SUMMER 2023

Western Harvest

REACHING 30,800 HOMES IN EASTERN WYOMING AND WESTERN NEBRASKA

After the drought

BY SHAUN EVERTSON
Contributing writer

WESTERN NEBRASKA – First a few caveats. With the exception of the weather data, collected over the last 130 years, much of what follows is based on personal but non-scientific observations made by the author on a single 2,000 acre ranch located roughly 3-7 miles due south of Kimball, Nebraska.

As for the weather data, all observations come from a few very small locations. For instance, precipitation is measured using six-inch precision measuring cylinders. Therefore, rain and snow are only measured precisely in those six inch diameter cylinders. As most farmers and ranchers understand, rain and snow quantity can vary a great deal over remarkably small areas. This being the case, precision measurement is only useful as a proxy. We know that over time, measured precipitation is somewhat correlated to plant growth, but it is not precisely correlated. It's useful information, but it doesn't tell us how much water is in the soil profile and available for crops and grassland plants to use. That last is the only factor which matters when it comes to precipitation and plant growth. Similarly, temperature, wind, humidity, and barometric pressure are measured at and report data from those single locations.

Drought and dry spells are a natural part of the weather pattern here on the High Plains of North America. When it comes to precipitation, some years are dry, and a few years are very dry. Some years are wet, and a few years are very wet. Most years are pretty much average. If we look at the last 130 years of weather records at Kimball, Nebraska, we see that the weather we've experienced in the most recent 30 years (1993-2023) is pretty much the same as it was during the 100 years which preceded it (1893-1993). When we look at the data, it's pretty clear that the past 130 years reflect a naturally variable climate, and there doesn't appear to be any reason to believe that this has fundamentally changed since the end of the last ice age some 12,000-15,000 years ago.

The last several years have been quite dry. This is true on the EJE Ranch and across pretty much all of the tri-state region of southeast Wyoming, northeast Colorado, and the Nebraska Panhandle. It's generally fair to describe the period of October, 2019 through April, 2023 as a drought. It's important, however, to understand that the term "drought" doesn't simply mean a significant shortfall of precipitation. Very low precipitation totals can certainly cause drought conditions, but across the High Plains of North America, where precipitation totals average 10-20 inches per year, the timing of precipitation is critical. It's entirely possible to measure average or even above average precipitation over a particular year and still experience drought – or even profound drought – conditions.

SHAUN EVERTSON/WYOMING NEWSPAPERS INC.

Intermediate Wheatgrass was flowering on July 12 on the EJE Ranch near Kimball, Nebraska. This year the Intermediate Wheatgrass was more than 4 feet in height, where in the previous three years it ranged from a few inches to about a foot.

How can this be so? Well, there are a couple of factors to consider. First of all, many – perhaps even most – short-to mixed-grass prairie ecosystems across the region feature very well drained soils made up of thin, sandy loam topsoil overlaying sand and gravel. In such soils rain and snow melt percolate through the soil profile rather quickly. Then we come to the grassland plants themselves. Cool season grasses are evolved to do nearly all of their annual growth during relatively short, 6

see ***DROUGHT*** *page* ***2***

Drought: 2022 saw below-average precipitation

FROM PAGE 1

to 12 week periods. Think mid-March to mid-May. Warm season grasses are similar, with rapid growth phases from roughly mid-May through mid-July. Many, but not all, of the other prairie plants such as shrubs and forbs (broadleaf native plants) have similar growth patterns. Another factor is air temperature, humidity, and wind.

How do the above factors affect the prairie in dry, average, and wet years? The key lies in the way prairie plants have evolved since the end of the last ice age. The plant life of prairie ecosystems across our region has evolved to survive the naturally variable climate of the region. We've generally got plenty of sunshine and atmospheric carbon as well as adequate micronutrients in the soil. These are two of the three things plants require to grow. Sunshine (including adequate warmth) and nutrients. The third and limiting factor in prairie plant growth is the availability of water in the soil profile, which is where the plant root systems take it up. This factor is always variable, day-to-day, seasonally, and annually. A contributing factor is air temperature, humidity, and wind. During hot, dry, windy conditions both plant transpiration and soil moisture evaporation (collectively known as evapotranspiration) take much more water from the soil than during cooler, more humid, and more calm conditions.

