GSL Researcher

Spring 2024

Mitch Stephenson,
Range and Forage Specialist

Greetings from the staff, students, researchers, and crew at the Gudmundsen Sandhills Lab!

Last year was a year of change at GSL. In August 2023, Travis Mulliniks, Range Cow-Calf Nutritionist, took a position as Associate Head of the Department of Animal and Rangelands Sciences at Oregon State University. Dr. Mulliniks was instrumental in developing the GSL Researcher newsletter, developing research projects at GSL, and contributing to extension outreach over the last 5 years. We wish Travis well in his new endeavors. This has left a hole at the ranch for the important role of Cow-Calf Nutritionist. Jacki and John and other UNL researchers are working to make sure that multiple research projects at the ranch continue and we are hopeful we will be able to welcome new faculty at the ranch in the coming months.

Continuance of long-term research projects has been, and will continue to be, vital to the success of work happening at GSL. Since UNL began research work at GSL in 1981, multiple researchers have used this tremendous working ranch laboratory to provide important livestock and rangeland research for ranchers in the Nebraska Sandhills and beyond. Many of these projects are applied in nature and are the direct results of addressing challenging problems that ranchers have presented to us. Long-term cattle production data collected at the ranch includes research exploring 18 years of cow milk production on calf performance (go.unl.edu/gslmilkproduction), 12 years of data exploring the age of the dam on heifer performance (go.unl.edu/ageofdam), and multiple years of data exploring late-term supplementation (go.unl.edu/lategestationsupp). The extent of these studies allows for larger sample sizes and measurements over a wider range of environmental conditions. These are just a few of the studies that have required strong continuity of data collection and organization.

Like cattle production, rangeland research at the ranch has explored changes that happen over weeks (example: changes in nutritive value of different plant species during the growing season) to long-term changes that happen over decades. We recently analyzed a data set that started nearly 20 years ago. In 2004, Dr. Jerry Volesky had the foresight to begin collecting rangeland plant production data annually to develop a record of how precipitation and temperature influenced total plant production and biomass of important plant functional groups (e.g., warm-season grasses, cool-season grasses and sedges, forbs, and shrubs) at GSL. Multiple scientists, grad students, and interns have participated in collecting these data from grazing exclosures in mid-June and mid-August. With multiple years of data, we are learning more and more about the dynamic response of upland sandhill plant communities to the timing of precipitation and temperature variability within and across years. The only way we can fully understand these dynamics is with multiple years of long-term data to determine the best models for explaining plant biomass.

In addition to the long-term research at the ranch, long-term outreach programs have been an important mission at GSL for disseminating research-based information to ranchers. The Nebraska Ranch Practicum has provided hands-on training within a holistic learning framework for 25 years to more than 750 participants. On August 21, 2024, we will celebrate the 25th consecutive annual Open House at GSL. We are excited to host this event and look forward to providing updates on current research as well as reflection on the foundational research that has happened at GSL. We hope you will be able to join us!

INSIDE THIS ISSUE

UNL GUDMUNDSEN SANDHILLS LABORATORY

GSL SPOTLIGHT

Troy Gilmore was first introduced to GSL in January 2016. He has enjoyed visiting ever since, not only to conduct research on connections between streams and groundwater, but also to enjoy the beauty of the Sandhills. Troy grew up hunting and fishing in a wooded, rural part of Ohio. His engineering degrees are from North Carolina State University. He enjoys spending time with his family, exploring new places, and bike riding on trails and gravel roads. Read more about Troy's GSL work at go.unl.edu/sandhillswater.

GRADUATE STUDENT UPDATE

Josie Crouch: M.S student from Rolla, MO, working with Kacie McCarthy and Travis Mulliniks, will graduate in August. Her heifer development research will come in handy as she starts her new job in Nebraska Extension. She will be working as a Livestock Systems Educator and based in Fullerton.

Rush Receives NC Foundation Award

Nebraska Cattlemen honored Ivan Rush (pictured above with wife Doris) with the Friend of the Nebraska Cattlemen Foundation Award Dec. 7, 2023.

