

A REGENERATIVE RANCHING PUBLICATION FROM NOBLE RESEARCH INSTITUTE

LEGACY

WINTER 2024 | VOL. 18, ISSUE 2

Grazing Cattle in Grizzly Country

Hilary Zaranek of J Bar L Ranch is redefining what it means to be a keystone species in the Greater Yellowstone Ecosystem.



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Noble Research Institute, LLC is the nation’s largest independent 501(c)(3), agricultural research organization, serving as a trusted guide in land stewardship through education and mentorship of ranchers and farmers since 1945. Learn more at www.noble.org.

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J Bar L ranch manager Hilary Zaranek rides near the Crazy Mountains (or "the Crazies") in Montana. Photo by Ami Vitale.



LEGACY
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Noble Research Institute is the nation's largest nonprofit agricultural research organization, serving farmers and ranchers with research, education and mentorship for regenerating soil health to improve their land, livestock and livelihood. Since 1945, Noble Research Institute has been a leading, trusted resource in agricultural research and education dedicated to land stewardship. Demonstrating our ongoing commitment to regenerating our nation's grazing lands, Noble actively manages 13,500 acres of working ranchlands to provide real-world insights and applications for farmers and ranchers. To learn more about Noble Research Institute, visit www.noble.org.

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PRESIDENT'S NOTE

SAVING OUR GRASSLANDS



Oklahoma and Texas are home to one-fifth of the nation's cattle. Before cattle, there was wheat and cotton — in fact, Ardmore, Oklahoma, was a thriving cotton town at the turn of the 20th century, when our founder, Lloyd Noble, began his career sweeping floors at his father's hardware store. And before row crops, the Great Plains were grasslands as far as the eye could see. Shortgrass and tallgrass prairies thrived as a result of hungry herds of bison, deer and pronghorn.

That picture of productive grasslands is being revived today by farmers and ranchers in the Southern Great Plains and across the country who are adopting ranching practices that take a greater view. But the economic and ecological benefits of reviving these grasslands is stunted by the continued substantial loss of grasslands — an average of 2 million acres per year — in the United States.

My grandfather was the cattleman in our family. He was a brilliant man who was long on patience for his only grandson. While it meant little to me then, he served and retired from the Soil Conservation Service — the predecessor to today's USDA Natural Resources Conservation Service. Whether he meant to or not, he built in me a respect for the land — including the soil and the power of water and their undeniable role in supporting cattle.

He and my grandmother operated about 250 dryland acres in southeastern Oklahoma. They, like many around them, were cow-calf operators. A few chickens. No sheep or goats. Absolutely no horses. It became the definition of "farm" in my mind. Living close, it was where I (willingly) spent my Christmas breaks, spring breaks and much of my summers (until I could drive). Even as a tagalong in the early days, it wasn't hard to appreciate that my grandfather took the responsibility for his animals and his land seriously.

Although he has long since passed, he remains an enduring point of reference for me. There is little doubt in my mind that he would be a great supporter of Noble and the great work of the men and women of this organization. He would champion our purpose of saving our nation's grazing lands and keeping farmers and ranchers on the land.

To save our grazing lands is to save our grasslands.

Protecting our grasslands ensures a foundation for our domestic food system, supports cleaner water and air, provides a natural carbon sink and provides ample space for hunting, wildlife habitats, hiking and more. It's a core part of Noble's mission to advance the protection and conservation of these grasslands.

We have the vision, educational resources and collaborative mindset to work with others around the U.S. who have the same objectives. For farmers and ranchers dissatisfied with conventional approaches and seeking alternatives to improve their land, operations, profitability and/or family condition, we offer a path to revitalize the health of their land and build a better future for them and their lands. For more information about Noble's commitment to protecting grazing lands with profitable livestock production, visit www.noble.org/long-live-our-grazing-lands/

Steve Rhines, PRESIDENT

NOBLE RANCHES

A Tale of Two Ranches

A FIVE-YEAR STUDY by a Noble Research Institute team examines how the contrasting ecosystems of Noble's Coffey and Red River ranches respond to regenerative grazing management.

BY MARILYN CUMMINS



Myoung-Hwan Chi, Noble research lab facility scientist, photographs pasture forage and records data in a sea of bermudagrass and maretail at Noble's Red River Ranch.

It's a mere 10-mile drive between two of the Noble Ranches that sit in southern Love County, Oklahoma, just north of the Red River that separates Oklahoma from Texas.

Despite their close proximity, the context and ecosystems of the Coffey Ranch west of Marietta and the Red River Ranch south of Burneyville are as different as night and day. Given the dissimilarity in their soils, topography, use history and the forages and crops grown there, the two ranches are an ideal study in contrasts for a team of Noble Research Institute researchers studying how rotational adaptive grazing and reduced reliance on fertilizers and herbicides are affecting the two environments during the five-year study period.

Basically, the researchers consider the ranches to be two different contexts – Coffey with a long history of rotational grazing on mostly native rangeland, and Red River as “introduced” pasture where former cropland was planted to bermudagrass seven years ago and fertilized and sprayed for hay production until late 2020. That's when rotational grazing with cattle started on both ranches, along with reduced reliance on fertilizer and herbicide use.

Having these two contrasting systems will help Noble understand more about how regenerative management affects the soil microbiomes and nutrient cycling processes in grazing lands. The research goals are not only to learn all they can about how pastures on the two ranches now respond to the same regenerative strategies and practices, but also to learn more about the drivers of soil health. Their work could help unlock secrets of just how the plants and the community of microbes belowground interact and ultimately create more organic matter in the soil.

“We are testing the regenerative strategy as a way to improve soil health. What we are targeting is



Noble researchers Maira Sparks (left) and Eloa Moura Araujo monitor vegetation on Noble's Coffey Ranch as part of a five-year study of the impact of regenerative strategies.

understanding the microbial community, but also the changes in the plant community, in order to quantify and understand the drivers of soil health,” says Eloa Moura Araujo, a postdoctoral fellow at Noble and the soil and statistics member of the team.

“We are trying to understand the processes that happen and what players are responsible for the change, if we have changes” in organic matter, she says. “By understanding the process, maybe it can help you make better decisions in the future.”

PART OF A STATEWIDE NSF RESEARCH PROJECT

Araujo; Myoung-Hwan Chi, Noble research lab facility scientist; and

Maira Sparks, Noble research associate, are conducting the research under a National Science Foundation grant that is funding a statewide Established Program to Stimulate Competitive Research (EPSCoR) project in Oklahoma. The overall project, “Socially Sustainable Solutions for Water, Carbon and Infrastructure Resilience in Oklahoma,” draws on expertise from more than 40 researchers in a social-

science-led, multi-disciplinary collaboration of social, physical, biological, engineering and computational scientists from university and other research organizations in the state.

Chi is the primary investigator for the work at Noble, which falls under

“We are testing the regenerative strategy as a way to improve soil health.”

—ELOA MOURA ARAUJO

Continued on page 8



COFFEY RANCH

WEST OF MARIETTA, OKLAHOMA

COFFEY RANCH is mostly composed of native rangeland and has a long history of rotational grazing. The study sites are in grassy open areas with forbs, shrubs and trees, similar to an oak savanna. Out of the 55 grass species recorded, 35 of them are native and typical of mixed-grass prairie. Forbs and legumes are responsible for a sizable proportion of the species observed, with 148 species noted, mostly perennial. While woody species are only 5% on average, the make-up of some areas is up to 30% greenbrier, a reminder that proper management is crucial in maintaining native grasslands in the face of brush encroachment.

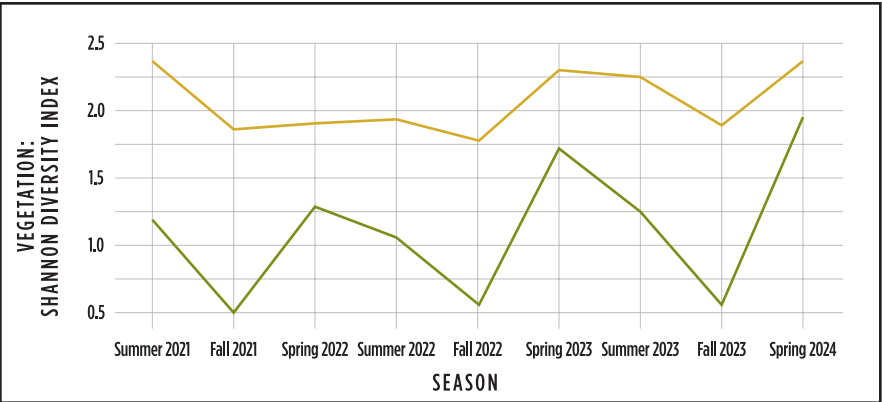
TOP 5 PLANT SPECIES BY FREQUENCY OF OBSERVATION

COFFEY RANCH | ACROSS ALL SEASONS 2021 TO 2024

Plant	Relative Abundance	Classification
Little bluestem <i>Schizachyrium scoparium</i>	23%	Perennial grass
Western ragweed <i>Ambrosia psilostachya</i>	8%	Perennial forb
Indiangrass <i>Sorghastrum nutans</i>	5%	Perennial grass
Brome <i>Bromus spp.</i>	5%	Annual grass
Tall dropseed <i>Sporobolus compositus</i>	4%	Perennial grass

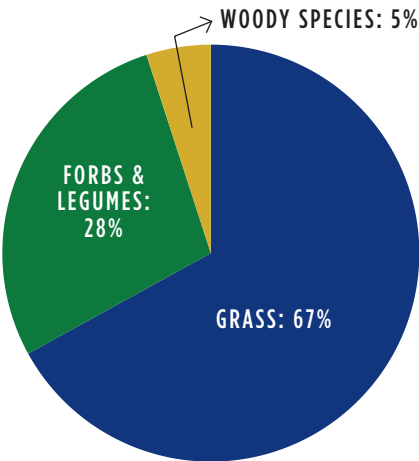
VEGETATION DIVERSITY IN NATIVE VS. INTRODUCED PASTURE

COFFEY RANCH RED RIVER RANCH



Vegetation diversity in native and introduced pastures over time. Note how the height of the graphs for each environment varies greatly. The native rangeland of Coffey Ranch is a well-established, diverse system with little variation in plant diversity from season to season, even during the drought periods in 2022 and 2023. Conversely, the introduced pasture at Red River suffered seasonal changes due to its simpler plant community.

