day. They'd invested in the stock market, and

conditions are right. Now they took some profit back out of it.

And it's very similar in the way we handle the land. If we want to pull that organic matter-- If we want to pull that profit back out of that land, with a very high-value animal-- yearlings, or dairy cows, or stockers, or something-- we've got to put that profit into the land. We've got to put organic matter into it. And the problem is-- for 100 years or more, most of our previous management has been very extractive in how we dealt with that organic matter. We grazed and grazed and grazed and pulled that organic matter out.

And so I think if we're really going to build it up, we have to put thatch down. And the only way we're going to do that is to have a lignified material. And the only way we're going to do that is to extend our rest periods.

I hadn't thought about that-- trampling not staying down without a more lignified material. I'm getting several questions related-- are you on forested soils, or have you seen a difference between those that are-- like in Indiana-- more forested-based, versus the farther west you go?

We are in prairie and transitional soils where we're at in Missouri. But the principles-- even if you're on a timbered soil-- are you trying to-- if that's in grass now-- are you trying to manage that as a timbered soil, or are you trying to manage that as a prairie soil? If you're trying to manage it in a grazing situation, you're going to try to manage it as a prairie soil, even if it was historically a timbered soil.

So you follow the same exact principles that we do on our prairie soils. Recovery periods adequate to ensure that you get enough material to trample down. Recovery periods long enough to ensure that you get plant diversity. And high enough stock density to impact the land in whatever manner you're attempting to, or what your goals are for.

What about fire? Does that play a role? Have you seen that utilized at all? And what's your thoughts on that?

Fire-- that's a really good question. Fire is a tool that I think can be used at some point. It was part of the prairie ecosystem, although I believe it probably was not as big of a component as we've been led to believe. But right now, I think a lot of times people are using fire in place of what we can do, or what would have happened with animal impact.

I can take out almost any woody plant, as long as it's short enough that the cows can reach it. I can control woodies-- in a lot of cases-- with livestock. And that's the big reason that a lot of people use fire. There are some other cases to use that.

But I guess my question would be-- what's your reason for using fire? If it's to remove the woodies-- are you going to-- why are the woodies there? You had bare soil, so you got some seedling development. If you're going to burn them to eliminate them, then you're going to have to change your management so that they don't come back. Or you're just going to have to burn them again. Which burning too often-- thatch is our-- that's the thing we need, and fire is not going to be friendly to maintaining that thatch on the surface of the soil. So fire may have a place in our operation, or in our prairie, but boy, it's going to be a long time down the road.

Quick question again-- you get to spring, you get this tremendous amount of growth in all your pastures. Do you go in and hay any of that, or what do you do? It seems like you'd have-- everything's going to be three foot tall at the same time. How do you control that kind of situation?

A couple of different ways, Dave. We have to have a flexible stocking rate. There's no doubt about it. If you have-- that's the problem with too many operations. They say, well, I've got 100 cows, and that's what I'm going to have all the time. Boy, in a really good year, you can grow a lot of grass. Our growing season is about six months, and our dormant season is about six months. So if I'm going to graze most of the year-- and we try to-- there's no way I'm going to keep up with my grass in the spring if I have a set number of cows. So we use cows. We bring in contract cows to help deal with that.

And then the other side of it is-- no, we don't do any haying. We hay nothing of our own. If it gets tall, it gets tall. I've always laughed at this. People will say, well, that grass is too tall. It's too rank. It's too blown up. I can't graze it. So I've got to go in and hay it. So let me ask this. It's not good enough quality to graze, but yet it's good enough quality to go mow it off, and bale it up, and then feed it back to my cows next winter? That thought process just never made sense to me.

So what we'll do with really tall forage is-- there's going to be a percentage of that forage that is going to meet the needs of my cows. Maybe it's only 20%. If I've got some big, tall, rank material, I'll flash my cows through there at fairly high density, let them graze that 20 or 30% that meets their nutritional needs, and trample the vast majority of it down. That's the perfect opportunity to feed that soil livestock with all that tall lignified material that most people would bale and hay. That's the best opportunity.

That's the best use of it.

So instead of feeding your cows that lignified material, you're feeding your biology in the soil, which would improve your next-time grazing period-- the forage quality at that point in time?

That's the thought. You bet.

One quick question again about stockpiling. Do you have any kind of stockpiling forage in your rotational? And you maybe explain what that is a little bit?

If it grows, we stockpile it. We try to graze virtually year-round. We feed about a bale per cow. Our 10-year average is about one bale per cow per winter. And that's pretty much in the deep snow. Other than that, we're grazing for the other 11 months, typically.

We will stockpile anything. I try to rotate the areas that we stockpile around. To give a-- I'm big believer in those rest periods at different times of year. I don't ever want to get into the habit of grazing a certain field at the same time every year. Because that will really impact my diversity. And so-- it will simplify it. If I graze a field in the exact same way year after year after year, it will simplify that plant community in that field. Because it's going to favor whatever likes that specific management regime.

And so we try to manage different fields different every year. So we try to stockpile different fields every year. Occasionally I will-- almost every year, we will take at least one field and stockpile it the entire growing season. Give it a full year's rest. And then we'll come in in the spring, whenever the green grass is growing up through it. Boy, you want some cows that will really improve in the spring, and come out of winter looking good, you give them some grass that's had a full year's recovery. And then it's got a six or eight inches of green grass growing up through it. That's just about a perfect mix of a protein and energy and dry matter ratio. They will just absolutely perform.

OK. Well, listen, Doug, I'm going to let you end on that note. And again, I appreciate your insights and appreciate-- this is the second presentation you made today. I understand you had a field day earlier, and we appreciate the work you're doing again. And I just thank you for your time. And it's always enjoyable. And I learn something every time I hear you speak.

And with that, I just want to say-- thanks everybody for participating. And remind you folks that are interested in getting the continuing education credits that you need to go back and follow step two, as

Holli described in her introductory comments. And with that, we'll call it a day.