

GSL Researcher

Fall 2022



Travis Mulliniks,
Range Cattle Nutritionist

Greetings from the faculty, cowboys, staff, and students at and associated with Gudmundsen Sandhills Laboratory.

The annual or intra-annual variation in weather conditions are always a test for livestock producers. Dry conditions the previous three years have been difficult. A lot of cows across the state were sold early in May due to drought. Some of our trigger points in our drought plan were made early in May by culling some bottom producing cows or cows that just didn't fit. We also opted to fertilize more sub-irrigated meadow than we usually do. Timely rainfall seemed to really help forage quality and growth. John Nollette did a great job navigating the conditions at GSL and cowherd management while not inhibiting any research projects. For an update on range conditions, Jerry Volesky has an article later in the newsletter that will get you up to date on the forage and rainfall conditions at GSL through July. Jacki Musgrave and John Nollette will update us later in the newsletter on the cattle operations.

This edition's employee spotlight is Andy Applegarth. Andy has been a part of the crew and/or the ranch manager at GSL for almost as long as there has been a GSL. Over the years, Andy has brought a lot of experience to crew. Later this fall, Andy is moving into retirement phase of his life. We are extremely thankful for the leadership and commitment Andy has brought to GSL over the years. Andy, we hope you enjoy retirement.

We have a lot of new "technology-based" research going on that is adding to the on-going production systems research. As new technologies for cow-calf producers come available or being developed, GSL should be on the forefront as a testbed for how, or if they work within our production systems. Yijie Xiong and her lab has made a lot of progress in being able to accurately estimate body weights of cows and yearling with 3-D imagery. We have new virtual fence research starting up this fall. Mitch Stephenson and his graduate student, Kaitlyn Dozler, have written a technical note on the use of virtual fence in production systems later in the newsletter. Virtual fence systems are not a new concept for the beef industry; however, in the last few years there has been a lot of interest in virtual fencing. With the increased interest, there has been an increase in companies in this space. In the next few years, we will likely see 5-6 companies with virtual fence product in the US.

This year's Open House will be a hybrid format with our traditional in-person event held at GSL along with being live streamed online webinar. We are excited about the lineup of speakers and topics for this year's Open House. You can find a complete agenda for the day later in the newsletter. If you are not or were not available to watch the Open House live, the recorded presentations will be available on the GSL website.

I hope you enjoy the August 2022 GSL Researcher. If we can do anything better to serve you, please let us know.

INSIDE THIS ISSUE

Greetings.....	1
Students.....	2
Range & Pasture Update.....	3
Technical Note.....	4
Ranch Update.....	5
Highlighted Research.....	6
GSL Open House Agenda.....	7
GSL Spotlight.....	8



INTERN UPDATE



Sara Erby has been an intern at GSL since May. She is originally from Pineville, Arkansas where she grew up on her family's Black Angus cow/calf operation. She starts her senior year this fall at Arkansas Tech University and will graduate in the spring with a B.S. in Agricultural Business & Animal Science. She was thankful for the chance to intern at GSL over the summer and learn new aspects of ranching and the research process.

Caleigh Iwanski started her internship at GSL in May. She grew up in Stockton, Kansas and has been involved with her parents' veterinary clinic and family's cow-calf operation as long as she can remember. She is currently a junior at the University of Nebraska-Lincoln studying Animal Science and Grassland Systems-Grazing Livestock. Caleigh is grateful for the unique opportunity to work as a ranch intern at GSL and has enjoyed all aspects of ranching and research.



Angelica Alcalá will be going into her senior year at California Polytechnic State University, San Luis Obispo studying Dairy Science with a minor in Rangeland Resources. At GSL, she is working for Mitchell Stephenson as a rangeland intern. She has had the opportunity to assist grad student Kaitlyn Dozler with her virtual fencing research, clip and weigh grass samples from GSL and Barta Brothers Ranch, and work with cattle.

GRADUATE STUDENT UPDATE

Kaitlyn Dozler: M.S student from Spalding, NE, is working with Mitch Stephenson and Andrew Little. She received her bachelor's in Fisheries and Wildlife with a minor in Grassland Ecology and Management from the University of Nebraska at Lincoln in May 2022. She moved out to the ranch for the summer to start her graduate research. Her research investigates the potential impacts virtual fencing can have on cattle stress, precision grazing strategies, and wildlife.



Nicole Woita, M.S. student working with Travis Mulliniks and Kacie McCarthy, successfully defended her thesis and graduated in August. She is currently searching job opportunities.

