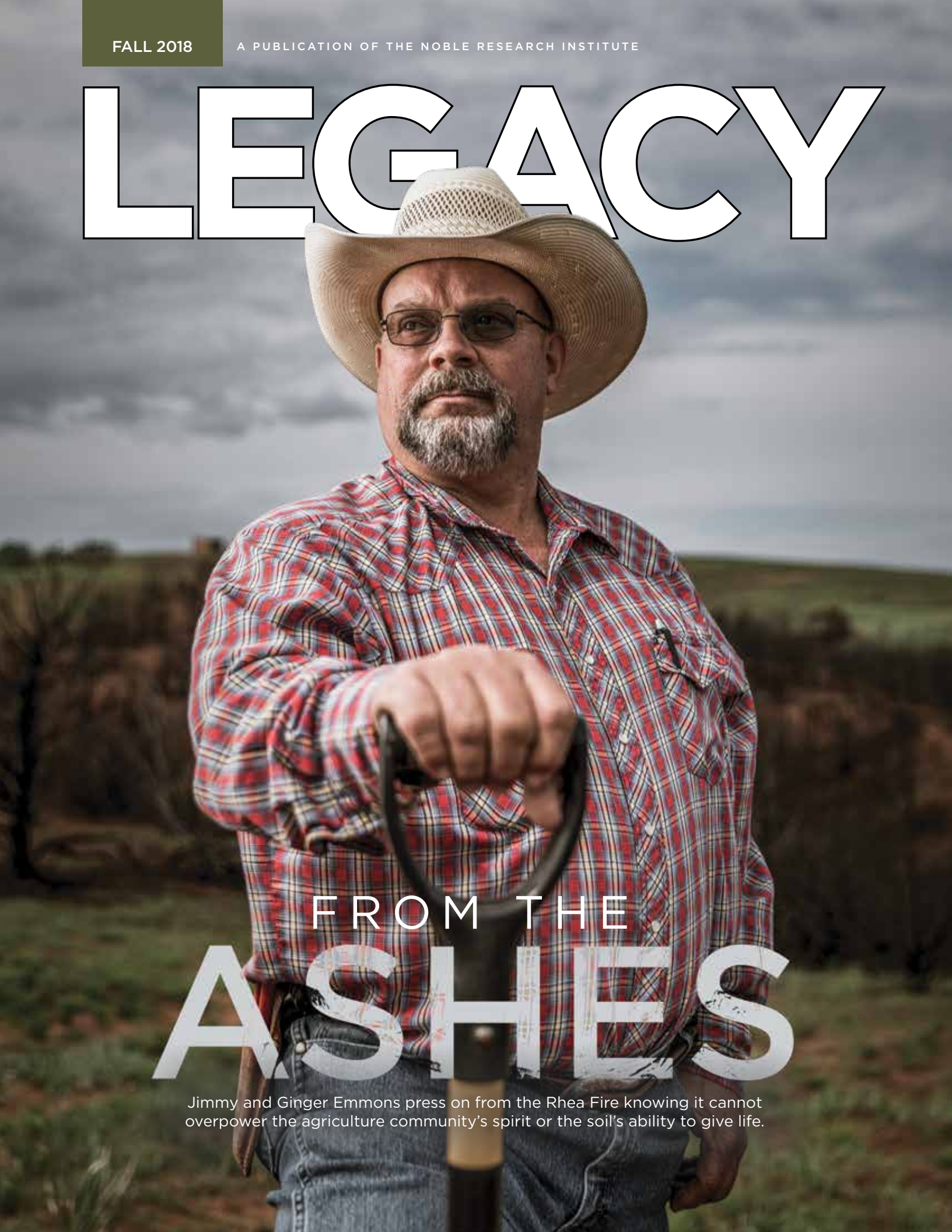
FALL 2018 A PUBLICATION OF THE NOBLE RESEARCH INSTITUTE

LEGACY



FROM THE ASHES

Jimmy and Ginger Emmons press on from the Rhea Fire knowing it cannot overpower the agriculture community's spirit or the soil's ability to give life.

2018 SEASON CONTINUES

20th ANNIVERSARY

PROFILES AND PERSPECTIVES

Community Enrichment Series

OCTOBER 23
7 p.m. | Ardmore Convention Center

The Science of Storm Chasing

Reed Timmer, Ph.D.

A storm-chasing veteran of over 20 years, Reed Timmer, Ph.D., takes his audience directly inside the tornado with videos and scientific data collected from the tank-like Dominator intercept vehicles, as featured on Discovery Channel's *Storm Chasers* series in 2008-2012. Reed also provides advice for those interested in pursuing storm chasing and meteorology as a hobby or career.

All *Profiles and Perspectives* programs are open to the public at no cost. For additional information, call Adam Calaway at 580-224-6209 or visit www.noblefoundation.org/profiles.

THE SAMUEL ROBERTS NOBLE FOUNDATION

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Pecan research at the Noble Research Institute seeks to find new methods for managing disease and increasing productivity in pecan orchards.

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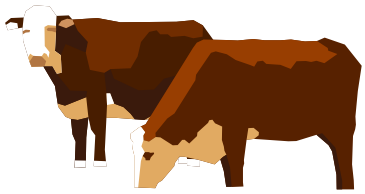

ON THE COVER: Jimmy Emmons, a farmer and rancher from Leedey, Oklahoma, is known across the state and U.S. as a soil health champion. He and his wife, Ginger Emmons, raise cattle and grow crops for both forage and grain. They use practices like no-till, cover crops and rotational grazing to help build the soil and boost the land's productivity. In April 2018, the Rhea Fire crossed nearly half of the land they operate and put their cattle and livelihood at danger. See their story on page 16.

LEGACY

FALL 2018 | Vol. 12, Issue 1

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Legacy is provided at no cost to the general public as a courtesy of the Noble Research Institute. To receive a copy of the magazine or to change your mailing address, please email jacalaway@noble.org.

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NOBLE RESEARCH INSTITUTE

TO OUR READERS:
PUMPKIN PATCH PONDERINGS

Fall always evokes some of the strongest memories. Harvesting soybeans or corn. Family gatherings. And maybe the most indelible memory of all: *It's the Great Pumpkin, Charlie Brown*.

Don't judge. As a child of the 1960s, connecting with the Peanuts Halloween television special was inevitable. A pumpkin patch lay right next to the old cabin on our family farm.

Countless hours of my youth were spent in that patch, working and playing. Every time I drive by a field tangled with leafy vines and dotted with orange gourds, I am instantly 8 years old searching for the perfect jack-o'-lantern. I don't even try to fight the smile.

More than just memories reside in the pumpkin patch of my youth; rooted there are answers to many of life's questions. How do you handle change? Just look at a pumpkin, and you will understand that each season brings its own treasures. One month it's a fruit; the next it is art. What's most important when forming a team? Connectivity. Look at how the pumpkins share a vine. And then there's the biggie: What's my purpose? For those in agriculture, there are many ways to approach this question. There is the grand answer: "Agriculture is society's foundation," the moral answer: "We are feeding the world," and the practical answer: "This is how we provide for our families." Each of these are true and reasonable.

And then there's my answer. Which brings me back to the pumpkin patch.

A few weeks ago, the family gathered in North Carolina. The Buckner clan is spread across the Eastern Seaboard and into Canada, so these get-togethers are important for maintaining our family bond, especially as my four children grow into their late 20s and early 30s.

Soon after receiving welcome hugs and warm greetings, my 5-year-old grandson Johnny darted to my side to discuss whatever was running through his kid brain. Grandchildren are God's way of showing you that — despite all your worries and frustrations — life really is simple and sweet.

Johnny is precocious and curious, so we decided to travel to the pumpkin patch at our North Carolina farm so that he could experience a Buckner tradition for the first time. Watching him explore brought an incalculable joy. Seeing life through his eyes, experiencing this moment of discovery again, brings instant clarity to my perspective.

In this life, there exists a basic human creed: pass onto your children better than what you received.

That's my purpose, and that's why I work at the Noble Research Institute.

Lloyd Noble established this organization with the desire to safeguard the soil and the land for future generations. He once said: "No civilization has outlived the usefulness of its soils. When the soil is destroyed, the nation is gone." He believed these words, and so do I.

This generation has a fiduciary responsibility to pass on healthier soils and to protect the land. We are all stewards of this earth. We do not own it; we merely pass through for a short time. Yet we are accountable. We must shepherd and improve what has been given to us before handing it to those who will come next.

WE ARE ALL STEWARDS OF THIS EARTH.
WE DO NOT OWN IT;
WE MERELY PASS THROUGH FOR A SHORT TIME. YET WE ARE ACCOUNTABLE.

So I will continue to work toward this goal as will the men and women of this great organization, who share in the daily chore of making this simple belief a reality.

There is no final destination to our mission, just an ongoing pursuit to ensure that Johnny and every generation after him have the opportunity to watch their children play in pumpkin patches.

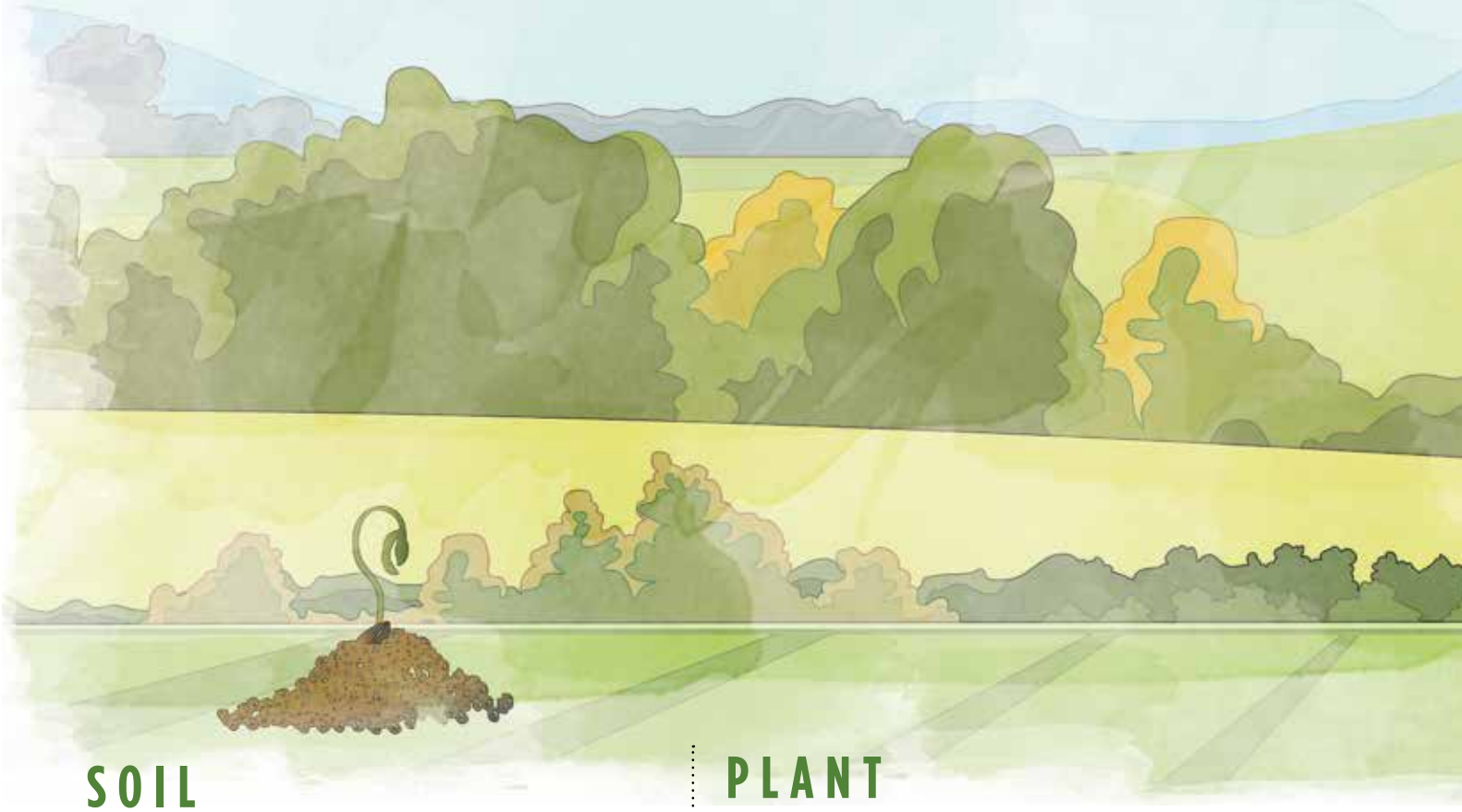
Sincerely,

BILL BUCKNER, PRESIDENT AND CEO

WHY WE NEED PRESCRIBED FIRE

Fire is essential to the health of the Southern Great Plains. Prescribed fire is a management tool that benefits the land in a safe, planned way.

The Southern Great Plains once stood as one of the most biologically diverse prairie ecosystems in the country. There are multiple reasons these rangelands are not in the condition they once were: overgrazing, land fragmentation, woody encroachment and, arguably the most impactful, fire suppression. Removing fire from the landscape reduces nutrient and energy cycling. More importantly, it allows woody species to encroach and recruit, eventually creating a woodland. Fire in this region is a core ecological process often overlooked and more often completely removed. Historically, every square inch of land in the Southern Great Plains evolved under a fire-dependent ecology. This means the proper function of that ecosystem depended on fire as an integral component. Today, fire is relegated to the application of prescribed fire in our rangeland and forest systems. In contrast to wildfire (uncontrolled and unplanned fire), prescribed fire is a management practice that involves applying fire on a landscape under a specific prescription with a proper plan and all safety measures considered. Prescribed fire allows land managers to tailor their application to meet specific ecological outcomes and management objectives.



SOIL

Keeping the ground covered is a cornerstone principle that assists in building healthy soil. Timely and well planned prescribed fire can limit the amount of time that soil is bare following fire. Given adequate soil moisture, cover can return quickly during the growing season. Prescribed fire can also aid in soil nutrient cycling and availability, often providing legacy effects for additional years.