So when it comes to plant growth in the prairie ecosystem, if there is abundant soil moisture in the spring and early summer there will be abundant plant growth. If there is average soil moisture during this period there will be average plant growth. And if there is little to no soil moisture during this period there will be little to no plant growth. Fortunately, the prairie ecosystem has evolved to survive periods of drought by essentially hunkering down and waiting for the rains to return. It can easily survive multiple and consecutive years of drought by going more or less dormant. Then, when the rains return and there is adequate to abundant soil moisture it fairly explodes into life.

So let's look at the way the recent drought affected the shortgrass prairie ecosystem on the EJE Ranch. Many locations across the region will have had similar responses, depending on timing and quantity of precipitation.

On the EJE in 2020, we had five inches of precip in the spring and 3.7 inches in the summer. Our 130-year average is 5.65 and seven inches, respectively. It was also quite warm, dry, and breezy during the summer months which increased evapotranspiration. September-December were quite dry as well, including very little snowfall. For the year, we counted 11.33 inches of liquid precipitation, compared to the 130 year average of 16.77.

In 2021, we had 5.35 inches of spring precip and three inches of summer precip, compared to the 130 year average of 5.65 and seven. Again, it was warm, dry, and breezy. Fall and winter were rather dry and warm, and while there was more snowfall, much of the moisture evaporated or sublimated back into the atmosphere and little enough made it into the soil moisture profile in the spring. For the year we had 12.89 inches of liquid precipitation, compared to the 130 year average of 16.77.

In 2022, we had 6.46 inches in the spring and 6.24 in the summer, compared to the average of 5.65 and seven inches. Much of both the spring and summer totals came from two thunderstorms, though, so runoff and rapid percolation through dry soils kept soil moisture available for plant use to very low to nearly absent levels. Spring and summer were warm, dry and breezy. We had heavy snow and very cold conditions during winter and an impressive snow cover developed which remained into early

*see **DROUGHT** page 3*

Published by Wyoming Newspapers Inc., which operates these newspapers in Eastern Wyoming and Western Nebraska:

TORRINGTON TELEGRAM

The Business Farmer
Your Rural Voice in Nebraska, Eastern Wyoming and Northeastern Colorado

The Lingle Guide

The Lusk Herald

The Guernsey Gazette

Platte County Record-Times

Western Harvest is published in January, April, July and November.

Publisher:
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Drought: May and June bring nearly 14 inches of rain

FROM PAGE 2

spring. Keeping cattle fed and watered was a chore, but perhaps we were seeing a promising weather pattern developing. For the year we had 19.37 inches of liquid precipitation, compared to the 130 year average of 16.77. This was an above average year for total precipitation, yet little of that moisture was ever available in the soil for plants to utilize.

Winter and early spring were a bit disappointing in 2023. While we had 45 inches of snow through April, much of the liquid water content ran downhill as the spring snowmelt occurred before the ground thawed. March and April were very dry. Most of us were preparing for yet another year of drought. And then came May and June, where we received nearly 14 inches of rain, pretty much all of which came in slow, steady, multi-day rain events, perfect for filling the soil moisture profile and keeping it filled. Unsurprisingly, spring growth of cool season grasses and spring forbs was remarkably abundant. Warm season grasses and summer forbs took the post-drought opportunity of plentiful soil moisture to grow abundantly as well. Compared to the previous three years the sheer quantity of plant biomass produced on the ranch has been remarkable. The shortgrass prairie ecosystem has been astonishingly prolific this year, producing bountiful plant growth which has allowed animal growth to thrive. About the only downside has been the overabundance of biting flies which have and continue to bother both cattle and people.

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Coneflowers tower above summer grass Wednesday on the EJE Ranch near Kimball. Coneflowers are a summer-blooming forb native to the shortgrass prairie ecosystem

For those who practice agriculture across the region, it continues to be our great good fortune to be able to experience our natural world over time. We see and experience the drought years and how nature responds. We see and experience the average years. And we see and experience the bountiful years, such as 2023 has thus far been. We have a deep and profound understanding, built on experience over time, of how nature works in this part of the world. Many of us find a great deal of personal peace in our understanding of the natural ebb and flow of seasons and years, peace which many of our city- and town-confined fellow humans struggle to find. For me personally, this is a priceless boon.

Agriculture technology and innovation

'The world needs more low-flying cowboys'

BY CYNTHIA SHEELEY
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TORRINGTON – The University of Wyoming (UW) held its "Ranch Management and Agricultural Leadership 2023 Seminar" in conjunction with the Eastern Wyoming College (EWC) on Thursday, Mar. 2 at the EWC campus. This seminar focused on technology and innovation and was the third event in a five-part series titled "Ranching in the West."