The Gudmundsen Sandhills Laboratory (GSL) is a research ranch located in the heart of the Nebraska Sandhills. It is comprised of 11,600 acres of upland native range and 1,200 acres of subirrigated meadow. It was gifted to the University of Nebraska Foundation in 1978.

Since GSL's inception, research and educational programs have become more ecologically diverse and team oriented. Joint projects with animal, range, soil, veterinary, economics, entomology, geology, hydrology, forestry and wildlife have increased our understanding of the Sandhill's ecosystem. This has resulted in advances in range livestock nutrition, beef cattle reproduction, grazing systems, rangeland ecology, low cost cattle management, groundwater issues, and wildlife management.

RANGE & PASTURE UPDATE

By **Jerry Volesky**,
Range Scientist



Table 1. GSL Precipitation (inches)

Month	Average	20-21	21-22	21-22 Cumulative
Oct. – Mar.	3.69	5.57	1.68	1.68
April	2.04	0.62	2.40	4.08
May	3.31	2.37	3.56	7.64
June	3.50	2.85	0.97	8.61
July	3.06	1.66	3.39	12.00
August	2.17	0.85		
September	1.78	2.08		
Total	19.55	16.00		

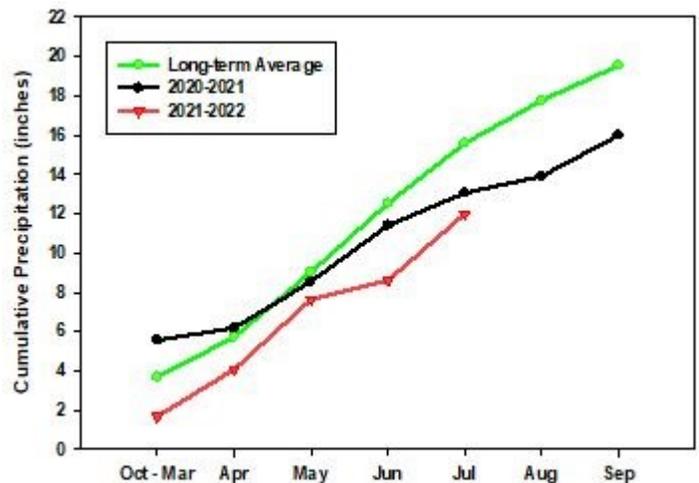
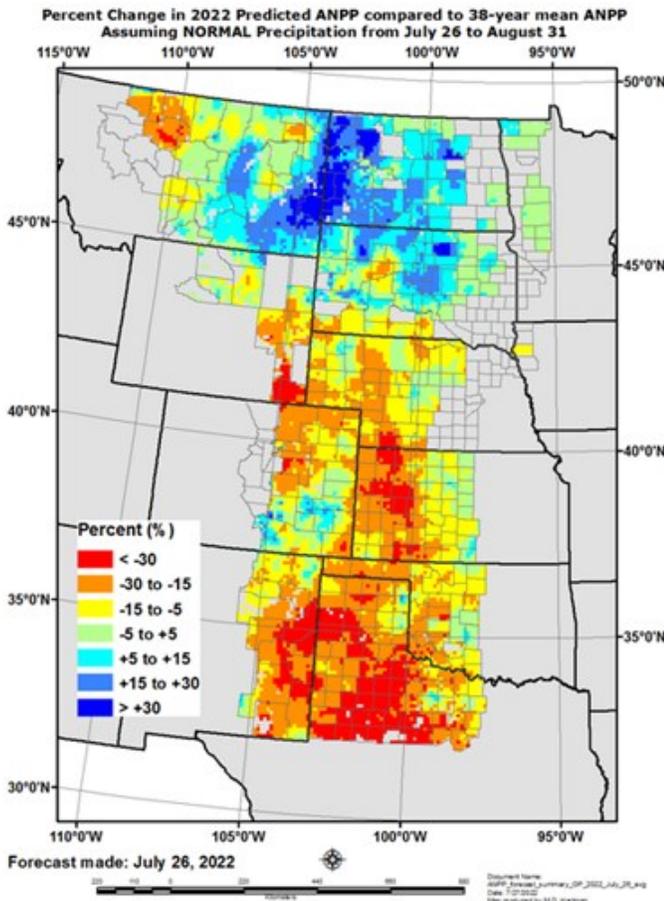
The 2022 growing season continues to see dry conditions at the Gudmundsen Sandhills Lab (GSL) and across most of the state. While April and May precipitation was near normal at GSL, rainfall during June was only 28% of the long-term average (Table 1). Through July, the cumulative forage year precipitation (since last October) was also below the long-term average and previous year (Figure 1).