PLANT

Three plant-related drivers for applying prescribed fire include forage quality, forage quantity and brush management. Studies have indicated that forage quality is increased and year-end forage quantity is not reduced following prescribed fire. However, the primary driver is controlling woody encroachment in prairie ecosystems. Consequently, brush management is the most common purpose for applying prescribed fire in the Southern Great Plains.

MEET THE NOBLE EXPERT SOURCE
Jeff Goodwin serves as conservation stewardship leader and a pasture and range consultant at the Noble Research Institute. He leads development of the Noble Research Institute's Land Stewardship Program. Before coming to Noble in 2016, Goodwin served as the state rangeland management specialist for the Natural Resources Conservation Service (NRCS) in Temple, Texas.

ANIMAL

Animals benefit from prescribed fire primarily due to increased forage quality and availability. Following fire, forage regrowth is higher in protein and lower in fiber thusly increasing digestibility. Prescribed fire can also be used as a tool to increase forage availability for small ruminant livestock and deer by lowering browse lines of woody species making their forage more available.

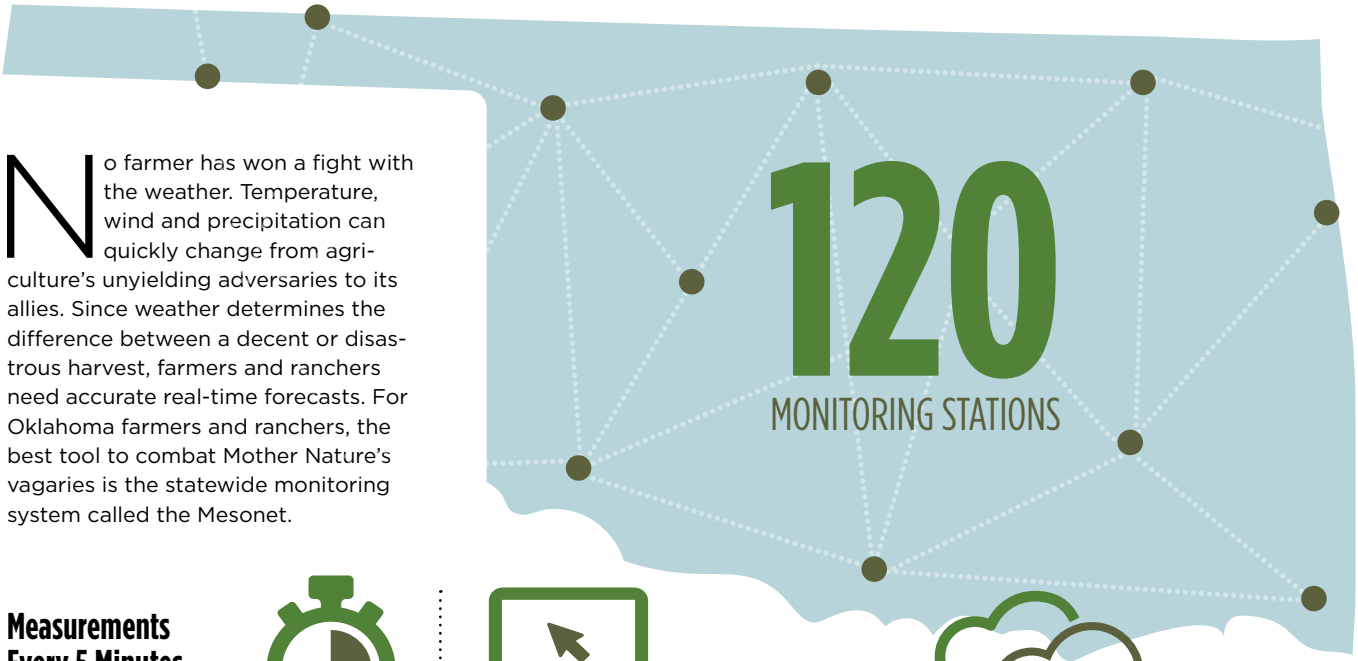
AIR

The primary air concern regarding prescribed fire is smoke management. Numerous environmental factors, including mixing height, transport, wind speed and wind direction, can have positive and negative effects on smoke dispersion during a fire. Nevertheless, proper planning and appropriate application can mitigate air quality issues. For some plant species, smoke actually increases seed germination.

MESONET COLLECTS WEATHER DATA IN REAL-TIME

Noble Research Institute research and demonstration farms and ranches host three Mesonet sites, which help producers across Oklahoma adjust to fluctuating climate pressures.

by Arielle Farve



No farmer has won a fight with the weather. Temperature, wind and precipitation can quickly change from agriculture's unyielding adversaries to its allies. Since weather determines the difference between a decent or disastrous harvest, farmers and ranchers need accurate real-time forecasts. For Oklahoma farmers and ranchers, the best tool to combat Mother Nature's vagaries is the statewide monitoring system called the Mesonet.

Measurements Every 5 Minutes

The Mesonet takes the guesswork out of weather prediction thanks to a network of 120 monitoring stations that includes at least one weather tower in each of Oklahoma's 77 counties. The automated stations transmit measurements to a central facility every five minutes, every day. This system features weather monitoring basics plus multiple maps detailing soil temperature, changes in dewpoint, cattle comfort and other measures across the state.

Access Online or in App

All the real-time updates can be viewed for free online or in the Mesonet app. The Oklahoma Climatological Survey (OCS) at the University of Oklahoma receives every measurement the towers collect and verifies the information to ensure its accuracy. It takes less than 10 minutes for measurements to be uploaded online for use by farmers and ranchers across the state.

Weather Data for Ag

The Mesonet is a cooperative venture between Oklahoma State University and the University of Oklahoma. OSU's primary goal at the Mesonet's founding in 1994 was to expand the use of weather data in agricultural applications. The project remains the gold standard for weather monitoring networks and offers the ultimate hack for Oklahoma farmers and ranchers in the digital era.

Agriculture Tools Available Through Mesonet

Find these tools and more at www.mesonet.org.

- Black Rot Advisor
- Cattle Comfort Advisor
- Drift Risk Advisor
- Fire Prescription Planner
- First Hollow Stem Advisor
- Irrigation Planner
- Mesonet Monthly Rainfall Table
- Peanut Leaf Spot Advisor
- Pecan Scab Advisor
- Wheat Growth Day Counter

Chisholm tall fescue grows in early spring on the El Dorado Ranch in western Argentina. The field was planted by GENTOS, the Noble Research Institute's collaborator in the project to develop a tall fescue variety adapted to drier climates. Western Argentina's climate is similar to that of western Oklahoma and northern Texas.

NOBLE RELEASES TALL FESCUE ADAPTED TO HOT, DRY SUMMERS

The Noble Research Institute has released a tall fescue variety called Chisholm to provide a new forage option for agricultural producers in western Oklahoma and Texas. Chisholm is the first tall fescue variety released by Noble that is adapted to the hot, dry summers typical west of Interstate 35 in Oklahoma and Texas, where tall fescue has traditionally been unable to persist.

"A major goal of Noble's plant breeding program has been to develop a cool-season perennial grass that could provide producers with an alternative to planting winter annuals, like wheat and cereal rye, each season," said Mike Trammell, senior plant breeder. "Chisholm, a cool-season perennial, could complement or replace winter annual grazing systems, providing more grazing flexibility to livestock producers or reducing their need to feed hay when bermudagrass is dormant."

Mediterranean-type tall fescue varieties, including Chisholm, are summer-dormant, which means they stop growing during the summer in response to long days, high temperatures and dry conditions. They start growing again in early fall in response to moisture and cooler temperatures. Perennial grasses like Chisholm can also benefit soil health by sequestering carbon in the soil year-round, improving organic matter and reducing soil erosion.

Chisholm is available for purchase through Warner Brothers Seed Company in Lawton, Oklahoma.

For more information, read Mike Trammell's article in the May 2018 issue of *Noble News and Views* available at www.noble.org/new-fescue-cultivar.

Letters to Noble

MAY 15, 2018

I wanted to take a minute to thank your team and the Noble Research Institute for the training class held at the Oswalt Ranch yesterday. It was a great day.

As a small-scale producer, it is difficult to find professionals interested in my business. Which is understandable. But in many ways, I still need the same skill set and knowledge as any other person responsible for livestock. And as much as any other producer, I have a strong desire to be successful and grow my operation over time. These shared core needs and goals are what drive my appreciation for folks like yourself and the Noble Research Institute. And rest assured, I will now take the experience and share what I have learned with my circle of small-scale producers.

I thank you for your time and effort. And I thank you for inviting small family operations to participate in your organization.

—Scott Grazer

AUG. 3, 2018

Wow, the burn seminar was incredible. I had heard how great burning is for your land, but I was absolutely terrified of ever doing one or even letting others do one on our land until yesterday. We learned so much. I'm so thankful we went and thankful once again for the great people at the Noble Research Institute for helping me so much.

I'm seriously in awe of the equipment and method involved in doing smart, safe burns. Yesterday was just the best. Your folks at Noble are top notch!

My dad would be so glad I've been seeking Noble's help. I think he knows.

—Karen (Eggenberg) Kapella

The Ecosystem Services Market aims to incentivize farmers and ranchers to improve soil health systems that benefit society.

Farmers, ranchers set to gain market opportunities for improving soil health

A national coalition convened by the Noble Research Institute has announced its intent to create a voluntary environmental services market that benefits agricultural producers and improves the environment for society at large.

"Farmers and ranchers are the unsung heroes of our world. Their hard work feeds and clothes us. Their dedication is the foundation for our society," said Bill Buckner, Noble Research Institute CEO and president. "This market-based approach seeks to reward farmers and ranchers for the land stewardship they practice for the benefit of all of us."

The focus will be on monetizing soil health to reward farmers and ranchers actively adopting and improving practices that protect the environment. Scientific rigor for the program will be established by the Soil Health Institute and the Noble Research Institute's Land Stewardship Program.

In 2018, an ecosystem services protocol and go-to-market business strategy will be developed. Pilots will be conducted in early 2019 with the national rollout of the program to follow.

Visit www.noble.org/market to learn more about the program.

Kinder earns recognition as Leonard Wyatt outstanding cooperator

Jimmy Kinder, fourth-generation farmer from Walters, Oklahoma, was selected as the 2018 Leonard Wyatt outstanding cooperator. He and his family were recognized at the Noble Research Institute's annual Texoma Cattlemen's Conference.

"Kinder manages every aspect of his operation, always treating it as a business while improving the land he owns and operates," said Hugh Aljoe, director of producer relations. "He remains active with our consultants in his operational planning. He also strives to be a continual student and mentor to others, which makes him an outstanding producer to interact with other producers."

Kinder operates 5,000 acres on his family's diversified operation, which consists of stocker cattle, wheat, canola, sesame and grain sorghum. He was an early adopter of no-till farming practices and remains an avid investigator and adopter of farming technologies to add value to his operation.

To read more about Kinder's passion for agriculture, visit www.noble.org/jimmy-kinder.

Ninnekah school wins Oklahoma Envirothon for second year in a row

Ninnekah High School team members include (front row, from left) Caden Smith, Dakota Dinsmore, Bruce Trammell, (back row) Kaylee Crutchfield and Madison Mink.

The Ninnekah High School team placed first at the 2018 Oklahoma Envirothon competition, hosted by the Noble Research Institute in March. The team advanced to represent Oklahoma in the North American competition.

"This competition is an exciting, fun way for high school students to learn about the environment and the issues facing current and future generations," said Frank Hardin, Ph.D., youth education manager. "The Oklahoma Envirothon demonstrates the role we have in important environmental issues through in-class curriculum and hands-on field experiences."

The 2019 Oklahoma Envirothon competition will be held March 29. To learn more about the Oklahoma Envirothon or to register, visit www.oklaenvirothon.org.

Oklahoma ranchers gain web-based cattle market tools

Producers can now easily access Oklahoma cattle auction data using two new web-based tools: price slide and value of gain breakdowns, and auction market comparison charts.

U.S. Department of Agriculture Ag Marketing Service market reports were used to collect the information from the seven reporting livestock auctions in Oklahoma: Ada, Apache, El Reno, McAlester, Oklahoma National, Tulsa and Woodward.

All the information is updated each night. The dataset also provides producers the ability to look at historical conditions for each market.

Read more about the tools in Jason Bradley's June 2018 *Noble News and Views* article available at www.noble.org/new-cattle-market-tools. The web tools and information are publicly available at www.noble.org/ag/services.

Researchers record bird tunes to measure ecosystem health

Tweets are more often seen than heard these days, but an emerging technology has researchers, grassland managers and soil health advocates singing a new tune.

Noble researchers led by Stephen Webb, Ph.D., ag systems technology manager, are using audio recording units known as bioacoustics monitors to survey Noble Research Institute farms and ranches for important avian and wildlife species. The researchers are able to use the sound recordings and software to isolate wildlife species based on the frequency of their sound or call.

"We are able to capture the sounds of everything from birds to frogs to insects," Webb said. "If it makes a noise, we can record it."

The researchers use the recordings to determine how many species, as well as how many individuals of a species, are in a given area. They can also gain clues about how the habitat is used and the overall health and function of the ecosystem.

"This information can give us a better picture of soil health through the effects that soils have on forage and habitat of native species," Webb said.

Webb's team is currently testing the bioacoustics monitors for potential use in research studies, such as those that measure populations of quail. The technology could also be applied in the Noble Research Institute's Land Stewardship Program, and subsequently the Ecosystem Services Market, as a tool to measure biodiversity.

Learn more about the bioacoustics monitors through the eyes of Cresten Sledge, who used them during his summer as a Lloyd Noble Scholar in Agriculture, at www.noble.org/quail-experience.

Noble Research Institute launches Land Stewardship Program to Quantify Benefits

The Noble Research Institute has launched its Land Stewardship Program as part of its seven-decade-long effort to support the guardians of soil: farmers, ranchers and land managers.

The Land Stewardship Program is designed to quantify the ecologic and economic benefits of managing land with a land stewardship ethic. The program will provide producers with critical information to help them make timely decisions within their current enterprises as well as a mechanism to help them fully understand the value of their ecological contributions to society (called ecosystem services).

