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Spring 2022

### Benchmark Portfolio for ASCI 451/851: Livestock on Range and Pasture, Fall 2021

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# **Benchmark Portfolio for ASCI 451/851: Livestock on Range and Pasture, Fall 2021**

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## ABSTRACT

The aim of this portfolio is twofold: first, the portfolio serves to provide a means for the author to reflect on and improve their approach to teaching an ACE 10 course. The Livestock on Range and Pasture course (ASCI 451/851) serves seniors and graduate students with a major and/or minor in Animal Science, Grazing Livestock Systems, Agronomy and Horticulture, or Range. Since taking over the course, the last two semesters have included students primarily from Animal Science or Agribusiness with a major or minor in Grazing Livestock Systems, respectively. This Peer Review of Teaching project evaluated student feedback from the experiential learning component of the course which was data compiled from a survey at the end of the trip. The second learning evaluation is from the lecture component of the course that incorporates the Ranch Plan Assignment and post-course survey responses. Through the portfolio process, it has allowed the author to re-evaluate course objectives, add peer-review processes, be purposeful with surveys/student evaluations, and dive into what implementations and changes can be integrated to make this course and the final project better.

Keywords: experiential learning, peer review, ranch plan

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## Objectives of Course Portfolio

The goal of this course portfolio is to revise, assess, and document teaching and student learning for a class, Livestock on Range and Pasture, I started teaching for the first time in Fall 2020. This course has generally been co-taught by one faculty in Animal Science and the other in Agronomy and Horticulture. The last two semesters I have been assisted by two other faculty extension specialists to help me get through Range and Nutrition material until we hire a permanent team instructor. One of the original instructors who taught the course for over 15 years was gracious enough to share materials regarding format of the course and what had been required of students in the past. With that being said, we did not change much for the course objectives the first semester teaching primarily because we had never taught the course. However, my goal for this project is to work through, improve and articulate goals and objectives that are measurable and clear for the course and understand how the course meets ACE 10 requirements. This portfolio will also allow me to evaluate the current assignments and materials provided to students and evaluate how these materials help students collect and reflect on information that they can synthesize in their final ranch plan (ACE 10 project). It will also allow me to evaluate delivery methods and structure of the course and how I can make improvements for future semesters.

I believe students find a lot of value in working through an entire livestock enterprise and make science-based changes to the current management to help improve efficiency and profitability of an operation. With that, I am unfamiliar with reporting of ACE course outcomes, and I want to ensure that we are meeting those requirements. Furthermore, this course portfolio allows me to reflect on current aspects of the course and see where improvements or changes can be implemented to monitor student interpretation and implementation of materials covered throughout the course of the semester and integrates knowledge from other courses and experiences.

## Benchmark Memo 1: Course Descriptions, Goals, and Learning Objectives

### Course Descriptions

Livestock on Range and Pasture (ASCI 451; Crosslisted as ASCI 851, AGRO 445, AGRO 845, RNGE 445, GRAS 445), is a three-credit, capstone course offered in the fall. This course is one of three capstone courses offered for the Animal Science major. The course description includes: “Analyzing the plant and animal resources and economic aspects of pasturage. Management of pasture and range for continued high production emphasized”.

Participants are primarily seniors in Animal Science or are completing a major and/or minor in Grazing Livestock Systems (GRLS) and it is also crosslisted as a graduate course option for primarily Animal Science or Agronomy and Horticulture graduate students interested in ranch management concepts. A summary of enrollment numbers for students that have taken the course from 2017 to 2021 can be found in Table 1. The enrollment numbers have increased over the



past few years, which is exciting for the program; however, it will pose some logistical challenges moving forward.

Table 1. Enrollment per semester from Fall 2017 to 2021.

Item	ASCI 451 <sup>1</sup>	ASCI 851 <sup>1</sup>
Fall 2017	16	1
Fall 2018	10	1
Fall 2019	8	2
Fall 2020	16	4
Fall 2021	21	3

<sup>1</sup>ASCI 451 is the undergraduate course listing

<sup>2</sup>ASCI 851 is the graduate course listing

Generally, the students taking this course come from a variety of backgrounds including but not limited to either a ranching (cow-calf or seedstock operation), feedlot, graduate experience or have no livestock background. Typically, our students are interested in various fields including ranch management, becoming consulting nutritionists, extension, sales, or natural resource management consultants when they are done with their programs within our department.

Due to the prerequisites required for the course, we generally see students who are taking this to fulfill their ACE 10 requirement for their Animal Science degree as well as completing a GRLS minor or major, which completes both requirements for their degrees. The course requires students to have completed the following courses to be able to enroll in the course: ASCI 250 (Animal Management) and AGRO 240 or 340 (Forage Crop and Pasture Management or Range Management and Improvement) and recommends AECN 201 (Farm and Ranch Management). Generally, the forage crop and pasture management courses are additional courses that are not required for the animal science minor but fall within required courses for the GRLS major/minor.

### Course Goals

After completion of this course, students should have an overall understanding of management decisions for a livestock operation with specific skills related to evaluating forage availability and demand, grazing systems, nutrition, reproduction, and marketing strategies.

There are 5 main goals for the course, which are relative to the ACE 10 outcomes associated with the course, those include: 1) collect information, 2) synthesize information, 3) interpret information, 4) presentation, and 5) reflection. Therefore, by the end of the course, students should be able to achieve the following learning objectives as stated in the syllabus:

1. **Collect information**
  - a. Develop the skills required to conduct a survey of a growing livestock operation, including plant identification, determining range and pasture composition and productivity, site classification, and degree of plant and pasture utilization.
  - b. Collect and interpret research-based information to help make management decisions
2. **Synthesize information**

- a. Use computer-based decision tools to develop and evaluate management strategies for livestock enterprises
3. **Interpret information**
  - a. Calculate forage availability and animal demand by making grazing and supplement decisions
  - b. Integrate different management strategies to ranch improvements (grazing plans, breeding system, nutrition, disease control, hay and supplemental forage management) by developing a comprehensive management plan
4. **Presentation**
  - a. Each student will effectively communicate ranch strategies developed in Ranch Plan Assignment by preparing and giving a 15-minute presentation
5. **Reflection**
  - a. Reflect upon peer review comments and integrate into final ranch plan
  - b. To effectively assess the strengths and weaknesses of peer ranch plan parts and make concrete recommendations for improvement.

By achieving the goals and completing the objectives in this course, students should be more prepared to take the materials and concepts from this class back home to the ranch or implement these skills into their future endeavors. Many of our students are planning to go back home and take over some segment or the whole operation; therefore, students need to understand and integrate the management decisions discussed in this course and apply them to their experiences during or after school. For those students looking to go into other careers, hopefully these skills can be integrated into other skillsets needed for their success.

### Course Organization

Currently, the course is organized in topic areas that relate to the 5 different parts of their ranch plan which include: 1. Ranch Goals and Objectives, 2. Forage Resources, 3. Breeding, Reproduction, Health and Nutrition Program, 4. Forage Management and Drought Contingency, and 5. Economics and Marketing (See Appendix B. Ranch Plan Assignment). Within each topic area students are provided examples and spreadsheets that they will work on through case study examples and include in their final ranch plan components. The case studies are intended for students to work through the material and provide feedback prior to submitting their ranch plan parts. Once we cover material for each component, that is when each part of their ranch plan is due; therefore, it allows students to practice and listen to lectures while they work on each section of the final ranch plan.

However, last year we had a condensed semester, and it was hard to get appropriate feedback to students towards the end of the semester. My solution this year is to rearrange some materials and have time for students to think about the economics and marketing earlier in the semester so their management decisions can reflect on their goals and objectives for the operation. I would also like to think about ways to streamline feedback or how to develop rubrics that help highlight information that is missing and provide useful and timely comments. There is an ACE 10 rubric; however, it is hard trying to integrate the general concepts with providing specific feedback to the related information that students need to improve upon or change. Therefore, this semester I

an implementing peer-review of each draft ranch part. This allows students to read different group assignments and provide feedback and suggestions to different groups in class.

Another component of the course is the experiential learning piece where all students are required to participate in a one-week field trip in central or western Nebraska prior to the beginning of the fall semester. Due to covid in 2020, we were unable to complete the field trip portion of the course. However, the Fall 2021 course will be completing the required portion of the class and will be traveling to the Sandhills for the field trip component. In the past, the class has stayed at the 4-H Camp in Halsey, NE where they have an opportunity to immerse themselves in the Sandhills and interact with producers in the area. The field trip provides ample experiential learning opportunities through plant identification and species composition demonstrations and hands-on collection of forage samples and calculations, along with peer teaching and learning over the course of the week. Additionally, students have the opportunity to tour multiple ranches in the Sandhills to gain different perspectives in management styles, resources, and overall goals for different operations.

## Benchmark Memo 2: Assessments and Activities

### Assessments

There are 5 major assessment categories that students are evaluated on in the course which include: 1) Field Trip, 2) Attendance, 3) Case Ranch Assignments, 4) Ranch Plan Assignment, and 5) Peer Review Activities. The breakdown of points allocated for each assessment can be found in the syllabus.

### Field Trip

The course starts off with a weeklong field trip to complete the experiential learning component of the course. Typically, students will spend a week in Halsey, NE where they will learn skills related but not limited to ranch management, plant identification, and plant utilization to name a few. During the week, we have an initial session that gives a brief overview of the week, I make sure students are on the same page by lecturing on the overview of cow-calf management and we hand out our materials for the week. The next few days consist of walking through the field identifying plants, learning how to survey range, students learn how to identify and calculate species composition within pastures, and students have an opportunity to tour multiple operations in the Sandhills and can ask questions about management related to that operation. We plan to cover a large portion of hands-on materials during the field trip; however, that should provide students a clearer understanding of how things are calculated when they are working through forage species identification, calculating forage supply and demand, and thinking through grazing plans and supplementation strategies for their case study assignments and final ranch plan. At the end of the week, students are expected to complete a plant identification quiz and a comprehensive field trip exam to test their knowledge and application of the skills and materials we covered throughout the week.

### Lectures and Group Work

With the format of the class, we currently have two lecture periods (TR 9-9:50 am) and a lab (R 10-10:50 am) portion. What we are planning to do this year is set up our lecture periods to go

more in-depth on management decisions or work through case-study decision making tools to provide examples that they will be able to integrate into their final project. Our plan is to schedule labs for group work and project discussion; if we are not covering material or working through case-study assignments, we have time set aside during the week for students to talk through their ranch plans. We have also built-in peer review opportunities for students to work through group assignments and provide compliments and critiques to the materials submitted. So, our plan is on days that their ranch plan components are due, groups will work on providing peer review feedback to another groups ranch plan assignment. They will submit assignments through Canvas allowing all instructors access to the group's assignments.

### Case Studies

Throughout the course of the semester, we will have lectures that are related to a specific management topic (i.e. season of calving, nutrition requirements, heifer selection and development), which in turn will help students critically think through their management decisions related to their ranch plan. Therefore, students should be able to translate and implement management decisions they've learned in class and integrate ideas into their own management plan or in future careers. To meet one of our course goals related to synthesizing information, we will incorporate in-class homework assignments that require students to practice and use computer-based decision tools to develop and evaluate a specific management strategy related to the topic of interest. Students will have an opportunity to work through the homework assignment in class and receive feedback for their justifications and implementation of the tools.

Case study instructional methods allow students to assess a specific scenario where they will need to implement, conclude, summarize, or recommend management skills. Furthermore, this course is a combination of hands-on experiential learning and case study work. So, by implementing case study homework assignments that students work through prior to implementing the same concepts in their ranch plans, this allows students to use and see the materials multiple times through the semester. Students are challenged to critically think and understand and conceptually apply management principles in their management plan.

### Ranch Plan Assignment

A ranch plan is a creative and scholarly product that will require the students to critically analyze and interpret the resource information that they collected during the survey of the case study ranch. Therefore, to achieve the ACE 10 outcome, students will develop a comprehensive management plan which makes up 60% of the course grade. Historically, we have had higher expectations of graduate students than of undergraduates in terms of depth, breadth, and quality of the ranch plan. Based on the course objectives and different assessment tools, students will develop ranch goals and objectives that will guide them in preparing their ranch plan. The plan will be an integration of range and grazing management, forage crop production, livestock nutrition, livestock reproduction, and marketing. See Appendix B for more information on the assignment.

Following completion of their Final Ranch Plan, students (undergraduate and graduate) will present (15-minute presentation) on their suggested management changes. This provided

students a time for reflection on the major changes they implemented throughout the semester from feedback they received.

#### Peer Review Activities

Peer review activity assignments were added to the course this semester following Triad group discussions prior to the Fall semester. Each student was responsible for providing peer feedback to a randomly assigned groups Ranch Plan. The five peer review activities allowed students the opportunity to accomplish course goal objectives for Reflection which included: 1) Reflect upon peer review comments and integrate into final ranch plan and 2) To effectively assess the strengths and weaknesses of peer ranch plan parts and make concrete recommendations for improvement.

#### Course Materials

This semester, we purchased three extension NebGuide books that include common grasses, forbs and shrubs in Nebraska, and the Range Judging Handbook. During our field trip, students had access to them (and can use in the future) to help with more in-depth understanding of the plants they were identifying during the week. In addition to the books, students are provided a Notebook with additional information related to native Sandhills plants, cow-calf management, the syllabus, the field trip agenda, and information related to the Sandhills.