Formerly the beef extension specialist at the UNL Panhandle Research Extension and Education Center, Rush was one of the original organizers of the Range Beef Cow Symposium (RBCS), a respected production-level beef cow-calf educational meeting. Rush was part of the team of range livestock specialists that helped establish and configure GSL to investigate production and management questions pertinent to the region.

Read more about Ivan at https://ianrnews.unl.edu/scottsbluff-cattleman-receives-award-commitment-beef-industry.

RANGE & PASTURE UPDATE-GRAZING IN 2024

By **Jerry Volesky**,
Range & Forage Specialist

2023 Weather and Forage Production at GSL

Total annual precipitation during 2023 at the Gudmundsen Sandhills Lab (GSL) was 22.23 inches which was 2.40 inches above the long-term average (Table 1). Total precipitation during May, June, and July was well above average and contributed to excellent pasture growth.

In 2023, overall upland range forage production at GSL was 11% higher than the long-term average (Table 2). Warm-season grass production was higher than the long-term average in response to the wet June and July. Cool-season grass and sedge production was below the average.

Table 1. 2023 Monthly precipitation and temperature data for GSL.

Month	Precipitation (inches)	Departure from Average
January	1.00	0.68
February	0.80	0.35
March	0.85	0.02
April	0.76	-1.30
May	5.00	1.68
June	4.50	1.07
July	4.68	1.61
August	2.04	-0.15
September	1.25	-0.49
October	0.15	-1.07
November	0.20	-0.33
December	0.64	0.33
Total	**22.23**	

Table 2. Forage production of upland range at GSL by plant functional group, 2023.

	Cool-season grasses & sedges	Warm-season grasses	Forbs	Shrubs	Total
	lb/acre				
2023	**444**	**1,055**	**359**	**119**	**1,977**
2004 – 2023 average	**627**	**870**	**232**	**45**	**1,778**

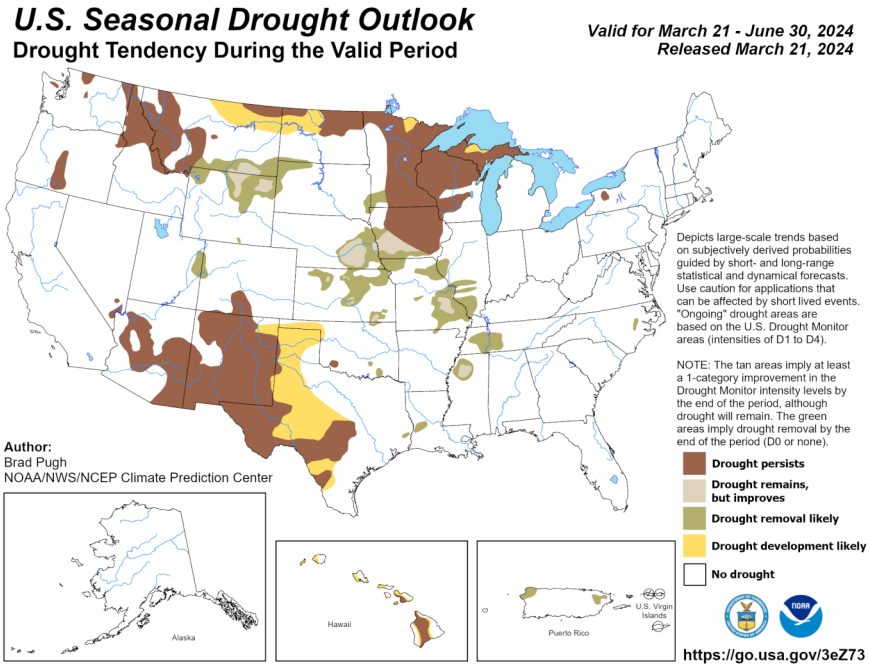

***Figure 1**. U.S. Seasonal Drought Outlook for March – May 2024.*

2024 Spring and Early Summer Outlook

The U.S. Seasonal Drought Outlook through June 30 is optimistic and suggests an easing of drought conditions in eastern Nebraska (Figure 1). The current El Nino pattern is expected to dissipate by early summer and be replaced by a La Nina pattern.

