

GSL Researcher

Fall 2021



Travis Mulliniks,
Range Cattle Nutritionist

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

Gudmundsen has been lucky to get timely rainfall during the growing seasons. Even with that rain, the ranch crew has done a tremendous job juggling the grazing management plan with research needs/goals while maintaining our cow numbers in the last two years of dry periods. Without John Nollette's leadership overseeing the ranch operations at GSL, much of what we do or try to do as scientists and specialists would not have happened.

We look forward to hosting the August 25 Open House in person this year, and we are livestreaming the morning session as well. That session focuses on sustainability, and we are excited to have Jason Sawyer, King Ranch Institute of Ranch Management, and Leah Beyer, Elanco, speak on this topic. We hope to provide information geared to increase environmentally sound, socially responsible, and economically viable practices supporting ag profitability to maintain beef production in Nebraska. We thank Elanco for their financial support of the Open House, allowing us to provide a quality program for our stakeholders. If you are not able to attend the Open House or watch the live webinar, the recorded presentations will be available gsl.unl.edu.

After a year off, the Nebraska Ranch Practicum started again this year with 31 participants in this class.

We are part of a three-state collaborative project with Montana State University and Oregon State University that secured \$3 million annually for five years from the USDA Agricultural Research Service. The focus of the project is to develop and address 1) precision management in livestock nutrition and selection, 2) precision tools to monitor rangeland productivity and utilization, and 3) precision livestock and rangeland management outreach and education programs.

We are excited to see how this funding and research can impact producer productivity and sustainability. Earlier this year, Yijie Xiong, UNL Precision Livestock Management Specialist, started a preliminary study looking at the efficacy of cameras and artificial intelligence to estimate body weight and condition score of grazing livestock. Mitch Stephenson starts projects later this fall using virtual fencing. In addition, we continue with our precision supplementation research using two C-Lock pasture-based feeders. We are purchasing two more feeding systems that will allow us to weigh cattle at each feeding event. With volatile commodity markets, increased drought occurrences, and other environmental and marketing challenges, we believe these funds will help us develop new livestock, range management, and decision-making tools that allow for efficient and environmentally responsive livestock production and improving rangeland health.

Please enjoy the August 2021 GSL Researcher. If we can do anything to better serve you, please let us know.

INSIDE THIS ISSUE

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

INTERN UPDATE



Brittney Emerson has been interning at GSL since May. She grew up on her family's ranch neighboring GSL's south place. She is currently a senior at the University of Nebraska-Lincoln studying Grazing Livestock Systems with a minor in Agricultural Leaderships and Environmental Communications. She has enjoyed all of the unique opportunities to learn during her time at GSL this summer!



Jessica Starr began her internship at GSL in May. She is originally from Mullen, Nebraska and will graduate with her B.S. degree in Animal Science from Fort Hays State University this winter. She has learned a lot this summer from daily ranch work to gathering research data. She has really enjoyed her time spent at GSL.

GRADUATE STUDENT UPDATE



Selby Boerman, M.S. student, working with Travis Mulliniks and Mitch Stephenson, and **Nicole Woita**, M.S. student working with Travis Mulliniks and Kacie McCarthy, moved to GSL full-time this spring while finishing their graduate programs.



Check out seasonal drone footage of GSL's South Meadow on YouTube by scanning the QR code below or visit go.unl.edu/csbeefyoutube



Selby Boerman (left) and Jess Milby talking Sandhills Plant ID at the Nebraska Ranch Practicum in July.

GSL SPOTLIGHT

Jess Milby



Jess Milby has worked with Jerry Volesky as the range and forage research technologist at UNL's West Central Research, Extension, and Education Center, North Platte since the fall of 2014. She grew up on a farm outside Fullerton, NE and discovered her love of range (especially the plants) through range judging in high school. She attended UNL and received a B.S. in Rangeland Ecosystems and M.S. in Natural Resources. She has been involved in a variety of research projects at the Barta Brothers Ranch ranging from grazing systems to prairie chickens and collects forage production data at GSL every summer. Jess is a self-proclaimed plant nerd and recently co-authored Legumes of the Great Plains. In her free time, she enjoys visiting family and friends, spending time in nature, and traveling to experience new places/foods/cultures. Her goal is to visit all 7 continents and so far she has been to 5.