On Canvas, students have access to lecture notes, additional peer reviewed articles, PDF extension publications, spreadsheets, and handouts that are supplemental to topics discussed in class. The lecture materials and spreadsheets are then used for case study assignments and are expected to be incorporated into their final project.

#### Justification of Teaching Methods

I believe group work is a huge component to our students' future endeavors and being able to manage different personalities and deadlines related to group projects are key to success and gaining skills related to group work. Our goal is to prepare students for group work (which we know is a large component of any job) and being able to meet deadlines with required information that is relative to their ranch plans. I see value in different viewpoints and experiences, which each student brings to their group. Therefore, students will work in groups for their ranch plan assignments to provide a broad depth of experience and knowledge to the group and assignment. Students selected their group members at the start of the semester by completing a Google Form with their first, second, and alternative choice for group members. Students provided feedback that was positive and liked the opportunity to select their group.

Our goal is to provide several different perspectives through guest lecturers, ranch managers, instructors, and peer interactions. These experiences should provide students with opportunities to ask several questions, gain perspective from differing experiences and management styles, and implement what they have learned into a cohesive product. Students can then learn from these experiences and take the skills into their next endeavors. These interactions may also spark interest in other areas of study or potential job opportunities when they complete their degree.

### [Link to the Broader Curriculum](#)

As a capstone course, this course should build upon the previous courses and apply what materials have been learned in the prerequisite courses and experiential learning opportunities presented in the course. Therefore, students should be able to 1) demonstrate sophisticated understanding of the complexity of the disciplines of Animal Science, 2) make references to previous learning (formal classroom and experiential learning) and apply in new and creative ways that knowledge and those skills demonstrate comprehension and performance in novel situation, 3) they should be able to propose one or more solutions that indicate a complete comprehension of the problems within the case study ranches, and 4) communicate, organize, and synthesize information from sources to fully achieve a specific project, with clarity and depth. Thus, this class fulfills the ACE 10 requirement for students in Animal Science as well as for students majoring or minoring in Grazing Livestock Systems.

### Benchmark Memo 3: Documenting Student Learning

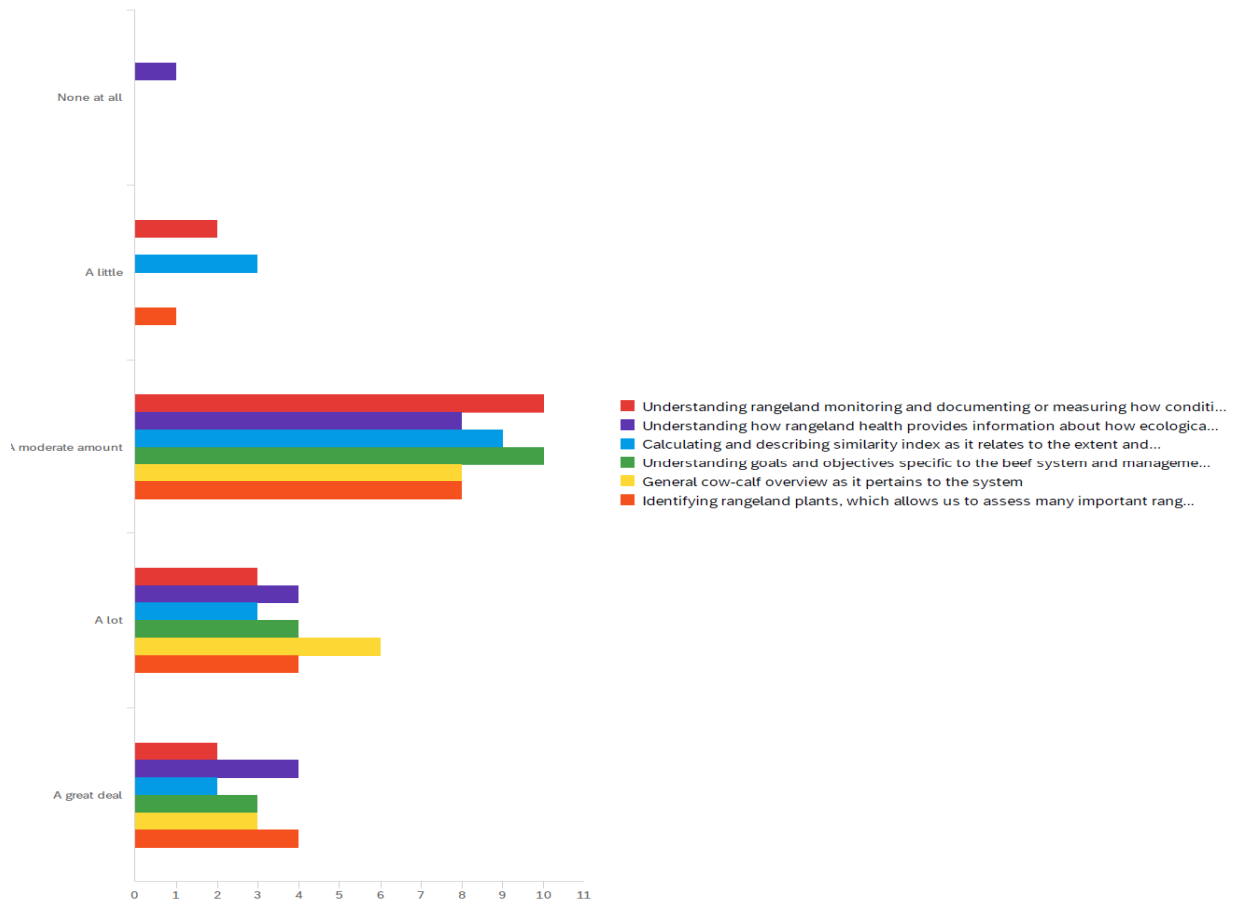
This review documents learning in a couple different ways. The first student learning evaluation is student feedback from the experiential learning component of the course. This was data compiled from a survey at the end of the trip. The second learning evaluation is from the lecture component of the course that incorporates the Ranch Plan Assignment and post-course survey responses.

#### Experiential Learning: Field Trip Evaluation

We surveyed the students at the end of the trip and asked a series of questions asking students to address how confident they were in our various objectives we set out for the field trip. This will highlight a couple of the questions from the survey. The Likert responses for the question, “How confident are you in making decisions related to the following topics we covered over the course of the field trip?”, can be found in Table 2. According to the survey, 58.82% of students were moderately confident in understanding objective 1. For objective 2, students were 47.06% moderately confident, whereas 23.53% were a lot more confident and a great deal more confident, respectively. Illustrating that the students were understanding hands-on rangeland monitoring and health demonstrations were beneficial. For objective 3, 52.94% of students were moderately confident in calculating and describing similarity index; whereas 17.65% were a lot more confident and 11.76% were a great deal more confident. Fifty-eight percent of students were moderately confident in understanding goals and objectives specific to beef systems and management decisions. After brief discussions about general cow-calf overviews as it pertains to the system, 57.06% were moderately confident, 35.29% were a lot more confident, and 17.65% were a great deal confident about general beef systems and management. The last objective, students were 47.06% moderately confident in identifying rangeland plants, where 23.53% were a lot more confident and a great deal confident, respectively. Figure 1 illustrates the range of confidence selected by students, with a moderate amount being selected the most.

Table 2. Likert response totals for the question, “How confident are you in making decisions related to the following topics we covered over the course of the field trip?”						
Objective	None at all	A little	A moderate amount	A lot	A great deal	Count
1. Understanding rangeland monitoring and documents or measuring how condition of your land and/or vegetation are changing in response to the environment and the management you’re applying	0	2	10	3	2	17
2. Understanding how rangeland health provides information about how ecological processes are functioning relative to ecological potential.	1	0	8	4	4	17
3. Calculating and describing similarity index as it relates to the extent and direction of changes that have taken place on a siter from its original characteristics or condition	0	3	9	3	2	17
4. Understanding goals and objectives specific to the beef system and management decisions	0	0	10	4	3	17
5. General cow-calf overview as it pertains to the system	0	0	8	6	3	17
6. Identifying rangeland plants, which allows us to assess many important rangeland or pasture variables that are critical to proper management.	0	1	8	4	4	17

Furthermore, when we asked students how helpful each of the following elements were to them learning the material, students noted that the plant identification activity and ID quiz, course notebook provided at the start of the field trip, cow-calf overview, and the ranch tours were the top five most helpful to their learning. The comments and feedback are reflected in the responses found in Table 3. Students noted exceptional progress (52.63%; 8/19 responses) towards developing skills related to plant identification. Furthermore, 52.63% (10/19 responses) of students noted substantial progress towards developing skills in determining range and pasture composition and productivity along with developing skills related to plant site classification and utilization. The last field is a bit more distributed across the Likert scale with 21.05% noting slight progress, 21.05% moderate progress, 42.11% substantial progress, and 15.79% exceptional progress for learning management strategies related to ranch improvements.



**Figure 1.** Likert responses for question, “How confident are you in making decisions related to the following topics we covered over the course of the field trip?”



Table 3. Likert responses for question, “Related to your time on the field trip, describe your progress in the following areas and how they prepare your development of your ranch plan”

Objective	No apparent progress	Slight progress	Moderate progress	Substantial progress	Exceptional progress	Count
1. Developing skills related to plant identification	0	0	1	8	10	19
2. Developing skills in determining range and pasture composition and productivity	0	0	4	10	5	19
3. Developing skills related to plant site classification and utilization	0	1	6	10	2	19
4. Learning management strategies related to ranch improvements (grazing plans, breeding, nutrition, supplementation, and forage management)	0	4	4	8	3	19

Based on the responses for the time spent on different activities during the experiential component of the class, students reported substantial progress on core objectives that we set out to complete for the field trip. This is encouraging when evaluating the responses for the materials provided and activities on the field trip. The additional comments along with the Likert questions will be beneficial in making improvements to how and when material should be delivered on the field trip. Thus, the experiential component of the course was very beneficial to the students learning prior to in-classroom activities.

Excerpts of responses from open ended questions with a focus on what additional comments students wanted to provide in relation to their likert responses:

- “Overall, I really disliked going the week before school but that’s the only time this class has a chance to go on the trip. It was time well spent and a good opportunity to see everything first-hand.”

- “Overall, I really enjoyed the field trip. I would have appreciated not having to leave quite so early on Sunday. After a summer away from classroom learning and a long drive, I think it would have been beneficial to have had the cow-calf review on Monday morning rather than Sunday night so it would have been easier to pay attention and be more prepared to learn. As far as the ranch tour goes, I would have appreciated them being called ranch visits or something along those lines. When it says it was a tour, I automatically thought we would be shown around the ranch and get to see different aspects of the operation. So it was a bit disappointing for the first tour to just sit and listen.”
- “Give the group more free time to interact with each other.”
- “The provided materials were helpful for studying for the exam and ID quiz, but the things I retained the most were the things we actively experienced or herd.”
- “I have had minimal experience in Sandhills range so this was a great learning experience.”
- “I really didn’t have a lot of skills in any of these before this trip”
- “I thought the field trip was helpful in the fact that it gave the students hands on experience regarding things we will be doing for our ranch plan.”
- “I think the trip was really good on the range side of things. I really enjoyed refreshing and learning this information. As far as grazing, supplementing and other strategies there was some information presented but those areas seemed a bit vague. The ranches that we visiting briefly went over that information but a few more programs or examples might be helpful.”
- “The physical aspect of plant id really helped me to see and visualize the plants over and over again really driving home the knowledge.”

I believe this is very helpful feedback, especially related to the timing of when some materials are presented and how we can think about structuring our tours. It was evident that students were tired after arriving in Halsey after a long drive from Lincoln. I think incorporating an activity to get them up and talking would have been beneficial for them to stay alert. We can reorganize the tour to encompass more time for the cow-calf overview prior to ranch visits. The active learning with the Plant Identification seemed to be beneficial, I can also work on incorporating more programs related to nutrition and see examples that we are researching at GSL. I also think that we can allow students to meet in their groups while on the trip and generate questions they need answered for their ranch plan would be beneficial to start having more conversations around the plan and expectations.

#### Experiential Learning: Course and Ranch Plan Evaluation

At the end of the semester, students were asked to complete their Final Ranch Plans and present on their major changes. Students were also surveyed at the end to compile feedback related to the course. Overall, students did a great job compiling their Final Ranch Plan assignment. The average grade for the Final Ranch Plan was an 85% (Figure 2). To illustrate some of the differences observed in the students’ work, samples can be found in Appendix C. Samples of

Student Work. Group 8 was our graduate student group and groups 1 through 7 represent our undergraduates.