"Managing landscapes based on land stewardship principles provides benefits that impact every single consumer and society at large, from cleaner water to sequestered carbon," said Jeff Goodwin, Noble Research Institute conservation stewardship lead and a pasture and range consultant. "The key is quantifying, verifying, and subsequently valuing and marketing these metrics for our producers."

Noble's agricultural consultants have enlisted the help of 12 producers, six in Oklahoma and six in Texas, to begin testing the program. Data will be gathered in four management areas: ecological efficiency, production efficiency, soil resource management and water resource management.

Learn more about the program at www.noble.org/land-stewardship-launch.

The Noble Research Institute Land Stewardship Program aims to help farmers and ranchers make timely decisions and understand their ecological contributions to society.

TIPS FOR A SAFE HUNTING SEASON

Fall hunting season is here, and with it comes an opportunity to engage with nature. Hunting can also be a valuable tool for managing wildlife, especially deer populations. Even in today's modern age, hunting is an excellent way to provide food for friends and family. It is also a great opportunity for maintaining and creating new opportunities for fellowship.

As you go out into the woods for a few days, don't forget to take precautions to keep yourself and those around you safe. Here are a few tips to get you started:

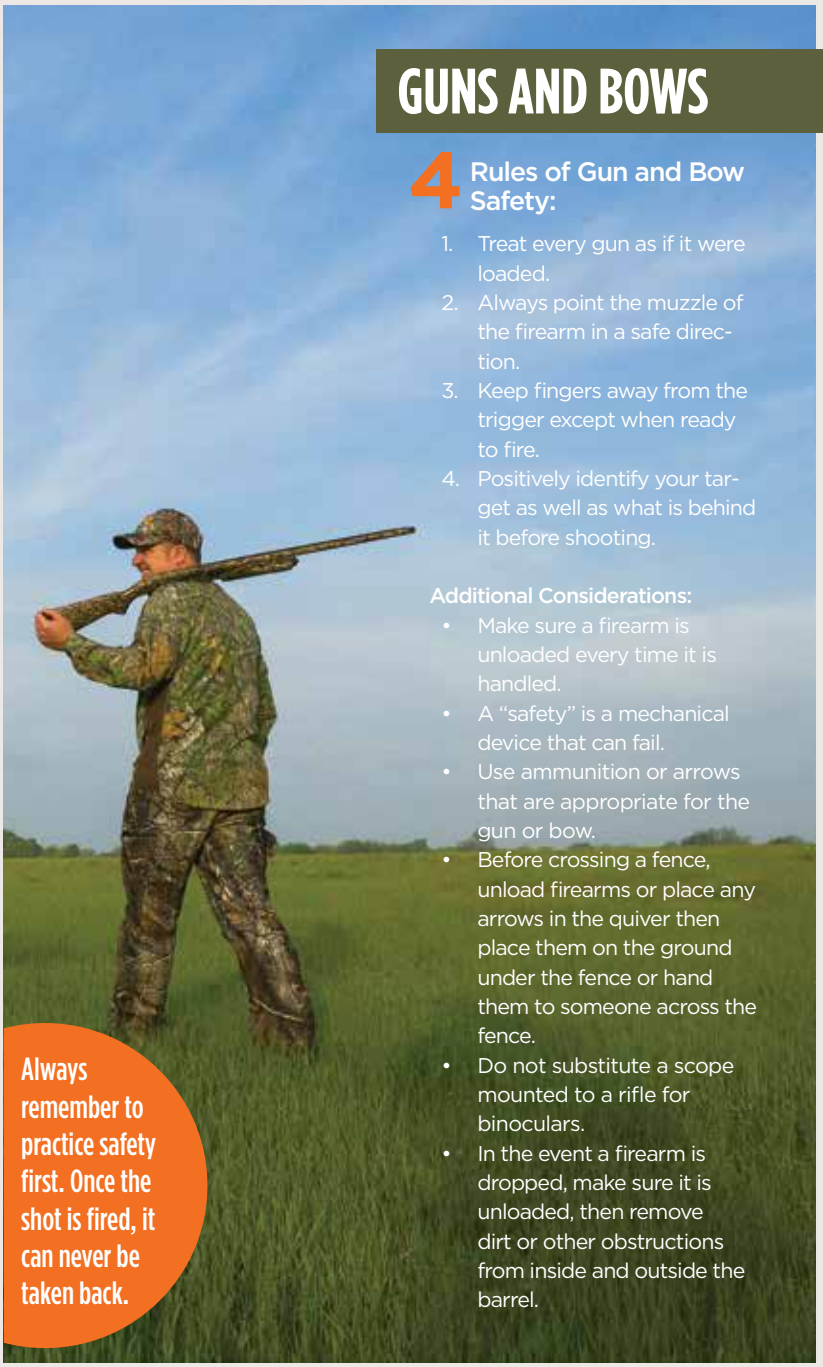
COMMON PRACTICES

Tree Stand Safety

- Always inspect trees to make sure they are healthy with no dead branches or trunks before climbing or installing stands.
- Use the three-point method of contact: two feet and one hand or two hands and one foot in contact with steps. Go slowly when climbing a tree.
- Use string or rope to raise and lower firearms, bows and other equipment into elevated stands or blinds.

General Safety Tips

- Follow local hunting laws and regulations.
- Never use drugs or alcohol when target shooting or hunting.
- Wear rubber gloves when field dressing game.
- Wear a helmet when riding an ATV.
- Inform someone about plans and locations before hunting.



GUNS AND BOWS

4 Rules of Gun and Bow Safety:

1. Treat every gun as if it were loaded.
2. Always point the muzzle of the firearm in a safe direction.
3. Keep fingers away from the trigger except when ready to fire.
4. Positively identify your target as well as what is behind it before shooting.

Additional Considerations:

- Make sure a firearm is unloaded every time it is handled.
- A "safety" is a mechanical device that can fail.
- Use ammunition or arrows that are appropriate for the gun or bow.
- Before crossing a fence, unload firearms or place any arrows in the quiver then place them on the ground under the fence or hand them to someone across the fence.
- Do not substitute a scope mounted to a rifle for binoculars.
- In the event a firearm is dropped, make sure it is unloaded, then remove dirt or other obstructions from inside and outside the barrel.

Always remember to practice safety first. Once the shot is fired, it can never be taken back.

EQUIPMENT

- **Hunter Orange:** Wear hunter orange to identify yourself to other hunters when hunting for upland birds and big game such as deer.
- **Full-Body Safety Harness:** Use a full-body safety harness to protect yourself from falls when hunting from a tree stand.
- **Climbing Rope:** Use a climbing rope when installing tree stands.
- **Helping Hand:** Make sure a helper is present when installing a hanging or ladder tree stand.

Go online for more hunting information:
Oklahoma Department of Wildlife Conservation
www.wildlifedepartment.com

Texas Parks and Wildlife Department
www.tpwd.state.tx.us/learning/hunter_education

Read the full article, "Hunting Season Begins With a Review of Safety," by Steven Smith, wildlife and fisheries consultant, at www.noble.org/hunting-season-safety.

FROM OUR FEEDS

FOLLOW ALONG @nobleresearchinstitute @nobleresinst

We love to hear from colleagues and friends on social media, and we'd love to hear from you. See what people have been saying.

The most impressive, hardest working team of professionals I know!!! I'm proud to know this team as partners in the quest to save our soil. Great job Noble Research Institute and CEO Bill Buckner.
Jimmy Emmons, *July 16*

We have a cattle ranch in Tishomingo, and you all helped in numerous ways over the years! Everything from wildlife conservation, grass and soil analysis, to fertilizer recommendations! Plus, the great conferences, and the wealth of info is amazing! Truly grateful!!!
@runlikeaturkey, *Jan. 3*

Bill Buckner @noblefoundation, @nobleresinst projects new ecosystem service market may go live nationally in 2022. #shi2018
@soil_institute, *Aug. 2*

Thanks for all you do especially in the area of much needed #covercrop research!
@CoverCropCoach, *Aug. 2*

Dr. @isipg from @nobleresinst telling the audience at #ISRR10 about her work with seedling root vigor in winter wheat (from Blancaflor lab).
@LarryMattYork, *July 10*

Thank you Noble Research Institute for hosting the OACD's Conservation Leadership Class!
Oklahoma Association of Conservation Districts, *Oct. 20*

Tour Stop #11: Noble Research Institute in Ardmore, OK. Awesome instruction on several Oklahoma agriculture subjects and tour of state of the art research facilities. We are grateful for Noble Research Institute's long-time support of Oklahoma FFA Foundation and especially this program.
Oklahoma FFA Foundation, *June 29*

Yesterday we demoed high-throughput hand phenotyping live, and it actually worked! Pictured are the setup, an analyzed hand (my boss, Udvardi!) and the histogram of males and females. The average male hand is around 200 cm^2 and the female 160 cm^2.
@**LarryMattYork,** *Feb. 2*

IN CASE YOU MISSED IT: SUNFLOWERS

Sunflowers attracted more than just pollinators to the field across from the Noble Research Institute's main campus this summer. The sunflowers, which were a commercial oil seed variety, were grown as a cover crop and as a border around cover crop research plots planted in the center of the field. The flowers provided several benefits to the soil, but they also became a popular destination for people to stop and take photos for social media.

Instagram STORIES

FOLLOW ALONG @nobleresearchinstitute

APRIL 18

This echeveria, like most succulents, comes from semi-arid and desert regions, so it does well in various garden settings and is a great houseplant for those who aren't good at remembering to water. They have an amazingly complicated whorl-shape to their leaves and are sometimes called the Mexican rose. #agfacts #succulents #nobleresearchinstitute #greenhouse #mexicanrose #plantresearch #plantscience

3 Things to Look Up

Benefits of Patch Burning: Prescribed Fire Program

Oklahoma State University's fire ecology division has a great article on benefits of patch burning as opposed to traditional burn methods. Rather than burning a large area every three years, land managers can opt to burn in small patches throughout the year. The process extends the period when a burn can be completed and can be more thorough than traditional methods.

Learn more at bit.ly/okstate-prescribed-fire

Living with Texas Fire

Texas A&M University's AgriLife Extension Service has released an extensive video series that covers many important topics to consider when conducting prescribed burns. The information also is great for those who want to learn about controlled burn methods, safety and related issues.

Watch the videos at bit.ly/texas-prescribed-fire

Prescribed Fire Is a Forest Management Tool

North Carolina State University assembled a great list of resources for those interested in managing prescribed fire. These include a list of free publications, an online course, a news blog and a workshop. If you want to learn more about using prescribed fire in forested areas, this website is a great place to start.

Find the resources at bit.ly/nc-state-prescribed-fire

Q AND A

Meet some of the college students who joined the Noble team for a summer as Lloyd Noble Scholars.

McKENZIE CARVALHO
Lloyd Noble Scholar in Agriculture

What have you enjoyed most about this summer?
The Noble Research Institute serves as a way to showcase what producers do and to solve problems producers face. We've learned about everything Noble is doing and helped by working on things we're passionate about. I've loved getting to learn how that ties to helping producers.

How has this internship been valuable to you?
There are a lot of internships out there, but at Noble it's a different experience. This is not your typical internship. I've done hands-on projects. I've visited farms. I've learned how my work is relevant to the field.

CAMERON REED
Lloyd Noble Scholar in Plant Science

What did you expect when you came to the Noble Research Institute?
I had to look up Ardmore, Oklahoma. But when I came here I was so impressed with the facilities and how great the people are.

Why is what the Noble Research Institute does important?
The Noble Research Institute is vital because we need to feed a growing population with bigger constraints. The only way to do that is with the research we are doing here at Noble. This research is going to save a lot of lives and make the planet more sustainable. It means a lot to me to come here and conduct research that helps the world.

NATALIE GRAFF
Lloyd Noble Scholar in Agriculture

What has your experience at the Noble Research Institute been like?
My experience with the Noble Research Institute has been unbelievable, beyond anything I could have thought. All the people have been so nice and helpful. Everyone has been welcoming and made our learning experience a top priority here.

What has impressed you about the Noble Research Institute?
I would say the most impressive thing about Noble is the generosity. The Noble Research Institute's goal is to be stewards of the land and to help producers do the best they can. They present agriculture in the best light and tell our story to people who don't know about it.

CHALI SIMPSON
Lloyd Noble Scholar in Agriculture

What has your experience with the Noble Research Institute been like?
This has been one of my greatest summers. All the experiences and connections I've made here have given me a direction I want to go with my career. I thought I wanted to go into research. However, after going on farm visits and talking with the consultants, I think consulting is where my heart is.

What would you say to someone who has never heard of the Noble Research Institute?
I would tell people to come visit. You have to see it to believe it. This place is such an outstanding opportunity for research and agriculture. It makes you a stronger voice for agriculture.

MATTHEW CULLEN
Lloyd Noble Scholar in Plant Science

What impressed you about the Noble Research Institute?
I was expecting this internship to be similar to the ones I had done previously, but I was blown away by the facilities here. It exceeded my expectations. It's been a big deal to be a part of the mission of the Noble Research Institute. It feels incredible to work on a crop that is needed by farmers and ranchers.

How has this internship prepared you professionally?
This internship has helped me to learn a lot of new lab techniques. Lots of times in teaching labs you get one try and don't have an opportunity to fix mistakes. Here I actually had time to try things again until I mastered them.

SYED UDDIN
Lloyd Noble Scholar in Plant Science

How has your time at the Noble Research been valuable to you?
My time at the Noble Research Institute changed me completely. I became a more patient person, both in and outside the laboratory. One scholar taught me to live with positivity. Another trained me to use more precision in my work. And I learned plants are cool. I had never worked with plants before.