RANGE & PASTURE UPDATE

By **Jerry Volesky**,
Range Scientist

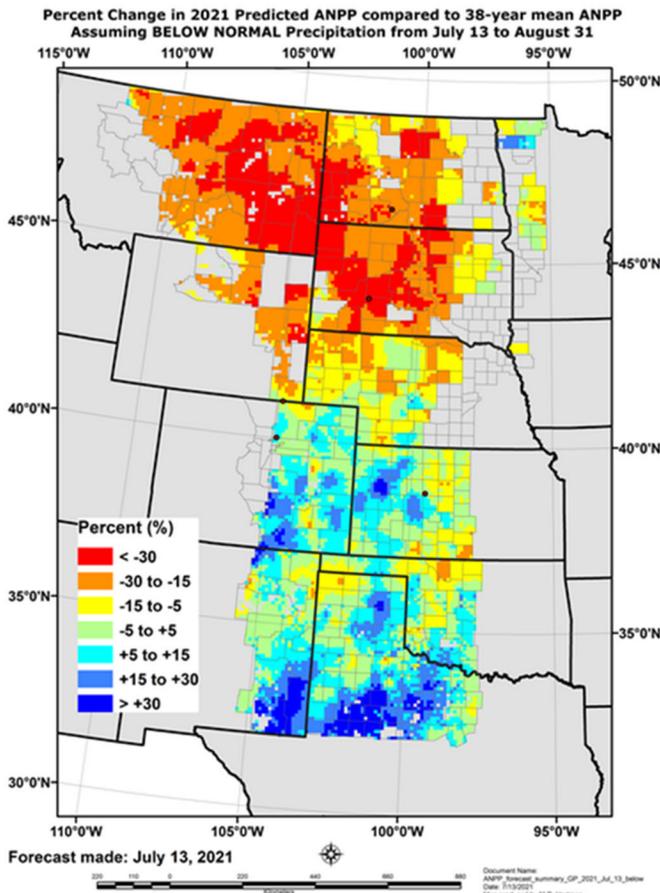


Month	Average	2019-2020	2020-2021	2020-2021 Cumulative
Oct. – Mar.	3.36	5.32	5.57	5.57
April	2.14	0.88	0.62	6.19
May	3.04	4.10	2.37	8.56
June	3.66	2.28	2.85	11.41
July	2.95	4.04	1.63	13.04
August	2.15	0.54		
September	1.76	0.71		
Total	19.06	17.87		

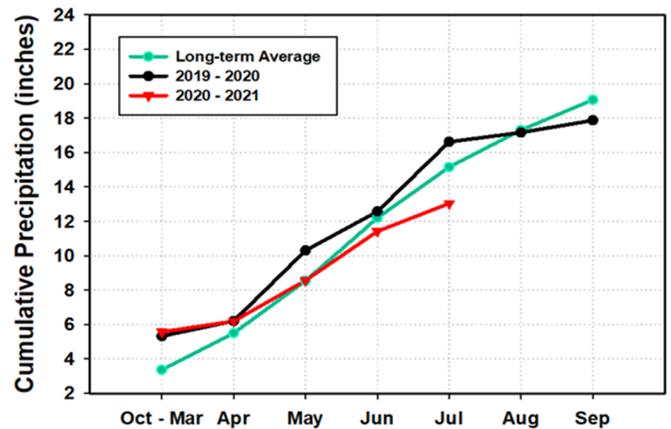
	Cool-season grasses & sedges	Warm-season grasses	Forbs	Total
2021	554	365	83	1002
2007 – 2020 average	533	412	99	1044

The 2021 growing season continues to see dry conditions at GSL and across many parts of the state. At GSL, monthly precipitation during the critical months of April, May, June, and July was below the long-term average (Table 1). Through July, the cumulative forage year precipitation (since last October) was also below the long-term average (see below).

From our annual mid-June sampling of upland range production at GSL, we found current year forage production at that time to be 1,002 lb/acre (Table 2). This is slightly below the long-term average for that date. Most of the difference came from lower production of warm-season grasses. Annual upland range production (measured in late August) in the central Sandhills averages about 1850 lb/acre. It is likely that the 2021 annual production will be markedly lower than average given the lower precipitation amounts in late June and through July.