PLANT COMMUNITY:



RED RIVER RANCH

SOUTH OF BURNEYVILLE, OKLAHOMA

THE SANDY BOTTOM LAND of the Red River Ranch was used as cropland for decades, followed by the establishment of bermudagrass (a perennial) as monoculture “introduced” pasture in 2017. Sites sampled here are in an open bermudagrass field with no woody vegetation, where annual grass species dominate (only five out of the 14 grass species are perennial). Forbs and legumes, mostly made up of cover-crop species and cool-season forbs, are present in spring but taper off as warmer weather arrives.

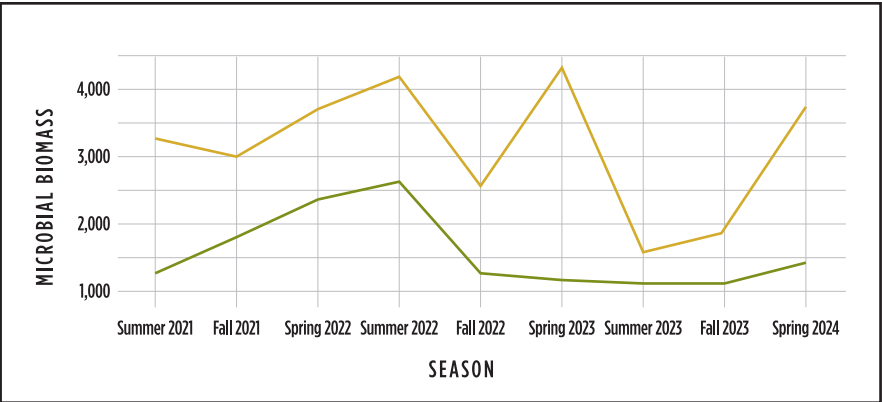
TOP 5 PLANT SPECIES BY FREQUENCY OF OBSERVATION

RED RIVER RANCH | ACROSS ALL SEASONS 2021 TO 2024

Plant	Relative Abundance	Classification
Bermudagrass <i>Cynodon dactylon</i>	54%	Perennial grass
Cereal rye <i>Secale cereale</i>	11%	Annual grass
Sixweeks fescue <i>Vulpia octoflora</i>	8%	Annual grass
Marestail <i>Conyza canadensis</i>	5%	Annual forb
Common vetch <i>Vicia sativa</i>	5%	Annual legume

SOIL MICROBIAL BIOMASS IN NATIVE VS. INTRODUCED PASTURE

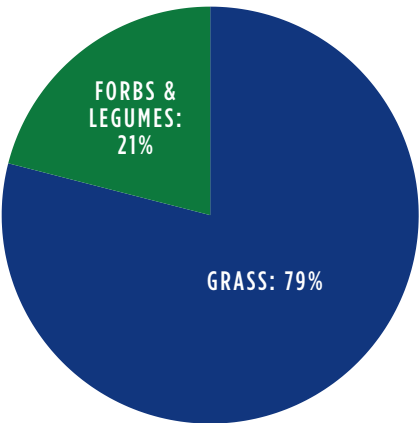
COFFEY RANCH RED RIVER RANCH



Soil microbial biomass observed in native and introduced pasture soil samples over time [nanograms per gram (ng g⁻¹) of soil]. The size of the soil microbial community of the introduced pasture of Red River Ranch increased from summer 2021 to summer 2022, after which it sharply dropped and remained at lower levels during and after drought followed by low rainfall.

On the native rangeland of Coffey Ranch, there was a similar drop of microbial biomass in fall 2022, followed by a sequence of recoveries (spring 2023 and 2024) and declines (summer and fall 2023). This is likely a direct effect of the drought events from 2022 and the reduced rainfall during summer and early fall 2023. Note that microbial biomass in spring 2023 and spring 2024 showed a pattern of recovery in native rangeland that was mostly absent in the introduced pasture.

PLANT COMMUNITY:



“We are tracking everything we do now to try to understand if there is any connection between what you are seeing above ground and what is happening in the soil.”

—ISABELLA MACIEL



At top, Eloa Moura Araujo takes a soil core sample (below) in one of the research sites at Red River Ranch.

Continued from page 5

the Terrestrial Water & Carbon Dynamics focus of the NSF EPSCoR project. His area of expertise is plant microbiology, looking at the biomass levels and diversity of individual organisms making up the soil microbial communities. Sparks takes the lead in studying the above-ground plant community.

Isabella Maciel, systems research manager at Noble, says one of the reasons why having a diverse system is important is the hypothesis that vegetation diversity also helps the diversity and vitality of the microbes in the soil, and ultimately, soil health.

“We are tracking everything we do now to try to understand if there is any connection between what you are seeing above ground and what is happening in the soil,” she says.

Toward that end, the team has set up 18 sampling sites per ranch, three triangles marked with posts in each of six pastures at Coffey Ranch and six pastures on Red River Ranch. Three times during the growing season (spring, summer and fall), they sample and perform vegetation assessments. They take soil samples two or three times a year, waiting to pull soil cores until two to four weeks after the cattle are moved out of the sampling area.

To assess what plant species are growing in the pasture and at what frequency, they establish a transect (line) and place a rod in the ground. They record all plant species touching the rod. The process is repeated at 6-inch intervals at 46 points along each of five 23-foot transects at each sampling site, for a total of 230 points of plant population data collected each time.

At Coffey Ranch, the team has recorded 55 grass species, 35 of them native and typical of a mixed-grass prairie. All grasses make up 67% of the community. Forbs and legumes in 148 species have been recorded there, mostly perennial. The number of woody species varies depending on the pasture. (See the top five species on pages 6-7.) At Red River, grasses dominate at 79%, with bermudagrass being the most abundant out of only 14 grass species ever recorded there.

From the soil samples, Haney tests show multiple aspects of the soil health; phospholipid fatty acid (PLFA)



Noble scientist Myoung Hwan Chi logs vegetation data in a pasture at Coffey Ranch.

tests quantify functional groups of microbes, like bacteria and fungi; and DNA sequencing identifies the individual microbes that make up the community. Between soil and vegetation measurements, the team assesses a total of 100 variables three times per year.

TRACKING RESILIENCE OVER TIME

Long-term monitoring studies like this allow Noble to detect seasonal differences and trends over time so the team can explore how multiple factors — such as grazing strategies and the weather — affect the key indexes they are studying. The graphs in the infographics on pages 6 and 7 illustrate some of the seasonal changes already observed and how they differ between the two ranch ecosystems.

For example, one important indicator of soil health is the total microbial biomass, a valuable metric to represent the size of the soil microbial community. Overall, the greater the community (more microbial biomass), the more functions can be performed by the soil, like nutrient cycling, turnover of organic matter and regulation of pathogens.

While it is too early to draw definitive conclusions from results to date,

the team has observed differences in the microbial biomass between the two ranches and is investigating to discern the composition of the microbial communities. They know that key players in the microbial community in the introduced pastures at Red River shut down and the whole community decreased during drought, indicating it was sensitive to extreme events and needs long recovery periods.

At Coffey, under the same climate stress, the microbial community in the native pastures were able to better absorb the stress and recover faster after periods of dry weather. This suggests that the native pasture could be more resilient to disturbances such as drought.

NOBLE RESEARCH BENEFITS RANCHES AND RANCHERS

The NSF EPSCoR research is just one of many ongoing studies Noble scientists are conducting on Noble Ranches and beyond.

Noble is co-leading a multi-institution team investigating grazing management systems and their impact on ecosystems and producer well-being. The 3M project (full name: Metrics,

Management, and Monitoring: An Investigation of Pasture and Rangeland Soil Health and its Drivers) is a five-year, \$19 million endeavor monitoring ecosystems on participating rancher sites in multiple states as well as on Noble Ranches and properties owned by the University of Wyoming and Michigan State University. Ecological samples include soil cores, forage samples, energy flux measurements and water impact-related measurements. (Read more on page 10.)

In other work on Noble Ranches, the Noble Transitions Team is recording data from soil and water infiltration tests as well as surveys of vegetation, insect and wildlife populations across all six ranches to monitor changes over time following the transition to regenerative management practices in 2021. The team hopes to put “hard numbers” to what’s happening in the ranch ecosystems now that chemical inputs are no longer used and adaptive, multi-species grazing is in use. A key benefit will be learning which of the many tests they’re conducting delivers the most valuable information and also which are the easiest and most economical for ranchers to do. 🌱

ENTERING YEAR 3

Noble Releases Updates on 3M Study

A MULTI-INSTITUTION RESEARCH TEAM co-led by Noble Research Institute reports significant progress in data collection, added intensive monitoring at producer sites and early insights gained from work completed through 2023 in the Metrics, Management, and Monitoring: An Investigation of Pasture and Rangeland Soil Health and its Drivers, also known as the 3M project. The team's intensive sampling across more than 60 sites has already resulted in hundreds of ecological samples — including soil cores, forage samples, energy flux measurements and water impact-related measurements — coupled with producer interviews about their management, economics and more. 🌱

READ MORE HERE:



From left, Noble research associates Thomas James and Janer Hale count plant species at a producer site in Decatur, Texas.