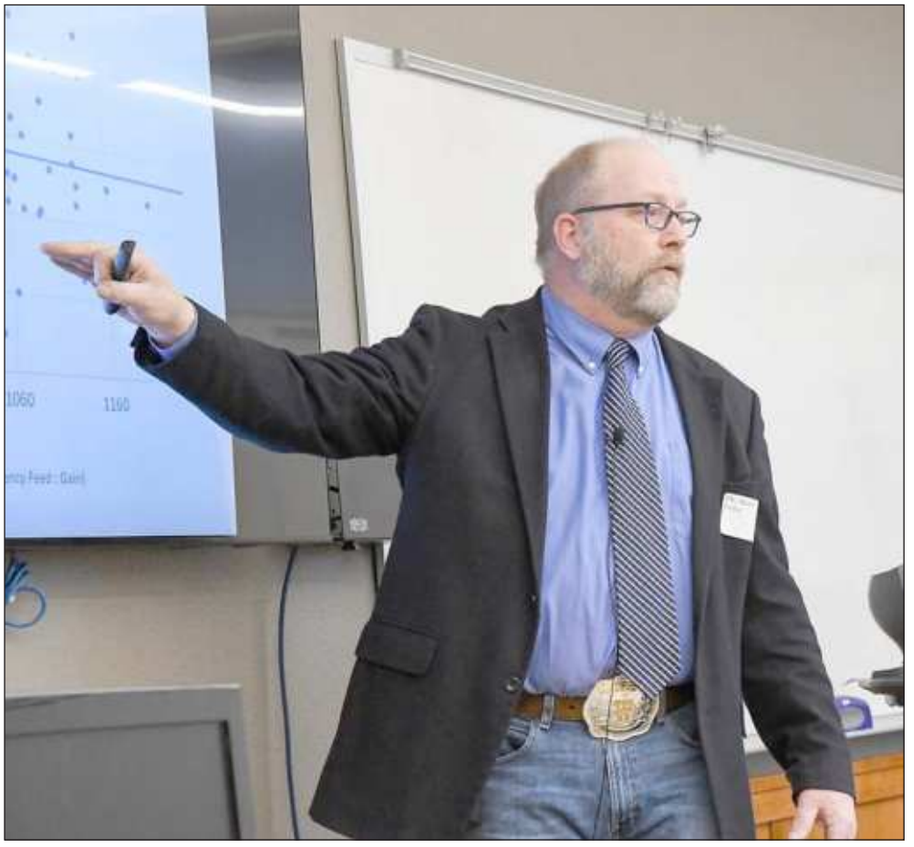
EWC's Director of Institutional Development John Hansen welcomed the audience and introduced each of the speakers during the event.

"I believe in the future of agriculture and that's what we're looking at today," Hansen said. "We're looking at drones and technology. What are better ways to better days for how we are going to manage the farms of the future."

The first presenter of the evening was the Associate Director of UW's Ranch Management and Agricultural Leadership (RMAL) Program Dr. Randall Violett. He presented on RMAL and livestock industry technology.

RMAL is a program that focuses on providing different learning opportunities for students and members of the community interested in ranch management and agriculture.

"Why this program," Violett asked. "We feel strongly that we want to graduate students that are deliberately prepared to take on the challenges of working in the agriculture industry and develop leadership skills to advance the industry and enhance the quality of life in the west."



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UW's Director of the James C. Hageman Sustainable Agriculture Research and Extension Center Dr. Steve Paisley speaking about incorporating precision into livestock management.

Violett also discussed common technology used in the industry. This technology includes solar panel-powered wells, soil profile sensors and Knight Livestock Collars. The wells and soil sensors can help optimize water use. The livestock collars can be used to track animals.

The final piece of technology Violett discussed was virtual fences. Virtual fences are a temporary fence option where the boundary is marked, and the animals wear electric collars triggered by the boundary. These types of fences could be beneficial to public permits that have been affected by wildfire and have restricted access to burned land.

"Now we can put a virtual fence around the burn scar, and not lose complete use of that allotment if you're on public land," Violett explained.

The next speaker was EWC's Precision Agriculture Professor Matt Scott. He spoke about multispectral drones, spray drones and precision agriculture.