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The NOAA long-term precipitation outlook for June, July, and August 2024 shows a chance for below normal precipitation during that period. (Figure 2).

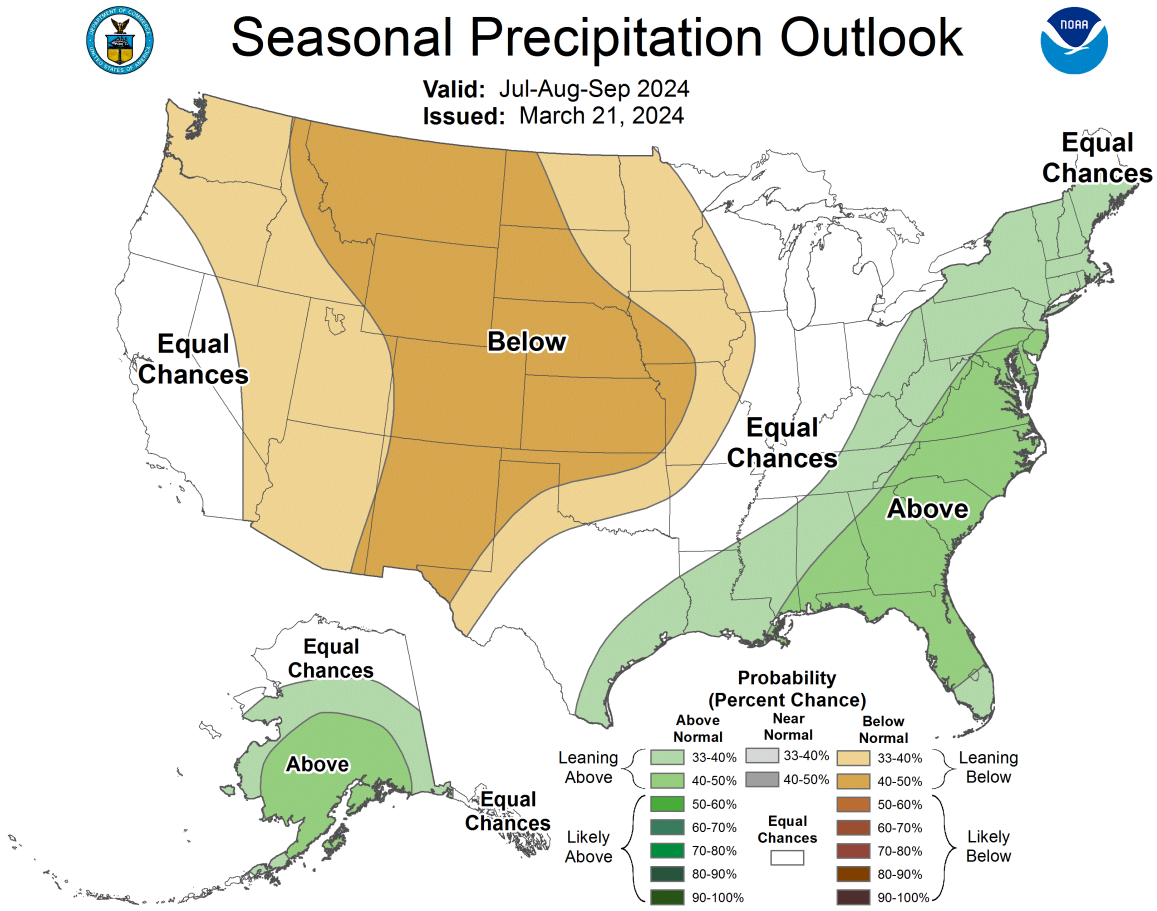


Figure 2. NOAA long-term precipitation probability outlook for June, July and August 2024.

2024 Grazing Plans

As always, putting together a grazing plan for 2024 should include the possibility of dry conditions. Some general key points include:

- Evaluate 2023 grazing records with emphasis on:
  - Time of grazing
  - Stocking rate
  - Amount of residual herbage
- Outline a (flexible) plan for the entire 2024 season.
- If you use rotational grazing with several pastures, remember to change the sequence in which you rotate through the pastures to avoid grazing the same pasture during the same time period in consecutive years.