From our annual mid-June sampling of upland range production at GSL, we found current year forage production at that time to be 899 lb/acre (Table 2). This is below the long-term average for that date. Most of the difference came from lower production of warm-season grasses. The dry June and cooler temperature in May likely contributed to that lower warm-season grass production.

Table 2. Mid-June forage production (lb/acre) of upland range at GSL by plant functional group, 2022.

	Cool-season grasses & sedges	Warm-season grasses	Forbs	Total
2022	562	241	96	899
2007 – 2021 average	533	412	99	1044

The Grassland Production Forecast (Grass-Cast), a model for the Central and Northern Great Plains does predict that 2022 range and pasture production will be below normal in most parts of Nebraska (Figure 2). The northern states of South Dakota, North Dakota, and eastern Montana, will have significantly greater range production compared to 2021 when they were in severe to exceptional levels of drought. Additional information on Grass-Cast can be found at <https://grasscast.unl.edu/>



Cumulative precipitation at the Gudmundsen Sandhills Laboratory from October 2021 through July 2022.

TECHNICAL NOTE: VIRTUAL FENCING



Kaitlyn Dozler, Graduate Student

Yijie Xiong, Precision Livestock Management Specialist

Mitch Stephenson, Range Management Specialist

As technology continues to improve and advance, the idea of virtual fencing, or being able to manipulate grazing management remotely through on-animal devices linked with GPS, has intrigued ranchers all over the world. The ability to adjust where herds are grazing in real time from a computer or smartphone would save time, labor, and make targeted and diversified grazing strategies more attainable to ranchers. At GSL, research is being conducted to explore how virtual fencing compares as a modern approach to traditional fencing for modified grazing strategies and the overall impact on cattle management and stress levels caused by the virtual fence collars.

Virtual fencing technology is used to create invisible boundaries that function similarly to a physical fence. Cattle are managed to stay within or away from designated areas. The technology is very similar to the idea of invisible fence collars for dogs. Richard Peck patented the concept of invisible fence in 1973 with the first research trials occurring in the late 1980's. The first virtual collars used for livestock management were successful but battery length and their cumbersome design made them impractical for commercial scale opportunities. Fast-forward to 2022 and the modern-day advances to the collar design and easy to use programs are making virtual fencing more accessible to ranchers.

On a virtual fence pasture, each cow is equipped with an around the neck wearable virtual fence collar (see picture 1). The collars use GPS to locate where the animal is located in relation to the user defined virtual fence. Low frequency signals are sent to a receiver tower and a cellular networks relays the information for real time updates on fence boundaries and GPS location data. Livestock managers have the ability to “build” fences on a map-based online user interface. These virtual fences can be formatted and changed quickly to meet the needs of grazing cattle and landscape vegetation use. When cattle go near the virtual fence, the first deterrent is a loud beeping sound administered by the collar if the cow gets within a certain distance of the virtual boundary, if the cow continues to move closer to the boundary a small electric shock will be emitted by the collars. *continued on page 6*



Cattle with virtual fence collars and an example of the online user interface with the white “fence” showing the area where cattle will receive a sound warning and the red “fence” showing areas where cattle will be shocked if they continue within the area. Current cattle GPS locations are represented by the black cattle icons.

RANCH UPDATE



By **John Nollette** and
Jacki Musgrave

With the mild winter and spring, calving conditions were good for both the March and May herds. We had 80% of March cows calve in the first 21 days of the calving season, down from 92% in 2021. However, 92% of March heifers calved in the first 21 days compared to 79% in 2021. Calving distribution for May cows had 84% calving in the first 21 days, similar to the 85% in 2021. Fewer May heifers calved in the first 21 days in 2022 than in 2021 (76 vs 83%, 2022 vs 2021).

Even with the dry conditions at GSL, hay production in our home valley for 2022 was 96% of our long-term average but 13% lower than 2021. This year we did fertilize 300 of the 475 acres in the home valley, 50 acres more than previous years. Hay production in the unfertilized south valley, was 25% lower than 2021. We were fortunate to get fertilizer at a good price and feel this helped us harvest close to our average production in a year considerably short of our average rainfall. Crude protein (CP) of 2022 hay was 9.2% compared to our average of 7.8%, whereas TDN was slightly lower (56.4 vs 57.1, 2022 vs average).

Forage quality in June was lower than average, but July quality was at or above average. Crude protein value of upland range diets collected from esophageal fistulated cows were 11.7% in June compared to our average of 12.6%. However, in July, upland range quality was similar to our average (10.1 vs 10.0%). Meadow CP values were also lower than average in June at 11.0 vs 14.3%. Meadow quality increased to slightly above average in July at 14.0 vs 13.4%. Dry conditions early contributed to lower-than-normal June values. Rain in early July seemed to really help those CP values hold or rebound.