The Grassland Production Forecast (Grass-Cast), a model for the Central and Northern Great Plains, does predict the 2021 range and pasture production will be below normal in many parts of Nebraska (see left from July 13, 2021). South Dakota, North Dakota, and Montana, which of course, are currently in severe to exceptional drought levels will have significantly reduced pasture and range production. Additional information on Grass-Cast can be found at <https://grasscast.unl.edu/>



Cumulative precipitation at the Gudmundsen Sandhills Laboratory from October 2020 through July 2021.

TECHNICAL NOTE: HEARTRATE LOGGERS



Travis Mulliniks,
Range Cattle Nutritionist

In the last few years, we have been conducting studies using indwelling heart rate loggers (Figure 1) and GPS collars on young, range cows. Heart rate monitoring is common in the equine industry, where animal stress response, recovery, and training intensity are of high importance. Heart rate has been used to monitor changes in activity level of the sympathetic nervous system in cattle, and an increased heart rate is a good indication of short-term stress. In addition to indicating stress, heart rate can give us an idea of how much energy is used during grazing. Energy use, or expenditure, of range cows has been determined mostly under controlled, confined conditions. These conditions do not necessarily reflect those of free-ranging animals or of commercial cattle in feedlots. Environmental conditions, feeding level, time spent eating and digesting, tissue and hair conductance, production level, and season of the year may affect the energy expenditure of animals. Combining other technologies like GPS have also enabled researchers to combine information on various activities with data such as locomotion speed and traveling distance, to measure energy expenditure over short intervals, and to calculate the energy cost of each specific activity and of distance traveled under diverse grazing conditions.

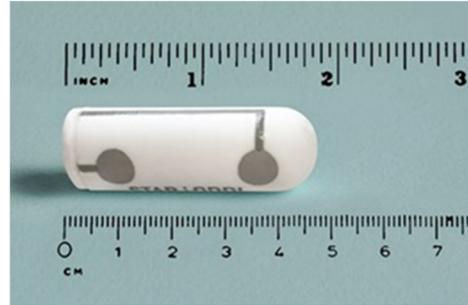


Figure 1. Indwelling heart rate logger.

So why does all this matter?

Measuring efficiency in extensive cow-calf production systems is either unattainable or measured after the fact (i.e., open cows). Identifying range cows in better fitness may indicate overall production efficiencies. While a thorough investigation of this concept is still incomplete for range livestock, there are strong indicators that this may be true. Preliminary data has shown cows with increased adaptive metabolism are more resilient to environmental stress like drought and are still reproductively competent. Previous research has indicated heifers grazing rangeland exhibit a lower resting heart rate and experience an increase in average daily gain compared with heifers fed in confinement. In the future, continuous monitoring of heart rate might provide producers with a sensitive tool for identifying changes in the energy status or energy efficiency of their cows.

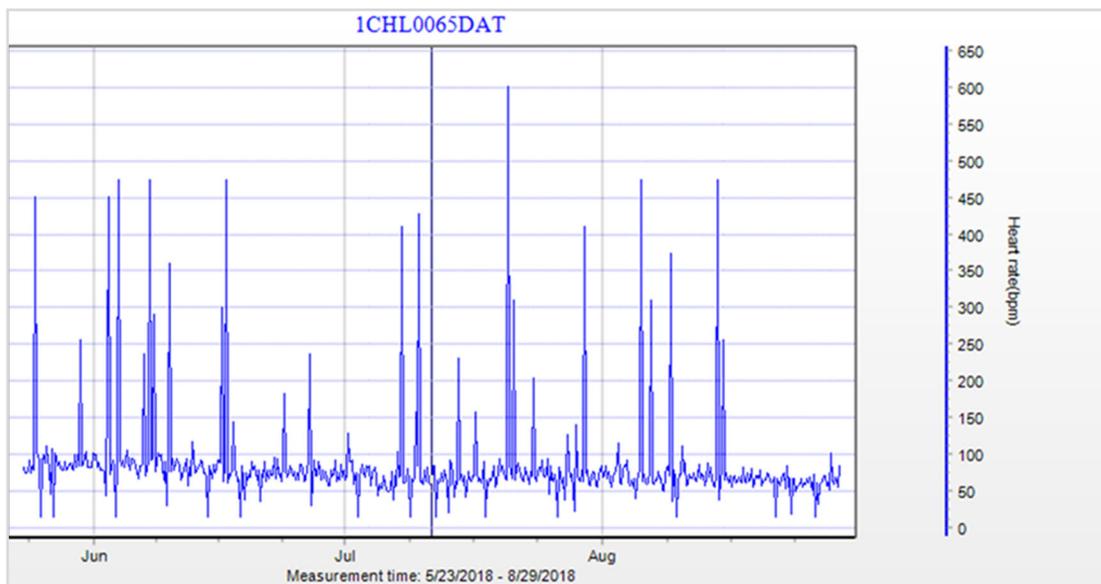


Figure 2. Heart rate of a May 2-year-old range cow grazing upland range during the breeding season.