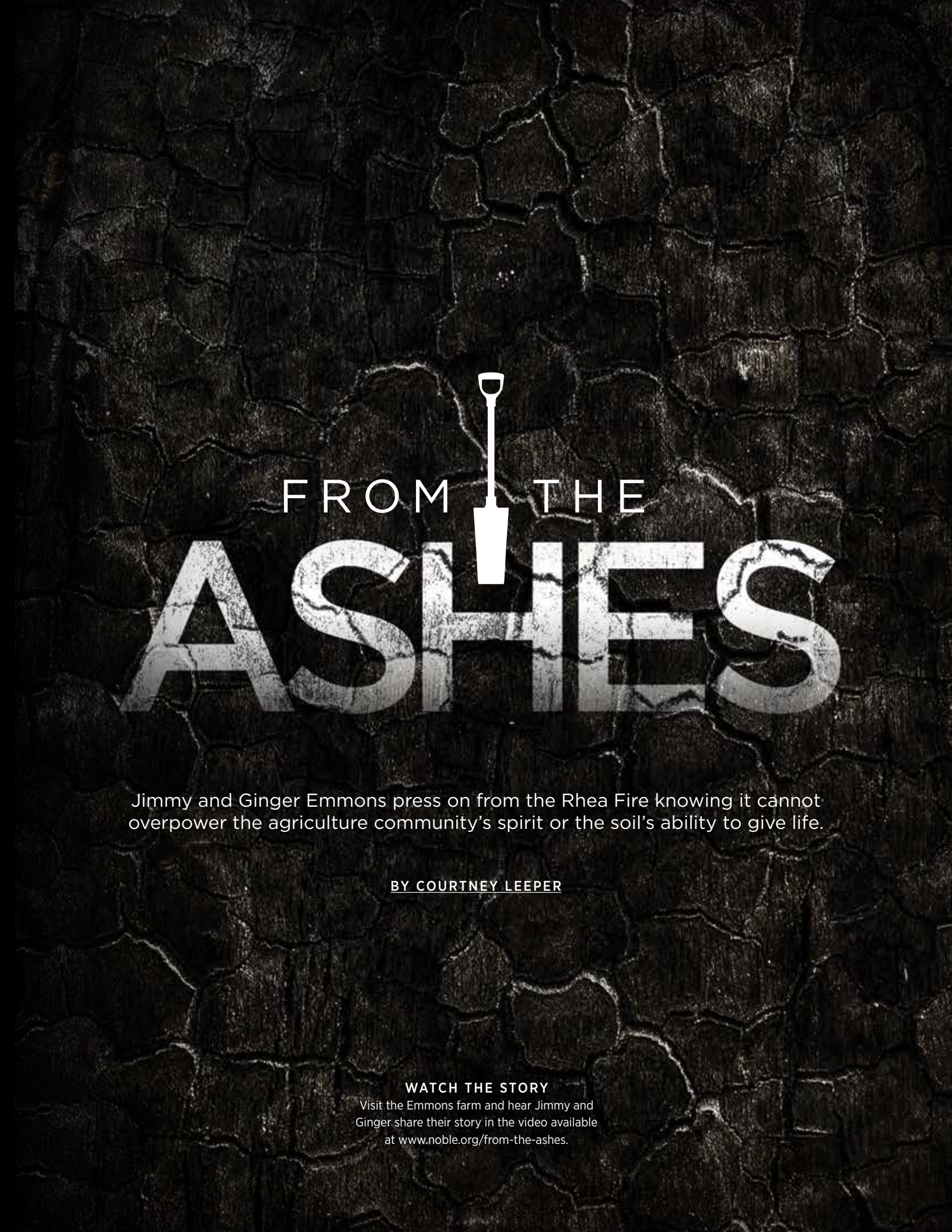
How has your mentor helped you?
My mentor encouraged me throughout my entire time here. I also got to meet some big-time scientists and learn how they think.

KELLY KOWIS
Lloyd Noble Scholar in Agriculture

What has impressed you most about the Noble Research Institute?
What has impressed me most is the positivity and the environment here. It's been phenomenal. I love it.

How does the Noble Research Institute stand out?
They care about producers and about sharing how they can improve their agricultural practices. You can see a sigh of relief after a producer gets advice from a consultant. The consultants walk them through solutions. This is real-world application. What Noble does is immensely important for the agricultural side and the environment. It's also important for the people. The people are the most important part.

Lloyd Noble Scholars come from universities across the country to spend the summer working alongside Noble Research Institute agricultural consultants, researchers and plant scientists. Scholars gain practical, hands-on experiences in real-world environments on the farm and in laboratories. More than 200 qualified individuals applied for the program in 2018, and 19 were selected. Applications for 2019 are due Feb. 6, 2019. Learn more at www.noble.org/education/scholar-program.



FROM THE ASHES

Jimmy and Ginger Emmons press on from the Rhea Fire knowing it cannot overpower the agriculture community's spirit or the soil's ability to give life.

BY COURTNEY LEEPER

WATCH THE STORY

Visit the Emmons farm and hear Jimmy and Ginger share their story in the video available at www.noble.org/from-the-ashes.

Jimmy Emmons rarely goes to the field without a shovel.

Once, when he and his wife, Ginger Emmons, had traveled to Indiana for a farm conference, he realized he had left his shovel at home. Ginger laughs, remembering they found a farm supply store and bought a new one. Now the replacement is his favorite.

Jimmy often uses this shovel to unearth samples of the rusty red soil of Dewey County, Oklahoma, where he and Ginger farm and raise cattle. Both have always depended on this land. Before the high school sweethearts married 36 years ago, they grew up on farms just 6 miles apart near their hometown of Leedey.

This soil has helped them build their lives, and now they help build up the soil.

After scooping a spadeful of the loamy substance, Jimmy looks for qualities that point to a healthy foundation for the farm. Through the last three decades, he and Ginger have sought ways to nurture the soil and its ability to support life: plant, animal and their own.

The journey has led them to try ideas against the norm.

Jimmy remembers the earthy smell of freshly plowed soil. Tillage was long believed to be the best way to prepare fields for planting. But in the 1990s, he realized the practice was costing him carbon, an essential component of healthy soil, and ultimately soil itself. So, he turned to no-till.

Most recently, he has added diversity to the earth's palate by planting cover crops — sometimes as many as 30 species in one field. Growing plants when the ground would otherwise lie bare shields the soil from being swept away by rain and wind. The mix of root systems feed the soil in ways a single species cannot. The cover crop can also, in some cases, provide a source of forage for cattle when wheat, the traditional forage crop in the area, is out of season.

The soil has responded. More earthworms wriggle through the sediment, which points to a more vibrant community of microorganisms below. And the soil now needs less supplemental nutrition. Jimmy has been able to cut back on fertilizer by 40 percent.

Healthier soils also hold more water, a desirable quality especially for farmers, like Jimmy and Ginger, in areas prone to drought. On April 12, 2018, the Emmons farm had seen less than an inch of rain in the past 140 days.

Not even soil health champions are immune to drought and its fallout.

A DAY TO REMEMBER

Jimmy's interest in the soil has not gone unnoticed. In mid-October 2017, he learned he would receive the state's first Leopold Conservation Award, which is part of a national program that honors farmers and ranchers for their commitment to the land.

The morning of April 12, Jimmy and Ginger rose early to finish chores around the farm before heading out on the two-hour drive to the award ceremony at the Capitol building in Oklahoma City. Afterward, they planned to stop by their 5-year-old grandson's T-ball game.

Jimmy's cellphone buzzed in his pocket a couple of times during lunch, but it wasn't until he and Ginger pulled in at the softball field that they realized something was terribly wrong.

Another call came in, this one from Ginger's friend LaDena Kauk. LaDena and her husband, Mike Kauk, own a local construction business. The couples had gone to school together and remained close. Jimmy picked up the phone.

"I don't want to alarm you," LaDena said, "but you might want to come home. There's a fire."

LaDena's voice was calm, but Jimmy could tell the façade was for his and Ginger's benefit only.

"How bad is it?" Jimmy asked as he and Ginger jumped back into the pickup.

"If you turn on the news, you'll understand," she replied.

Ginger turned the radio to the Woodward station, and they listened in rising alarm as the reporter announced fire department after fire department called in to control the flames. LaDena sent the first photographs of the fire when the Emmonses were within 50 miles of home. It was headed straight for their house.

As Jimmy and Ginger approached home, they saw 60- to 70-foot walls of fire light the night's sky. For weeks, they had been watching the wheat bake in the sun. Now they watched it burn.

Firefighters and Mike Kauk with his company's bulldozers had built firebreaks around the home to protect it from flames of what had become known as the Rhea Fire.

Later, the Oklahoma Forestry Services would tell Jimmy the fire was burning 118 acres per minute as it went past his house that night. At the last minute, the winds had shifted. The home was spared.

OPPOSITE PAGE: Jimmy Emmons (left) talks with Hugh Aljoe, Noble Research Institute director of producer relations, about his plans for recovery following the Rhea Fire, on May 24, 2018. Noble consultants stay in contact with Emmons about his operation and how they can help other producers in the area.

ABOVE: Jimmy Emmons steps down from his tractor after spraying a field July 2, 2018. While the Rhea Fire has created new challenges for the Emmonses, they have continued to carry on with daily farm activities needed to care for their cattle and grow crops.

RHEA FIRE FACTS

Fire started: Approximately 2 p.m., Thursday, April 12, 2018

Cause: Unknown

Date of containment: Thursday, April 26, 2018

Size:

286,196 acres

Location: Primarily Dewey County, Oklahoma

Number of responding fire departments:

At least 179

(Rhea and 34 Complex fires combined; 34 Complex Fire also started April 12 in Woodward County, north of Dewey)

32 states provided resources to assist wildfire firefighting efforts across Oklahoma from Jan. 22 through April 26, 2018

Source: Oklahoma Forestry Services

SAVE THE COWS

Jimmy and Ginger thought they had dodged the bullet. Then, the next day, two turkey hunters were on land just south of the Emmonses' when they heard what sounded like a gunshot.

Strong winds had created a dance among the power lines. Leaping cables crossed, and the ensuing sparks hit the dry grass. Another fire was born. It consumed a neighbor's barn filled with hay before heading toward the Emmons home again. Mike's bulldozers and the Leedey fire department returned to try to extinguish the flames.

"The panic had set in at this point," Jimmy says. "You're thinking: 'What do you try to save? Is it photos or documents, the dogs, the cattle in the lot?' All that is going through your mind as you're trying to figure it out on the fly."

Up to 50-mile-per-hour winds shifted in every direction, at one point pushing the fire away from the house but putting more cattle in danger. Jimmy and Ginger together with Karson Leibold, who has worked as the Emmonses' ranch hand for 10 years, sprang to action to save the cows.

At one point, Leibold was nearly run over by the fire while moving a group of cows to safety. Most darted through the open gate to shelter, but one cow would not budge. Ginger remembers Leibold's frantic call and telling him he needed to save himself.

"I kept telling Ginger and Karson, 'We want to save the cows, but let's not do anything to lose ourselves,'" Jimmy says. "The fire was moving so fast, and we'd never had so much wind. We just didn't have time to reach all the cows. It was a helpless feeling."

That first night, Jimmy and Mike were in bulldozers until 10 p.m. trying to build firebreaks and shield what land they could. They could feel the heat from flames 50 feet away, which the firefighters continued to battle.

Eventually, Jimmy and Ginger left the burn area. The smoke was too thick, and there was nothing more they could do without hindering the fire department.

The house was quiet that night as the couple made their game plan for the next day. They knew they had not been able to reach all of the cattle in the fire's path. They didn't know how many cows would be left standing in the morning.

EMMONS

ABOVE: Jimmy and Ginger Emmons raise cattle and grow crops and forages on their farm near Leedey, Oklahoma. As a result of the Rhea Fire, 120 of their 250 cows lost their pastures.

RIGHT: Farming and ranching has always been part of life for Jimmy and Ginger Emmons, who have been married 36 years. Jimmy Emmons (left) says his favorite aspect of the operation is farming and working with the soil. Ginger Emmons (right) most enjoys working with the cattle.

MIRACLE IN THE CLEARING

The sun was just peeking over the horizon when Jimmy rushed to one burnt pasture and Ginger to another.

Ginger went to a lot that had been filled with eastern redcedars, an invasive species that contributed to the intensity of the fire. Her stomach was in her throat, she recalls, as she forced herself to walk across the blackened ground and through the thicket of charred trees.

"I just knew I was going to find all of the cows dead," she says. "There was no way that they could have survived with so many cedar trees there to fuel the fire."

But in the back corner of the pasture, on top of a hill, the cattle were grazing a patch of grass that somehow had not burned. It was an area less than an acre in size and the only sign of life within seeing distance.

> "I could not believe they were alive," she says. "Not even one hair on them had been singed. I was so grateful they weren't hurt."

Jimmy, too, found live cattle. But the uncontrollable winds made it difficult to stay ahead of the fire.

"To remedy the cow situation, we just didn't always know what to do next," Jimmy says. "I'd rush to one place. Ginger would rush to another. We moved cows from one pasture to another, sometimes even loading them up in trailers to haul out. But the fire was so hot that even green pasture burned."

ASK THE EXPERT: TIM BOATRIGHT

Tim Boatright, an agricultural equipment mechanic at the Noble Research Institute, serves as the captain of the Shady Dale Volunteer Fire Department in Love County, Oklahoma. He has volunteered as a firefighter for more than 15 years.

Q: What is it like to serve as a volunteer firefighter?

A: Volunteer firefighters do not work set hours at the department. Most of us have full-time jobs. I've worked as an agricultural equipment mechanic for the Noble Research Institute for three years. Previously, I served as a technician with John Deere for 30 years.

As a volunteer, you're always on call. We respond to about 90 percent of the emergency calls sent out since there are so many more volunteer fire departments than paid, especially in rural areas. Of the 1,000 fire departments in Oklahoma, 968 are volunteer.

Our crew numbers vary based on volunteers and their work schedules, so we never know how much help is coming until we're on the scene.

Because of this, it's important that we have relationships with other fire departments. In 2006, the state implemented an automatic aid response, which is a multistation page based on department zones. When an emergency call is received, at least three fire stations are expected to respond. The first fire officer on the scene determines if and how much more help is needed.

We receive some funding from the state, but it's not enough to cover all our expenses. We depend on fundraising drives for water and food supplies. Each volunteer department has a rehab group (made up of volunteers) that makes sure firefighters have enough supplies to get them through each call. The bigger the call, the bigger the crew and the more supplies needed during and after the call. Monetary donations made to a station can go directly to a station for use where needed or to a rehab group to stock supplies.