Yearling gains over summer provide us a good indicator of forage quality. Average daily gains on sub-irrigated meadow were higher in 2022 than 2021. Gains from early May to early August were 2.45 lb/d in 2021 compared to 2.95 lb/d in 2022. The increase in gains may be partially due to the increased meadow quality we saw this year. We also decided in late April to decrease our number of yearlings due to dry conditions. This lower stocking rate could have also impacted diet quality selected by these cattle.

This summer was another busy one at GSL. We were fortunate to have the help of summer interns Sara Erby and Caleigh Iwanski. Selby Boerman and Nicole Woita have been full-time GSL residents for well over a year as they worked on their master's research. Selby left in June and Nicole plans to leave later this fall. A special thank you goes to these two ladies that have been more than willing to juggle the demands of their master's program with helping out with all the other activities at the ranch.



HIGHLIGHTED RESEARCH

Effect of feed additives in protein supplements on reproductive performance in young postpartum cows

Reproductive performance in young beef cows is often compromised due to a mismatch of physiological demands and suboptimal environmental conditions to support the increase nutrient requirements. Previous research has illustrated that increasing the post-ruminal supply of glucose can partition nutrients away from lactation, which results in decreased days to resumption of estrus and improved pregnancy rates in young range cows. This study was conducted over a three-year period (2019 – 2021) utilizing two- and three-year-old cows (n = 189) from the March-calving herd at the University of Nebraska Gudmundsen Sandhills Laboratory (GSL) located near Whitman, NE. Postpartum supplementation was provided at a rate of 2 lb/d of a 30 % crude protein supplement with the addition of either: 1) 160 milligrams per cow per day of rumensin (MON; Elanco Animal Health) or 2) 40 grams per cow per day of a propionate salt product called NutroCal 100 (CAP; Kemin Animal Nutrition and Health). Supplementation started approximately 10 d after parturition and continued through the first of June for an average of 70 days postpartum. Cow body weight and body condition score were not influenced by postpartum supplemental treatments at all measurement points from calving to weaning. Similarly, calf body weight and ADG were not influenced by supplemental treatments of their dam. In addition, 24-h milk production was not different between cows receiving either CAP or MON. However, overall pregnancy rates were greater in cows receiving CAP (89% pregnancy rate) compared to cows receiving MON (80% pregnancy rate). The results from this study indicated that supplying a protein supplement with the addition of either rumensin or calcium propionate did not improve cow body weight or BCS. However, addition of 40 grams per day of a propionate salt in a protein supplement resulted in increased pregnancy rates in young range cows. These results illustrate how reproductive performance can be uncoupled from changes in body weight or condition score. In addition, supplemental packages designed to provide metabolically potent feed additives can be strategically fed at small amounts can positively alter important economic production traits such as conception date and overall pregnancy rates.

This study was conducted by Tasha King as part of her PhD research working for Dr. Travis Mulliniks.



Nebraska Ranch Practicum class discussing meadow management June 7, 2022.

Technical Note: Virtual Fencing, *continued from page 4*

How can this benefit grazing managers? Virtual fencing systems give ranchers the ability to create diverse grazing strategies with very little or added expense of putting up miles of electric fence to create grazing paddocks when it can all be done in minutes from a computer. This allows for more flexibility in management without permanent or temporary fencing infrastructure. The virtual fence system allows for inclusion and exclusion grazing. For example, if a rancher burned half a quarter of pasture to get rid of cedar trees and they want to give more rest in the grazing season, virtual fence can be used to exclude the cattle from the burned half of the pasture. It can also be used to monitor where cattle are grazing and exclude those areas as the growing season progresses to provide in-season recovery while still grazing on areas that have had little or no grazing. Lastly, targeted cattle grazing at strategic locations for specific purposes (e.g., invasive species management) can be accomplished by managing virtual fencing to increase stock densities at these locations. More research is needed to develop a stronger understanding of the economic feasibility of this technology, but as the technology improves, there will be more opportunities to develop virtual fencing as a viable tool to manage cattle grazing across large landscapes.

**Gudmundsen Sandhills Laboratory:
Serving the Beef Industry for 43 years**



23rd Annual Open House

Wednesday, August 24, 2022

8:00 AM to 3:30 PM (MDT)

Gudmundsen Sandhills Laboratory

Wagonhammer Education Center

Whitman, Nebraska

This year's Open House will be a hybrid format with our traditional in-person event held at GSL along with being live streamed online. Activities, demonstrations and commercial exhibits are planned so our guests can come and go as they please throughout the day.