RANCH UPDATE


By **John Nollette** and **Jacki Musgrave**

With the exception of about 10 days in January, we have had a pretty mild winter at GSL. After the winter of 2022-2023, we have appreciated the warmer weather and lower snowfall totals.

A combination of fertilization and higher than normal precipitation resulted in a 2023 hay crop that was 17% over our long-term average. Although the quantity was higher, both crude protein (CP) and energy (TDN) were lower than average (6.7 vs 7.8% CP and 51.9 vs 56.8% TDN for 2023 vs average, respectively). We were not surprised by this after seeing much lower CP values in our July meadow diet samples (7.9 vs 13.2%, 2023 vs average).

Calf weaning weights for mature March calving cows were slightly lower than average (8 lb) in 2023 but considerably lower than 2022 (58 lb). Weaning weights for March 2- and 3-year-old cows were also lower than average (35 and 32 lb lower for 2- and 3-year-olds, respectively). Mature May calving cows weaned calves 13 lb lower than average in 2023. May 2- and 3-year-old cows also weaned lighter than average calves in 2023 (12 and 29 lb lower than average for 2- and 3-year-olds, respectively).

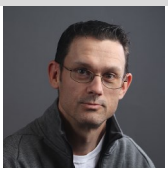
March-calving mature and young cow body condition scores (BCS) at weaning in 2023 were similar to average (5.3). Mature May-calving cows BCS were 0.3 lower than average in 2023 while May 2-year-olds were 0.1 lower than average.

Pregnancy rates for mature March-calving cows were higher than average (94.9 vs 92.3%, 2023 vs average, respectively). March 2- and 3-year-old cows had lower than average preg rates (79.2 and 81% vs 87.8 and 84.4% for March 2- and 3-year-olds, 2023 and average, respectively). March heifers were slightly below average as well (80 vs 82%, 2023 vs average, respectively). Mature May-calving cows had higher than average pregnancy rates (95.9 vs 91.0, 2023 vs average, respectively). May 2-year-old pregnancy rates were higher (79.6 vs 77.6, 2023 vs average, respectively), while 3-year-old pregnancy rates were lower (80 vs 89.3%, 2023 vs average, respectively). May heifers were lower than average (47 vs 65.8%, 2023 vs average, respectively). We feel that lower forage quality combined with residual effects of the hard winter of 2022-2023 had an impact on our young cow pregnancy rates, especially in the May-calving herd.

March calving has started off well. March heifers are 75% done at 15 days post due date. March cows have 35% calved two days post due date.

We have been fortunate to have Josie Crouch at the ranch since May 2023. Josie has been working on her MS degree with Kacie McCarthy and Travis Mulliniks. Josie will complete her program in May and has accepted the Livestock Systems Extension Educator position in Nance County. Thank you for all your help, Josie, and we wish you the best in your new role with Nebraska Extension!

Heritability of milk yield traits March- and May-Calving Cows at GSL



Matt Spangler, Extension Beef Genetics Specialist
Travis Mulliniks, Range Cattle Nutritionist, Oregon State

As part of a USDA-CARE grant looking at the impacts of increasing milk production in cow-calf production systems,data were analyzed to characterize milk production parameters and the heritability of milk production in the March and May-calving herds at GSL. See the Fall 2023 GSL Researcher for impact of calving season on milk production characteristics.

Given the GSL herd has undergone routine genotyping since 2019, genetic analysis including estimating the heritability of traits important to cow-calf production can be conducted. Table 1 includes heritability estimates of parameters of the lactation curve (Wood's curve) and milk yield at each time of collection (days postpartum). Total milk yield (area under the curve of the Wood's curve) and milk yield at peak lactation were both moderately heritable; for these two traits between 26-37% of the variation was estimated to be due to variation in additive genetics. These heritability estimates are similar to what we typically observe for growth traits. Persistence of lactation was lowly heritable. Given when recording started after calving and when peak lactation occurred in these data, estimating the heritability of time to peak milk yield was not possible because enough records did not exist. Milk yield by collection time was moderately to highly heritable except for 120 d postpartum.