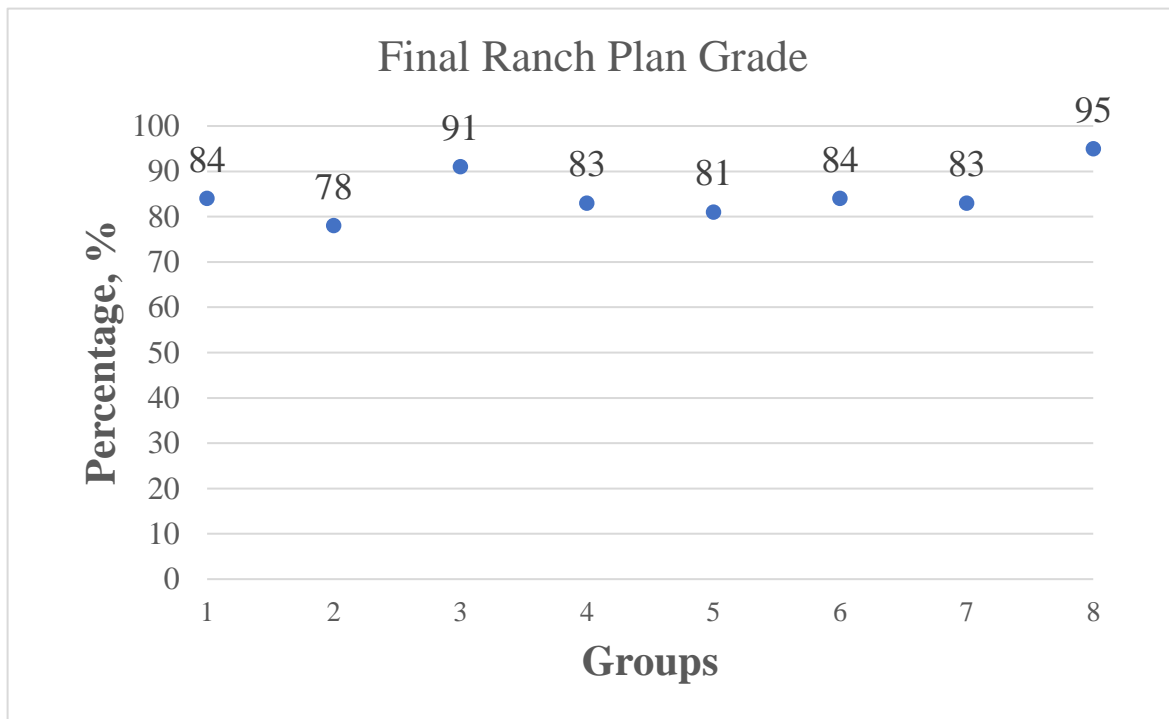


Figure 2. Graph illustrating final percentage grades for group Ranch Plans.

The feedback from the post course survey will be valuable in making improvements and changes to delivery of material and structure of the course. Below are excerpts from open ended questions to provide reasoning behind their survey responses.

- “Presentation at the end helped me understand my plan way more. Was surprised by how helpful that was. Also gave me closure on finishing such a long project. I was proud after I presented to the class”
- “The main thing I feel like should change is allowing more time in class to work on ranch plans so that we could ask questions and get more time, or Thursdays give a break between the lectures. I would lose interest fast after the hour lecture.”
- “Kacey did a great job presenting the content in a relevant way that went over the essentials. I learned a ton, very engaging professor.”

Overall, students found that the reflection and presentation component of the Final Ranch Plan helped them synthesize and appreciate the hard work and time put into their final projects.

## Summary: Reflection on the Course

One of the new teaching assessments that we incorporated this fall was the peer review component. This allowed students to work through different group ranch plans and I thought it was helpful in providing additional feedback from students to consider and allowed students to see different approaches to the assignment. Allowing the students to work on providing feedback helped the instructors evaluate each ranch plan part after comments were given. Providing more structured rubrics for this component will help with clarity and show students where improvements can be made in how they provide constructive feedback.

Additionally, this was the first semester teaching the course that we were able to participate in our experiential learning component of the course. We received a lot of feedback from the students which will help with planning next years field trip. I thought that for our first time working through that itinerary, it was very successful in meeting our objectives; however, we have an opportunity to improve when and what materials are delivered and structuring the time a little differently.

The student feedback was extremely helpful in understanding what the students liked, didn't like, or what suggestions they had for the course. Unfortunately, this semester, I asked the Midterm questions too late to adjust at the end of the semester. Therefore, next year, I plan to ask students at the halfway part of the semester to help make changes to the schedule or delivery of information to help meet their needs. After reviewing student feedback, I have a few planned changes for next fall. First, I would like to restructure some of the field trip to help with early fatigue day one. I also would like to get students out looking at cattle, grazing implementations, etc. when we are on ranch tours. Next, I would like to work on structuring the peer review activity rubrics. I was able to connect with a fellow colleague and they shared their rubrics which clearly shows where students are being graded for feedback comments and depth. Thirdly, I wanted to be intentional of providing group time during our labs when I started the semester; however, lectures went long, and I want to work on providing more structured group time and working through the spreadsheets over multiple lab sections to help with integration and provide a structured time for discussion and group feedback. Lastly, the ranch plan assignment parts need to be more structured and clarity in expectations for content needs to be flushed out for next year. Students liked that each part broke down this large assignment into manageable parts; however, there was a little repetition with some information and details need to be clearer.

Through the portfolio process, it has allowed me to re-evaluate course objectives, add peer-review processes, be purposeful with surveys/student evaluations, and dive into what implementations and changes can be integrated to make this course and the final project better. I really valued being intentional with the student feedback and plan to work on changes before next fall. I really enjoyed working on the FIRST/Peer Review of Teaching process through the summer and fall semester and valued the triad connections and discussions that helped me implement a number of changes to my course.

# ASCI 451/851: Livestock Management on Range & Pasture

FALL 2021 | In-Person Class



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West Central Research & Extension Center



Schedule via email

## Course Communication

- Please regularly check your UNL ('Huskers') email account and Canvas for course information.
- When sending an email to the instructor, write professionally and include **"ASCI 451: [Topic]"** in the subject.

## What We Learn

This course fulfills UNL Achievement Centered Education (ACE) Outcome 10: Generate a creative or scholarly product that requires broad knowledge, appropriate technical proficiency, information collection, synthesis, interpretation, presentation, and reflection. To achieve the outcome described above, students will develop a comprehensive management plan for their ACE 10 project as described in Objective 5 which makes up 60% of the course grade. Historically, we've had higher expectations of graduate students than of undergraduate students in terms of depth, breadth, and quality of the ranch plan.

All students will present (15-minute presentation) on suggested management changes. In addition, graduate students will be required to individually submit a 5-page paper (with JAS citations) discussing one of the suggested changes to their management approach (i.e. impact of changing calving season, early weaning, cover crop grazing, etc.). Graduate students will select an approach and work with the instructors to get approval.

**By the end of the course, students should be able to:**

1. Develop the skills required to conduct a survey of a growing livestock operation, including plant identification, determining range and pasture composition and productivity, site classification, and degree of plant and pasture utilization.
2. Collect and interpret research-based information to help make management decisions
3. Use computer-based decision tools to develop and evaluate management strategies for livestock enterprises
4. Calculate forage availability and animal demand by making grazing and supplement decisions
5. Integrate different management strategies to ranch improvements (grazing plans, breeding system, nutrition, disease control, hay and supplemental forage management) by developing a comprehensive management plan
6. Each student will effectively communicate ranch strategies developed in Ranch Plan Assignment by preparing and giving a 15-minute presentation
7. Reflect upon peer review comments and integrate into final ranch plan
8. To effectively assess the strengths and weaknesses of peer ranch plan parts and make concrete recommendations for improvement.

**Important Resources**



**Class Time/Location:**

Tuesday and Thursday 9:00- 9:50 A.M. and Thursday 10:00 – 10:50 A.M.  
KEIM 264 East

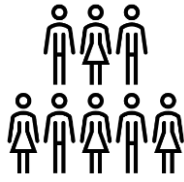
**Canvas:**



**All readings, assignments, grades and resources will be posted on the course page throughout the semester.** Students are expected to check Canvas frequently and are responsible for monitoring their grades on the system.

**Note:** There is no required text for this course.

## Assignments



### Field Trip and Attendance

Students will spend a week in Halsey, NE where they will learn skills related but not limited to ranch management, plant identification, determining range and pasture composition and productivity, site classification, and degree of plant and pasture utilization. Attendance throughout the semester will be taken for class participation.



### Case Ranch Assignments

Use computer-based decision tools to develop and evaluate management strategies for livestock enterprises



### Ranch Plan Assignment

Parts I-V, Complete Final Ranch Plan, Group Presentation, and Graduate Student Paper



### Peer Review Activities

Students will be required to individually read and answer a set of questions per part for valuable feedback. The set of questions will help students evaluate and critically think about management concepts and provide critiques and compliments to the paper.

## Course Prerequisites

ASCI 250; AGRO 240 or 340; ACEN 201 recommended

## Grade Breakdown

A	94 - 100%	C	75 - <77%
A-	90 - <94%	C-	70 - <74%
B+	87 - <90%	D+	67 - <70%
B	84 - <87%	D	64 - <67%
B-	80 - <84%	D-	61 - <64%
C+	77 - <80%	F	0 - <61%

## COURSE ASSIGNMENTS

ASSIGNMENT	DUE DATE	POINTS
<b>Field Trip</b>		<b>150</b>
Plant ID Quiz	August 17	50
Field Exam	August 19	100
<b>Attendance</b>		<b>50</b>
<b>Ranch Plan Parts</b>		<b>600</b>
Ranch Plan Part I	September 1	25
Ranch Plan Part II	September 15	75
Ranch Plan Part III	October 6	100
Ranch Plan Part IV	October 27	100
Ranch Plan Part V	November 17	100
Complete Final Ranch Plan	November 29	150
Group Presentations	Nov. 30 – Dec. 9	50
<b>Peer Review Activities</b>		<b>100</b>
Part I – Peer Review	September 7	20
Part II – Peer Review	September 21	20
Part III – Peer Review	October 12	20
Part IV – Peer Review	November 2	20
Part V – Peer Review	November 23	20
<b>Case Ranch Assignments</b>		<b>100</b>
BS Ranch Forage Supply and Demand Assignment		25
BS Ranch Grazing Allocation Worksheet		25
BS Ranch Ration Worksheet		25
BS Ranch Reproduction Worksheet		25
<b>TOTAL POINTS</b>		<b>1000</b>



## Course Schedule (Subject to Change):

Date	Topic	Speaker
<b>Aug 15-19</b>	<b>FIELD TRIP – 4-H Camp Halsey, NE</b>	
Tue. Aug 24	Peer Review Process + Activity	All instructors
Thur. Aug 26	Season of Calving	Dr. Kacie McCarthy
Tue. Aug 31	Production Measurements and Utilizing Records	Dr. Kacie McCarthy
Thur. Sept 2	<b>Ranch Plan Part I – Peer Review</b>	
Tue. Sept 7	Forage Supply Demand Balance	Dr. Mitchell Stephenson
Thur. Sept 9	Forage Supply Demand Balance Worksheet	Dr. Mitchell Stephenson
Tue. Sept 14	Unit Cost of Production	Aaron Berger
Thur. Sept 16	Grazing and Ranch Management style="color: red;"> <b>Ranch Plan Part II – Peer Review</b>	Guest Speaker
Tue. Sept 21	Grazing Systems and Management	Dr. Mitchell Stephenson
Thur. Sept 23	Grazing and Hay Records Spreadsheet	Dr. Mitchell Stephenson
Tue. Sept 28	Ranch Economics and Marketing	Dr. Jay Parsons
Thur. Sept 30	Ranch Economics and Marketing	Dr. Jay Parsons
Tue. Oct 5	Drought Contingency Planning – culling, yearling systems	All instructors
Thur. Oct 7	<b>Ranch Plan Part III – Peer Review</b>	
Tue. Oct 12	Nutrition Requirements	Dr. Travis Mulliniks
Thur. Oct 14	Cow Herd Supplementation Strategies	Dr. Travis Mulliniks
<b>Tue. Oct 19</b>	<b>Fall Semester Break</b>	
Thur. Oct 21	Heifer Selection and Development	Dr. Kacie McCarthy
Tue. Oct 26	Yearling/Stocker Production Systems	Dr. Travis Mulliniks
Thur. Oct 28	Wineglass Ranch style="color: red;"> <b>Ranch Plan Part IV – Peer Review</b>	Guest Speaker
Tue. Nov 2	Cow-Calf Management Reproduction Strategies	Dr. Kacie McCarthy
Thur. Nov 4	Value Added Programs	Dr. Kacie McCarthy
Tue. Nov 9	Weaning Strategies and Managing Health Risk	Dr. Kacie McCarthy
Thur. Nov 11	Optimizing Harvest Endpoint	Dr. Elliott Dennis
Tue. Nov 16	Annual & Perennial Forages- Forage Crop Production	Dr. Jerry Volesky
Thur. Nov 18	<b>Ranch Plan Part V – Peer Review</b>	
Tue. Nov 23	TBA	
<b>Thur. Nov 26</b>	<b>Thanksgiving</b>	
Tue. Nov 30	Student Presentations	
Thur. Dec 2	Student Presentations	
Tue. Dec 7	Student Presentations	
Thur. Dec 9	Student Presentations	
<b>Dec. 13-17</b>	<b>FINALS WEEK</b>	

## Additional Course Administration Policies

### Academic Honesty

Academic honesty is essential to the existence and integrity of an academic institution. The responsibility for maintaining that integrity is shared by all members of the academic community. The University's [Student Code of Conduct](#) addresses academic dishonesty. Students who commit acts of academic dishonesty are subject to disciplinary action and are granted due process and the right to appeal any decision.

### Counseling and Psychological Services

UNL offers a variety of options to students to aid them in dealing with stress and adversity. [Counseling and Psychological & Services \(CAPS\)](#); is a multidisciplinary team of psychologists and counselors that works collaboratively with Nebraska students to help them explore their feelings and thoughts and learn helpful ways to improve their mental, psychological and emotional well-being when issues arise. CAPS can be reached by calling 402-472-7450. [Big Red Resilience & Well-Being \(BRRWB\)](#) provides one-on-one well-being coaching to any student who wants to enhance their well-being. Trained well-being coaches help students create and be grateful for positive experiences, practice resilience and self-compassion, and find support as they need it. BRRWB can be reached by calling 402-472-8770.