LANDING ON MARS

In the midst of the chaos, Jimmy called Jim Johnson, a Noble Research Institute soils and crops consultant. Johnson and Bill Buckner, Noble president, visited the Emmonses on Saturday, April 14.

"I was not prepared for the vastness of the devastation," Johnson says. "It looked like we had landed on Mars. The smoke was still thick. We had to wear safety goggles and dust masks just to get around."

Power lines were down, creating a maze to navigate. Yet linemen were already out, just feet from the flames, working to restore electricity. Jimmy and Ginger had been without power since Thursday. Johnson and Buckner brought a generator for the house, but the linemen were able to restore the power by that evening.

The winds were still blowing, and Johnson remembers watching dirt flow through a ditch like a river. The fire had burned around some areas that should have been candy to the flames. Others burned so hot that not even ash was left.

"It didn't make sense as to why some areas burned and others didn't," Johnson says. "The only thing I can say is God must have put his hand on the land and said, 'This guy has suffered enough.'"

Jimmy and Ginger's immediate concern was what to feed the cattle. They had lost a stack of hay, and 120 of their 250 cows had lost their pastures. In the meantime, some of those cows were giving birth.

Johnson helped Jimmy calculate how many days of forage he had left and plan where he could move the cattle next. Some would be placed on triticale pasture originally intended for hay until drought stunted its growth. Jimmy had been disappointed with the pasture, but now he is thankful for it.

Johnson and Buckner also helped patch fences along some of the 23 miles of fence line the Emmonses will need to repair. About 18 miles will need to be completely replaced. A few weeks later, they learned a government program would reimburse 75 percent of the costs. But they would still need to be able to cash flow the expense up front.

"Ginger wanted to figure how much money we'd need to put back for the fence repairs," Jimmy says. "I told her, 'You don't want to know that number.'"

He laughs but adds: "It's overwhelming. That's the word I've been using a lot lately: 'overwhelmed.'"

ABOVE: A house lies in pieces as a result of the Rhea Fire, which consumed 286,196 acres in western Oklahoma from April 12 to April 26, 2018. OPPOSITE PAGE BOTTOM: A melted stop sign photographed on July 2, 2018, reminds drivers of the intensity of the Rhea Fire more than two months after it occurred. OPPOSITE PAGE TOP: Plant life emerges from the scorched ground in Dewey County, Oklahoma, on May 24, 2018.

A LONG ROAD AHEAD

By the time the Rhea Fire was fully contained April 26, it had consumed 286,196 acres, or about half the county. Volunteer firefighters from across the country had come to fight the fire.

"Most of them didn't know the lay of the land," Jimmy says. "But they fought relentlessly, and they took care of each other. They are true heroes."

The fire crossed about half the land the Emmonses manage, but they are quick to say they were fortunate. Their home stood, and most of their herd was intact. Of their 250 cows, they lost only two — not to fire but to smoke. They also lost an outbuilding with a few pieces of machinery and some hay. Some of their neighbors lost their homes. Every acre of grass. Half their herds. All of their equipment. Two people lost their lives.

"It makes us feel pretty blessed compared to what others went through," Jimmy says. "We're very thankful."

Donations of hay and fencing supplies poured in from around the country. Jimmy, who serves on the local conservation district board, was among community leaders who helped ensure people, especially those who had lost hay-moving equipment, received what they needed.

Students from the local FFA chapter came out to help Jimmy and Leibold fix fence two weeks in a row. The community also banded together to buy the Leedey fire department a new truck.

"It's going to be a long, difficult road to recovery for many people around here," Jimmy says. "But farmers are some of the most resilient people in the country. Most of us try to stay positive or we wouldn't be able to stay in agriculture. You've got to have that fortitude."

PROMISE OF BETTER DAYS

Within days of the fire, green began to sprout from the scorched surface of the soil.

Five weeks later, remnants from the fire — melted stop signs, downed fences, the scent of charred cedar — still filled the countryside. But, Jimmy says, life moves on. There are cattle to tend and decisions to make. Many, including him, will sell cattle that the land cannot currently support.

Much of the land will be better off in the long-run because of the Rhea Fire, Jimmy says.

This land evolved under fire, which makes fire a natural — and essential — part of the landscape. Once it's removed, brush becomes more difficult to control. Unruly vegetation leads to a heavier fuel load that, once an unplanned fire has been sparked, leads to hotter and more dangerous wildfires. The No. 1 contributor is eastern redcedar.

"That's one of the silver linings," Jimmy says. "Cedars are a big problem around here. This land wasn't meant to have them, and the fire did a good job of clearing them out."

The challenge is going to be getting everything back in working order, Johnson says. Burned pastures will need to rest for at least a year. Noble consultants stay connected with Jimmy and others in the area. They plan to make a trip to Dewey County to help with recovery once producers are ready to start making grazing management plans.

"Jimmy has some advantages for recovery," Johnson says. "Fire is a pretty big equalizer, but he is going to see his grass rebound better and faster because of his and Ginger's good grass management practices."

Jimmy and Ginger have been careful not to overgraze their pastures, and they've controlled eastern redcedar on what land they could. Their biggest advantage, though, Johnson says, will be their use of cover crops.

Within weeks of the fire, Jimmy had sown a mix of species — sesame, corn, soybean, milo, even watermelon and okra — as cover crops for wheat pasture. A practice he originally adopted for soil health will now pay off in the form of forage he would not have if he farmed in the traditional wheat-only system.

> "The resiliency of our soils is greater than the resiliency of the agriculture community, and that's saying a lot," Jimmy says. "We don't give up, and neither does the soil."

MANAGING PASTURES BEFORE AND DURING DROUGHT

Pasture managers may dread droughts. However, with proper planning, they can minimize damage and keep operations running smoothly.

by Hugh Aljoe, Noble Research Institute director of producer relations

There are many philosophical statements that come to mind when considering pasture management during drought. One of my favorites came from Wayne Hamilton, one of my range science professors at Texas A&M, "The time to start planning for a drought is when it's raining." He immediately followed that statement up with, "And the time to start planning for rain is during a drought." The bottom line is pasture management requires planning. There is no substitute for planning ahead for both "typical" conditions and for more difficult conditions, like drought, that we know are inevitable.

As land managers, the best way we can prepare our pastures for drought is by consistently implementing good pasture management practices. Well-managed pastures are more resilient during stress and recover more rapidly.

We also need to have an appropriate contingency plan that includes strategies and activities to be executed in an orderly fashion as adverse conditions persist. We must answer two important questions before writing such plan: What needs to be done to get to the next season of anticipated rainfall? And, what needs to be done to get to the next spring growing season? With both of these questions, we must consider how we will limit the long-term damage to the pastures due to grazing livestock.

Drought conditions in a region are usually forecasted and certainly are easily monitored as conditions change. We can use weather and climate tools, such as the U.S. Drought Monitor and Oklahoma Mesonet, to stay informed on regional weather conditions and help with the planning process.

Once drought settles on a region, it's time we implement our drought plans. It will be important to assess available and projected forage production, develop a destocking plan for livestock, acquire anticipated hay needs, maintain adequate standing forage, target introduced pastures for grazing, and plow and maintain fire guards and breaks.

Another good management practice is prescribed fire. When we regularly use prescribed fire on native pastures, we help reduce buildup of plant material for wildfires to consume. This aids in suppression and the severity of wildfire on native pasture health.

Lastly, the U.S. Department of Agriculture Risk Management Agency's Pasture, Rangeland and Forage (PRF) insurance program can provide some assistance during drought periods. PRF insurance is supplied by local and regional independent insurance agencies, and it is well worth considering for producers who graze livestock and produce hay. However, the best pasture drought insurance is good long-term management prior to and during the drought.

For the full article, please visit www.noble.org/managing-pastures-drought. For more information on drought management options, please visit www.noble.org/drought.

WHAT FIRE DOES TO SOIL MICROBES

Soil microorganisms are among the most successful creatures on the planet.

by Steven Shafer, Ph.D., Soil Health Institute interim chief scientific officer and retired soil microbiologist

Fire affects many important ecosystem processes. Much of what we understand about the impact of fire on terrestrial ecosystems comes from many decades of research on the effects of forest and prairie fires on plant communities and succession, nutrient cycling, erosion, and soil properties.

Soil itself is a complex ecosystem that supports all living things above ground. Soils also host an incredible diversity of bacteria, fungi and other microbes that are affected by various factors such as soil nutrients, seasonal changes, drought, pH, chemical applications, plant species and farming practices. Although many microbes are adapted to high-temperature environments (we're all fascinated by reports of weird microbes growing right at the edges of geysers and undersea vents), no physiologically active microorganism can survive fire.

However, we've learned that fire is a powerful regenerating force. This is why prescribed burns are useful management tools in forests and rangelands to clear out old growth, stimulate new growth and recycle nutrients.

We can see benefits of fire on plant communities that rebound from dormant seeds and surviving roots, but there are pluses for the unseen as well. The microorganisms that are killed by fire near the soil surface, where temperatures are greatest during a fire, become food for the survivors that escape by living deeper down or by being protected within the occasional soil aggregate (bound-up clusters of soil particles that may encase microbes and protect them from high temperatures).

The duration and intensity of the peak temperature is what affects the soil organisms most. If it gets hot enough, the soil can actually be sterilized, at least in the top few inches. Emissions of carbon dioxide normally rising from the soil microbes may be briefly suppressed due to the reduced population.

Some of the most sensitive microbes are the mycorrhizal fungi, which are adapted to a symbiotic (literally "living together") relationship with plant roots. The fungi may be reduced near the soil surface, where new plant roots eventually take hold. Those plants may struggle at first, in the absence of these fungi that aid in nutrient uptake. But the microbe population will recover once the heated soil cools down and microbial cells and spores re-enter on wind and in water. Cycling of nutrients ramps up fast, and their availability to newly emerging plants allows recolonization to begin.

Fire is a disturbance in nature, but life is strangely hard to deny. Individual types of soil microorganisms may be extremely sensitive to the conditions created by fire and its immediate aftermath, but as a group microorganisms are the most successful on the planet. Once they begin the recovery process, the plants and animals are soon to follow.

PRESCRIBED FIRE CAN HELP PREVENT WILDFIRE

The land needs fire combined with grazing and rest to maintain integrity, stability and beauty.

by Russell Stevens, Noble Research Institute strategic consultation manager

Aldo Leopold, an American ecologist and forester, introduced the phrase "land ethic" in his 1949 book *A Sand County Almanac.* The phrase refers to a responsible relationship between people and the land they inhabit, and it helped usher in the first major change in human awareness of and attitude toward land management. A chief tenet of Leopold's land ethic is: "A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community (naturally occurring organisms within the ecosystem). It is wrong when it tends to do otherwise."

Prescribed fire, grazing and rest are integral processes for maintaining the integrity, stability and beauty of the biotic community throughout the U.S. When managing native plant communities, it is impossible for us to achieve beneficial outcomes when using only fire, grazing or rest. Land managers must constantly monitor plant community diversity and structure and apply differing amounts of fire, grazing and rest together to meet their land management goals.

When needed, we can use prescribed fire to temporarily shift the existing plant community to accommodate certain livestock or wildlife species, but the timing is important to achieve the appropriate shift. Historically, we considered the burn season to last from January to April. However, in recent years, through research and demonstration, we've determined that the burn season is year-round. Burning during the growing season, especially the latter part, has proven to be safer and more effective at controlling brush encroachment and increasing plant diversity.

Brush encroachment throughout the Great Plains has been beneficial to some birds and animals, but it is detrimental to those that rely on wide-open spaces. It also has a negative effect on total forage production for cattle, reducing the number of cattle that an area of land can support without degrading one or all ecosystem processes. We can apply fire properly to keep spaces open for certain wildlife species and to maintain cattle production. Fire can also increase forage quality for cattle by removing old plant growth.

Recent wildfires in many Western states were fueled in part by excessive buildup of plant material. When we leave vegetation unchecked over time, we create more hazardous conditions in the event of a wildfire. By regularly applying prescribed fire, we can mitigate fuel buildup and reduce the intensity of wildfires.

Prescribed fire is a process — not a silver bullet — for managing native plant communities, and it should be well-planned to safely accomplish desired land management goals. Grazing and rest are major considerations for the successful use of prescribed fire. If grazing causes an inadequate fuel load in grassland communities, burning is ineffective until the stocking rate or grazing management is corrected. Wise use of prescribed fire combined with grazing and rest certainly preserves the integrity, stability and beauty of the biotic community. It is wrong to do otherwise.

For the full article, please visit www.noble.org/prescribed-fire-essential. For more information on prescribed fire, please visit www.noble.org/news/prescribed-fire.

PRESCRIBED BURN ASSOCIATIONS ARE GETTING FIRE ON THE GROUND

Land managers work together to safely conduct prescribed burns.

by John R. Weir, associate extension specialist, Oklahoma State University Natural Resource Ecology and Management

Prescribed burn associations (PBAs) have been active in Oklahoma and Texas since the late 1990s. Landowners, with assistance from local agencies and groups, form local associations to safely and effectively apply fire to land. To accomplish this task, PBA members pool their equipment, labor and expertise to assist each other in conducting prescribed burns.

Community support is essential for an effective burn association. We encourage landowners and managers to set goals and objectives when forming an association to help gain the needed support.

My role as an associate extension specialist for Oklahoma State University and board president of the Oklahoma Prescribed Burn Association (OPBA) is to help local groups become formal associations. I help landowners find equipment and training, and I serve as one of their main support contacts.

Formed in 2013, the OPBA is the statewide organization that assists individual PBAs with training, equipment, funding opportunities and other resources. The formation of the OPBA was one of the most important steps to help landowners reclaim the Oklahoma landscape, which was historically shaped by fire. The state association establishes, educates and assists a network of local burn associations across Oklahoma.