RANCH UPDATE



By **John Nollette** and
Jacki Musgrave

Calving in both the March and May herds went well this year. Like most in the Sandhills, we had one major storm in March; however, we made it through that with minimal death loss. We had 92% of March cows and 79% of March heifers calving in the first 21 days. In the May herd, calving distribution was similar between cows and heifers at 85 and 83% calving in the first 21 days. We have used a 45-day breeding season on both cows and heifers for almost 20 years. Due to the number of late calving heifers each year, we decided to move the March and May heifer breeding season to a 30-day season. We hope this will help on the rebreeding percentage in the 2-year-old cows that has been a challenge.

We utilized artificial insemination (AI) on two studies this year. In the March herd, 40 mature cows were bred to a terminal sire using either sexed or conventional semen. Our May 2- and 3-year-old cows were bred to high-milk EPD Red Angus sires. The high-milk Red Angus sires were selected to mimic current practices in the industry and create a higher milking group at GSL. The 7-day Co-synch + CIDR with timed AI protocol was used on both groups. The response rate to synchronization was 85.7 and 59% in the March mature cows and young May cows, respectively. Response was measured by heat detection patch score. Both groups increased about four percentage points from 2020.

Forage quality early in the grazing season was lower than our average. Crude protein (CP) value of upland range diets collected from esophageal fistulated cows were 10.4% in June compared with our June average of 12.2%. However, in July, upland range quality picked up slightly above our long-term average (11.9 vs 11.2%). Our meadow CP values responded similarly from June to July, increasing from 10.9 to 13.6%. Conditions were dry in late May and early June but timely rains later in June and early July allowed for CP values to rebound.

We decided to fertilize our hay meadows again this year. The fertilizer and timely rainfall paid off for our hay production. Hay production was 18% greater than last year and 8% over our long-term average. However, with the hot dry weather since hay was harvested, we have not seen much re-growth. We hope to get enough rain this summer for meadow regrowth for fall and winter grazing.

As usual, summer is a very busy time at GSL with intensive data collection on multiple studies, along with the normal ranch activities. We have been fortunate to have help from interns, Brittney Emerson and Jessica Starr, and graduate students, Selby Boerman and Nicole Woita.



HIGHLIGHTED RESEARCH

Impact of cow size on cow-calf and postweaning progeny performance in the Nebraska Sandhills

In efforts to increase income, cow-calf producers have placed heavy selection pressure on growth traits to increase weaning and yearling weights. Previous research focused on cow size and production system efficiency is limited in the number of animals evaluated and duration of the study (ie., only up to weaning). Cow-calf data were collected from 2005 through 2017 from both March- and May-calving herds at GSL. The objectives of this research were to determine the impact of mature cow size on 1) preweaning calf growth and weaning weights and cow reproductive performance, 2) postweaning steer feedlot growth performance and carcass characteristics, 3) postweaning heifer progeny growth and reproductive performance, and 4) impact of cow size on the profitability of the cow-calf segment and retaining ownership of steer calves. The average mature cow BW over the 13-yr period was 1102 lb and ranged from 642 to 1744 lb. Compared to the national average body weight that has been reported to be over 1350 lb, it is likely that this study contains cows smaller than the current national average cow size. Cow pregnancy rates in the study were positively influenced with increasing cow body weight. Using regression coefficients, smaller (1,000 lb) cows were estimated to have 90% pregnancy rates, whereas larger (1,220 lb) cows were estimated to have 96% pregnancy rates. The increased pregnancy rates with increased cow body weight may have been driven by the ability for larger cows in the current data set to gain body weight more quickly after calving. Calf-adjusted 205-d weights increased by 32 lb for every 220-lb increase in cow mature body weight. Although heifer body weights increased with increasing dam mature body weight, heifer reproductive performance was not impacted by size of dam. Steer feedlot entry BW, reimplant BW, and final live BW increased with every additional 220-lb increase of dam mature body weight. However, feedlot ADG was not influenced by dam mature body weight. Regardless of pricing method or marketing strategy in this dataset, cow-calf producers maximize the highest amount of profit by selecting smaller cows. Larger cows than the ones evaluated in the current analysis may yield different results in limited nutrient environments.