DIVERSITY AND DUNG BEETLES

Rancher and Nature Profit from Adaptive Grazing

ON BECKY SZARZYNSKI'S VIRGINIA

cattle farm, intensive management that prioritizes soil health using adaptive grazing is paying off in multiple ways. This case-study video shows how Ember Cattle Co. has been able to show a profit using the right genetics, a diverse forage base and regenerative practices that combine for healthy cattle and a bounty of wildlife, pollinators and her favorite insect: dung beetles. 🐛

WATCH HERE:



Consider Rain Events in Grazing Decisions

A new study suggests that ranchers may be able to mitigate the amount of livestock waste leaving their pastures by taking the weather forecast into account. University of Illinois Champaign-Urbana researchers say reducing the number of animals grazing an area in times of substantial rainfall can reduce nutrient runoff. They recommend a strategy that matches grazing activities with prevailing weather patterns to increase livestock production while promoting environmental sustainability in pasture management. 🌱

READ MORE HERE:



Land Stewardship

By Noble Research Institute and Certified Angus Beef



THE
Best Beef
STARTS WITH
HEALTHY LAND

Certified Angus Beef and Noble Launch Educational Course

Noble and Certified Angus Beef, a brand known for its commitment to quality beef, have partnered to develop and deliver Land Stewardship, an educational course designed for livestock producers worldwide. Fully online and free, the new course will help producers gain insights into improving their land management for healthy soil, better grazing animal performance and a more resilient and profitable operation. 🌱

READ MORE HERE:



SOCIAL MEDIA ACCOUNTS TO FOLLOW

From Our Feeds

Get info and inspiration from what other regenerative ranchers and like-minded peers are saying on social media.

CARBON COWBOYS, FACEBOOK

Explore the documentary films, adaptive multi-paddock (AMP) grazing research and news from this group of “inventive farmers and maverick scientists building a path to soil health and farmer wealth.”

bit.ly/carbon-cowboys-fb

THE HIGH LONESOME RANCH, INSTAGRAM

Check out inspiring Colorado scenery and see how this cattle ranch is restoring 300 square miles of mountain landscape with adaptive grazing and regenerative land management.

bit.ly/high-lonesome

GRASS FED GENETICS FORUM, FACEBOOK

For discussions and resources about grass-fed genetics of grazing ruminants to be used in rotational grazing operations, consider joining the private Facebook group, Grass Fed Genetics Forum.

bit.ly/grass-fed-genetics

SOILSDIVA X

Education and colorful posts by Kansas State University soil scientist and agronomy professor DeAnn Presley, self-proclaimed “soils diva.”

bit.ly/soils-diva

NCBA AIDS RANCHER RESILIENCE

New Grant Supports Producer Course Attendees

IT CAN BE HARD TO GET AWAY FROM THE RANCH or farm to attend courses and events, but now the Rancher Resilience Grant, supported by the National Cattlemen’s Foundation and Cargill Protein and administered by the National Cattlemen’s Beef Association, can help. Cattle producers can apply online for scholarship and grant opportunities to attend educational events, including those offered by Noble Research Institute: Noble Grazing Essentials, Noble Land Essentials, Noble Profitability Essentials and Business of Grazing.

READ MORE HERE:



USDA Offers Funds for Producers Who Use Virtual Fencing

The USDA Natural Resources and Conservation Service now offers financial assistance to livestock producers to help pay for virtual fence systems and related grazing plans. Virtual fencing can contain animals within a desired area, exclude them from undesired areas or move them across the landscape without the need for physical fences. Cattle, sheep and goats wear collars that communicate with GPS to form a virtual paddock set remotely by the rancher. Animals learn to stop when the collar emits a series of warning beeps, saving them the benign shock sent if they breach the invisible fence line.

READ MORE HERE:



3 Podcast Episodes To Listen To

Listen to these recommended episodes on your favorite podcast app.



RANCHING RETURNS

186: Levi Kokes - Regenerative Ranching, Carbon Contracts and Virtual Fencing

New to regenerative ranching, Levi Kokes talks about taking over the family ranch, changing management on both the livestock and cropping side of the farm, and using virtual fence.



GRAZING GRASS PODCAST

E135: Revitalizing the Land with South Poll Cattle with Dakota Blanks

Dakota Blanks, a farmer from Appomattox, Virginia, transitioned from a tobacco family background to grass-based livestock production, raising South Poll cattle. He highlights his grazing management practices and the integration of various livestock to revitalize nutrient-depleted land.



SOIL SISTERS PODCAST

Regenerative Ranching and Breeding Award-Winning Beef

The Soil Sisters’ conversation with Michael Klein of Windy Bar Ranch in Stonewall, Texas, covers his ranch’s transition to Angus cattle, ranching regeneratively, moving into direct-to-consumer beef sales and more.



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noble.org/find-a-course



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MAY
Bluffton, Georgia

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Use your available forages to get the best out of your livestock and grazing land.



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APRIL
Paicines, California

Business OF Grazing

Discover how to make your grazing strategies work for your bottom line.



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Edmond/OKC, Oklahoma

JUNE
San Angelo, Texas

Noble Profitability ESSENTIALS

Improve your business skills with financial tools to maximize your ranch’s profitability.



JAN. 28-29
McKinney, Texas

JUNE
Kansas City, Missouri



The Only Constant on a Ranch Should Be Change

A CALIFORNIA CATTLE RANCHER discovers a new take on what it means to be a sustainable rancher and encourages others to do the same.

BY LAURA BRENNER

PHOTOGRAPHY BY BARBARA DAVIDSON

Mike Williams and his horse, Suzy.

Fifteen years ago, Mike Williams was not a sustainable rancher. At least he didn't use the word to describe himself or the way he chose to manage his ranch. The word itself – especially when uttered by folks who don't ranch – brought about an unsettling feeling within him. The former Army man turned California cattle rancher is skeptical of anyone who can't spot a bull in a herd of heifers telling ranchers how to do things on their land.

Williams has learned to weather tough times, including droughts and wildfires, since he started ranching nearly a quarter-century ago. But an encounter with environmental activists was the catalyst that spurred him to reevaluate what it means to be a sustainable rancher.

KEEPING AN EYE ON THE SUSTAINABILITY MOVEMENT

Years ago, Williams was the target of a campaign by a local group of activists concerned about his ranch's impact on water quality. Challenged with how to best respond, Williams found support and resources with the California Cattlemen's Association (CCA).

"After that, I became a believer in ranchers working together through these associations," says Williams.

Williams swiftly moved from new CCA member to serving in a leadership position. During his tenure, Williams learned of the U.S. Roundtable for Sustainable Beef (USRSB). It's an initiative led by stakeholders across the industry focused on continuous improvement in the sustainability of the U.S. beef supply chain. Carrying his preconceptions about what a sustainability group might mean for his industry, he asked to be involved.

"I got started because I was very alarmed about the fact that the CCA, not to mention National Cattlemen's Beef Association, was involved in an organization that had sustainability in its name," Williams says. "When I got there, I was comforted because there were other producers and other people that had the right ideas on this issue."

He came to understand that USRSB didn't intend to be a burden on farmers and ranchers. Instead, he found there was benefit from understanding constraints at every point in the supply chain and working together to address them.

"The group was asking, 'how can we work together? How can we help our



"A rancher doesn't have to care about climate change or the big picture; all he has to care about is better forage production, because it's the exact same practices that increase your forage production on your ranch."

—MIKE WILLIAMS

industry partners address the issues they're facing from their investors or their board of directors and how can we help ranchers and farmers become better ranchers or farmers," says Williams.

Not only was his conscience eased that the USRSB was aligned to support farmers and ranchers, but he also began to develop a different definition of sustainability related to farming and ranching.

SUSTAINABILITY CREATES SUCCESS ON RANCHES

Today, Williams leads the work of the USRSB as its 2024/2025 Chair. And he now considers sustainability a key management factor on his ranch. For Williams, being sustainable simply means taking better care of his resources. When he looks at practices that improve environmental health and those that improve ranch profitability, he sees a win-win.

"A rancher doesn't have to care about climate change or the big picture; all he has to care about is better forage

production, because it's the exact same practices that increase your forage production on your ranch."

Williams encourages ranchers to evaluate their ranch and ask themselves how they can improve the operation. Last year, he updated his holding pens for safer cattle handling. Currently, he sees that the water infrastructure on the ranch is the area holding him back.

"No ranch is run the same today as it was at the turn of the 20th century," says Williams. "Every rancher has to adjust to make changes based on the availability of knowledge, resources, markets and all these outside factors."

Sustainability is a word Williams uses often now. Not just to describe his ranch, but to encourage other ranchers to reclaim the word for the industry. He's seen a shift in conversations he has with ranchers when the term 'sustainability' comes up. Today they are more likely to discuss the idea, as is Williams. 🌱



Letting NATURE Do The WORK

SINCE LEAVING THE SEA FOR THE LAND THREE DECADES AGO,
cattleman Bill Legg's North Star for soil health and sustainability has been education.

BY LAURA BRENNER

PHOTOGRAPHY BY WILLIAM DESHAZER





The entrance to Legg Farms, Lawrence County, Tennessee.



Bill Legg inspects a shovelful of soil in one of his fields.

Attending courses, talking with other farmers and ranchers and reading have all helped Bill Legg improve his soil health and forage production. That's the advice he gives other farmers who want to explore regenerative practices on their farm.

When Bill Legg was a senior in high school, he and his father would drive out to their family's newly acquired farm on weekends to prepare it for cattle. Having grown up in Huntsville, Alabama, it wasn't until those working trips with his father that Legg discovered his passion for farming and raising livestock.