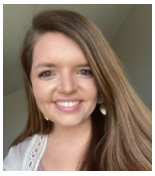
Another way to look at milk yield is as repeated observations across a single lactation, treating each time point as the same trait simply recorded at different times. The repeatability model allows us to separate genetic effects from those that are permanent environmental effects of the cow and estimate how repeatable a cow's performance is likely to be (additive genetics + her permanent environmental effect). At least in these data, the permanent environmental effects of the cow were negligible and thus repeatability was low. Collectively, these results suggest milk yield and characteristics of the lactation curve are under genetic control.

Do not confuse Milk EPD with any of the parameters studied here. Milk EPD is expressed in units of calf weaning weight attributed to differences in maternal environment.

Table 1: Mean, Standard Deviation, and Heritability Estimates of Milk Yield Traits of March and May-Calving Cows at UNL's Gudmundsen Sandhills Laboratory. (* Repeatability estimate, i.e., permanent environmental variance = 0)

Model	Trait	Mean	StdDev	Heritability
Wood's Curve	Milk Yield, lb	2,377	513	0.37 ± 0.13
	Time to Peak Milk Yield, d	30.3	30.2	Not Estimable
	Peak Milk Yield, lb/d	19.9	9.0	0.26 ± 0.14
	Persistence	6.4	1.7	0.08 ± 0.13
By Day	Milk Yield: 30 Days	16.7	5.6	0.42 ± 0.13
	Milk Yield: 60 Days	12.9	3.4	0.50 ± 0.12
	Milk Yield: 90 Days	13.1	2.6	0.65 ± 0.10
	Milk Yield: 120 Days	10.3	2.9	0.07 ± 0.11
	Milk Yield: Weaning	5.5	2.6	0.60 ± 0.11
Repeatability Model	Milk Yield	11.7	5.2	0.15 ± 0.04 (0.15 ± 0.04*)
	Milk Yield – No 120D	12.1	5.5	0.18 ± 0.04 (0.18 ± 0.04*)

TECHNICAL NOTE: USING GAME CAMERAS IN RESEARCH



Kaitlyn Dozler, Graduate Student
Mitch Stephenson, Range & Forage Specialist
Andrew Little, Landscape & Habitat Management Ecologist

In today's era of ranching, we are seeing a growing overlap between agriculture and natural resource conservation. Ranchers are investing in techniques not only to maintain profitable ranching operations but also to positively impact natural resource conservation for future generations. At GSL, research is being conducted to explore how game cameras can help ranchers evaluate the influence of landscape structures such as topography, vegetation differences, and overall range management practices can have on wildlife communities. In many agricultural landscapes, game species management is an important economic driver for landowners. Our research can help landowners identify ways to improve land management to benefit both livestock operations and wildlife habitat.

While game cameras are not new to the technology scene, they have been utilized by outdoor enthusiasts for years, most often used for hunting or wildlife monitoring. The first game camera was developed in the late 1880s by George Shiras, using trip wires and an automatic flash bulb to catch images of deer near Whitefish River, Michigan. The technology has advanced to utilize cellular signal sending the photos from cameras straight to our phones in 2024. Setting up game cameras throughout a working cattle operation can prove to be a challenge, with curious cattle potentially altering camera angles, or damaging equipment. To overcome this issue at GSL we have utilized cattle exclusion devices around our game cameras placed in areas frequently utilized by the herds.

Game cameras are a standard tool for wildlife research, aiding in studying wildlife activity patterns, monitoring species presence-absence, and estimating population parameters. They are crucial tools when overcoming research limitations such as rugged terrain, time, human resource constraints, and utilizing less invasive monitoring methods. Ranchers take pride in their operations, recognizing the significant impact their management strategies have not only on cattle herd performance but also on the area's natural resources. Incorporating game cameras into an operation can provide ranchers with valuable insights into the wildlife that inhabits their land. This allows them the opportunity to adapt their management strategies to protect or enhance wildlife habitat, especially during critical times such as nesting/brooding season for game birds.