To view the manuscript, see: <https://academic.oup.com/tas/article/4/4/txaa194/5940764?searchresult=1>



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



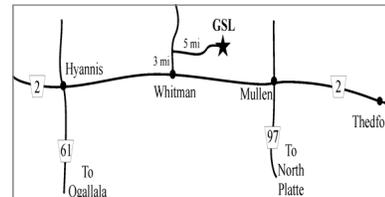
Thank you to our
2021 corporate sponsor



Please join us at the University of Nebraska–Lincoln Gudmundsen Sandhills Laboratory for the 22nd Annual Open House. 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. The online webinar will only cover the morning sustainability topics. Activities, demonstrations and commercial exhibits are planned so our guests can come and go as they please throughout the day.

Please RSVP online at: <https://go.unl.edu/2021-gsl-openhouse> or call Jacque @ 308 696-6700 by August 18 for the complimentary lunch.

**Wednesday, August 25, 2021
8:00 AM to 3:30 PM (MDT)
Gudmundsen Sandhills Laboratory
Wagonhammer Education Center
Whitman, Nebraska**



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.
8:20	Welcome
8:30	Cattle Markets Update - Dr. Elliot Dennis, UNL Extension Livestock Marketing Specialist
9:00	Sustainability: What does it mean at the ranch level? - Dr. Jason Sawyer, King Ranch Institute for Ranch Management
10:00	Break - View exhibits
10:15	Sustainability & Media’s Influence - Leah Beyer, Elanco
10:45	Producer panel on direct marketing - Moderated by Brianna Buseman, UNL Meats Ext. Asst. Professor
	◆ Dan and Clarissa Feldman, Setting D Ranch https://www.settingdranch.com
	◆ Jaclyn Wilson, Diamond D Beef https://www.flyingdiamondbeef.com
11:30	Rusty Kemp (update on Sustainable Beef LLC)
11:40	Lunch (furnished by co-sponsors and exhibitors; browse exhibits)
1:00	◆ Early Calf hood immunity - Dr. Bruce Hoffman, Elanco
	◆ Leveraging immunologic memory for long-term protection in the cowherd - Dr. Brian Vander Ley, Great Plains Veterinary Education Center
	Breakout Sessions (In-person only) ~30 min each (Attendees can attend 3 of the 4 sessions)
2:00	1. <i>Flies and Lice</i> - David Boxler, UNL Livestock Entomology Extension Educator
	2. <i>GSL Beef Research Update</i> - Travis Mulliniks, UNL Range Cow Production Specialist; Kacie McCarthy, UNL Beef Cow-Calf Specialist; Yijie Xiong, UNL Precision Livestock Management Specialist
	3. <i>GSL Range Research Update</i> - Mitch Stephenson, UNL Range and Forage Specialist; Jerry Volesky, UNL Range and Forage Specialist
	4. <i>Pregnancy checking demonstration</i> - Rick Funston, UNL Beef Cattle Reproductive Physiologist
3:30	Adjourn, thank you for attending!

GUDMUNDSEN SANDHILLS LABORATORY

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.



PUBLICATIONS & AWARDS

Kodati S, Adesemoye AO, Yuen GY, **Volesky JD**, Everhart SE. (2021) Origin of agricultural plant pathogens: Diversity and pathogenicity of *Rhizoctonia* fungi associated with native prairie grasses in the Sandhills of Nebraska. PLOS ONE 16(4): e0249335. <https://doi.org/10.1371/journal.pone.0249335>

Grant awarded to **Travis Mulliniks** and **Mitch Stephenson**. 2021. Improving production through the development of precision rangeland management technologies. USDA-ARS, \$2,250,000

Grant awarded to **Yijie Xiong** and **Travis Mulliniks**. 2021. Optimizing rangeland cow-calf production with precision livestock management tools. USDA-NIFA ARD Hatch Multistate Enhanced Program, \$150,000.



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