After high school, Legg was called away from farming – and land altogether – for over two decades. He worked as a deck officer and navigational pilot on merchant ships going to sea. It was fulfilling work, but he was quietly building a future for himself on land, buying farmland near his father's farm as he could. By the time he was in his mid-40s, Legg realized he'd rather be on his farm full-time than split his time between land and water.

"I just made an occupation change, I guess, almost 30 years ago," says Legg. "And I have no regrets. I came to see agriculture as the single-most important profession on the planet. I realized I wanted to be part of that."

Legg and his wife, Peggy, farm 1,600 acres of land in Lawrence County,

Tennessee, 90 miles south of Nashville, along the Alabama state line. The landscape is most conducive to grazing, with its rolling hills and rocky soil. Today, he describes his farm management style as very low input. He relies on rotational and sometimes multi-species grazing to build soil health and forage quality.

LIGHT-BULB MOMENT: "IT'S ABOUT THE SOIL"

Without the second income from going to sea, Legg realized he had to find a way to make his farm more financially sustainable. So, in 1996 he attended his first educational workshop in hopes it would help him find some way to squeeze a little more out of his land and livestock.

"For probably the first two decades, I just learned everything I could about the animals," Legg recalls. "And then at some point I suddenly realized, it's not about the animals, it's more about the plants, the forages. So, I started learning everything I could about that. And then a few years ago, the light bulb came on. It's not about the forages, it's not about the animals, it's about the soil. And that's when I got so excited

about soil health and learning everything I could about that."

Over time, Legg's farming philosophy changed as he learned more about how agriculture interacts with the natural ecology of southern Tennessee. He began to divide up his pastures and train his cattle to respect polywire and move more frequently. Legg saw a noticeable difference in his pastures immediately, but he admits it took some time before his whole farm came around to the picture of lush diversity he has now.

"I just made an occupation change, I guess, almost 30 years ago, and I have no regrets. I came to see agriculture as the single-most important profession on the planet. I realized I wanted to be part of that."

—BILL LEGG



The biggest amendment Legg has used in the past few decades is education. Attending courses, talking with other farmers and ranchers, and reading has helped him improve his soil health and forage production. That's the advice he gives other farmers who want to explore regenerative practices on their farm.

"Just learn in any way you can and talk to people like me or somebody else doing it to get a general overview of all the different aspects," Legg says. "Then just observe, and you'll immediately see changes on your farm."

"What's really neat is when we're in a three- or four-week drought, not a drop of rain, and you're walking through the pasture and it's mid-thigh height and you come out of there soaking wet."

—BILL LEGG

PROGRESS OVER PERFECTION

Immediate changes give way to a bit of "ugly chaos," according to Legg, but it all serves his end goal of increasing soil health through organic matter. He tests his soil often to see where his nutrient numbers are and to help him keep an eye on his organic matter. It's one piece of the pie that Legg hopes to influence little by little. Increasing organic matter across his farm is his main focus for the future of his land.

"I've heard it referred to as a poor man's center pivot when you raise that organic matter," Legg quips. "It's like a sponge that can absorb and hold more moisture. And so, I would love to see my whole farm get up to the amount of my very best land, about 4% organic matter."

The average organic matter rate in his county is 1%. Legg is proud of his

[Left] Legg will observe his flock's health as he gathers and moves them to a new paddock. [Below] He moves his cattle frequently, as well, to improve soil health and forage quality.

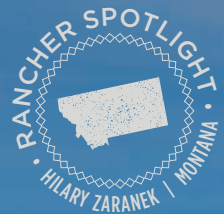


farm's soil health, but he knows it will take time to get every acre up to 4%. It's time he'll pass by doing the thing he enjoys the most: carefully observing the changes on his land. Monitoring his pastures is his favorite part of farming.

"What's really neat is when we're in a three- or four-week drought, not a drop of rain, and you're walking

through the pasture and it's mid-thigh height and you come out of there soaking wet," Legg says with a smile.

It's moments like that on the farm that have kept Legg happy in one place. With a horizon filled with lush grass, grazing livestock and a symphony of birds and insects, life on the land sounds as romantic as life on the water. 🌿



GRAZING CATTLE IN GRIZZLY COUNTRY

HILARY ZARANEK OF J BAR L RANCH is redefining what it means to be a keystone species in the Greater Yellowstone Ecosystem.

BY LAURA BRENNER

PHOTOGRAPHY BY AMI VITALE

Ranching in Montana takes a unique blend of patience and determination. In some parts of the state, snow covers the ground from October to May, then toxic tall larkspur (*Delphinium exaltatum*) blooms as hungry cattle are set out to summer grazing pastures. Grizzly bears are the apex predator year-round.

Unexpectedly, it was the latter two challenges that led Hilary Zaranek, manager of J Bar L Ranch, with her husband, Andrew Anderson, to leasing Montana's largest contiguous grazing allotment.

The National Forest Service's 55,000-acre West Fork Allotment is Montana's largest public-land grazing tract. The allotment falls within the Greater Yellowstone Ecosystem (GYE), making it home to one of few populations of grizzly bears in the contiguous United States. Through a partnership with the National Wildlife Federation, the Greater Yellowstone Coalition

and the Property and Environment Research Center, Zaranek purchased the grazing permit for 25,000 acres in the historic West Fork Allotment on a mission to balance cost-effective grazing access with the GYE's notorious predators and wildlife habitat.

BALANCING ECOSYSTEMS AND ECONOMICS

Prior to 2021, the West Fork Allotment's grazing permit was held by the same group of families for generations. They worked together to graze their cattle in the high mountains every summer. But over time, the status quo on the landscape changed, and the families lost more cattle than usual in their final few years on the allotment. In 2019, the ranchers lost 19 head of cattle to tall larkspur poisoning or grizzly attacks; it was the final straw.

"There are a lot of ways cows can die, and a lot of ways that you can't figure out what's going on or do something about it," says Zaranek, based on her own experiences. "Between 2005 and 2015, grizzly bear numbers really started increasing around the GYE. They're now perfectly positioned to be blamed for trouble, and legitimately so to some extent. But now you have just another thing that can be killing cattle out there."

While most neighboring ranchers weren't standing in line to take over the allotment after news spread of the grizzly challenge, environmental and wildlife groups were waiting in the wings. Hoping to protect wildlife and conserve the natural resources of the area, several conservation groups were eager to buy out the lease, retire it and end grazing in the West Fork altogether.

However, in Montana, grazing rights for allotments — as the name suggests



A NEW RELATIONSHIP

Gaining access to affordable summer pastures in the mountains of the West Fork helped J Bar L reach their grazing and enterprise needs. It also brokered a new approach to grazing cattle alongside at-risk wildlife.



Hilary Zaranek bottle-feeds a calf while holding one of her daughters several years ago. Her children have ridden the range with her and her husband from a young age.



Cattle grazing in Montana's Centennial Valley.

— can only be leased to someone who will graze livestock on the land in accordance with the government contract. That's where Zaranek comes in, and how the voluntary Grizzly Conflict Reduction Grazing Agreement came to be, helping the J Bar L get the lease with the support of the conservation organizations.

Before Zaranek became a rancher, she was a wildlife biologist researcher. She spent time in Canada then in Yellowstone focused on wolves and wolf predation. Increasingly, her career as a wildlife researcher and her life as part of a ranching family merged.

"That is what gave birth to the focus on large carnivores like wolves and grizzly bears, in conflict with livestock," says Zaranek. "My husband and I are super progressive on the scale of ranchers. And in our case, we couldn't continue ranching the same way that the previous generations did, so we had to look at it differently."

Zaranek and her husband try to pair their landscape and ecology with a complementary enterprise. They predominantly run yearlings as stockers

instead of cow-calf pairs to allow for more flexibility in how they use the land and market their cattle. Gaining access to affordable summer pastures in the mountains of the West Fork helped J Bar L reach their grazing and enterprise needs; it also brokered a new approach to grazing cattle alongside at-risk wildlife.

"We represented an option that worked best for everybody. We said, 'Hey, what if we keep the cows on that land and just do this in a new way.'"

—HILARY ZARANEK

"We represented an option that worked best for everybody. We said,

'Hey, what if we keep the cows on that land and just do this in a new way,'" recalls Zaranek. "That was attractive to the Forest Service and the conservation groups. It was attractive to the neighboring ranchers, too, because they are terrified of being run out of business."

REIMAGINING TRADITIONAL COWBOY CAMPING

For generations, Montana ranchers have driven cattle up into the mountains to graze during the summer to avoid the hot, dry weather in the valleys. It's a time-honored tradition that provided compelling storylines in many classic western movies. To manage the challenge of the West Fork allotment, Zaranek had to create a new relationship between the landscape, wildlife and her cattle.

"It's a wilderness right outside of Yellowstone, and cattle would wander around and then you have a couple of cowboys checking on things and trying to keep track of everything," explains

Zaranek. "I mean, you could ride all day and only find a handful of cows, and so it can get pretty wild."

She can speak from personal involvement about the challenge of managing cattle in such wild country. Zaranek, Anderson and their four children, ages 9 to 17, are the cowboys on the allotment today. The family spends much of its summer camped out in the high country, keeping close watch on the cattle and counting stars.

To create the fewest conflicts between their cattle and both grizzlies and tall larkspur, Zaranek evaluated the landscape and changed four main pieces of the traditional cowboy management style. In the first three years of grazing the West Fork, Zaranek believes her plan is working.

TIMING

A traditional Forest Service contract for grazing rights allows ranchers about four months of access for a set number of cattle. Zaranek knew the timing overlapped with tall larkspur season and wanted to avoid setting cattle out during that time. Instead, she worked with the Forest Service to allow her to graze the same number of animal units (AUs) over a shorter timeframe.