It's important that we provide landowners with information, training and funding opportunities to help them safely and effectively apply fire to their lands. Liability is one of the greatest concerns landowners have when considering prescribed fire. By bringing landowners together to equip and train them in the proper use of fire, we can help reduce that anxiety. We also have to combat the decades-long anti-fire campaign of a certain cartoon bear, so the OPBA has a major focus on educating the public and policymakers about the importance of prescribed fire and the safety of this management practice. When we are more proactive and safely use prescribed fire, it helps the public become less fearful of fire and see the many benefits it provides to the land.

We currently have 21 PBAs in Oklahoma. They cover 37 counties and include more than 300 members. These associations have been gaining in popularity and activity during the past 10 years.

Associations can enter information about prescribed burns conducted in Oklahoma and across the nation through our online form. It does not ask for any personal information. We use this information to show people prescribed fire activity, safety records and the reasons for conducting burns.

In 2017, 15 Oklahoma PBAs conducted 106 burns on 22,720 acres across 22 counties. The top three reasons for burning were livestock production, cedar control and wildlife habitat. Most burns were conducted in April, but burns were conducted in eight different months. This shows growing season burns are gaining acceptance and popularity. No insurance claims or lawsuits were reported, which should reduce fears of liability when burns are performed under proper conditions with adequate equipment and the assistance of the local PBA.

Learn more about prescribed burn associations at bit.ly/nrem-burn-assc, or enter a burn you have conducted at www.ok-pba.org.

NOT JUST ANOTHER BANDAGE FOR PECAN SCAB

A discovery about pecan scab reproduction could give producers a new way to fight the fungus and potentially save them thousands of dollars in the process.

by Dana Smith, Ph.D.

In a bad year, Buck Paulk has lost 40 percent of his crop to pecan scab, costing him upwards of $5 million.

"Pecan scab is our No. 1 concern," says Paulk, owner of Shiloh Farms in Georgia. "That's our major battle. It's not a minor issue, it is the issue."

Thanks to aggressive treatment with fungicides, Paulk predicts he will only lose 10 percent of his crop this year. However, the cost to protect crops from pecan scab can be nearly as expensive as the loss itself. With a 3,400-acre orchard, Paulk spends more than $1 million a year on fungicide, equipment and fuel for spraying.

"You might say, 'Wow, that's a high input on fungicide,' but look at what you stand to lose," he says. "It's not something you do to get a 5 percent bump. On certain pecan varieties, you're either in business or out of business."

Georgia is particularly susceptible to pecan scab because of its high heat and humidity, conditions in which the fungus flourishes. But growers in the Southern Great Plains aren't immune. In North Texas, Cecil Crabtree, owner of Crabtree Pecans, says he sprays several times a season to protect his 300-acre farm, costing him tens of thousands of dollars.

"You can put $1,000 in a sprayer and put it in the air, and there goes your $1,000," Crabtree says. "But it's cheaper to prevent scab than it is to stop it. I do everything I can to prevent it before it starts."

With consultation from Charles Rohla, Ph.D., Noble Research Institute pecan and specialty agriculture systems manager, Crabtree sprayed earlier this season, starting in March before his trees started to bud. He has also tried a new prevention tactic: burning his orchard. While the practice sounds extreme, recent research out of Noble suggests that burning the ground vegetation and leaf debris around trees in the winter could be one way to prevent pecan scab from taking hold.

Using these strategies, Crabtree says he's been able to cut his spraying in half this year. So how are these new prevention methods so effective? Like a teacher chaperoning a high school dance, they're stopping the fungus from having sex.

What Is Pecan Scab?

Since its discovery in the 1800s, pecan scab has always been thought to spread by asexual reproduction — cloning itself and traveling to new leaves and trees through the wind and rain.

The fungus starts as a small black spot on the young leaves, shucks and twigs of the pecan tree. Under a microscope, the black lesions can appear fuzzy, like mold growing on a piece of bread. This fuzziness indicates the fungus has sporulated, meaning it has cloned itself and started to release tiny bits of baby fungus. These spores are then carried to the leaves or shucks of neighboring trees, where they create a new lesion. Pecan scab can generate spores in as little as a week, meaning the fungus has the potential to reproduce and spread dozens of times during the growing season, eventually infecting an entire orchard.

Scab impacts both the harvestable nuts and the tree as a whole. If most of the shuck is covered in scab, the nut inside will be smaller and the edible

CONTINUES ON PAGE 34

Pecan scab can cause significant yield and quality losses at harvest time in pecan orchards across the U.S.Planting scab-resistant cultivars, removing orchard floor debris, and thinning and pruning trees can help control the disease. Currently, however, the best way to manage scab in an established orchard of susceptible trees is with multiple applications of fungicide.

Pecan scab attacks the shucks of Pawnee pecans growing in Madill, Oklahoma, on Aug. 15, 2018.

The fungus starts as a small black spot on the young leaves, shucks and twigs of the pecan tree. Under a microscope, the black lesions can appear fuzzy, like mold growing on a piece of bread. This fuzziness indicates the fungus has sporulated, meaning it has cloned itself and started to release tiny bits of baby fungus.

meat will be lower quality. Loss in size is a big deal in pecan economics because growers sell by the pound, so a smaller nut means more pecans will have to be harvested to make up a pound. If more than 75 percent of the shuck is covered in scab, the pecan may not be sellable. On the leaf, scab can decrease the photosynthetic capacity of the tree, which will impact the following year's crop.

Like Paulk and Crabtree, pecan growers manage scab with fungicides, but the fungus can develop resistance to the treatments. Other farmers grow pecan varieties that are resistant to the fungus, either naturally or because the varieties were bred that way. However, over time if the pathogen adapts, the trees could lose their immunity. This adaptation — both to the fungicides and to resistant varieties — is key because it means the pathogen is evolving, and that means it's reproducing sexually.

"The literature says scab is an asexual fungus, which means that it clones itself to reproduce, and yet there is a lot of diversity within the population," says Carolyn Young, Ph.D., Noble Research Institute molecular mycologist. "And those two things are counter-intuitive."

A Major Breakthrough

In 2015, Young and senior research associate Nikki Charlton, Ph.D., set out to determine, once and for all, whether the fungus reproduces asexually or if it also uses sexual reproduction. Working with Clive Bock, Ph.D., a scientist at the U.S. Department of Agriculture's Agricultural Research Service in Georgia, Young and Charlton searched for genes in the pecan scab genome that would indicate sexual reproduction. Thanks to the pecan scab's close cousin, known as apple scab, which is known to reproduce sexually, the researchers had a good idea of what this so-called mating-type gene should look like. With one quick scan across the pecan scab genome, the scientists were able to identify a mating type gene that closely matched the apple scab gene.

But that was only the first step. In order to mate sexually, two different mating type genes — a male and a female version — must be present in the population of the fungus. Young and Charlton tested 14 samples of pecan scab taken from farms across the Southeast and Southern Great Plains, again looking for the mating-type gene. They identified the original mating-type gene in half of the samples and discovered a second mating-type gene in the other seven.

"Just within that small subset of randomly selected samples, we had a 50-50 mix of both mating types, which is evidence of sexual reproduction," Charlton says. "So we screened another 1,200 samples and still found a 1-to-1 ratio between the two mating-type genes. That was the first concrete sign that pecan scab was a sexually active fungus."

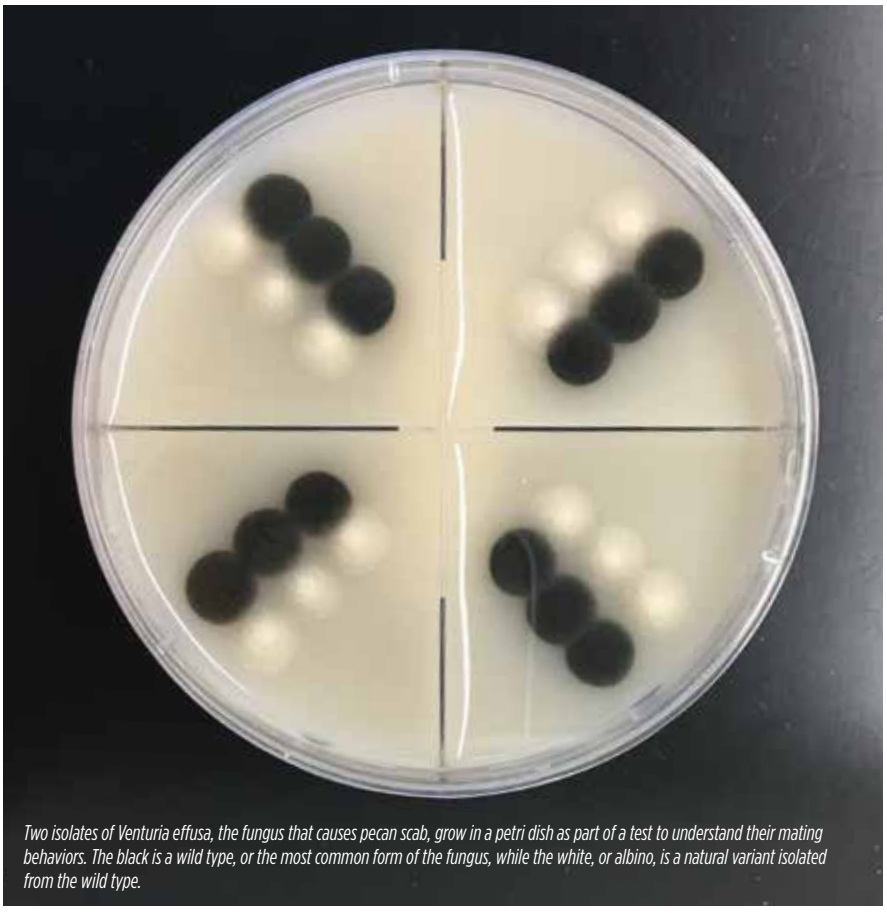
Young and Charlton have subsequently recreated the sexual stage in the lab by pairing two fungi with the male and female genes together in a petri dish. After "wintering" together in the refrigerator for four months, the fungi mated and produced unique offspring spores.

Just because the fungus reproduces sexually, though, doesn't mean it can't spread asexually as well. A lot of fungi undergo both modes of reproduction, and there are advantages and disadvantages to each method.

"Typically, asexual reproduction is energy efficient so it is really quick — seven to nine days for pecan scab to reproduce asexually. But the disadvantage of that is you have a clonal population, so all of those spores are genetically the same," Young explains. "Under sexual reproduction, you have to have both mating partners present and they have to be able to find one another and interact, which is very energetically costly and takes a lot longer. But that does introduce genetic diversity into the population, which allows it to better adapt to a changing environment."

The Search Is On

The researchers' next step is to identify the sexual stage in the field. Similar to the apple scab, Young, Charlton and Rohla think that sexual reproduction of the pecan scab occurs early in the season and is



Two isolates of Venturia effusa, the fungus that causes pecan scab, grow in a petri dish as part of a test to understand their mating behaviors. The black is a wild type, or the most common form of the fungus, while the white, or albino, is a natural variant isolated from the wild type.

the cause of the initial infection. The rest of the season, the fungus goes through an asexual cycle, repeatedly cloning itself and spreading via the wind and rain.

"If we can identify when that mating occurs, then we'll have a heads-up on management," Rohla says. "Just a single earlier spray may be able to stop the sexual cycle from causing that initial infection, which would hopefully limit the amount of scab present in the orchard for the rest of the season and reduce the number of sprays necessary."

To Georgia grower Buck Paulk, that would be a huge benefit. "My most expensive input from year to year is my disease control. If there was some way I could back off my input, if there was another avenue we could use to control scab, that would be a godsend for us," he says.

The other question is where pecan scab sexual reproduction occurs. Apple scab's sexual cycle occurs on the leaf litter, so the researchers have been looking on the discarded leaves, shucks and twigs around the tree bases. Getting rid of that dead material may help remove some of the fungus that lies dormant there and potentially prevent the scab from sexually reproducing.

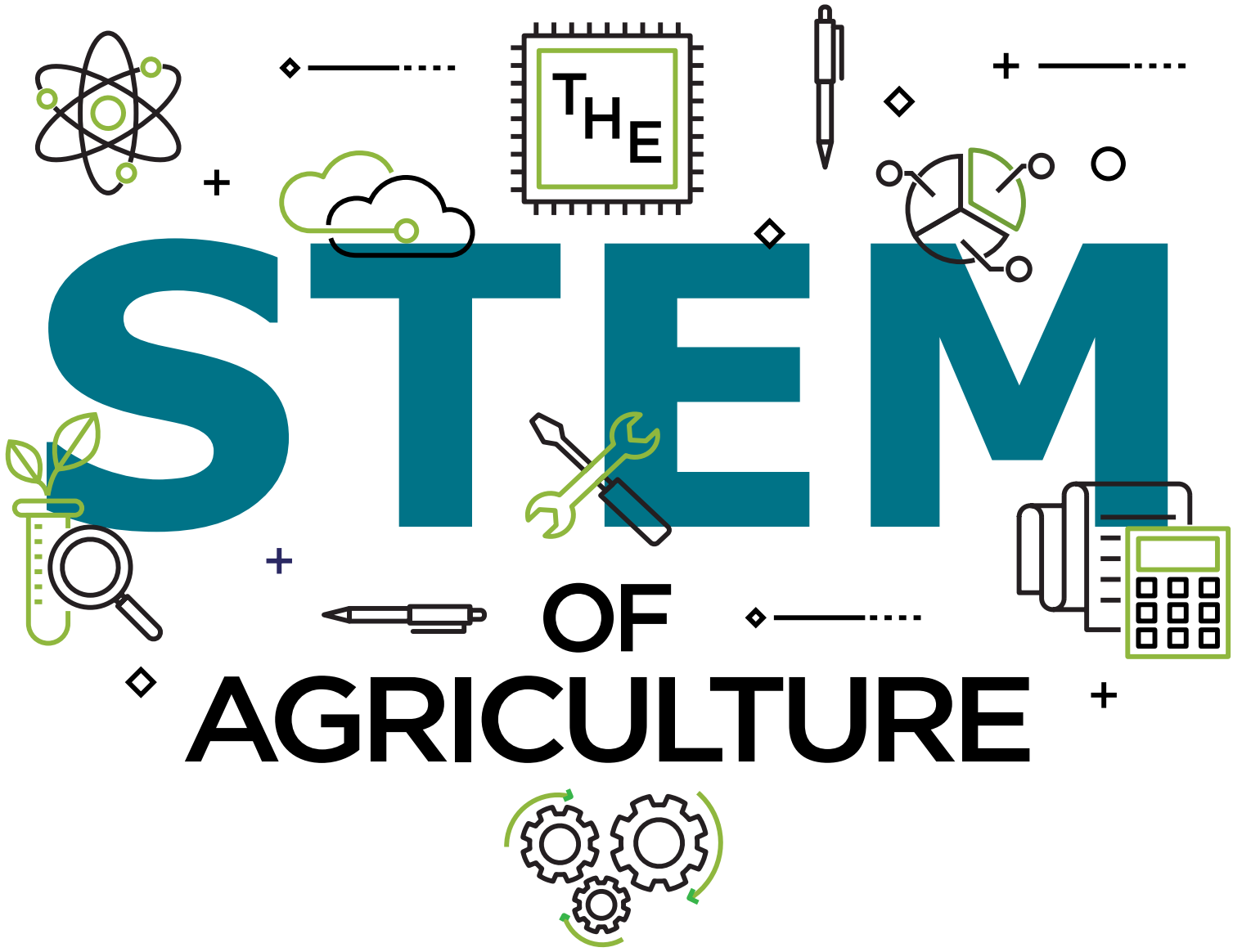
Crabtree says that after burning the ground vegetation in his orchard last winter, he's noticed a reduction in pecan scab. "I've learned more in the last two years than I've learned in the last 10," Crabtree says about working with Rohla and the Noble Research Institute. "We in the pecan industry often think we've learned all there is to know, but I've been in the industry 50 years and I'm still at first base."