### Services for Students with Disabilities

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can discuss options privately. To establish reasonable accommodations, I may request that you register with Services for Students with Disabilities (SSD). If you are eligible for services and register with their office, make arrangements with me as soon as possible to discuss your accommodations so they can be implemented in a timely manner. SSD contact information: 117 Louise Pound Hall; 402-472-3787.

### Emergency Responses

1. **Fire Alarm (or other evacuation):** In the event of a fire alarm, gather belongings (purse, keys, cellphone, N-card, etc.), and use the nearest exit to leave the building. Do not use the elevators. After exiting, notify emergency personnel of the location of persons unable to exit the building. Do not return to the building, unless told to do so by emergency personnel.
2. **Tornado Warning:** When sirens sound, move to the lowest interior area of the building or designated shelter. Stay away from windows and stay near an inside wall when possible.
3. **Active Shooter:**
  - a. **Evacuate** – If there is a safe escape path, leave belongings behind, keep hands visible and follow police officer instructions.
  - b. **Hide out** – If evaluation is impossible, secure yourself in your space by turning out lights, closing blinds, and barricading doors, if possible.
  - c. **Take action** – As a last resort, and only when your life is in imminent danger, attempt to disrupt and/or incapacitate the active shooter.
4. **UNL Alert:** Notifications about serious incidents on campus are sent via text message, email, unl.edu website, and social media. For more information, go to <http://unlalert.unl.edu>.
5. **Additional Emergency Procedures** can be found at
  - a. [http://emergency.unl.edu/doc/Emergency\\_Procedures\\_Quicklist.pdf](http://emergency.unl.edu/doc/Emergency_Procedures_Quicklist.pdf).

## **Livestock Management on Range and Pasture Ranch Plan Assignment**

### **PURPOSE:**

This course fulfills UNL Achievement Centered Education (ACE) Outcome 10: Generate a creative or scholarly product that requires broad knowledge, appropriate technical proficiency, information collection, synthesis, interpretation, presentation, and reflection. To achieve the outcome described above, students will develop a comprehensive management plan for their ACE 10 project as described in Objective 4 of the syllabus, which makes up 60% of the course grade.

1. Develop a comprehensive management plan including marketing strategies and economic analysis for the ranch unit. Use computer-based decision support tools to develop and evaluate management strategies/systems for livestock enterprises.
2. Organize material and effectively communicate a written plan with sound biological and economic justifications by working in groups (**Maximum of 3 students per group; A Contribution of Group Members Form** must be completed by each group member and completed upon submission of complete final ranch plan).
3. **Give a 15-minute presentation on major changes to the ranch plan**

### **I. PRESENTATION AND COMMUNICATION**

- Submit each required section (Part I, II, III, IV, and V) and the Complete Final Ranch Plan via **CANVAS**
- The Complete Final Ranch Plan will include the following:
  - Title page (including Group Member names)
  - Table of contents
  - Introduction (Part I)
  - Required sections (Part II, III, IV, and V), maps, and pictures
- Literature Cited. Students should **cite at least 5 peer reviewed articles** within the body of the text (using the style of JAS).
- Following the literature cited, **include a justification summary of the major revisions** you made in the Final Ranch Plan based on peer and instructors' reviews

### **II. REQUIRED SECTIONS**

#### **PART I. OBJECTIVES**

##### **A. Introduction**

##### **1. Purpose of Plan**

- a. Write a paragraph or two on the purpose of a plan. The purpose of a ranch plan can be “lifted” directly from the class handout on purpose of a plan. It can also include what you plan to gain from this assignment.

##### **2. Goals & Objectives for Proposed Plan**

- a. Present your goals and objectives (with measures and targets) in paragraph form, as a series of headings, description, and bullets, or as a table. The plan that you develop is to be based on the goal and objective statements that you write.

## **PART II. FORAGE RESOURCES**

### **1. FORAGE RESOURCE DESCRIPTION**

- a. Briefly describe the forage resource in terms of total acres, general pasture types (e.g., a mixture warm-season tallgrasses and cool-season introduced grasses along with some wooded pastures), seasonal availability of forages, past improvement practices, and other related environmental and management variables.
- b. Develop a list of all pastures along with size, range/pasture plant communities, stocking rate, total available AUMs, and use.
  - i. Refer to tables (Table 1) and figures (Figure 1 or Map 1) in the text. A full description of rangeland/pastureland conditions and use likely will require descriptive statements in the text. Briefly state what you plan to do.

### **2. Grazing System**

- a. Identify and describe the grazing systems to be used for the different groupings of pastures. You need to do this so that you identify the adjustment factor in the forage balance spreadsheet.

### **3. Pasture Improvements**

- a. Completely describe the improvements/changes you propose. If you do not plan to make a change/improvement in the following areas, simply state that no changes are planned.
  - i. *Fencing*. New and maintenance. Refer to maps (Map 2, for instance) showing changes.
  - ii. *Livestock Water*. Same as for Fencing.
  - iii. *Weed Control*. Same as for Fencing.
  - iv. *Blowout Control/Prevention*. Same as for Fencing.
  - v. *Cattle Distribution*.
  - vi. *Other improvements*
- b. Develop map(s) with descriptions. Indicate changes in fencing, water development, and other improvement practices. On a separate map indicate summer and winter pastures, identify pastures in grazing systems, and indicate acres and AUMs available using your management program. [Several maps may be necessary - one for grazing systems, one for improvement, one for winter-summer pasture, etc.).

### **4. Forage Crop Selection**

- a. State what forage crops you plan to grow including yields and acres so that you can enter numbers into the forage supply side of the forage balance spreadsheet.

### **5. Forage Supply**

- a. Summarize forage supply, relying primarily on the forage balance spreadsheet showing forage supply for both pastures and forage crops.

## **PART III. BREEDING, REPRODUCTION, HEALTH, AND NUTRITION PROGRAM**

### **A. SELECTION, REPRODUCTION AND LIVESTOCK INVENTORY**

#### **1. Description of herd (breeds, age, etc.)**

- a. Cows
  - i. Lactating

- ii. Dry (gestating)
      - b. Replacement heifers and young cows
      - c. Stocker feeder heifers and steers
      - d. Bulls (Yearling, 2-5 yr. old, etc.)
      - e. Horses
    - 2. **Develop breeding goals** (Sub-goals of production goals related to fertility, feed and labor costs, and quantity and quality of product produced).
      - a. Example: Maintain a mature cow weight of 1200 pounds.
    - 3. **Breed selection** - Provide breeds selected and traits of each breed that are needed to accomplish breeding goals (Examples: mature weight, milk production, age at puberty, carcass quality, disposition, color pattern, etc)
    - 4. **General breeding program/ mating system** (purebred, crossbreeding system) and justification related to goals.
    - 5. **Source and selection of bulls**
      - a. Genetic – Single EPDs or indexes (range within the sire summary for each individual EPD or index)
      - b. Phenotype – age, weight, structure, temperament, etc.
    - 6. **Source and selection of heifers**
    - 7. **Breeding/calving season** – Provide the following information regarding breeding protocols.
      - a. Natural breeding: Specific dates for bulls in and out of breeding pasture and specific dates of first and last date of calving season.
      - b. Artificial insemination: Specific AI protocols (compounds used, treatment dates, estrous detection, AI timing, clean up procedures) and first and last day of AI and clean up bull calving season.
    - 8. **Breeding pasture management**
      - a. Specifically identify the breeding pastures and calving pastures.
  - B. **HERD PRACTICUMS** – Specific detailed descriptions of:
    - a. **Methods of identification**
    - b. **Vaccinations**
      - i. Dates and diseases prevented for cows, replacements, and calves
    - c. **External and internal parasite control**
      - i. Specific dates and parasites controlled
    - d. **Weaning dates and management of weaned calves** (preconditioning)
    - e. **Pregnancy** (Date)
    - f. **Body condition evaluations**
      - i. Specific dates and target body condition score
    - g. **Breeding soundness exam** – Bulls (Specific dates and items evaluated)
- C. **NUTRITION PROGRAM**
  - 1. **Introduction**
    - a. **Summary of overall nutrition program**
      - i. Feeds that will be used and why
    - b. **Feeding procedures** (bunks, frequency, etc)
    - c. **Storage method** (Round bale, ensiled, etc.)

**d. Processing**

**i. Hay**

1. Rolled out on ground (No processing)
2. Bale processor
3. Other

**ii. Grains**

1. Whole
2. Rolled
3. Ground
4. Other

2. **Rations and NRC Evaluation Report for all classes of livestock**
3. **Annual Feed Summary Table – Harvested and Purchased Feed Only**
4. **Composition of Purchased feeds**
  - a. **Protein/Energy Supplements**
    - i. What are you providing? (Ingredients, TDN, CP%, etc.)
    - ii. How is it delivered?
    - iii. How often is it delivered?
  - b. **Mineral Supplements**
    - i. What are you providing? (i.e. ingredients)
    - ii. How is it delivered
    - iii. How often is it delivered

**PART IV. ECONOMICS AND MARKETING**

1. **Description of marketing plan** (buyer, location, method) for all animals sold (calves, cull replacement heifers, yearlings, cull cows, cull bulls) sold
2. **Partial budget** (One management change)
3. **Annual Budgets** (Cow/Calf; Stockers; etc.)

**PART V. FORAGE MANAGEMENT AND DROUGHT CONTINGENCY PLAN**

1. **A Complete Description of Grazing Management.**
  - a. Clearly identify the grazing system (e.g., deferred rotation, short duration, or variations of commonly-used grazing systems) to be used for each herd and group of pastures. Create a figure/chart illustrating each of your grazing systems, or refer to the Seasonal Distribution Summary Chart in the Grazing and Hay Records Spreadsheet. Include justification for each system and characterize each system, e.g., grazing period and recovery period length, number of pasture occupations/year, season of grazing, and change of pasture sequence over years.
  - b. Identify the harvest efficiency you expect for each system, and briefly justify the harvest efficiency used.
  - c. Be sure to include all livestock herds and pastures (hint: AUMs used plus those remaining should equal the total AUMs available in the forage balance worksheet).

- d. Be sure to explain your dormant season grazing plans, which includes a full description of winter grazing of rangeland, feeding hay in a dry lot, corn stalk grazing – location, lease agreement, dates on stalks, cost, etc.
- e. For the grazing and hay spreadsheet, be sure to submit all pasture and summary sheets including stocking rate summary, seasonal distribution of grazing, pasture forage demand summary, and fed hay summary.
- f. Enter stocking rate or total AUMs that reflect harvest efficiency for that pasture.
- g. Make sure your AUE calculations are correct including for cow-calf pairs.
- h. Enter amount of hay fed in hay fed column.
- i. Use close to all of AUMs available in each pasture.
- j. Do not have grazing periods or fed hay periods that include both December and January. The entry period for the grazing and hay spreadsheet is the calendar year. So, the start date is January 1 – a pasture entry starting in one year (e.g., December 5) and ending in the next year (e.g., January 28) does not work and causes crazy entries in your summary tables.
- k. Enter 1-Jan-21 and 31-Dec-21 in Seasonal Distribution of Grazing sheet.
- l. Total hay fed and total forage pasture demand should equal hay and forage demand in other parts of the plan.
- m. Be certain that your forage balance worksheet is updated and complete.
- n. There needs to be agreement in harvested (e.g., hay) and grazing AUMs supply in the forage balance sheet and the summary tables of the grazing and hay spreadsheet.
- o. Maps or tables are useful to demonstrate grazing plans (pastures to be in each grazing system/herd, sequence of grazing within each grazing system, etc.)

Cattle Herd	Number/Weight	AUs	Grazing Dates	AUMs Demand	Pastures	AUMs Supply
Replacement Heifers						
Fall Cows (dry)						
Fall Cows/Calves						
Spring Cows (dry)						
Spring Cows/Calves						

**2. Management of forages and drought contingency plan**

- a. **How to plan for a drought???**
  - a. How much do you get off of this pivot, etc.
  - b. Forage rotation plan?
- b. **Grazing aftermath vs. hay storage for Meadow Grass**
- c. **Alternative forages**
- d. **Reserved pastures**
- e. **Supplementation strategies**
- f. **De-stocking strategies**

## **GRADUATE STUDENT REQUIREMENTS**

Historically, we've had higher expectations of graduate students than of undergraduate students in terms of depth, breadth, and quality of the ranch plan. Graduate students will present (15-minute presentation) on suggested management changes and each individual will submit a 5-page paper (with JAS citations) discussing one of the suggested changes to their management approach (i.e. impact of changing calving season, early weaning, cover crop grazing, etc.). Graduate students will select an approach and work with the instructors to get approval.