"We massively increased the number of cattle but shortened the length of time. So instead of a few cattle back there for four months, we more than doubled the number of cattle back there for just two months. And that has made a huge difference," she says.

ENTERPRISE

Because Zaranek prefers to run yearlings, she was able to increase her AUs to 2,000 from the original 740 AUs in the Forest Service agreement, which is written based on cow-calf pairs.

"Ecologically, we have a lot of flexibility with yearlings and can use a lot of creativity with how we manage them on the landscape. Then, economically, there's a ton of diversity in how and when we choose to sell, and how we rebuy," explains Zaranek.

FENCING

Recognizing that 55,000 acres of grazing land is a lot to manage all at once, Zaranek wanted to keep the cattle together in a single herd. Using electric fencing, she's able to contain her herd of yearlings to smaller sections of the allotment at a time.

"Really, the idea of scattered versus gathered cattle came from watching how outcomes change when single animals are encountered by a predator versus a group of animals," she says. "So, we've really been working on keeping the cattle together so we can enable their natural ability to defend themselves through the herd."

MOVEMENT

When the herd is confined to a smaller pasture for each grazing event, movement to fresh grass is essential for putting pounds on cattle. Frequent movements also support Zaranek's goal to avoid conflict with grizzlies.

"If you leave a herd in one place, they're going to just hammer the land. So, you have to move them. And the



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[Top] Grizzly bears are the apex predator year-round in the Greater Yellowstone Ecosystem. [Bottom] Managers on the J Bar L Ranch watch over the herd and move it frequently to benefit the rangeland and help keep the cattle safer from grizzlies.



BEST OF BOTH

It seems J Bar L has found a way to thread the needle and balance a thriving wild ecosystem with a viable agricultural enterprise.

higher the stock density, the faster you have to move across the land. Wild ungulates use movement as a strategy to manage predation threat,” she says.

So much of Zaranek’s management philosophy is based on her observations of wildlife. She feels there’s little left that can be called harmonious between the way her family makes a living and the wild spaces of Montana. But she has a vision to close the gap as much as possible.

“It’s all like, ‘How do we take lives and manipulate them to serve us?’” Zaranek says of most forms of agriculture. “I understand that keystone species, like beavers, do that in some way, but not with the blinders that humans do it. Beaver manipulation of a system ripples out in this ultra-positive way, and I asked myself, ‘How do I recreate that? How can I meet my needs while having my presence be a positive ripple effect instead of a detrimental one?’”

“Beaver manipulation of a system ripples out in this ultra-positive way, and I asked myself, ‘How do I recreate that? How can I meet my needs while having my presence be a positive ripple effect instead of a detrimental one?’”

—HILARY ZARANEK

Beavers are an example of a keystone species, or a species that shapes habitat for other species and influences entire ecosystems. Ecologists view the beaver as a beneficial

keystone species, creating habitat for other animals and plants, lessening flood events and damage and reducing soil erosion. Without beaver dams, the wetlands that many other species rely on wouldn’t exist.

After three years, it seems J Bar L has found a way to thread the needle and balance a thriving wild ecosystem with a viable agricultural enterprise. Zaranek has limited the negative interactions between her livestock and GYE predators, which keeps her cattle safer and prevents grizzlies and wolves from relying on livestock as a food source. She’s also enhancing plant diversity through her intensive grazing practices.

She is quick to share that it’s not picture perfect – it’s incredibly hard work, and a few head of cattle still go missing from time to time. But she’s optimistic about the results so far and looks forward to refining her grazing management next season with the addition of a virtual fencing system, complete with GPS collars for the herd. 🌿



Black Angus calf and a friend relax on J Bar L Ranch in Montana.



Calculating Change



EVALUATE THE FINANCIAL IMPLICATIONS of adopting more regenerative practices with the attitude of a scientist.

BY LAURA NELSON

The ideals of increased soil health, lower input costs, higher grazing capacity, more wildlife on the land and healthier livestock in your herd make regenerative ranching an attractive proposition.

"Those are the headlines that get our attention; that's what we all want for our ranches," Noble Research Institute's Dan Childs says. "But the key question is, how do we get there without mortgaging the farm?"

Childs is an ag economist and senior regenerative ranching advisor at Noble. He's spent more than four and a half decades working with ranchers on financial and business planning while owning and operating his own ranch business.

"The best approach I've found is, you've got to do just a little bit at a time," Childs says, beginning with a good look at your financials.

START WITH A TRUE PICTURE OF YOUR FINANCIAL HEALTH

There's a good reason your banker requires a profit and loss (P&L) statement and balance sheet before offering a line of credit, Childs says. Unfortunately, too many ranchers record those numbers solely to satisfy loan requirements and then leave the documents in their banker's file cabinet. But those who take the power of their P&L and balance sheet into their own hands place themselves in a strong position to make clear decisions at the start of their regenerative journey.

"Those statements should be the beginning of evaluating the financial implications of adopting more regenerative practices," Childs says. "We want to ask ourselves, 'What's our net farm income before we start down this journey, and do we have a record-keeping system in place that will support an enterprise analysis?'"

An enterprise analysis is a process business owners use to allocate income and expenses by enterprise to clearly evaluate the most profitable (or not!) parts of their ranching operation.

A typical cow-calf rancher might say he or she has only one enterprise, but Childs suggests ranchers think a little deeper about how money flows in and out of the business. Are weaned calves really the only source of income or expense on the ranch? Or do you also sell replacement heifers? Cull cows? Grow hay or some other forage crop to feed your cows? Run a trucking business on the side or help neighbors with artificial insemination?

Perhaps you truly identify only one enterprise in your business. That's fine, Childs says, as long as you're able to track the true profit or loss of your work.

KNOW YOUR PROFITABILITY TARGET, THEN EXPERIMENT ON PAPER FIRST

With this financial information in hand, Childs says, you're in a prime position to evaluate where you can experiment with new practices that align your ranch with the principles of soil health and a more regenerative mindset.

Start by identifying an ideal yet realistic profit target. Locking in a true profit target allows us to look beyond production as our primary measure of success.

"Sometimes, perception is not really reality," he says. "We think we did something right or wrong, but it's the records that will substantiate and reinforce the truth."

Perhaps in your opening financial evaluation, you're rightfully proud of the calf check you cashed on sale day, but you see that purchased feed costs crippled your ability to show it as a profit. Do you need to cut those costs to get to your goal?



“You can theorize whatever you'd like in these scenarios, but you can't make a very clear decision unless you project a budget that looks at the true profit potential.”

—DAN CHILDS

Pencil out what it might take to replace the 1,300-pound cows you culled this year with 1,000-pound cows instead. Estimate the difference in their feed costs, then analyze if you can stomach the smaller cow weaning a 450-pound calf instead of the 550-pound calf you're accustomed to, in exchange for rolling out less hay next winter.

Make an honest analysis of your land's forage capacity. Perhaps you conclude you've been historically overstocked, making up for overstocking with purchased feed to carry livestock through the winter. What if

you reduced your cow herd by 20% to more accurately match the natural resources of your land? Now, with 20% fewer animals to stock, can you defer grazing some pasture to leave it as standing forage in the fall and make a serious reduction in or even eliminate the need to feed hay through the winter? Do those reductions add up to enough to cover the smaller calf crop?

“You can theorize whatever you'd like in these scenarios,” Childs says, “but you can't make a very clear decision unless you project a budget that looks at the true profit potential.”

EVALUATE THESE THREE BUDGET LINE ITEMS WITH THE SHARPEST PENCIL

As you evaluate different paths to profitability, Childs says he repeatedly sees three big categories of expenses that can sidetrack those plans. He cautions ranchers to look closely at each of these:



1. Spending on tax-evading assets: “We farmers and ranchers think that if we pay taxes, we've committed a cardinal sin,” Childs says. But avoiding paying taxes is not a good-enough reason to carry a heavy fixed-asset inventory. In general, he advises ranchers to keep their fixed-asset inventory low. “That's your tractor and your skid-steer and your hay baler – the things that are going to cost you the same amount whether you have 50 cows or 500 cows. For most, if you can rent it or hire it, that's a more cost-effective choice,” Childs says.



2. Supplemental feed costs: This is often the heaviest line item on a rancher's expense account. “Whatever we can do to reduce feed in a livestock operation generally makes a pretty major impact on the bottom line,” Childs says. “It's the easiest thing in the world to have a full hay barn to feed a cow out of, but it's also the most costly. It's much harder to manage stockpiled forage at a rate that will last your herd through the winter.”



3. Replacement females: “Many guys will say, ‘I can't buy the quality I can raise,’ and I understand that – that may be true,” Childs says. “But that doesn't mean it's profitable. “If we're really honest with our numbers, most will find we need to be a 300-to-500-head cow-calf operation before we can really justify raising our own replacements,” he says. “They're very expensive to carry.”



“If we can't make it work with a pencil, it's doubtful we'll make it work in real life.”

—DAN CHILDS

USE YOUR RECORD-KEEPING AS A CONVERSATION STARTER TOWARD SUCCESS

Whether it's from a banker, a business partner, a spouse or other family member, many ranchers need to earn the buy-in of other people before they make management changes. In many of these scenarios, a multi-year cash flow budget may be a necessary and powerful tool to show profit potential.

“You need to be able to show, ‘I want to make these changes, and this is how it's going to pay off or work out,’” Childs says. “Lenders love customers who come in with that depth of planning and documentation. It shows that you're serious about what you're doing, you've done your research, and that you have good reason to have confidence in your decisions.”

The budget analysis similarly could provide a confidence boost to a younger generation wanting to introduce a new practice to a family operation.

If creating these budgeting tools sounds daunting, Childs says the new Noble Profitability Essentials course was created to help ranchers walk through enterprise accounting and cash flow budget exercises.