Carolyn Young, Ph.D., (left) and Nikki Charlton, Ph.D., have found that the pecan scab pathogen (Venturiaeffusa) has a sexual cycle that may initiate the disease at the beginning of the growing season. By better understanding the pathogen, they and others can work toward providing growers with new ways to manage pecan scab.

MEET CHARLIE GRAHAM, Ph.D.,

NOBLE'S NEW SENIOR PECAN SPECIALIST

Charles J. "Charlie" Graham was raised on a farm in Anderson County, Texas. After 22 years with the Louisiana State University Agricultural Center, he has joined the Noble Research Institute as a senior pecan specialist. At Noble, Graham helps pecan and other horticultural producers achieve their goals. His research focuses on factors that influence quality and nut loss; profitability of crop production; crop, soil and water issues; and screening of potential new pecan varieties. To learn more about Graham and his work, visit www.noble.org/staff/charlie-graham



Students gain a greater understanding of the science, technology, engineering and math components of agriculture through tours, competitions and empowered teachers.

by Courtney Leeper

ABOUT ENVIROTHON

Oklahoma Envirothon is a team-based competition in which high school students learn about natural resource management. The competition combines in-class curriculum with hands-on field experiences and opportunities to interact with professionals. Students are tested in five areas: aquatic ecology, forestry, soils and land use, wildlife and a special topic that changes each year. Oklahoma Envirothon is part of the North American Envirothon program. To learn more, visit www.oklaenvirothon.org.

It was like Sierra Walker had returned home when she first stepped into the agriculture classroom — her new teaching domain — at Alva High School in 2015.

For three of the four years since she graduated with an agricultural education degree, Walker had been exploring the real-world classroom. She had traveled to Canadian farms while earning a master's in international agriculture, managed a Red Angus cow herd and worked for the nation's largest cattle feeder.

In 2014, Walker moved to Alva, Oklahoma, and took a job as the local high school's chemistry teacher. But she could not deny the pull of agriculture.

In addition to chemistry, Walker taught one hour of environmental science. She talked about the Dust Bowl and how people in agriculture had learned to be better land stewards because of it. Her students discovered ways farmers and ranchers protect wildlife habitat, reduce waste and conserve natural resources.

One day, a student stopped her after class and said he was learning more about agriculture in her class than in his agriculture classes. His words sparked within her the same flame that had inspired her to pursue her undergraduate degree.

"There's an incredible amount of science and math behind everything we do in agriculture, yet we don't always recognize it in the classroom," Walker says. "I originally set out to become an agriculture teacher to help bridge that gap."

Teaching science wasn't enough, Walker quickly realized. She wanted to teach agricultural science. When a position opened, she jumped at the opportunity.

ABOUT SCIENCE IN AG DAY

Eighth grade students from the Ardmore area discover the role science plays in agriculture during the annual Science in Ag Day. Students rotate among stations with interactive lessons focused on topics including plant breeding, soil health, ruminant digestion, vegetative reproduction, wildlife and drones. Each lesson is taught by a Noble researcher, consultant or educator specializing in the topic.

Students become scientists for the day as part of hands-on lessons developed by Noble Learning's youth education outreach program.

SPARKED CURIOSITY

Walker was preparing for her first year of teaching agriculture when she learned of the Noble Research Institute.

She had received an email from state FFA staff saying the organization was offering a workshop to help teachers prepare their students for Agriscience Fair, a competition that encourages FFA members to use the scientific method to explore agriculture.

That summer, Walker drove four hours south to the Noble Research Institute's campus in Ardmore to soak up as much as she could about the competition, which Noble helps sponsor in Oklahoma. During the next two days, Frank Hardin, Ph.D., and Jenn Scott, from Noble's youth-focused Noble Learning education team, offered ideas on how to get students thinking about projects. They showed experiments to the teachers and introduced them to the real-world research taking place on campus.

"It was an amazing experience," Walker says. "I loved everything they were doing. I loved seeing the research. I loved the way they gave us information to take back to the classroom by sparking our curiosity, too. I've been hooked on Noble ever since."

CONNECTING CONCEPTS

Walker returned home determined to involve her students in another of the programs she had discovered during the workshop: Oklahoma Envirothon, a team-based competition that combines in-class curriculum with field experiences to engage students in learning about natural resources.

That fall, Walker organized her first group of students to compete. The next year, her students asked to start preparing for the March competition as soon as school started, she says.

Walker also brings her students to the Noble Research Institute to connect the concepts they learn in class to real-world applications.

Walker may show her wildlife classes a video of BoarBuster capturing feral hogs. But, she says, the students gain a new level of excitement when they see the trap deploy in real-time during a conversation with Josh Gaskamp, a wildlife consultant who contributed to the research behind the trap.

Students familiar with raising livestock see a different aspect of agriculture when they meet Carolyn Young, Ph.D., a scientist who works with fungi to improve grasses consumed by cattle. Young leads them in observing fungi beneath the microscope and learning how to pipette genetic materials into gels and see DNA after successful completion of such an experiment.

"I love that Noble gets the kids involved in many of the areas they're working in," Walker says. "The kids get to see actual research that is happening and interact with the people who are doing it. They get to see that 'Hey, that's a job that I could do.'"

Teachers from across the U.S. complete 80 hours of training during the Principles of Agricultural Science – Plant CASE Institute hosted by the Noble Research Institute.

FOR TEACHERS AND STUDENTS +

During Walker's most recent visit to the Noble Research Institute, the teacher became a student.

In 2007, The National Council for Agricultural Education started CASE, or Curriculum for Agricultural Science Education, to enhance the rigor and relevance of agricultural course work. CASE Institutes are held throughout the country to train teachers in high-level, hands-on agricultural-themed curriculum that integrates science and math.

In 2016, the Noble Research Institute and Oklahoma State University brought the first CASE Institute, a course in plant science, to Oklahoma.

"We brought CASE to Oklahoma because it empowers agriculture teachers," says Hardin, youth education outreach manager. "We recognize that today's students are the future for agriculture and our society, and we want to do everything we can to help teachers cultivate critical thinkers who understand and appreciate agriculture and science's role in it."

Noble hosted another CASE Institute in the summer of 2018. Walker was among the 12 teachers from across the country — from as far away as Hawaii — who attended.

For 10 days, the teachers donned white laboratory coats and immersed themselves in lessons they could teach their own students.

They learned about soil and the microorganisms in it, pH levels and fertilizers, greenhouse and field production, commercial and at-home agriculture, plant reproduction, and photosynthesis. At each step, the curriculum introduced a new activity to promote deeper understanding. Activities drew the teachers-turned-pupils into projects and problems similar to those that plant scientists might face.

"Looking back, it was one of the best things I've ever done," Walker says. "The CASE curriculum brings out the STEM (science, technology, engineering and mathematics) of agriculture. It's just another way that Noble has been a great resource to me."

FINDING TRUE HAPPINESS

Team Noble lends a helping hand to neighbors through the Food and Resource Center of South Central Oklahoma.

by Ginger Daniel

It's a brisk winter morning in southern Oklahoma as Noble Research Institute employees trickle in through the back door of the Food and Resource Center of South Central Oklahoma.

Two men unload canned goods off the back of a large truck. They haul the food into a brightly lit warehouse, where the Noble group begins to assemble.

Each member is clad in a green T-shirt with the words "Team Noble." Most days this crew is absorbed in research that will help farmers and ranchers overcome challenges associated with food production. Today they will help ensure food is in the hands of community members who need it.

After a quick tour of the facilities, the team splits up. Some go help in the warehouse. Others end up in the grocery section, where they restock cans of green beans and bags of potatoes before the doors open for the day.

The volunteers gather for the daily review of available produce. Then the families begin to enter.

One Team Noble member escorts a woman and her grandson through the grocery aisles. The trio chats while the grandmother selects cereal and a bag of rice and the green-shirted volunteer drops the items into a basket.

"Serving humbles you," says Brook Gaskamp, an adult education associate at the Noble Research Institute and co-coordinator for the organization's Employee-Team-led community participation activities. "It makes you realize you are a small part of something bigger than yourself. Our founder, Lloyd Noble, once said, 'The only true happiness must come from not only understanding your own needs but an understanding and willingness to secure the same things for your fellow man.' That's the belief that fuels Team Noble."

LEFT: The Food and Resource Center of South Central Oklahoma can provide food to between 90 and 100 families each day. The center is set up to look like a grocery store with fresh produce as well as refrigerated and freezer sections. RIGHT: Amie Stearns, graphic and web production specialist, restocks shelves at the center.

Maofeng Chai, Ph.D., (foreground) a research scientist, and Landon Riggle, a Utility Services Center technician, help families shop and bag their food selections to take home.

FILLING A NEED

Within the four counties served by the center, 12,000 people are considered food-insecure. Without help, these families may not have food for their next meal.

According to the Regional Food Bank of Oklahoma, 7,730 people in Carter County alone are hungry. Of those, 2,980 are children. The food bank reports that 24 percent of Oklahoma's children are living below the federal poverty threshold.

In one day, the Food and Resource Center of South Central Oklahoma can provide food to between 90 and 100 families. The center served more than 1,500 households in June alone, and it is seeing 125 to 150 new households each month. With an average of three people per household, that's a need the center can't meet without volunteers.

"The volunteers make this run," says James Rosson, executive director of the center. "To run smoothly and stock shelves, we need 30 volunteers a day. Our first goal is to get food to people. We have worked hard to refine our system so we can be as efficient as we can to serve as many people as we can."

After clients pass through the doors, they begin at one of four intake desks. There, volunteers review household family members and help connect them to needed resources such as job openings, counseling or medical treatment. Through this step alone, the center strengthens partnerships in the community while offering stronger family stability.

From there, individuals or families are called into the food pantry, where they are met by a volunteer who provides personal shopping assistance. This personal connection makes the center a popular volunteer opportunity among Noble employees who sign up to serve the community through Team Noble.

BUILDING TOGETHER

"The food and resource center stirs something in you," says Julie Barrick, a project management associate who also leads Noble's Employee Team. "You get to interact with the people you help. It's definitely become a favorite volunteer choice at Noble."

It's that stirring that brings volunteers from Noble and around the community back again and again to stack canned goods or lift heavy bags of potatoes.

"It makes you feel like you are doing something worthwhile when you see the direct benefits of this program," Gaskamp says.

In addition to providing food valued at between $200 and $300 to each family, the center focuses on nutritional education. On Tuesdays at 10 a.m., clients can attend classes to learn more about nutritional needs and gain tips for shopping with healthy foods in mind. The Oklahoma Cooperative Extension office offers various cooking classes and recipe demonstrations to support the center's ongoing efforts to educate the community on healthy eating habits.

Collaboration is key to the success of the center, Rosson says.

"That's something we understand at Noble," Gaskamp says. "We believe that to build anything great, we must build it together. We show up one shift at a time to change one life at a time. And we walk away understanding a bit more of what our founder meant by 'true happiness.'"

Ronald Trett, North Farms facility manager, helps keep the warehouse clean and in working order so that food items can easily be sorted and ready to restock the food pantry.

REIGNING CHAMPIONS

The rains come, and the rains go. For those who grow food, life is directly tied to these shifting weather patterns. Farmers and ranchers in the Southern Great Plains are no strangers to drought. They know the importance of managing their water resources, but everyone can be a good water steward. One way you can help conserve water is by capturing rainfall to quench your garden's thirst on a dry day. You will find instructions on how to build a rain barrel on page 44. You will also find the recipe for an award-winning burger that was inspired by a sandwich from Vietnam, another country that has faced severe droughts in recent years, on page 46.

Collecting Rainwater Has Many Benefits

A rain water collection system is a great way to cut the cost of your water bill and use your land's resources more efficiently. Whether you want to water your backyard garden or have easy access to water for your livestock, setting up a rain barrel is a DIY project you can accomplish with only a few tools and at little cost in materials.

MATERIALS

- Barrel (wooden or food-grade plastic)
- Gutter material
- Y gutter diverter
- 3/4-inch male brass hose bibb
- 3/4-inch female PVC adapter
- Gutter screws
- Gutter outlet flange
- Landscape garden fabric (a window screen can also be used)

TOOLS

- Drill
- Spade bit
- Oscillating saw or hacksaw
- Roll of plumber's tape
- Tube of silicone
- Utility knife

DIRECTIONS

Step 1: Install gutters alongside the roof of a building. The gutters should have a downspout installed directly above where the rain barrel will be placed. Be sure to properly pitch the gutters so that rain water flows to the barrel.