- 1. 15-minute presentation on major changes to the ranch plan**
- 2. Individually write a 5-page paper with citations on specific management change**

### **III. SUBMISSION**

- 1. Complete Final Ranch Plan**
  - a. Executive Summary of management changes from first drafts
  - b. Revised Parts I – IV**
  - c. Contribution of Group Members Evaluation Form (online)
- 2. Due Dates (all due by 11:59 pm via Canvas)**
  - a. Ranch Plan Part I – September 1<sup>st</sup>**
  - b. Ranch Plan Part II – September 15<sup>th</sup>**
  - c. Ranch Plan Part III – October 6<sup>th</sup>**
  - d. Ranch Plan Part IV – October 27<sup>th</sup>**
  - e. Ranch Plan Part V – November 17<sup>th</sup>**
  - f. Complete Final Ranch Plan – November 29<sup>th</sup>**
  - g. Group Presentations – November 30<sup>th</sup> – December 9<sup>th</sup>**

### **IV. GRADING**

- 1. Grading Rubric**
- 2. Contribution of Group Members**
- 3. Presentation Rubric**
- 4. Graduate Student Paper Guidelines**



**Written Project Rubric**

Criteria	Exemplary = 5	Good = 3	Marginal = 1	Unacceptable = 0	Score
Knowledge of Animal Sciences	Demonstrates sophisticated understanding of the complexity of the disciplines of Animal Science.	Demonstrates adequate understanding of the complexity of the disciplines of Animal Science.	Demonstrates partial understanding of the complexity of the disciplines of Animal Science.	Demonstrates surface understanding of the complexity of the disciplines of Animal Science.	
Transfer	Makes explicit references to previous learning (formal classroom and experiential learning) and applies in new and creative ways that knowledge and those skills to demonstrate comprehension and performance in novel situations	Makes references to previous learning (formal classroom and experiential learning) and shows evidence of applying that knowledge and those skills to demonstrate comprehension and performance in novel situations	Makes references to previous learning (formal classroom and experiential learning) and attempts to apply that knowledge and those skills to demonstrate comprehension and performance in novel situations	Makes vague references to previous learning (formal classroom and experiential learning) but does not apply knowledge and those skills to demonstrate comprehension and performance in novel situation	
Defines Problem	Demonstrates the ability to construct a clear problem statement with evidence of consideration of all related factors.	Demonstrates the ability to construct a clear problem statement with evidence of consideration of most of the related factors.	Begins to demonstrate the ability to construct a problem statement with evidence of most of the related factors, but the problem statement is superficial.	Demonstrates limited ability in identifying problem statement or related factors.	
Identify Strategies	Identifies multiple approaches for solving a problem that apply within a specific context.	Identifies multiple approaches for solving a problem only some of which apply within a specific context.	Identifies only a single approach for solving a problem that does apply within a specific context.	Identifies one or more approaches for solving a problem that do not apply within a specific context.	
Propose Solutions	Proposes one or more solutions that indicate a complete comprehension of the problem.	Proposes one or more solutions that indicate partial comprehension of the problem.	Proposes only one solution that is "off the shelf" rather than individually designed to address the specific contextual factors of the problem.	Proposes a solution that is difficult to evaluate because it is vague or only indirectly addresses the problem.	
Uses information effectively to accomplish the project	Communicates, organizes, and synthesizes information from sources to fully achieve a specific project, with clarity and depth.	Communicates, organizes, and synthesizes information from sources. Project is completed.	Communicates, organizes information from sources. The information is not yet synthesized so the project is not fully completed.	Communicates, information from sources. The information is fragmented and/or used inappropriately, so the project is not completed.	

**Livestock Management on Range and Pasture**  
**Final Ranch Plan – Contribution of Group Members**  
**\* Due after group presentations (December 9, 2021)**

Please assess the work of you and your colleagues by using the following google form:  
<https://forms.gle/MdbGzkSchM21KBZu9>

The feedback provided will be considered in assigning the grade for the final group Ranch Plan. Please try to be as honest and fair as possible in your assessment. Please provide any additional comments in the comment/justification section for each individual.

Complete the following sections that evaluate the “Skills of your Peer” on a 1 to 4 scale:

1. Contributions and Attitude
  - b. (1) Seldom cooperates
  - c. (4) Always cooperates
2. Cooperation with Others
  - a. (1) Did not do any work
  - b. (4) Did more than others
3. Focus, Commitments
  - a. (1) Often is not a good team member
  - b. (4) Tries to keep people working together
4. Team Role Fulfillment
  - a. (1) Participates in few or no group meetings
  - b. (4) Participates in all group meetings
5. Ability to Communicate
  - a. (1) Rarely listens to, shares with, or supports the efforts of others
  - b. (4) Always listens to, shares with, and supports others
6. Accuracy
  - a. (1) Work is generally sloppy and incomplete
  - b. (4) Work is complete, well-organized, error-free, and done on time or early

**STUDENT ORAL PRESENTATION: 50 points total**

**Presenters:** \_\_\_\_\_ **Reviewer:** \_\_\_\_\_

1. **Organization of presentation** \_\_\_\_\_ **/5 pts**
  - **Clear, logical, and complete**
2. **Oral delivery** \_\_\_\_\_ **/15 pts**
  - **Speaker(s) is professional and has confidence**
  - **Effective delivery – capture audience attention**
  - **Appropriately presented**
3. **Technical content** \_\_\_\_\_ **/15 pts**
  - **Sufficient depth of detail provided (didn't just provide vague information)**
  - **Recommendations were clear**
  - **Data was provided to adequately justify recommendations**
4. **Knowledge of subject** \_\_\_\_\_ **/ 5 pts**
  - **Concepts integrated – systems thinking is evident**
  - **Evidence that research was done by student**
  - **Evidence the student has a good understanding of the operation**
5. **Overall presentation** \_\_\_\_\_ **/10 pts**
  - **Overall quality of presentation was good.**
  - **Slides were of high quality, easy to read, and grammatically correct.**
  - **Students were able to maintain audience interest and stimulate questions**

**Total:** \_\_\_\_\_ **/ 50 pts**

**GRADUATE STUDENT PAPER: 150 points total**

**Topic:**

1. Topics are limited to a management consideration/approach of some aspect that was implemented as a change in the ranch plan.
2. Students will select an approach and work with the instructors to get approval by late September.
3. Authors should keep in mind that paper length should be five pages (not including title page and references), typed and double spaced using 12-point Times New Roman font. Page margins are to be set at 1" for all sides. Students should cite at least 5 refereed journal articles within the body of the text (using the style of JAS).

**Format and References:**

1. Papers are to be written in a technical form.
2. Sections and sub-headings will be at the author's discretion, but information should be presented clearly and logically.
3. Students **MUST** follow the Journal of Animal Science (JAS) formatting for all abbreviations, units, and formatting. Journal of Animal Science Instructions to Authors will be posted on CANVAS and can be found at [https://academic.oup.com/jas/pages/General\\_Instructions](https://academic.oup.com/jas/pages/General_Instructions).

**Grading:**

1. Papers are due **November 11<sup>th</sup>, 2021.**
2. Points will be divided as follows:
  - a. Content - 100 points
  - b. Format - 50 points
    - i. Organization
    - ii. Sentence Structure
    - iii. Spelling
    - iv. References

# **LNU Ranch Plan**



**Group Three**

**AGRO 445/ASCI 451**

**Fall 2021**

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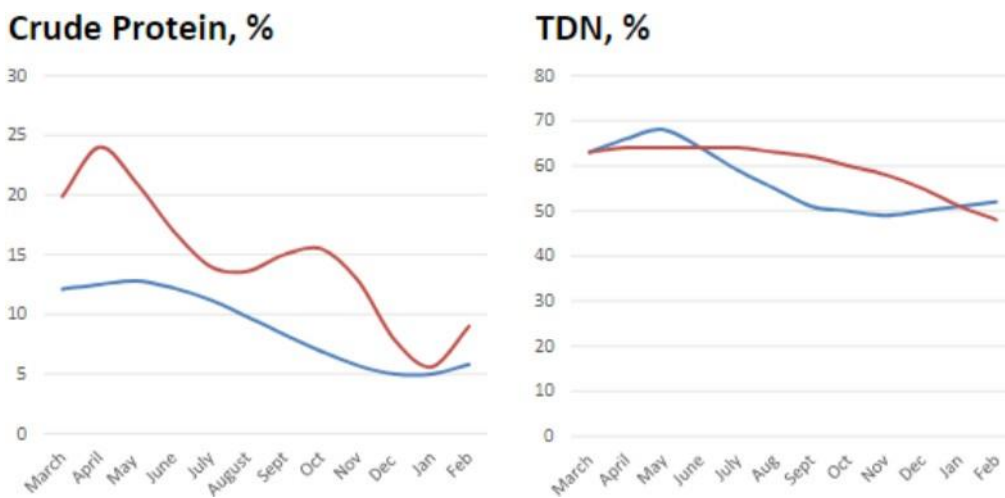
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## Part 1: Introduction

### Ranch Description

The LNU Ranch is a 12,800 acre ranch located in the midst of the sandhills north of Whitman, Nebraska. With a combination of sands, sandy, and choppy sands sites, it consists of 11,600 acres of upland native range and 1,200 acres of subirrigated and wetland meadows. In the recent past, many of these meadows have been fertilized and grazed or cut for hay. The following charts in Figure 1 describe the crude protein and TDN values of the present forage.

**Figure 1.** Crude Protein and TDN% of present forage

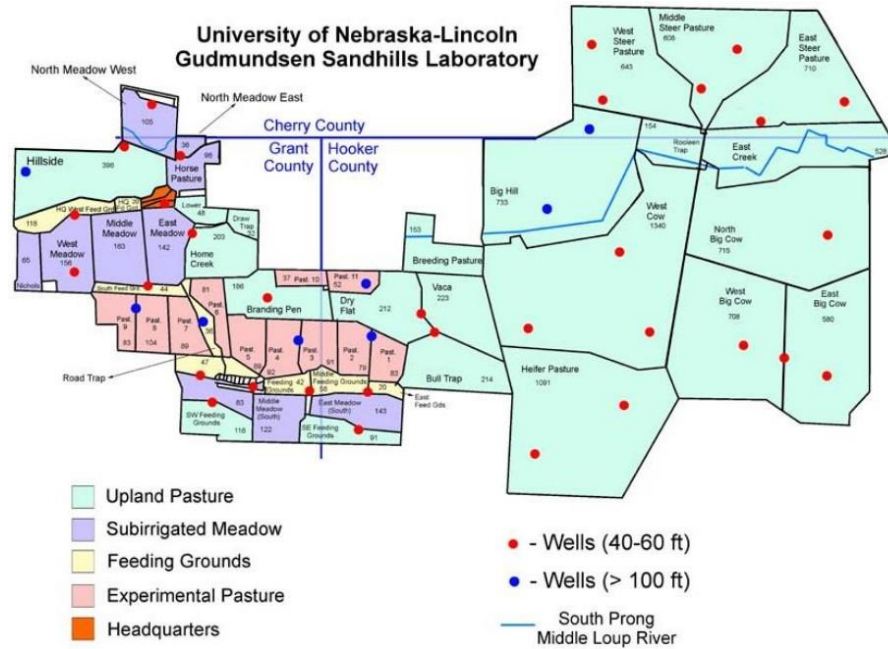


The property is divided into several pastures, surrounded by standard 5-strand barbed wire fence with wooden posts. The fences are in good repair, and windmills provide at least one water source in every pasture. The South Prong Middle Loup River also traverses the ranch, making water available for both livestock and forages. Currently the ranch serves as a research and educational operation dedicated to advancement in many areas, including the understanding of the Sandhills ecosystem, reproduction, nutrition, and livestock and range management.

The ranch is host to a total of about 707 head of Red Angus/Simmental cattle, among which are 8 fistulated cows. Mature cow body weight ranges from 623 to 1,885 pounds, at an average weight of 1,002 pounds, and with milk production at an average of 18 pounds. Between the March and May calving herds, there are 480 cows, 150 replacement heifers, 85 steers, 24 purchased bulls, and 27 cull yearling heifers. All bulls have been purchased from the UNL research operation near Mead, NE.

Additionally, the LNU Ranch boasts several functional meeting and research facilities. The Wagonhammer Education Center contains a large lab for sample preparation, two offices, and a conference room with the ability to accommodate 300 people.

**Figure 2.** Map of current LNU operation



Another dormitory contains six bedrooms with a total of 12 available beds. The current inventory of the ranch is as follows:

- 1987 Model 120G Road Grader
- 2003 Hay Rake
- Case IH tractor Model BF 14HC
- Round Baler Model BR780
- 3 ATVs
- Emerson 6 bale Processor/Mover
- Emerson 2 bale processor
- Skidloader
- 3 16 ton overhead grain bins
- Case IH140 T4 Maxxum tractor
- Polaris Ranger UTV
- 24' featherlite stock trailer
- 2 hydraulic livestock chutes
- Portable panels
- 2 cake feeders

### Purpose of Ranch Plan

The purpose of the following ranch plan is to improve the LNU operation in structure, record keeping, profitability, and management direction. A detailed plan must be formed and implemented in order to be successful. Current resources must be accounted for while also exploring potential resources that must be acquired outside of the operation. Because of the



many factors affecting a ranch including those influenced by humans and nature, a ranch plan can become quite complex. It is important to highlight not only what the manager wishes to achieve, but how progress will be monitored as they work towards that goal. As a plan progresses, measurements should be taken and information must be analyzed and evaluated, leading to contingency plans for how adjustments will be made later on. Undoubtedly, there will be unexpected obstacles that must be accounted for. Many times these challenges come in the form of extreme weather events or dramatic changes in the markets. By being flexible enough to make predictions and replan when needed, a manager can mitigate risk and be sure they stay on course towards the goal. The outcomes of decisions and events are difficult to predict, but by carefully planning ahead, a manager will increase their control over the results.