It's important to understand that these practices really are the economic engine of an operation, Childs says.

“If we can't make it work with a pencil, it's doubtful we'll make it work in real life.”

Maximize Your Ranch's Profitability with Noble Profitability Essentials

Running a ranch isn't just about working hard — it's about making smart, informed decisions that will help your operation thrive in the long run. Noble Profitability Essentials is a hands-on course that helps ranchers and farmers like you improve profitability through strategic financial planning and identifying areas that can be optimized for better performance.

WHAT YOU'LL GAIN:

- **Strategic Profit Planning:** Learn how to map out a plan that sets your operation up for long-term success.
- **Comprehensive Budgeting:** Develop detailed profit and loss statements and cash flow budgets that will guide your decision-making.
- **Efficiency Improvements:** Identify inefficiencies in your operation that are draining resources and learn how to eliminate them for better returns.

Noble Profitability Essentials uses real-world exercises to walk you through the essential steps of improving your ranch's bottom line. You'll leave with the tools to manage your finances better, plan for a profitable future, and make changes that increase your operation's overall success.

READY TO TAKE THE NEXT STEP?



Enroll in Noble Profitability Essentials and start building a more profitable future for your operation. For more information, scan the code or visit noble.org/noble-profitability-essentials



“The Noble Profitability Essentials course has helped me identify my enterprises and make management decisions much easier with clear, concise data that is usable ... to make my operation more profitable and sustainable.”

— Jennifer Hernandez
3J FARMS OK | BLANCHARD, OKLAHOMA

THE INVISIBLE FORCE SHAPING THE GREAT PLAINS

BENEATH THE SURFACE OF THE CENTRAL AND SOUTHERN GREAT PLAINS, a placid aquifer of water controls the future of agriculture production.

BY LAURA BRENNER



For millions of years, water has shaped the landscape of the western United States. The Missouri River feeds millions of acres of fertile farmland; the Great Salt Lake summoned civilization to the desert; and the Colorado River carved out the Grand Canyon. The future of the American West is now being shaped by an invisible source of water — aquifers.

While the water from aquifers doesn't move above ground with the force required to erode rock, farms in the Great Plains are changing. The Ogallala Aquifer, which provides nearly all the groundwater in western Kansas and Oklahoma, the Texas Panhandle and eastern New Mexico, is drying up faster than it can be replenished.

Experts have sounded alarm bells for the Ogallala Aquifer for decades. Since the advent of center-pivot irrigation in the 1960s, thirsty row crops like corn have drained parts of the aquifer faster than it can be replenished. In arid climates like Kansas, Oklahoma, Texas and New Mexico, center-pivot irrigation is the most profitable way to produce row crops. In many areas, 80% to 90% of the permitted groundwater from the aquifer goes to irrigation.

MANAGING AN INVISIBLE RESOURCE

Unlike the interstate highway system that is overseen by a federal agency, the water in the Ogallala is managed state-by-state. Each state is empowered to determine the best way to allocate water rights and manage water resources within their boundaries.

Managing a largely invisible resource like an underground aquifer presents some challenges. Brownie Wilson is well versed in Kansas' groundwater dilemma. He's a water data manager at the Kansas Geological Survey (KGS) in their geohydrology division. Given the natural variability in the subsurface, Wilson doesn't call water-level declines a crisis in all areas, but he won't minimize the significance of the issue in the state either.

"Sometimes you have a water permit and there's no water there to use. We call this 'paper water,' because the water was there at one point and today it's not," explains Wilson.

It's a challenge Bret Riley, a rancher in New Mexico, watched several farmers struggle with in the 1980s when he started his career with Federal Land Bank.

"My job was up at Clovis, New Mexico, and that's kind of on the edge of the aquifer," says Riley.

"We were seeing some wells go dry just northeast of town.

Producers were put in some bad situations where they were carrying a debt load for irrigated production, but they didn't have any irrigation water."

Some wells have run dry, but other areas are luckier. That's because the bedrock beneath the aquifer is more like an egg crate than a level floor. Some areas have deep pockets of groundwater, while others are shallower.

Part of Wilson's job is collecting aquifer data for Kansas. Every January

since 1996, staff members at KGS and the Kansas Division of Water Resources (DWR) collect hand-measured readings from over 1,400 wells to track the water levels of the aquifer. With this point-in-time data, Wilson has been able to

identify places where the aquifer level is declining, increasing and staying level.

"Groundwater is not declining everywhere. But the western third of our state is the Ogallala-fed portion, and that typically is in a state of decline," he says.

Most estimates at the turn of the 20th century called for producers to reduce their water use by 80% to 90% to restore balance to the aquifer. However, modern technology

has changed that assessment. In the last 15 years, the KGS staff has installed electronic sensors that record water

"Sometimes you have a water permit and there's no water there to use. We call this 'paper water,' because the water was there at one point and today it's not."

—BROWNIE WILSON



Brownie Wilson, water data manager with the Kansas Geological Survey.

Photo courtesy of StateLine <https://stateline.org>



Sorghum is considered a drought-tolerant alternative to corn, using only half to three-quarters of the irrigation water corn needs to produce a comparable yield, per field research.

levels every hour in a growing number of wells. This network of wells providing real-time data is helping researchers paint a less daunting picture.

“What we’re finding is, the number to stabilize water levels in many areas of the aquifer for the next decade or two is not nearly that big. It’s more like a 20%-30% reduction in the use than we’ve seen in the past. That’s one of the messages we’re trying to relay out to people,” says Wilson. Although he acknowledges some areas may still need 40% to 50% reductions, he is hopeful these lower reduction numbers are more in line with what’s possible.

SHAPING THE LANDSCAPE FROM BELOW

Thirty-five years ago, Riley recalls driving from the farm he grew up on in Estancia, New Mexico, to Texas Panhandle towns like Muleshoe or Lubbock to pick up tractor parts or tools anytime a harvester broke down. He recalls miles of cornfields coloring his drives then.

“Now I go into that same country, and I still see a lot of pivots, a lot of irrigation is still going on, but they don’t have enough water to grow corn

anymore. They’re growing cotton and wheat. And they’re having to tie two or three wells together to make one pivot run,” he observes.

Gina Gigot manages an aquifer-fed farm near Garden City, Kansas. Before her father passed away in 2015, Gigot remembers him telling her how important it is to conserve water on the farm.

“As he sat there, watching that the aquifer was dropping and dropping, and so he told us early on, probably 2010, 2012, he said this piece of property has some rechargeable areas to it, but we’re going to have to take care of it,” she recalls of her late father’s advice.

Gigot’s father started their family farm in the early 1970s with 300 center pivots. Through selling off pieces or decommissioning pivots, Gigot’s father left her brother and her

a farm that looked quite different from the one he bought.

The Gigot siblings followed their father’s lead in balancing water use and profitability. In 2017, Gigot harvested her last row crop. Today, the remaining 60 center pivots irrigate forage for her new cow-calf enterprise.

“Basically, we put a new outlook on life,” says Gigot. “We don’t do any more row crops. Everything we do here is either grazed, ensiled or pastured. And that’s our way of making the water conservation work for us.”

—GINA GIGOT

hesitancy is widespread and tends to thwart the efficacy of conservation efforts like Gigot’s.



The Ogallala Aquifer provides nearly all the groundwater in western Kansas and Oklahoma, the Texas Panhandle and eastern New Mexico. This windmill is near Rosston in western Oklahoma, just below the Kansas border.

FINDING WAYS TO CONSERVE

As experts and producers investigate options for long-term stabilization of the aquifer, they all point to agriculture as the catalyst for change. But historically, change isn't a mindset the industry quickly embraces.

The most effective approach Wilson has seen for stabilizing water levels is collective action within a region. To that end, the Kansas DWR facilitates two voluntary action programs: Local Enhanced Management Areas (LEMAs) and Water Conservation Areas (WCAs).

After a failed attempt to rally support for a LEMA in her community in 2017, Gigot met with her local DWR office to create a conservation area for her farm.

"You say 'this is what I think I'm capable of doing,' and basically what it amounted to is we put together a five-year plan that we would save 17% off our allotted acre-feet," explains Gigot. "At the end of that five years, we ended up saving almost 26% off our allotment. We went over and beyond what we said and basically banked that acre-feed to use in the future."

To get there, Gigot switched to low-flow nozzles on her center pivots that took their capacity down from 1,000 to 500 gallons per minute. She learned to manage her forage production with what she had, which meant understanding when a crop can make the most efficient use of irrigation, and she could shut down a pivot without harming the forage. She also used rotational grazing to stimulate forage production and improve soil moisture retention.

In New Mexico, there's a novel solution in the works to incentivize producers to de-commission wells. The Ogallala Land & Water Conservancy in Clovis launched a pilot project in 2022 that paid landowners through a water rights lease agreement to leave 80% of their water allotment in the ground.

"Since we shut off these wells in 2022, we have made three lease payments to our eight landowners, soon to be nine," says Ladona Clayton, executive director of the conservancy. "We saved almost 8 billion gallons of groundwater in just two years. By the end of 2025, with additional wells now decommissioned, it's going to be 13 billion."

New Mexico rancher Bret Riley sorts cattle on his 23,000-acre ranch in Caprock, New Mexico. He manages his grazing to give "intensive rest" to his pastures of diverse grasses.



Clayton believes the pilot project, which is transitioning into a long-term program, is replicable in other communities. But she admits it took some wrangling of state and local agencies, and even the federal government, thanks to the involvement and financial support of nearby Cannon Air Force Base, to get the project off the ground.

Established avenues that support producers in reducing their water use are scarce, likely because they face the same daunting task Clayton did in Mexico two years ago. But with a resource as precious as water, states and producers will be forced to get creative to find solutions.