"Precision agriculture is basi-

see **INNOVATION** page **6**


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Innovation: 'There are lots of different technologies ...'

FROM PAGE 4

cally micromanaging your farm so every square foot of your farm is giving you the maximum amount of return that you could possibly get with your investment," Scott explained.

Scott told the audience that GPS is the heart and soul of precision ag. By having a better understanding of their fields, a farmer can introduce Site Specific Crop Management (SSCM). If a farmer has a map of soil conditions and variability they can manage their crops accordingly and maximize profits.

According to Scott, there are several devices farmers can use to make these maps, including, different farming equipment, planes and drones. Drones can provide multispectral, high-resolution and quick results. In most cases, these multispectral images can help identify problems in the field quickly and before they become large issues.

"The advantage of that is you have a broader area of the spectrum you can look at to judge the health of the plant," Scott said. "You can detect the stress of that plan earlier and address that issue, that way you stop losing money."

The following presenter was UW's Director of the James C. Hageman Sustainable Agriculture Research and Extension Center Dr. Steve Paisley. His presentation focused on incorporating precision into livestock management.

Paisley discussed how technology can be tied to the challenges of the ag industry. It can help limit costs, provide knowledge and help improve livestock management.

"There are lots of different technologies out there that we can utilize to hopefully improve our efficiencies, improve our production and all these types of things," Paisley said.

The technologies that he described were the c-lock smart feed pro trailer, growsafe feeding system, electronic I.D. and carcass ultrasound. Each of these devices helps manage and/or monitor your cattle.

Next, Agriculture Professor Dr. Georgia Younglove spoke about the potential for gene editing and gene therapy in the beef industry.

Younglove explained that gene editing is the act of removing a gene to change it, and gene therapy is the act of adding a gene and hoping for it to take over. The first case of gene engineering was in the 1970s with BT corn. When engineering this corn, researchers added bacteria to the corn in order to kill caterpillars who attempted to eat it.

"When we start looking at gene editing, we have to ask, what will we do with it or why would we want to do it," Younglove said. "With livestock, we could improve their genes so we can make a superior livestock compared to what we have now."

She said the goals researchers have been working on with gene editing, include creating superior livestock and healthier cattle, making them more environmentally resilient and friendly and improving animal welfare. So far, the main characteristics that have been focused on have been removing horns, introducing a slick coat and diluting the color of the animal's coat.

"They're also looking at trying to modify milk so that the human population right now that is suffering from lactose intolerance can drink it," Younglove continued. "They figured out what causes the exact allergen in milk and they're looking at trying to do a 'knockout' on it to remove that particular gene."

The final speaker for the event was UW's Adjunct Faculty Member Dr. Gleyn Bledsoe. He discussed the aerial platform over Wyoming rangelands and the Ryse Recon ultralight personal eVTOL.

Bledsoe announced the company Ryse Recon had donated one of their new ultralight personal eVTOL vehicles to UW for a year. These devices look similar to a large drone, except they have a cockpit for a single person. They can reach speeds up to 63 mph, fly up to 400 feet off the ground and operate on both land and

*see **INNOVATION** page 6*

Innovation: UW to complete four short projects

FROM PAGE 6

CYNTHIA SHEELEY/WYOMING NEWSPAPERS INC.

EWC's Precision Agriculture Professor Matt Scott presenting on multispectral drones, spray drones and precision agriculture.

water.

"The company that produces these is called Ryse and they're a bunch of engineers with mechanical, electrical and aeronautical expertise," Bledsoe told the audience. "They developed this for agriculture. So far, they've used initial production prototypes in the Ohio area, and they wanted to find out if they would be useful up here in the mountains."

Bledsoe said their goal is to evaluate these devices' role, decide if they are practical for ag in Wyoming and evaluate their cost-effectiveness. UW will achieve this goal by completing four short projects over the next year. They also are planning a few collaborative projects with Wyoming agencies, such as forestry and Wyoming Game and Fish. They will explore applications for both beef and sheep operations, precision agriculture and wildlife management.

Bledsoe finished his presentation by saying, "Pardon the pun, but the world needs more flying cowboys."

Following this event, UW hosted two additional seminars this spring. One was on revenue diversification at the Northwest College in Powell on Mar. 30. The other was a leadership symposium and luncheon at the UW in Laramie on Apr. 20.

Those interested can visit https://www.uwyo.edu/uwag/rmal/index.html for more information.