Beyond research, game cameras can also be utilized for recreation activities, whether for personal enjoyment or a potential source of additional income for the ranch by offering private hunting, or wildlife viewing opportunities. Additionally, the data gathered from game cameras can inform the placement of precision grazing technology, optimizing grazing practices for both livestock and wildlife habitat management. Overall, even though game cameras are not a technology typically utilized on ranching operations, they can prove to be a helpful tool to improve land management to benefit both livestock operations and wildlife populations.

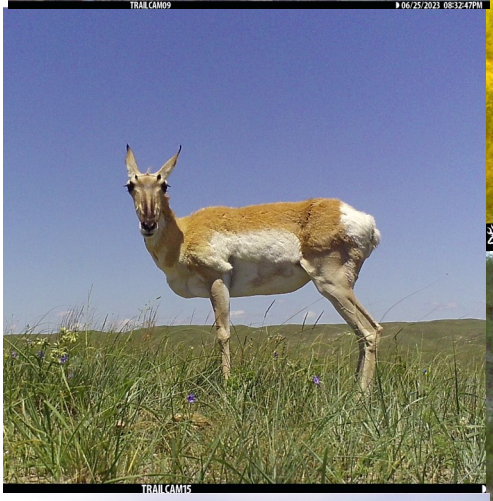
Pictured right is an example of how game cameras are set up in exclosures at GSL.

Pictured on the next page is some of the wildlife captured on the game cameras at GSL.