### **Explanation of Plan**

The opportunity to create a ranch management plan in college will undoubtedly help students as they apply the experience in life after graduation. Each member of the group has an interest in the cattle industry and is looking to gain real-life understanding and experience before entering a career. Being able to make educated decisions now, while the risk is minimal, provides a valuable opportunity for students to learn what works well and what doesn't on a ranching operation. This is imperative to later success in managing one's own operation or helping other producers make management decisions. Furthermore, the project allows members to work with other students and staff who may have varying perspectives and experiences. The different interests and backgrounds of each person can stimulate an environment where working together is key to success, an important factor that many working ranches disregard.

### **Goals & Objectives**

#### Quality of Life

- ❖ *Goal:* The operation should ensure that there is adequate time for family, community outreach, and recreation. There should be a positive work environment that prioritizes workers' health.
  - *Objective 1:* Employees should have adequate time to spend with family and/or to go to family events/vacations on evenings and weekends.
    - *Target:* Every other weekend off; at least 2 days/week off by 5pm, 1 week maximum vacation

- *Objective 2:* Attend community meetings, expositions, and maintain a social media presence for public education and outreach, as well as hosting events at GSL.
  - *Target:* Attend or host six events, two social media posts per month
- *Objective 3:* Hold regular meetings to discuss operation business and to encourage employees to set and follow personal goals.
  - *Target:* Bi-weekly meetings, set four personal goals/employee

### Natural Resource and Landscape

- ❖ *Goal:* The operation should be maintained in a sustainable and resource-efficient manner to steward the land in a way to preserve it for future generations.
  - *Objective 1:* Maintain excellent rangeland health by encouraging soil health, ground cover, and native vegetation.
    - *Target:* Similarity index 80% or higher, NRCS Rangeland Health Assessment  $\geq$  1 moderate departure
  - *Objective 2:* Properly manage stocking rates and grazing periods.
    - *Target:* >60% of forage remaining; all areas grazed equally
  - *Objective 3:* Maximize profit and forage utilization by haying meadows and grazing uplands.

### Production

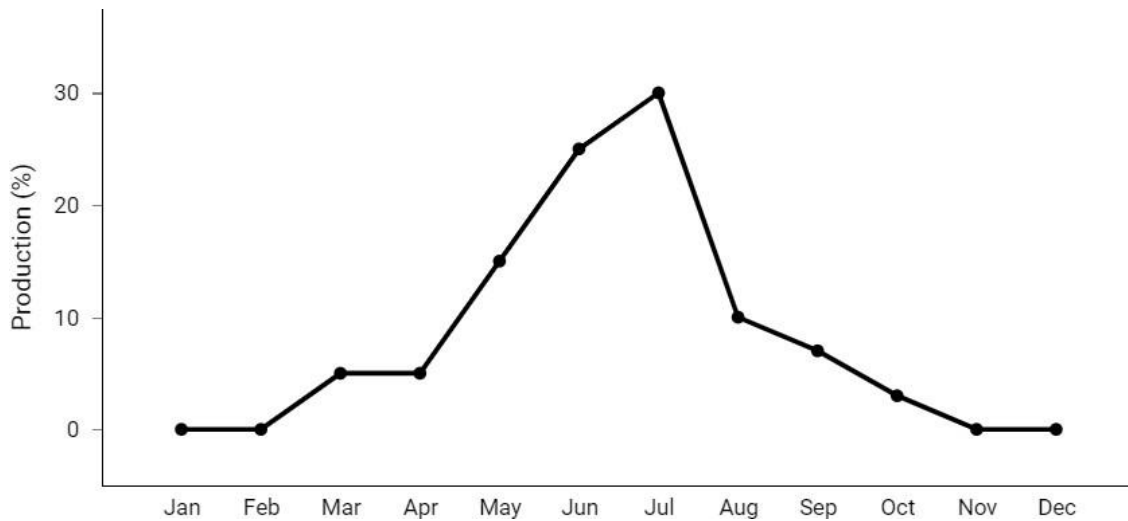
- ❖ *Goal:* The operation will produce high quality beef with no additional hormones to connect with consumers and maximize profit.
  - *Objective 1:* Minimize inputs by eliminating/reducing unnecessary costs
    - *Target:* Keep a yearly spreadsheet of costs and equipment/feed/resource uses to be sure the use of each item outweighs the cost.
  - *Objective 2:* Maintain a desired calf crop and pounds weaned per cow
    - *Target:* 90% calf crop, >500 lb weaned/cow
  - *Objective 3:* Produce moderately sized cows and calves to increase grazing efficiency
    - *Target:* Average weaning weight of 715 lb; mature weight of 1000-1200 lb

## Part 2: Forage Resource Description and Improvements

### Forage Resource Description

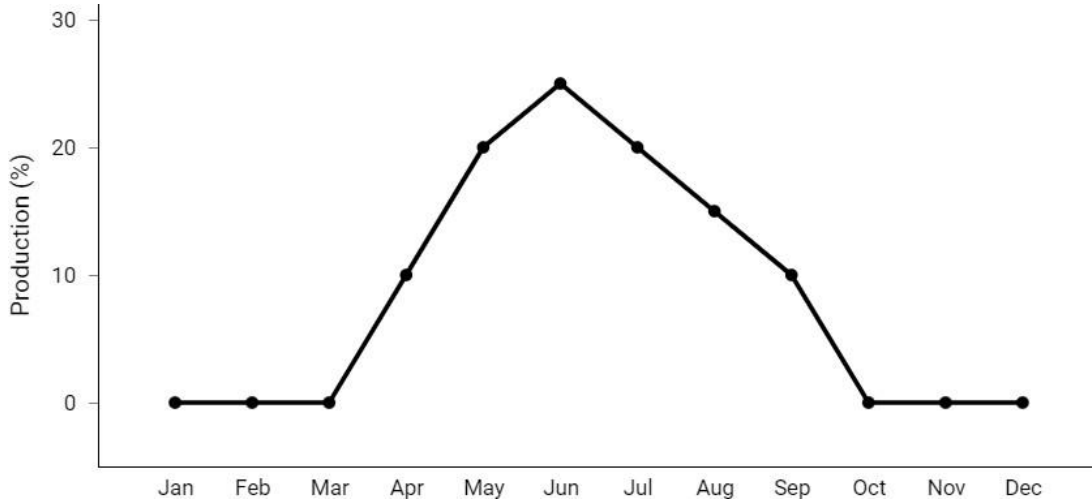
The LNU Ranch is a 12,800 acre ranch with 11,600 acres of upland range and 1,200 acres of subirrigated and wetland meadows. Upland areas are mainly Sands ecological sites, with a dominant plant community of Sand Bluestem, Prairie Sandreed, and Needlegrass. Overall, the vegetation includes mainly tall and mid warm season grasses and cool-season introduced grasses. Heavy grazing or improper rest periods will lead to loss of needlegrass, while no use or no fire practices will lead to excessive litter.

**Figure 3.** Plant community growth curve. NE6534, NE/SD Sandhills, Native Grasslands. Warm-season dominant, cool-season subdominant, mid- and tallgrasses (EDIT).



Wet sub-irrigated meadows with tall warm season grasses also make up a large portion of the ranch. These areas are dominated by a resilient and drought tolerant big bluestem and switchgrass community, along with some prairie cordgrass in north pastures due to heavier use. In most years, the meadows are hayed, and regrowth may be grazed. Forage quality is improved when cool season grass competition decreases and warm season grass vigor increases, which may be achieved by harvesting prior to the onset of warm-season grass growth and waiting to graze until after a fall killing frost. Vegetation may shift to the undesirable cool season dominant plant community if annual mid summer haying or grazing is repeated.

**Figure 4.** Plant community growth curve. NE6544, NE/SD Sandhills, Hayed and Grazed Sub Irrigated Meadows. Warm-season dominant, cool-season subdominant, mid- and tallgrasses (EDIT).



Historically, in the grazing season, cattle have been rotated to prevent overgrazing. A general rule is to utilize 25% of the available forage and leave the other 25% for trampling and wildlife use while the last half is left for plant vigor. Another range improvement practice previously implemented has been fertilizing meadows for hay production. Research has been done to learn new practices for ranching strategies and cattle efficiency, resulting in pastures that are not utilized to their maximum capability due to the need for consistent experimental trials.

**Forage Availability**

The following chart describes the pastures with their respective plant communities, carrying capacity, and AUMs available. In total, the LNU operation has 8,698 AUMs that may be used, and approximately 2,301 lbs/acre are produced per year.

Figure 5-A. LNU Ranch Upland Range and Meadow Grazing AUMs

<u>Pasture - Upland</u>	<u>Plant Communities</u>	<u>Acres</u>	<u>Carrying Capacity (AUM/ac)</u>	<u>AUMs available</u>
Hillside	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	396	0.6	238
Lower	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	48	0.6	29
Draw Trap	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	32	0.6	19
Home Creek	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	203	0.6	122
South Feed Ground	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	445	0.6	267
Breeding Pasture	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	153	0.6	92
Branding Pen	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	186	0.6	112
Dry Flat	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	212	0.6	127
Vaca	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	223	0.6	134
Bull Trap	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	214	0.6	128
West Steer Pasture	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	643	0.6	386
Middle Steer Pasture	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	608	0.6	365
East Steer Pasture	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	710	0.6	426
Big Hill	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	733	0.6	440
Rooleen Trap	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	154	0.6	92
East Creek	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	528	0.6	317
West Cow	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	1340	0.6	804
North Big Cow	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	715	0.6	429
West Big Cow	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	708	0.6	425
East Big Cow	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	580	0.6	348
Heifer Pasture	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	1091	0.6	655
Pasture 1	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	83	0.6	50
Pasture 2	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	79	0.6	47
Pasture 3	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	91	0.6	55
Pasture 4	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	92	0.6	55
Pasture 5	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	89	0.6	53
Pasture 6	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	81	0.6	49
Pasture 7	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	89	0.6	53
Pasture 8	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	104	0.6	62
Pasture 9	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	83	0.6	50
Pasture 10	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	37	0.6	22
Pasture 11	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	52	0.6	31
HQ West Feed Ground	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	118	0.6	71
HQ Feed Ground	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	20	0.6	12
Feeding Grounds	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	42	0.6	25
Middle Feeding Grounds	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	58	0.6	35



**Figure 5-B.** LNU Ranch Upland Range and Meadow Grazing AUMs continued

<u>Pasture - Upland</u>	<u>Plant Communities</u>	<u>Acres</u>	<u>Carrying Capacity (AUM/ac)</u>	<u>AUMs available</u>
SW Feeding Grounds	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	116	0.6	70
SE Feeding Grounds	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	91	0.6	55
North of South Meadow Pens	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	47	0.6	28
South Meadow Feed Ground	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	20	0.6	12
Hill Road Trap	Primarily Bluestem/ Prairie Sandreed/ Needlegrass	36	0.6	22
<b>Total Upland Range</b>		<b>11350</b>	<b>----</b>	<b>6810</b>
<b>Meadow</b>				
North Meadow West	big bluestem/switchgrass	105	3	315
North Meadow East	big bluestem/switchgrass	36	3	108
Home West Meadow	big bluestem/switchgrass	156	0.8	125
Home Nichols Division	big bluestem/switchgrass	65	0.8	52
Home Middle Meadow	big bluestem/switchgrass	163	0.8	130
Home East Meadow	big bluestem/switchgrass	142	0.8	114
Middle Meadow (South)	big bluestem/switchgrass	122	3	366
East Meadow (South)	big bluestem/switchgrass	143	3	429
West Meadow (South)	big bluestem/switchgrass	83	3	249
Horse Pasture	big bluestem/switchgrass	96	0.6	58
<b>Total Meadow</b>		<b>1015</b>	<b>----</b>	<b>1888</b>
<b>Total GSL</b>		<b>12365</b>	<b>----</b>	<b>8698</b>

\* Hayed meadow AUM production for grazing of regrowth

## Grazing System

For simplicity in describing grazing seasons, the following months have been assigned to each season: Spring: February-April, Summer: May-September, Fall: October-November, Winter: December-January. Each pasture was assigned to a particular season which can be seen in Figure 7. In the spring through the fall, a rotational grazing system will be used in which cattle will often return to a previously used pasture. This will allow cattle to have ample forage and allow for recovery time of vegetation in order to improve range health. Within the winter months, cattle will be rotated through the respective pastures for that season, but each pasture will generally only be occupied once. During the winter months, cattle will be supplemented with hay as needed, which will be cut from all the meadows in early June and early August to maximize the balance of yield and nutritional quality. Unutilized hay will be sold to other local producers, although some will be held back as an emergency supply.

Within the breeding season of January 1 - February 28 the cows, yearling replacement heifers, and bulls will be rotated together. Weaned heifers and steers will be in separate herds until they are marketed as yearlings or used as replacements. Bulls will be leased, so they will graze with the cow herd only during the breeding season in January and February. They will also have a period of quarantine on the ranch prior to the breeding season for biosecurity. Horses will spend March through August in the North Meadow East, and September through February in the Horse Pasture. The estimated grazing dates and pastures for each livestock class throughout the year can be found in Figures 6-A and 6-B.