Step 2: Install downspout and Y gutter diverter. The diverter directs the flow of rain water away from the barrel when it is full.

Step 3: Line up the barrel and the gutter downspout. The barrel should be placed on flagstones or gravel to deter rotting of the bottom of the barrel. Place the gutter outlet flange upside down and draw around the flange onto the barrel. Cut the area out and use gutter screws to secure the flange to the barrel.

Step 4: To keep mosquitoes and debris from collecting inside the barrel, place landscape garden fabric or window screen over the flange and cut the excess with a utility knife.

Use the extra gutter downspout material to connect the gutter to the flange. The downspout will need to be removed occasionally to clean off the debris from the landscape fabric.

Step 5: The last step of the process is to install the hose bibb. The hose bibb should be placed at the bottom of the barrel with enough room for a hose to connect to the bibb. Draw a circle around the female end of the PVC adapter and cut out the circle using the spade bit. Cover the adapter with waterproof silicone and slide the adapter into the hole. Then wrap plumbers tape in a counter-clockwise motion around the threaded end of the bibb. Screw the bibb into the adapter.

GET MORE FROM YOUR RAIN BARREL

A few rain barrel best practices and upgrades can help increase water pressure and capacity of your system.

- Do not collect rain during the winter months because frozen water can damage the barrel.
- Set the rain barrel off the ground with cinderblocks to increase the water pressure of the barrel and prevent the barrel from rotting.
- If you are collecting rain off a house or barn, consider connecting multiple rain barrels together. The barrels can easily be linked using 1/2-inch PVC pipe, silicone and an adapter at each end.

Josh Meo serves as a graphic designer in the Noble Research Institute's communications department. While living in Indiana, Meo developed a system that diverted rainwater running off the roof of the family chicken coop into watering troughs from which the chickens drank. Meo and his wife, Jennifer Meo, and their three children, now live in Dickson, Oklahoma, and are building a house on 11 acres of primarily wooded land.

Making a Super Burger, Vietnamese-Style

Sarah Kemp led Team Noble to victory in the Ardmore Corporate Fitness Challenge Super Burger Contest in June. Now she shares her award-winning recipe for a Vietnamese-style burger.

INGREDIENTS

- 3 tablespoons granulated sugar
- 1/4 cup rice wine vinegar
- 1/4 cup warm water
- 1 large carrot, peeled and cut into 1/8-inch-thick matchsticks
- 1/4 medium cucumber, cut into 1/8-inch slices
- 1/2 white onion, thinly sliced
- 2 large radishes, sliced
- 1 pound ground pork
- 1 tablespoon soy sauce
- 1 teaspoon ginger powder
- 1 teaspoon garlic powder
- 1 tablespoon sesame oil
- 1/3 cup minced green onion
- 3-4 hamburger buns
- Mayonnaise
- 1 medium jalapeño, cut into thin slices
- 1/2 cup loosely packed fresh cilantro leaves

Yields: 3-4 burgers

DIRECTIONS

Step 1: Combine the sugar, rice vinegar and warm water. Stir to dissolve the sugar. Add the carrot, cucumber, onion and radishes to the pickling liquid (the liquid should cover everything). Let sit for about 20 minutes then drain the liquid.

Step 2: Combine the pork, soy sauce, ginger powder, garlic powder, sesame oil and green onion. Form into 1/2-inch-thick patties.

Step 3: Prepare a gas or charcoal grill or a grill pan at medium-high heat. Brush and oil the grates.

Step 4: Make a thumbprint in the center of each burger then place burgers on the grill. Grill the first side until grill marks form, about 4 minutes. Flip and continue to cook until an instant-read thermometer reads 155° F, about 3 minutes more.

Step 5: Remove the burgers from the grill and let rest on a plate. Place the buns on the grill and toast until grill marks form on both sides, about 1 minute per side.

Step 6: Spread a small amount of mayonnaise on the upper and lower halves of the buns. Lay the burger on the lower bun. Top with a quarter of the pickled carrot, cucumber and onion; jalapeno slices; a few cilantro leaves; pickled radishes; and the top half of the bun.

Sarah Kemp serves as a food service assistant in the Noble Research Institute's cafeteria while working toward her degree in graphic design from Southeastern Oklahoma State University. Kemp grew up just down the street from Noble's main campus in Ardmore. She credits a close family friend originally from China with teaching her how to cook.

ABOUT THE INSPIRATION

Sarah's super burger is based on bánh mí, a Vietnamese-style sandwich made with baguette bread and filled with one or more meats (commonly pork meatballs or chicken) and vegetables like cucumber, cilantro and radishes. There are many variations of the bánh mí sandwich, which shares its name with the Vietnamese word for "bread." It was made popular in Saigon in the late 1950s. You can still find it across Vietnam as a popular street food. Today, the sandwich is also gaining popularity in the U.S.

OCTOBER

18 PECAN HARVEST FIELD DAY

1:30-4 p.m. | Thurs., Oct. 18
Noble Research Institute
Red River Farm
19735 Redhawk Road
Burneyville, OK 73430

No registration fee

You will see the process of preparing the orchard floor for harvest and observe pecan harvesting in action on the Noble Research Institute Red River Farm. Equipment demonstrations will highlight the different types of equipment needed for a successful pecan harvest, including tree shakers, limb rakes and harvesters. Pecan specialists will discuss the process of cleaning and marketing pecans. A question-and-answer session will address questions related to harvesting, marketing and orchard management.

23 THE SCIENCE OF STORM CHASING

7 p.m. | Tues., Oct. 23
Ardmore Convention Center
2401 N. Rockford Rd.
Ardmore, OK 73401

Open to the public at no cost

A storm-chasing veteran of nore than 20 years, Reed Timmer, Ph.D. takes his audience directly inside the tornado with videos and scientific data collected from the tank-like Dominator intercept vehicles, as featured on Discovery Channel's Storm Chasers series in 2008-2012. Reed also provides advice for those interested in pursuing storm chasing and meteorology as a hobby or career.

PROFILES AND PERSPECTIVES
Community Enrichment Series

NOVEMBER

29 MANAGING TAXES

1-5 p.m. | Thurs., Nov. 29
Noble Research Institute
Kruse Auditorium
2510 Sam Noble Parkway
Ardmore, OK 73401

No registration fee

Congress passed a new tax law in December 2017 that will impact all business entities and people who will file a tax return for the 2018 tax year. The way many personal and business deductions are reported have changed. Some deductions have gone away while new ones have been added. New reduced tax brackets were also included in the new legislation. Many of the details will be discussed at this seminar. Tax professionals will be available to answer questions.

This event will help you:

- Better understand how to manage taxable income.
- Know how to report certain types of income and expenses.
- Learn how the new tax law impacts agricultural operations

JANUARY

15 HOW TO USE PRESCRIBED FIRE FOR WILDLIFE AND LIVESTOCK

1-5 p.m. | Tues., Jan. 15, 2019
Noble Research Institute
Coffey Ranch
16877 State Highway 32
Marietta, OK 73448

Registration Fee: $25, includes lunch

Prescribed fire is a natural process in the Southern Great Plains, where the landscape evolved under fire and grazing. Fire can improve wildlife habitat, reduce woody plants, remove thatch, and improve forage quality and quantity for livestock.

During this course, you will learn about fire behavior and plant response to burning during the dormant season. You will also learn about prescribed burn plans, fireguards, weather parameters, equipment, labor and contingency plans among other topics.

JANUARY

29 SO YOU WAN TO GROW FRUIT IN YOUR BACKYARD?

6:30-8:30 p.m. | Tues., Jan. 29, 2019
Noble Research Institute
Kruse Auditorium
2510 Sam Noble Parkway
Ardmore, OK 73401

No registration fee

Producing fruit in your backyard presents special challenges, including limited space and lack of resources available to commercial growers. This course is designed to help you maximize resources available to you in order to grow small and tree fruits.

At the end of the program, you will have a more complete understanding of the various practices you can use to grow fruit in your backyard.

31 SO YOU WANT TO GROW VEGETABLES IN YOUR BACKYARD?

6:30-8:30 p.m. | Thurs., Jan. 31, 2019
Noble Research Institute
Kruse Auditorium
2510 Sam Noble Parkway
Ardmore, OK 73401

No registration fee

Each year, home gardeners use new methods to increase yields and minimize risks associated with growing vegetables in Oklahoma. This course is designed to introduce you to the many tools and techniques you can use to successfully grow vegetables.

At the end of the program, you will have a more complete understanding of the various practices you can use to grow vegetables in your backyard.

FEBRUARY

22 HEIFER SELECTION AND DEVELOPMENT

9 a.m.-3 p.m. | Fri., Feb. 22, 2019
Noble Research Institute
Oswalt Ranch
18414 Dixon Road
Marietta, OK 73448

Registration Fee: $25, includes lunch

Heifer development is the most costly management practice used to improve herd genetics. Proper heifer development is critical to improving longevity in your herd. Selecting for maternal traits is important for improving efficiency in your cow herd and complementing your production goals. This class will provide selection traits and strategies that are critical for developing heifers that match your production goals and environment.

What You Will Learn:

- How to select heifers at weaning using multiple traits (phenotypic and genotypic)
- The basic nutritional requirements for heifer development
- The proper tools for a successful breeding season
- How and when to determine pregnancy
- How to market heifers that are not retained
- The nutritional needs of a first-calf heifer

MARCH

5 NUTRIENT MANAGEMENT FOR PASTURES AND HAYFIELDS

1-4 p.m. | Tues., March 5, 2019
Noble Research Institute
Kruse Auditorium
2510 Sam Noble Parkway
Ardmore, OK 73401

No registration fee

Join the Noble Research Institute's soil and crop consultants as they discuss concepts in pasture and hayfield fertilization. Efficient and economical fertilization to increase yields while minimizing environmental risks is imperative to any operation using fertilizers. This seminar will cover the essential information you need to implement an effective nutrient management program.

For more information or to register for one of our agricultural events, visit www.noble.org/events or call 580-223-5810. Preregistration is requested. If you have other agricultural questions, please call our Ag Helpline at 580-224-6500 or submit a question using the online form at nobleapps.noble.org/aghelpline.

GETTING A GRIP ON LIFE

by J. Adam Calaway, editor

I am not a grease monkey.

Maybe my Y chromosome is defunct, but I just do not enjoy working on engines. A carburetor might as well be a cantaloupe. So the annual maintenance of the family riding lawn mower pushes the boundaries of my mechanical repertoire.

However, all chores must eventually be done. Armed with YouTube-generated false confidence, I wheeled the lawn mower into the garage and gave it a go.

Within a few minutes, the cover was disassembled and the battery disconnected. With deft and ease, I switched out the air filter, changed the spark plug and drained the oil. Replacing the oil filter was all that remained. As I began my first twist, a fleeting thought passed through my mind: "What will I do with the rest of my day?" As it turned out, my afternoon was booked.

What followed could best be described as *The Odyssey* meets The Three Stooges. It was two hours of slapstick and tragedy as I journeyed through increasingly ridiculous attempts to remove the filter. Muscle it off? Never budged. Extra-large wrench? Not big enough. Oil filter wrench? Worthless. Begging and cursing? Not helpful. What other tools do we have? Nothing worked.

My immediate response was to buy a new lawn mower, drag this clearly defective model into the yard and proclaim it as a piece of modern art entitled "YouTube lied."

Finally, I did what all perplexed men eventually do. I found an old guy. Old men are amazing. They've seen it all. They've broken it. They've pieced it back together. I fetched Ed from down the road. He brought more tools, strange and magical tools, but an hour later, the filter remained. It mocked me.

I needed another old guy, one with enough mechanical daredevil to attempt "unconventional" solutions. I called my father-in-law, Ray, who had one last ditch solution: ram a spike through it and use a long steel pipe for leverage.

I did as I was told. Admittedly, hammering a spike through the heart of the oil filter was satisfying, but I remained a skeptic. I found a pipe, slotted it over the spike and gave it one last hernia-inducing heave. The oil filter begrudgingly released. The fight was over. Sweating. Sore. I was the victor.

A few days later, the guys at work were handling the usual Monday-morning watercooler updates, and I rolled out the story. Self-humiliation always plays well to this crowd. We all laughed at my plight and returned to work with the memory of misadventure soon to fade.

Billy Phelps approached me a few weeks later and asked if we could talk in his office. Billy serves as our communications technology coordinator on the computing services team. You'd love Billy if you met him, and you'd respect him if you worked with him. Everybody does.

He smiles every day. He always makes time for people (even though he has little to spare). His first response is "yes." And he works like a coal miner on deadline. So when Billy asks to talk, you oblige.

Once in his office, Billy launched into his speech with a surprisingly serious tone. "Your story the other day got me thinking, Adam. Every man needs two things in this life. The first thing is love, and you have that with Summer (my wife). The second thing every man needs is a good set of Channellocks."

Billy then pulled a set of gargantuan Channellocks out from under the desk and presented it like a Christmas puppy. At almost 2-feet-long with a metal mouth and shiny blue handles, these Channellocks must have been bought at an aircraft carrier rummage sale.

It's difficult to properly respond to that type of genuine kindness. I shook Billy's hand and carried my new Channellocks down the hall to my office (receiving a few questioning looks along the way).

These are the moments that make me cherish working here at Noble. These simple personal interactions reveal the character of our people.

Great employees are not exclusive to Noble, but toss an oil filter down any hall here and you're bound to hit a dozen people you'd love to know.

Most every organization has a set of core values, and Noble is no different. These three statements reside in our organizational ethos: Begin with humility. Put words into action. Build together.

The ideas are written on paper, but it is our employees who breathe life into them. People like Billy, who model modesty, compassion and thoughtfulness every day.

The depth of integrity manifests in simple meaningful acts, which give rise to unity. A unified team is an unstoppable force, and that's all an organization really needs.

Oh, and a good pair of Channellocks doesn't hurt either.

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Fire is a natural process that is essential for healthy land, but wildfire can be disastrous to people and their communities. Prescribed fire is a useful, safe tool that is beneficial to the land and to the people who live on it.