AGENDA

Time (MT)	Wagonhammer Education Center (WEC) and Ray Bohy Conference Room
8:00 AM	Registration
All day	Visit with vendors, please note the sessions in grey will be livestreamed.
8:15	Welcome - Kelly Bruns, WCREEC Director and Mitch Stephenson, Panhandle Interim Director
8:25	Cattle Markets Update - Dr. Elliot Dennis, UNL Extension Livestock Marketing Specialist
8:55	Long Range Weather Forecast - <i>Don Day</i>
9:30	Break - View exhibits
9:45	Eastern Red Cedar Control Methods - Dr. Dirac Twidwell, UNL Associate Professor in the Department of Agronomy and Horticulture
10:30	Post-fire Grazing and Forage Management - <i>Dr. Laura Goodman, Oklahoma State University Range Extension Specialist</i>
11:15	Environmental Footprint of Livestock Production - Dr. Galen Erickson, UNL Feedlot Extension Specialist
12:00	Lunch (furnished by co-sponsors and exhibitors; browse exhibits)
1:30	Yearling Production Systems Research - Dr. Jim MacDonald, UNL Ruminant Nutritionist
2:00	Yearling Systems Producer Panel - Moderated by Dr. MacDonald
	Breakout Sessions (In-person only) ~30 min each
2:30	1. <i>GSL Beef Research Update - Travis Mulliniks, UNL Range Cow Production Specialist; Kacie McCarthy, UNL Beef Cow-Calf Specialist; Yijie Xiong, UNL Precision Livestock Management Specialist</i>
	2. <i>GSL Range Research Update - Mitch Stephenson, UNL Range and Forage Specialist; Jerry Volesky, UNL Range and Forage Specialist</i>
3:30	Adjourn, thank you for attending!

GSL SPOTLIGHT: ANDY APPLGARATH

Although official records might disagree, Andy Applegarth has been working for UNL since he graduated from there with an animal science degree.

“In 1978 I graduated in the spring. I hunted around for jobs, and they had an opening at Mead [UNL’s Eastern Nebraska Research and Extension Center] under Jim Gosey and I went up for the interview. They were putting bulls out. I had a working interview. I put bulls out for them,” he explained.

A year later, Applegarth moved to UNL’s now defunct Sandhills Ag Lab, north of Tryon. After weaning in Fall 1981, Andy and the cow-herd moved to GSL. From 1992 to 1996, Applegarth sort of took a break from GSL.

“However, honestly, I worked at the university 'cause I was on call. I helped do some feeding,” he added with his signature chuckle.

Over the years, Applegarth has worked with numerous students and staff on a wide range of research projects (including one where they fed chicken manure). What has he enjoyed the most about working at GSL?

“Being around the research and the people I have learned a lot. And I learned constantly. I mean, I'm still learning. I have worked with a lot of really good people. The original crew that started GSL, that was, to me, a hell of a crew. They started it right.”

Applegarth has taken that knowledge and used on his own ranch, where he and his wife, Binda, raised three kids. Some of the biggest changes he’s seen in ranching during his time at GSL have been moving calving dates later in the spring and feeding different feed stuffs.

Later this fall, Applegarth will retire from UNL. He looks forward to “being able to go and do things.” Andy, we wish you nothing but the best!



Andy Applegarth and late neighbor Ralph Pat Vinton discuss the plan at a GSL branding.

GSL RESEARCHER CONTRIBUTORS

TL Meyer: 308-645-2267 or tl.meyer@unl.edu

Travis Mulliniks: 308-696-6707 or travis.mulliniks@unl.edu

Jacki Musgrave: 308-544-6515 or jacki.musgrave@unl.edu

John Nollette: 308-544-6515 or john.nollette@unl.edu

Mitch Stephenson: 308-632-1355 or mstephen-son@unl.edu

Jerry Volesky: 308-696-6710 or jvolesky1@unl.edu

Yijie Xiong: 402-472-3246 or Yijie.xiong@unl.edu

Contact GSL at 308-544-6430 or visit gsl.unl.edu

The GSL Researcher is designed and co-edited by TL Meyer, Beef Extension Educator, Thedford, and Jacki Musgrave, Research Technologist III, GSL, Whitman. The GSL Researcher is published in the spring and fall of each year.



The University of Nebraska does not discriminate based on race, color, ethnicity, national origin, sex, pregnancy, sexual orientation, gender identity, religion, disability, age, genetic information, veteran status, marital status, and/or political affiliation in its programs, activities, or employment.