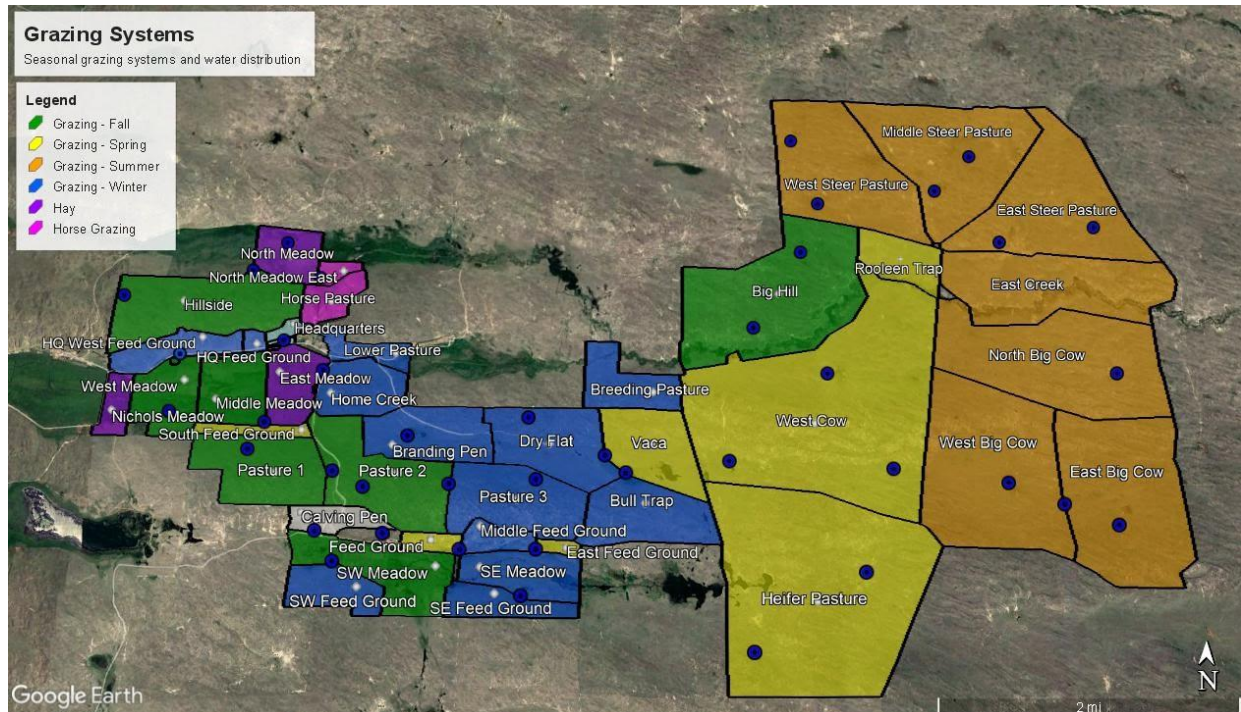
**Figure 6-A.** Estimated grazing dates and pastures for cows, steers, and bulls.

Cow-Calf Pairs		Dry Cows		Weaned Steers		Yearling Steers	
Dates	Pasture	Dates	Pastures	Dates	Pastures	Dates	Pastures
January 1-4	Branding Pen					Jan. 1 - Feb. 1	Home Creek
January 4-14	Pasture 3					Feb. 1 - Mar. 1	South Feed Ground
January 14-26	Dry Flat			March 1-24	Heifer Pasture	March 1-24	Heifer Pasture
Jan. 26 - Feb. 1	Breeding Pasture			March 24-April 1	South Feed Ground	March 24-April 1	South Feed Ground
February 1-6	Rooleen Trap			April 1-15	Vaca		
Feb. 6 - Mar. 31	West Cow			April 15-May 1	South Feed Ground		
		Mar. 31 - May 1	Heifer Pasture	May 1-21	East Big Cow		
		May 1-21	East Steer Pasture	May 21-31	West Steer Pasture		
		May 21 - June 11	North Big Cow	May 31 - June 21	East Big Cow		
		June 11 - July 1	West Big Cow	June 21 - Sept. 15	West Steer Pasture		
		July 1-16	East Steer Pasture	September 15-30	East Big Cow		
		July 16-30	North Big Cow			Oct. 1 - Dec. 1	Hillside
		July 30 - Aug. 14	West Big Cow			Dec. 1-17	HQ West Feed Ground
		Aug. 14 - Sept.7	Middle Steer Pasture			Dec. 17-20	HQ Feed Ground
		September 7-30	East Creek			Dec. 20 - Jan. 1	Lower Pasture
Oct. 1-4	West Meadow						
Oct. 4-7	Middle Meadow						
Oct. 7-17	Pasture 1						
Oct. 17-28	Pasture 2						
Oct. 28 - Nov. 5	SW Meadow						
Nov. 5 - Dec. 1	Big Hill						
December 1-9	Bull Trap						
Dec. 9-13	SE Meadow						
Dec. 13-18	SE Feeding Ground						
Dec. 18-24	SW Feeding Ground						
Dec. 24 - Jan 1.	Branding Pen						
				<b>Bulls</b>			
				<b>Dates</b>	<b>Pasture</b>		
				Dec. 10 - Jan. 1	Vaca		
				January 1-4	Branding Pen		
				January 4-14	Pasture 3		
				January 14-26	Dry Flat		
				Jan. 26-Feb. 1	Breeding Pasture		
				February 1-6	Rooleen Trap		
				Feb. 6 - Mar. 1	West Cow		

**Figure 6-B.** Estimated grazing dates and pastures for replacement heifers.

Replacement Heifer Calves		Yearling Replacement Heifers		Bred Replacement Heifers	
Dates	Pastures	Dates	Pasture	Dates	Pastures
		January 1-4	Branding Pen		
		January 4-14	Pasture 3		
		January 14-26	Dry Flat		
		Jan. 26-Feb. 1	Breeding Pasture		
		Feb. 1 - Mar. 1	Heifer Pasture		
March 1-10	East Feed Ground			March 1 - 31	Vaca
March 10-Apr. 1	Feeding Ground			Mar. 31 - Apr. 15	West Cow
April 1-15	South Feed Ground			Apr. 15 - May 1	Vaca
April 15 - May 1	West Cow			May 1-11	Middle Steer Pasture
May 1-11	East Creek			May 11-21	East Creek
May 11-21	West Steer Pasture			May 21-31	East Big Cow
May 21-31	Middle Steer Pasture			May 31 - June 11	Middle Steer Pasture
May 31-June 11	East Creek			June 11-21	East Creek
June 11-21	West Steer Pasture			June 21 - July 1	East Big Cow
June 21 - July 1	Middle Steer Pasture			July 1-11	Middle Steer Pasture
July 1-21	East Big Cow			July 11-21	East Creek
July 21-31	Middle Steer Pasture			July 21-31	East Big Cow
July 31 - Sept. 15	East Big Cow			July 31 - Aug. 14	Middle Steer Pasture
September 15-30	West Steer Pasture			Aug. 14 - Sept. 30	East Creek
		Oct. 1 - Dec. 1	Big Hill		
		Dec. 1 - Jan. 1	Middle Feeding Ground		

**Figure 7.** Pasture designation based on grazing season





## Pasture Improvements

### Fencing

Existing fencing will be maintained, although several pastures will be combined eliminating the need for division fences. The combinations are as follows:

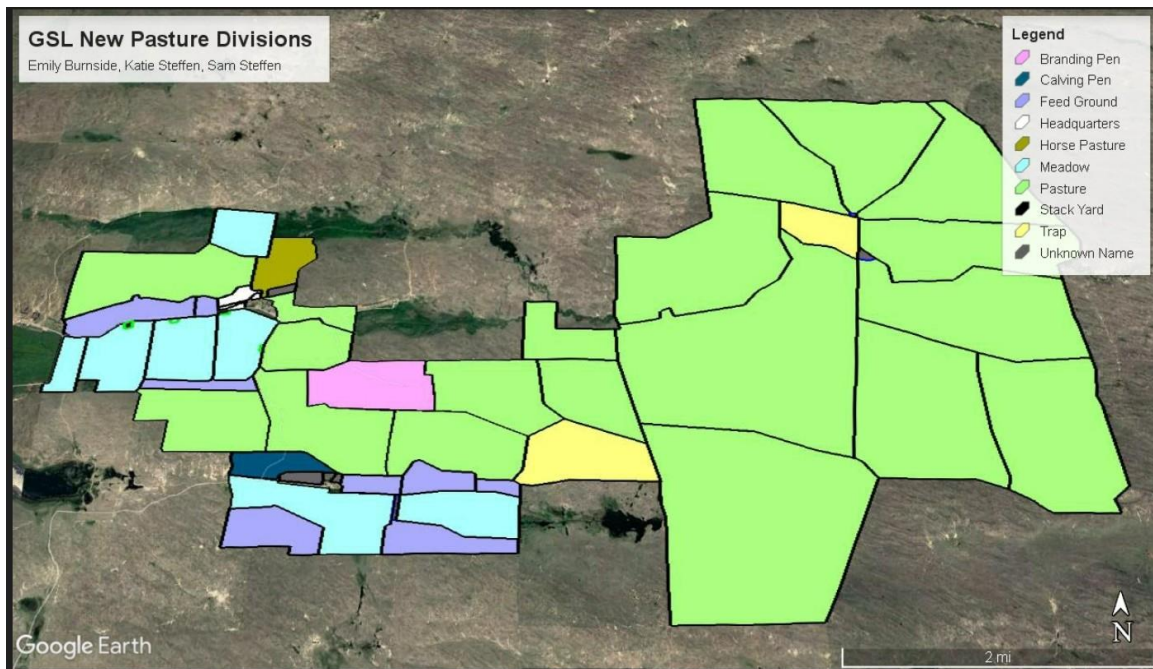
Branding Pen + Pasture 10

Lower Pasture + Draw Trap

Dry Flat + Pasture 11

West Meadow South + Middle Meadow South

**Figure 8.** Updated pasture divisions



### Livestock Water

The water on the ranch was well laid out and there will not be any changes to the wells or the submersible pumps. Each pasture will have at least one water source for cattle and as many as three in the largest pasture. Figure 7 shows the distribution of water tanks which are depicted as blue dots on the map.

### Weed Control

Weeds will be identified and eradicated if it is a noxious weed. If a species appears throughout a pasture there are multiple ways to control them. Burning pastures, selective pressure grazing, mechanical removal, and chemical applications are all potential methods to control weeds.

## Blowout Control/Prevention

Pastures must be monitored for developing blowouts. Proper vegetation must be maintained in order to encourage soil structure and stability. If a blowout begins, an enclosure should be formed to prevent cattle from further grazing or trampling to prevent erosion and to support regrowth.

## Cattle Distribution

Cattle distribution is important to provide and promote rangeland health. Spreading out different aspects such as water and minerals incentivise cattle to move throughout a pasture. Cattle will tend to stay close to water and prefer more level terrain. Having a uniform harvest across a pasture will lead to more efficient forage production than overgrazed pastures.

## Fertilizer

An enterprise for hay production will be included in the new plan for the LNU operation. As hay is both sold and fed to cattle, quality will be an important focus. Therefore, meadows will regularly be fertilized.

## Forage Crop Selection

Grass production at LNU will be sufficient and no additional forage crops will be grown.

## Forage Supply

As shown in the spreadsheet below, in total, LNU will have a grazing supply of 7,526.4 AUMs. No forage crops will be utilized, however 1,357 tons of hay will be available. Hay will be harvested from meadows, including North Meadow, Nichols Meadow, East Meadow, South Meadow, West Meadow, Middle Meadow and Southeast Meadow. Of the hay, 116 AUMs will be fed in the winter, and 1,750 AUMs will be kept in stack yards as drought mitigation. The remainder of the hay, cut before maturity, will be sold. All cattle and forages combined, there will be a demand of 7,526.47 AUMs, allowing for a balanced supply and demand ratio.

**Figure 9-A.** Harvested supply of hay with reductions for meadows that will also be grazed

Harvested Supply				
Type	Acres	Ton/A	Tons	AUMs
North Meadow	105.0	2.3	242	618.24
Nichols Meadow	65.0	2.3	150	382.72
East Meadow	142.0	2.3	327	836.10
South Meadow	47.0	2.3	108	276.74
West Meadow	78.0	2.3	179	459.26
Middle Meadow	81.5	2.3	187	479.87
SE Meadow	71.5	2.3	164	420.99
<b>Total Harvested Supply</b>			<b>1357</b>	<b>3473.92</b>

**Figure 9-B.** Forage balance sheet for estimating forage demand and usage

Class	Stage	No.	AU	AUM	Monthly Demand												Total	
					Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec		
Mature Cows	Non-lactating	368	1	368					368	368	368	368	368	368				2208
Mature Cows	Lactating	400	1.2	480	480	480	480								480	480	480	2880
Repl Heifers	Bred_18-24	36	0.9	32.4			32.4	32.4	32.4	32.4	32.4	32.4	32.4					226.8
Repl Heifers	Yr_12-17	40	0.8	32.0	32.0	32.0									32.0	32.0	32.0	160.0
Rep_Heifers	Calves 6_12	40	0.6	24.0			24.0	24.0	24.0	24.0	24.0	24.0	24.0					168
Calves	3-4 weaning	360	0.3	108		108	54											162
Weaned	6_12 mo	180	0.6	108			54	108	108	108	108	108	108					702
Yearling	Calves	180	0.8	144	144	144	144								144	144	144	864
Bulls	12_24 mo			0														0
Mature Bulls	2-5 yr	17	1.5	25.5	25.5	25.5												51
Misc.				0														0
Horses		5	1.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	75
Misc.				0														0
Misc				0														0
				0														0
				0														0
Total AUMS Demand/month					687.75	795.75	794.65	538.65	538.65	538.65	538.65	538.65	538.65	662.25	662.25	662.25		7496.8
Grazing AUMS Available					619.5	795.2	795.2	579.2	558	558	558	558	558	663.16	663.16	619.5		7526.47
Grazing Balance					-68.3	-0.5	0.6	40.6	19.7	19.7	19.7	19.7	19.7	0.9	0.9	-42.8		29.7
Harvested AUMS Allocated						70	1										45	116
Total Balance					2	0	1	41	20	20	20	20	20	1	1	2		146

### Part 3: Breeding, Reproduction, Health, and Nutrition Program

#### Selection, Reproduction and Livestock Inventory

Presently, LNU consists of two calving herds calving in March and May. We will be maintaining a herd of 400 mature Red Angus/Simmental cows in one herd which will be calving in October and November. Cows will be lactating and nurse calves until weaning in early March. There will be no set date for weaning in that month, so that the condition of calves, dams and forage may be monitored and adjustments can be made as seen fit. This means that calves are healthy, vaccinated, and capable of being shipped when marketing arrangements have been made. In addition, having a flexible weaning date will allow the ranch to adapt to changing markets. Replacement heifers will be retained at a rate of about 10% of herd size, and will be bred at 15 months of age. Steers will be kept for sale as yearlings. Concurrently, 10% of the cow herd will be culled, including open cows. Pregnancy checks will occur in late March to determine the open cows. Calves will be sold in April along with cull cows, and herd cows will then recover and remain dry while gestating until calving in October and November.