Back in Kansas, Gigot thinks of her water as a savings account. A gallon saved is a gallon earned for the future. She's constantly looking for ways to maximize water efficiency through planting different varieties or monitoring forage response to watering times, but she worries about the state of the aquifer as a whole.

"When you take all of western Kansas, there's a lot of areas that are really mak-

ing a lot of changes. But in southwest Kansas, they haven't been as aggressive. You know, change is hard on people, and especially if you're a third- or fourth-generation corn farmer," Gigot says.

Riley thinks crop subsidies disincentivize farmers from reducing their cotton or wheat crops despite repeated poor or nonexistent harvests. He believes we need a better solution, something that balances the needs of farm families today with the needs of the next generation.

"The young people that are coming in behind us, they're the ones that are going to pay the price of us utilizing all the natural resources. I think we have a duty to go in there and figure this

problem out and have enough gumption to carry it through," he says.

With a variety of depths across the aquifer, the timeframe for how long the water will remain viable can only be determined well-by-well. Experts are hesitant to attribute any timetable at all.

Nothing can resist the pursuit of water; fine flakes of chalk on a sidewalk, concrete dams and corn fields all succumb to water's whim. Producers know that weather – especially rain – is one

of the many things out of their control.

Water is one of the most powerful forces that shapes the Earth. Even when it lies placid below the surface, water, or lack of it, controls the livelihoods of all those above. 🌱

"When you take all of western Kansas, there's a lot of areas that are really making a lot of change. But in southwest Kansas, they haven't been as aggressive."

—GINA GIGOT

Cattle graze one of many irrigated pivots on Gigot's ranch at Garden City, Kansas.



NATURE'S NIGHT SHIFT

BATS ARE PROVING TO BE INVALUABLE PARTNERS IN AGRICULTURE,
offering natural pest control and improving crop health and productivity.

BY MADDY BEZNER

As the sun sets and farmers and ranchers wrap up their day's work, one vital group begins its work – bats. From pest control to supporting regenerative principles, these nocturnal flying mammals are essential in maintaining healthy ecosystems.

A partnership between Noble Research Institute and Merlin Tuttle's Bat Conservation (MTBC) is at the forefront of studying how bats contribute to agriculture.

"Through research and real-world applications, like Troy Swift's use of bat houses in his pecan orchards, the team is uncovering the important impact bats have on biodiversity through alternative pest control," says Lauren Jones, senior research associate at Noble.

THE SILENT PEST MANAGERS

Merlin Tuttle, founder of MTBC and leading international bat expert, has long championed the global impact of bats on both biodiversity and agriculture.

At a recent MTBC event in San Marcos, Texas, Tuttle showcased photographs of various bats he's encountered during his conservation career.

"The stranger the bat looks, the better their technology," Tuttle says. He explains that although bats are often misunderstood and mistakenly feared by humans, they provide important benefits for pest control in agriculture.

"Bats are absolutely central foundations for biodiversity worldwide," he says, emphasizing their role in controlling

pest populations that would otherwise require chemical management. With more than 200 bats housed in a single bat box, the numbers quickly become staggering.

"A single bat can eat a thousand or more insects in a night, and that makes a big difference for farmers," Tuttle says.

Their work is not just limited to one crop or region – bats are hard at work across a variety of agricultural settings, including orchards, grazing lands and even rice fields. Tuttle shares that in Thailand, bats help control pests in rice fields, leading to healthier crops and significant economic benefits.

"Guano sales for fertilizer at Khao Chong Pran Cave in Thailand moved from \$12,000 annually to almost \$100,000 and now over \$200,000 annually," Tuttle says, demonstrating the value bats offer beyond pest control.

Closer to home, bats are proving just as beneficial for American farmers and ranchers. According to the U.S. Fish and Wildlife Service, bats contribute an estimated \$1 billion annually to the U.S. corn industry by consuming pests like the corn earworm moth. In Texas alone, Brazilian free-tailed bats and other bat species are conservatively estimated to save farmers and ranchers \$1.4 billion annually.

Ongoing efforts at producer orchards and Noble's research orchards are focused on measuring the impact bats have on key pecan pests, such as the pecan nut casebearer and hickory shuckworm, two moths that damage pecan trees by laying eggs that hatch into larvae and feed on immature pecans.

USING BATS IN THE PECAN ORCHARD

Troy Swift, owner of Swift River Pecans in Lockhart, Texas, is one of the pioneering pecan producers using bats as a natural pest control method. After managing his orchard conventionally for years, Swift found that rising costs for inputs like fertilizers and pesticides were cutting into his profits.

"The inputs have become more expensive than the pecans. So, I decided to find another way out of necessity," Swift says.

That "other way" was regenerative agriculture, a system focused on building soil health, enhancing biodiversity and reducing chemical inputs. It was during this transition that Swift realized the potential of bats in his orchards.

Swift installed bat boxes in his pecan groves in the late fall of 2021, and bats arrived by the following summer.

"We're using bats – we call them the night shift and birds the day shift," Swift says. "Since installing the bat houses, we've observed fewer pests and healthier trees."

Swift, who runs a sawmill, uses salvaged lumber to build bat boxes he sells to other farmers.

"It's probably the only hope bats have," Swift says, who is also president of the Texas Pecan Growers Association. "We have to prove what they do for agriculture," he adds, highlighting the need for farmers to recognize bats' role in reducing pesticide use by controlling insect populations naturally.

The benefits go beyond just pest control. Swift is participating in ongoing research to analyze bat guano and identify



[Top] Troy Swift tells workshop participants how he recycles fallen timber to construct bat houses.
[Bottom] A bat emerges from its house at Swift River Pecans as day gives way to dusk.

which pests the bats are consuming. Early studies suggest that bats are particularly attracted to the moth phases of pests like the pecan nut casebearer, but Swift is eager to see what other pecan pests the bats might be helping to manage.

Tuttle is quick to point out that bats are not just an afterthought in regenerative agriculture – they are an essential component.

“Bats play a key role in controlling pests and maintaining healthy ecosystems,” he says, adding that their presence is a marker of a balanced, biodiverse farm.

This symbiotic relationship between bats and agriculture fits well with the goals of regenerative principles. By reducing chemical inputs and encouraging natural pest control methods, farmers can improve soil health, boost biodiversity and ultimately create more resilient farming systems.

As Swift notes, the transition to regenerative practices can be challenging, but the long-term benefits are undeniable.

“My goal is to be profitable by being environmentally conscious and leaving the land better than I found it,” he says. “The goal is to create a pest management system that works in harmony with nature, minimizing disturbance to the soil and reducing reliance on chemical inputs.”

PARTNERING TO INSPIRE BAT CONSERVATION WORLDWIDE

The partnership between Noble Research Institute and Merlin Tuttle’s Bat Conservation is poised to bring even more insights into bats’ role in agriculture. This collaboration explores bats’ role and ability as an alternative pest management strategy. From its work, the partnership will disseminate information and educational materials to equip farmers and ranchers with the ability to incorporate bats into their operations.

This collaboration will expand Noble’s Pecan Research Strategy project, a six-year program launched in 2023. As part of a comprehensive assessment of orchard management practices and economic impacts, the study uses bat guano to genetically identify specific bat species and their diet of economically impactful



Millions of Mexican free-tailed bats emerge in waves from Bracken Cave Preserve to hunt each night.

pecan pests. Examples of such pests include pecan nut casebearers, hickory shuckworms and stinkbugs.

“A key component of our research on bats and pest control involves the detailed analysis of bat guano. To determine which pests the bats are consuming, the process begins with guano collection followed by DNA isolation, using PCR (polymerase chain reaction) to identify the insect presence within the samples,” says Kim Cooper, Noble research associate. She adds that this process is intricate, and relies heavily on partnerships with bat rescue organizations, which have been instrumental in collecting the necessary bat guano for identification.

“We’re incredibly grateful to the Bat World Sanctuary and the Austin Bat Refuge for their support in helping us collect control samples,” Cooper says. “Their willingness to assist us in gathering these crucial samples has allowed us to take an important step forward in understanding the role bats play in managing orchard pests.”

With all control samples now in place, the team is eager to begin

uncovering the mysteries of what bats are consuming in the orchard environments. The data from these guano samples will provide critical insights into how bats can serve as an alternative pest management strategy.

“The goal is to create a pest management system that works in harmony with nature, minimizing disturbance to the soil and reducing reliance on chemical inputs.”

—TROY SWIFT

“We are still placing bat boxes in locations that we feel should be attractive to bats and checking for guano regularly. It’s a slow process, but the potential benefits for pest control and

biodiversity are significant,” says Laura Putman, another Noble research associate on the team.

Early results are promising, and the team is optimistic that bats can play a key role in regenerative farming systems, not only in nut orchards like Swift’s, but in livestock operations as well.

As the research continues, the hope is that more farmers and ranchers will recognize the value of bats in their operations. Whether through installing bat houses or simply encouraging wild bat populations through regenerative practices like lowering use of pesticides, producers can help protect and partner with these nocturnal creatures as powerful allies.

“Bats are really essential to biodiversity on our planet,” Tuttle concludes, “but we need to communicate that clearly.”

Through Noble’s partnership with MTBC, that message is beginning to spread. With further research and collaboration, bats could become a cornerstone of regenerative agriculture, helping to build a healthier, more sustainable future for producers. 🦇



IN THE KITCHEN

Hearty Bison Chili

BISON CHILI IS A FUN TWIST on traditional recipes. Bison is a lean protein that's a heart-healthy option for red-meat lovers. Some say bison has a sweeter, richer flavor, making it perfect for your fall chili recipe.