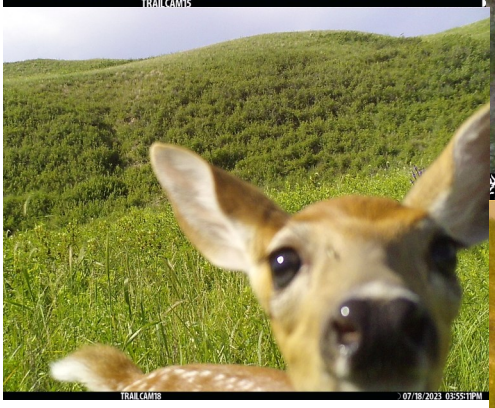

77 F
TRAILCAM12
06/29/2023 07:49:30PM


TRAILCAM09
06/25/2023 08:32:47PM


75 F
TRAILCAM12
06/28/2023 08:03:42PM


TRAILCAM15


60 F
TRAILCAM12
07/05/2023 08:22:59PM


TRAILCAM18
07/18/2023 03:55:11PM


78 F
TRAILCAM12
07/02/2023 08:26:20PM

2024-2025 Nebraska Ranch Practicum Applications Due May 3

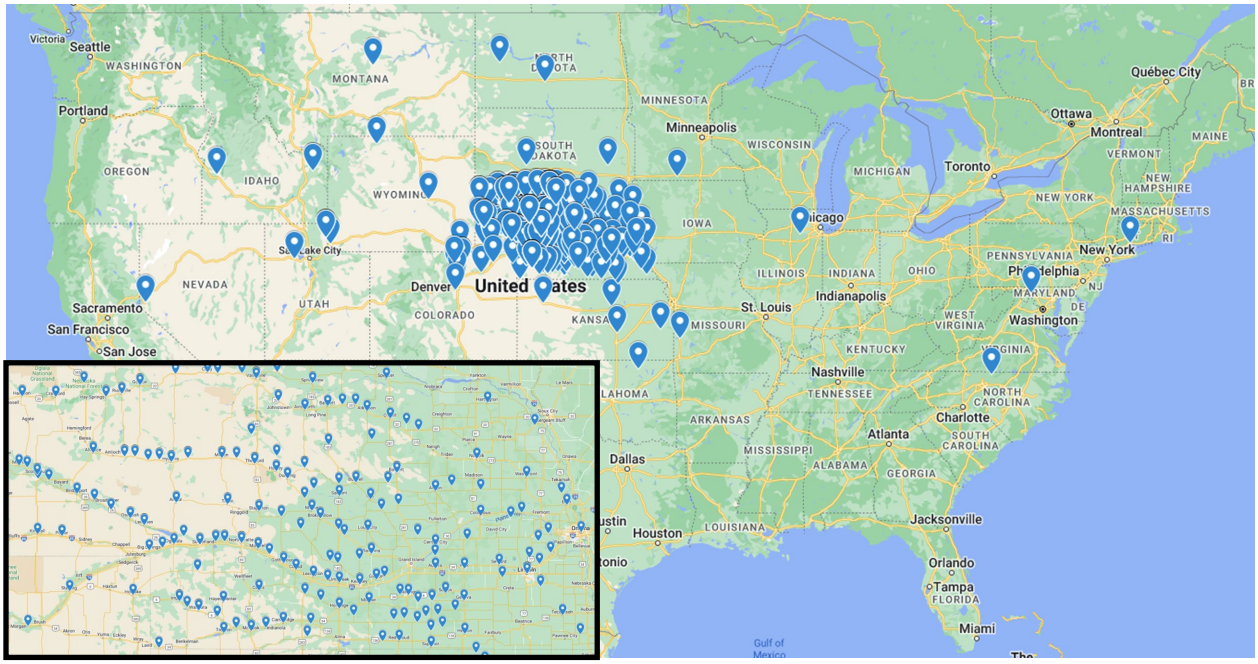
The Nebraska Ranch Practicum is an immersive educational program spanning three seasons. It is tailored to equip participants with the skills and knowledge for navigating the intricacies of modern ranching. Facilitated by Nebraska Extension, the camaraderie and the exchange of ideas among participants, instructors, and facilitators, fosters a dynamic learning environment.

A cornerstone of the program is its commitment to providing high-quality educational resources from the University of Nebraska. At the heart of the experience lies GSL, where participants delve into pioneering research in range livestock production and marketing.

Throughout the Practicum, participants hone their decision-making skills by engaging with diverse management and marketing scenarios. From optimizing grazing strategies and mitigating market risks to fine-tuning calving schedules and enhancing winter livestock nutrition, several aspects of ranch management are explored in depth.

Central to the Practicum is the integration of natural resources, livestock management, and economic considerations. Participants learn to track feed inventory fluctuations across seasons, mitigate market volatility, and employ various risk management tools. They also acquire invaluable skills in plant ID, range assessment, and wildlife habitat monitoring.

Moreover, practical assignments empower participants to apply decision aids for feed cost analysis, cull cow marketing, and break-even assessments. The economic aspects of herd replacement strategies and hay management are also examined.



Participants in the Nebraska Ranch Practicum have come from all over the state (inset) and United States.

The 2024-2025 Nebraska Ranch Practicum will be June 4 and 5, July 10, September 4 and 5, and November 7, 2024; and January 7 and 8, 2025. Classroom activities open and close the Practicum in North Platte with the remainder of the sessions conducted at GSL. The Practicum can count for college or continuing education credit.

Registration costs $675/person, and spouses can join for $350. Registration covers educational materials, noon meals and breaks. Participants are responsible for travel and lodging expenses. To register, submit a completed application and registration fee no later than May 3. Enrollment is limited to 35. To learn more, please visit nebraskaranchpracticum.unl.edu.

PUBLICATIONS

Zhao, B., M. B. Stephenson, T. Awada, J.D. Volesky, B. Wardlow, Y. Zhou, Y. Shi. 2024. 15-Yr Biomass Production in Semiarid Nebraska Sandhills Grasslands: Part 1—Plant Functional Group Analysis. *Rangeland Ecology and Management*. 93:49-61. Read at https://www.sciencedirect.com/science/article/pii/S1550742423001276?via%3Dihub

The **2024 Nebraska Beef Cattle Report** features multiple research projects at GSL. To read, please go to https://beef.unl.edu/2024-nebraska-beef-cattle-report

GSL IN THE NEWS

Jacki Musgrave, GSL research technologist, recently accomplished her long worked-for goal of running a marathon in all 50 states. Pictured is the buckle she designed to celebrate this achievement. Read more about this feat at https://go.unl.edu/musgrave50.

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.

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