PREP TIME: 30 minutes | COOK TIME: 90 minutes | SERVES 12

INGREDIENTS:

- 2 pounds ground bison
- 2 tablespoons cooking oil or butter
- 3 cups chopped onions (about 2 medium onions)
- 6 garlic cloves, finely chopped
- ¼ cup chili powder
- 32 ounces beef broth
- 28 ounces fire-roasted diced tomatoes canned, undrained
- ½ cup stout or dark beer
- 4 canned chipotle chiles, veins and seeds removed, chopped (optional)
- 3 tablespoons yellow cornmeal (optional)

- 30 ounces black beans canned, rinsed and drained
- 30 ounces kidney beans canned, rinsed and drained
- Salt and pepper to taste

OPTIONAL TOPPINGS:

- Sour cream
- Cheese, shredded
- Avocado, chopped
- Cilantro, chopped
- Green onion, sliced

INSTRUCTIONS:

1. Using a large stock pot over medium heat, add the oil or butter, chopped onions and garlic. Cook until fragrant, about 1 minute.
2. Add ground bison and brown the meat, breaking it up as it cooks.
3. Once the bison is almost browned, add chili powder, beef broth, tomatoes, beer and chipotle chile peppers (optional). Bring the mixture to a boil then reduce to low heat, cover partially and simmer for 1 hour.
4. Uncover and stir. Add black beans, kidney beans and cornmeal (optional) and stir to combine. Simmer uncovered for 30 minutes.
5. While the bison chili simmers, prepare your preferred base and toppings.
6. To serve, spoon the bison chili into bowls, top with sour cream, cheese, cilantro, avocado, green onion or anything else your family and guests enjoy. 🌿



NOTES & TIPS

- Canned chipotle chile peppers pack a punch. Scoop out the seeds and veins before chopping to tame them a bit. Or skip them for a milder chili.
- Adding cornmeal toward the end of cooking will help thicken the sauce but is not necessary for a delicious bison chili.
- Bison chili can also be prepared in a large slow cooker. Saute the onions, garlic and bison in a skillet first. Then, proceed with the recipe in the slow cooker, at low heat for 4-6 hours. Add the black beans toward the end of cooking.
- Chili is the perfect dish to experiment with. It's forgiving when you add a bit too much of one thing or another.
- Get creative with what side you serve with your bison chili. Cornbread or a baked potato is a crowd pleaser. But pasta, roasted sweet potatoes or even cinnamon rolls are all great complements to this recipe.

IN THE FIELD

Control Encroaching Brush with Goats

TIPS FROM NOBLE'S RANCH MANAGERS for how to best manage goats to control brush and diversify grazing.

Woody brush encroachment on pasture and grazing lands is an ever-present challenge on ranches. Noble's ranch managers are no strangers to this challenge and offer their advice about how adding goats to your operation can reduce encroachment while adding the benefits of multi-species grazing to your ranch.

Here's what they've learned from their experience at Noble's Oswalt and Red River Ranches in south-central Oklahoma.

Fencing

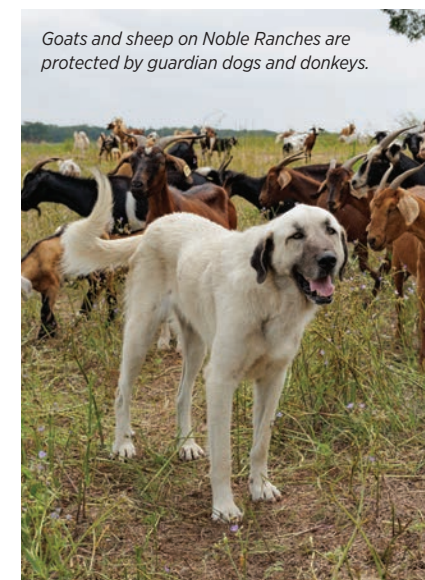
To add goats, you'll first want to modify your fencing to contain a smaller ruminant. We added three additional lines of barbed wire to bring the exterior fences on Oswalt Ranch to an 8-wire fence.

Maintaining a hot fence around goats is more critical than with cattle. Goats are naturally curious animals that like to explore. If a tree or animal damages your fence and it powers down, you'll find your goats roaming in the neighbor's yard by the next day. We recommend checking your fence daily and keeping it very hot – somewhere north of 6,000 to 7,000 volts if you can – to discourage meddling.

Guardian Dogs

In our experience, having guardian dogs is non-negotiable with goats. It's important to know that not every dog can be a good guardian dog, however. If you can find a herd that comes with a trained and bonded guard dog, start there when acquiring your goats. Otherwise, use your network to find reputable folks who breed and raise proven guardian dogs.

When grazing multiple species together or near each other, dogs and cows will adjust to each other over time, but there may be some tension between them at first. Allow them time to adapt.



Goats and sheep on Noble Ranches are protected by guardian dogs and donkeys.

survive in cattle. Another important part of parasite prevention is keeping a mineral supplement available to the herd to support balanced nutrition.

Rotation Plan

We tested a few ways of grazing goats and cattle on our Oswalt Ranch. The best scenario for both the livestock and grazing management occurred when goats grazed a section first, followed by cattle. The goats thinned out the woody stemmed forages and forbs, leaving the more desirable forages for the cattle.

While goats prefer brush, they will eat forbs and grass, too. If the goal is to leave grass for cattle, the goats need to be rotated to new pastures before their preferred foodstuff runs out. The goats also stayed healthier when they moved faster than the cows. This rotation pace allowed the goats to return to a section of pasture to graze new leaves on the refoliated brush and continue stunting it before regrowth got too far along.

Parasite Prevention

Goats are susceptible to parasites, especially when not managed properly. At Oswalt Ranch, we learned that moving the goat herd frequently helped cut down on the instances of common parasites such as barber's pole worms (*Haemonchus contortus*). The grazing rest periods are long enough on this ranch that parasite management isn't a big challenge. But it's important to be aware of parasite lifecycles when rotating goats back into sections of pasture.

Multi-species grazing helps break the parasite life cycle, too. Goats and cattle do not share the same parasites, which means goat parasites cannot

A Long-Term Mindset

At our ranches, we found that using goats worked best when large brush and trees were cleared mechanically first. Goats that are brought in after trees are pushed up and burned help clean up the re-emerging forbs and allow the desired grasses to return.

No two ranches will respond to brush control in the same way. It's important to take the time to observe what the goats are doing and how their presence influences your pastures. Goats are not an overnight fix to brush encroachment; be patient enough to see the plan through. 🌿

▲ A goat at Noble Research Institute's Red River Ranch with a diverse buffet.



HISTORY TEACHER TURNED RANCHER
shares his passion for American bison through
his educational YouTube channel.

BY LAURA BRENNER

*From left, Dusty and Marisa Baker and daughter Brooks with
Dusty's mother and stepfather, Donna and Kevin Lynch.*

In Sulphur, Oklahoma, visitors and residents can see bison anytime they want, thanks to the Chickasaw National Recreation Area located south of the town. And if they want to hear a living history of the animal, they can ask Dusty Baker, owner of the nearby Cross Timbers Bison Ranch.

The former history teacher readily shares his passion for the American bison with nearly anyone who will listen, including his 270,000-plus subscribers on YouTube.

"Most people don't know why there are two names for the animal – bison and buffalo," Baker explains. "When Europeans came over, they were used to seeing what they knew as buffalo – the African and water buffalo. American bison have been here a long time, before Native Americans arrived. Europeans called them buffalo because they look like something the Europeans already knew, but their scientific name is *Bison bison*."

Baker learned to appreciate bison while working at the Chickasaw National Recreation Area. He spent several summers caring for the animals and learning their history.

"Their story is incredible. That's a motivator for me, to raise an animal that once almost disappeared, to the

healthy, thriving herds we're raising today," says Baker. He focuses on improving the genetics of his herd, hoping to reverse some of the genetic loss that resulted from decades of dwindling populations.

Cross Timbers Bison started in 2018 when Baker and his wife, Marisa,

**"Their story is incredible.
That's a motivator for me,
to raise an animal that once
almost disappeared, to the
healthy, thriving herds we're
raising today."**

—DUSTY BAKER

purchased their first bison stock. The couple outgrew the space his mom and stepdad – Noble Research Institute employee Kevin Lynch – leased to him and purchased 189 acres in 2019 to accommodate their growing herd.

In his first couple of years raising bison, Baker turned to YouTube looking for answers to challenges he

encountered. But his searches came up short.

"I just thought, 'Why isn't there more information out there on these animals?' And so, I saw an opportunity, a niche. You know, what if we started filming our journey and showing people that you can raise these animals?" Baker says of his lightbulb moment for starting the Cross Timbers Bison YouTube channel.

Over time, the channel became an avenue to find new customers for their online storefront of butcher-cut bison meat, jerky and snack sticks. It's also a vital source of revenue for the ranch.

"I'm a first-generation bison rancher, and I wasn't handed a property that was set up for our operation, so we had to start from literally the ground up. You know, fencing, animals, barns, tractors. YouTube helps pay for all that stuff."

Baker relies on his background as an educator to use his videos to bridge the gap between ranchers and consumers. Beyond bison content, he uses the videos to talk about the conservation efforts on his ranch, including prescribed burning; his grazing rotation philosophy; and how he's improving soil health across the ranch.

Proof that you can take the rancher out of the classroom, but you can't take the teacher out of the rancher. 🌱



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*Sources: USDA, Agriculture.com, University of Illinois, Soil Science Society of America

Our Mission:

To guide farmers and ranchers in applying regenerative principles that yield healthier soil, more productive grazing land and business success.



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BIG SKY COUNTRY

Grazing cattle are silhouetted by the setting sun on the J Bar L Ranch in Montana, a regenerative ranch dedicated to preserving wild spaces.