Seventeen bulls averaging 3 years of age will be leased and put on pasture with cows and heifers during the months of January and February, at a ratio of 1:25. Heifers will be exposed for the first 6 weeks of this period to ensure an earlier calving date than the cows so they may be properly monitored and have a better chance of calving in desirable weather. Five quarter horses used for ranch work will also be grazed in the Horse Pasture and North Meadow East throughout the year.

## **Breeding goals**

Our overall breeding goal is to maintain moderately sized cows and calves to promote grazing efficiency. The LNU Ranch will work to maintain mature cow weights of 1,000 - 1,200 pounds. Each year, the ranch will expect to produce at least 500 pounds of weaning weight per cow exposed from a 90% calf crop. Therefore, the weaning weight goal is an average of 715 pounds per calf.

The current herd at LNU is made up of a Red Angus/Simmental composite which will be maintained going forward. A crossbreeding system of 50% Red Angus and 50% Simmental will be utilized to obtain hybrid vigor. This will take advantage of the weaning weight and marbling characteristic of Angus cattle as well as the milking ability, maternal traits, calving ease, and greater weight gain from the Simmental. Calving will take place from October 1st to December 1st. Replacement heifers will be selected from the LNU calf crop each year at a rate of 12% based on birth date, birth and weaning weight, and birth to weaning weight gain. As the ranch strives to produce high quality beef, being high in marbling and tenderness, we want our calves to gain condition quickly from a cow with excellent mothering ability and proper milk nutrition. As we try to connect with our targeted consumers, our non-hormone beef will be NHTC certified, while being a high quality protein source to meet dietary needs.

The herd will be naturally bred to three year old bulls averaging 2,500 pounds, leased from Jorgensen Farms with focus on these areas of the EPD. No artificial insemination will be performed. Bulls will be turned out on January 1st and removed March 1st. Docility in temperament is important as management is considered. Furthermore, bulls should be reproductively and structurally sound, with no history of lameness. Breeding Soundness Exams (or BSE's) and Trich tests, will be done by Jorgensen Farms before shipping bulls to the ranch. We will ensure the owner of the bull presents valid records for these exams. Emphasis will be on a moderate birth and weaning weight, high milk production, high calving ease, and a high quality carcass. The EPD's in the image below are the averages of the bulls available to lease. Targeting this average range in the EPDs will allow our herd to improve genetically, while avoiding selection for too much of one trait or causing large changes to the herd.

**Figure 10. Bull EPDs (Jorgensen Farms)**

Available Young Heifer Bulls		Avg Young Heifer Bull Statistics										
837		BW	BW EPD	Adj WW	WW EPD	Adj YW	YW EPD	Milk EPD	IMF EPD	REA EPD	RIB GEPD	SC EPD
		75	0.0	489	41	546	84	23	0.34	0.35	3.91	0.33

Available Young Cow Bulls		Avg Young Cow Bull Statistics										
616		BW	BW EPD	Adj WW	WW EPD	Adj YW	YW EPD	Milk EPD	IMF EPD	REA EPD	RIB GEPD	SC EPD
		92	2.5	540	49	604	92	21	0.30	0.37	4.07	0.37

Available Mature Heifer Bulls		Avg Mature Heifer Bull Statistics										
1068		BW	BW EPD	Adj WW	WW EPD	Adj YW	YW EPD	Milk EPD	IMF EPD	REA EPD	RIB GEPD	SC EPD
		75	0.4	563	41	1164	81	24	0.31	0.37	12.85	0.39

Available Mature Cow Bulls		Avg Mature Cow Bull Statistics										
1100		BW	BW EPD	Adj WW	WW EPD	Adj YW	YW EPD	Milk EPD	IMF EPD	REA EPD	RIB GEPD	SC EPD
		90	2.9	603	51	1205	92	24	0.28	0.36	11.18	0.49

Bulls will be brought to the ranch December 10 and kept in the Vaca pasture for 3 weeks to be quarantined from the cow herd. They will be evaluated for disease, lameness or libido problems that may limit their ability to breed or infect cows. Breeding will begin in the Branding Pen pasture on January 1st. Cows and bulls will be rotated to Pasture 3 next followed by Dry Flat, Breeding Pasture, Rooleen Trap, and ending in West Cow. Supplementation with hay and cake will be used as needed. Calving will begin in West Meadow in the beginning of October followed by Middle Meadow, Pasture 1, Pasture 2, SW Meadow, and Big Hill with the timing of rotation dependent on forage availability and good weather to keep calves healthy during and following rotation. If needed, the forage will be supplemented.

**Herd Practicums**

To identify the cows, replacement heifers, and calves, the ranch will use ear tags, Electronic Identification (EIDs), and branding. Ear tags will make quick identification easy. Tagging will occur at calving with heifers receiving a white tag in the right ear and bulls receiving a yellow tag in the left ear. Each tag will have four numbers with the first number indicating the birth year of the calf and the next three identifying the mother. For example, a calf born in 2022 to cow 365 would have a tag number of 2365. If twins are born, the letter A will be added to the end of the number for one calf and the letter B for the other calf. Only the initial cows and replacement heifers will receive EIDs which will make it easy to access and record information about each animal. These tags will be applied when the cattle are being vaccinated to

make it more convenient. Branding will occur in May after the replacement heifers have been selected and all other calves are sold. This will ensure that the cattle can be identified if their tags or EIDs are lost.

Calves will be placed in a preconditioning program through Zoetis. This program is PREVAC+ which focuses on vaccines given to calves at birth and before weaning. Calves enrolled in the program receive a premium when sold, easily averaging \$20 per head more (What is SelectVAC 1). At birth calves will receive ULTRABAC (clostridial and blackleg) and BOVISHIELD ONE GOLD SHOT (viral and pasteurella). Both of these will be given again between 6 and 2 weeks before weaning. Cows will be given antibiotics (DRAXIN and EXCEED) when necessary and CATTLEMASTER GOLD FP to protect the calf. At weaning, DECTOMAX pour on will be used on all animals to prevent external parasites (flies, mites, and Louse). VALBAZEN suspension will be for calves, which is an oral drench to prevent internal parasites (worms etc.) Calves on this program have been shown to be 4 times less likely to get sick than non-preconditioned cattle, and to have gained 36 more pounds in the first 85 days (What is SelectVAC 1).

The target weaning age will be between 180-220 days (Rasby, McGee 1). At this age, calves are better able to convert forage into muscle mass and tissue for growth, and are already beginning to eat a fair amount of forage on their own. This will be adjusted based on the condition of calves and dams, markets, and pastures. If drought occurs and there is inadequate pasture or cows are thin, we may wean earlier. Although it can result in lighter weaning weights, weaning calves at 120 to 150 days may be especially important for lactating first-calf heifers, who may need extra time to recover a higher body condition before their second calving, and to prevent long postpartum intervals or failure to rebreed. (Ishmael, 2018) Weaning should take place a minimum of 45 days before sales in order to implement the preconditioning program and reduce stress and susceptibility to disease when marketed. Preconditioned calves also receive higher prices for value. Fenceline weaning will be the method to wean calves. Calves will be put in the next pasture in the rotation before the cows to allow a proper weaning is executed. 600 lbs and 550 lbs will be our respective weaning weights for steers and heifers.

Since breeding will take place from January 1st to March 1st, and calving will ideally occur from October 1st through December 1st, cows will be pregnant for about nine months



throughout the Spring, Summer, and early Fall. Pregnancy checks will occur in late March with open cows being culled at this time.

No breeding soundness exams will be necessary since bulls will be leased and already examined. However, the body condition of cattle will be continually evaluated, and formal evaluation will be recorded three times throughout the year. The target BCS for cows is a five or six while the target for heifers is a six. The first evaluation will be on July 1st which would be about 90 days prior to the start of calving. At this point the cows will be reaching the beginning of the third trimester and there would still be time to make nutritional changes to adjust the BCS if needed. The second formal body condition evaluation will occur at calving (beginning of October) because the BCS at this time has the greatest impact on rebreeding. The third evaluation will take place at weaning in March. Since the cows will generally be thin from lactating at this time adjustments will be made to feeding.

### **Nutrition Program**

Cattle will be grass fed year-round. Hay cut from meadows will be rolled out and fed when grass is not sufficient, and cake will be spread each day in winter months and times with inadequate forage for energy and protein. A caker will need to be purchased. After meadows are hayed, bales will remain spread out for a period of time to protect from fire, and moved to bale lots for easy access as cold months approach. Cake may be stored in bins and consists mainly of dry distillers grains and soybean meal at 25-35% protein dry matter content, with 95% the energy of corn. The calcium to phosphorus ratio should be 1:2.

A bagged mineral supplement stored in a dry building will be constantly supplied in mineral tubs to fulfill requirements for salt, minerals, and vitamins. Mineral supply should be checked every day along with waters. Mineral bags will be delivered by pickup, and will be fed ad libitum in a covered mineral feeder. The mineral mix should have a minimum calcium to phosphorus ratio of 2:1. It will be 10% salt, 3% potassium, and 4% magnesium for the prevention of grass tetany. Trace amounts of microminerals including Cobalt, Copper, Iodine, Manganese, Selenium, and Zinc, along with vitamins A, D, and E are also included. No additional grains or forage crops will be fed.

As described in Figure 11, the ration will consist of grazed prairie grass and meadow hay, in addition to supplemental cake when nutrient requirements are not met by forage. Mineral will be provided year round to ensure mineral, salt, and vitamin needs are met.

**Figure 11.** Sample ration and supplements to be utilized

Feed Category	Feed or Forage	lb or %	% As Fed	% DM
Grazed forages	Native Range, Jan-March	0.65	64.94	63.50
Harvested Forages	Prairie Hay, vegetative	0.27	26.97	27.93
Concentrates	Distillers Grains with Solubles, sorgh	0.07	6.99	7.32
Mineral and Vitamins	B-350 RCRC Mineral	0.01	1.00	1.14
Mineral and Vitamins	Magnesium Oxide	0.00	0.10	0.11
		<b>1.00</b>	100.00	100.00
<b>Cost Per Day</b>	\$0.79	<b>Feed Intake, lb As Fed</b>	<b>23.00</b>	
<b>Projected ADG, lb</b>	<b>0.64</b>	<b>Feed Intake Ratio</b>	<b>1.04</b>	
<b>Desired ADG, lb</b>	<b>-0.04</b>	Feed Intake, lb DM	20.0	
Days to	gain	Predicted Intake, lb DM	19.2	
one condition score:	197	DM Intake, % of Body Weight	1.88	

## **Part 4: Economics and Marketing**

### **Description of Marketing Plan**

As a cow-calf operation, the primary animals being produced are calves. Both bull and heifer calves will be raised through weaning time and then separated. Bull calves will be castrated and the steers will be raised as yearlings prior to being sold the following year. Heifer calves not retained as replacements will be sold soon after weaning. The heifer retention rate will be at 10% of the cow herd (assuming a 90% pregnancy rate of heifers, and 1% cow death loss) with open replacement heifers being sold. Open, old, injured, or low performance cows will be sold at about an 8% cull rate. Bulls will be leased during the breeding season. Cull cows and open replacement heifers will be sold in March while all of the yearling steers and weaned heifer calves not being retained will be sold in April.

All cattle will be certified through the Non Hormone Treated Cattle (NHTC) program through the USDA. These cattle earn approximately \$20/cwt more than non certified cattle (Dennis 1). The program requires that an on-site audit be conducted before cattle are sold and verifies the source, age, and non-hormone treated status of your cattle. The cattle will be required to be sold to an approved NHTC location to avoid losing their status, and qualify for export to the European Union, adding more value at sale time (Superior Livestock Auction). As an



approved NHTC market, we will be selling cattle online through the Superior Livestock Auction. Not only will this ensure premiums for hormone-free beef, but eliminate health risks associated with transporting cattle to sale barns, decrease transportation costs if cattle are picked up on-farm, offers competitive prices with a large pool of buyers, and free up time as ranch employees are not required to be present (Marketing Feeder Cattle).

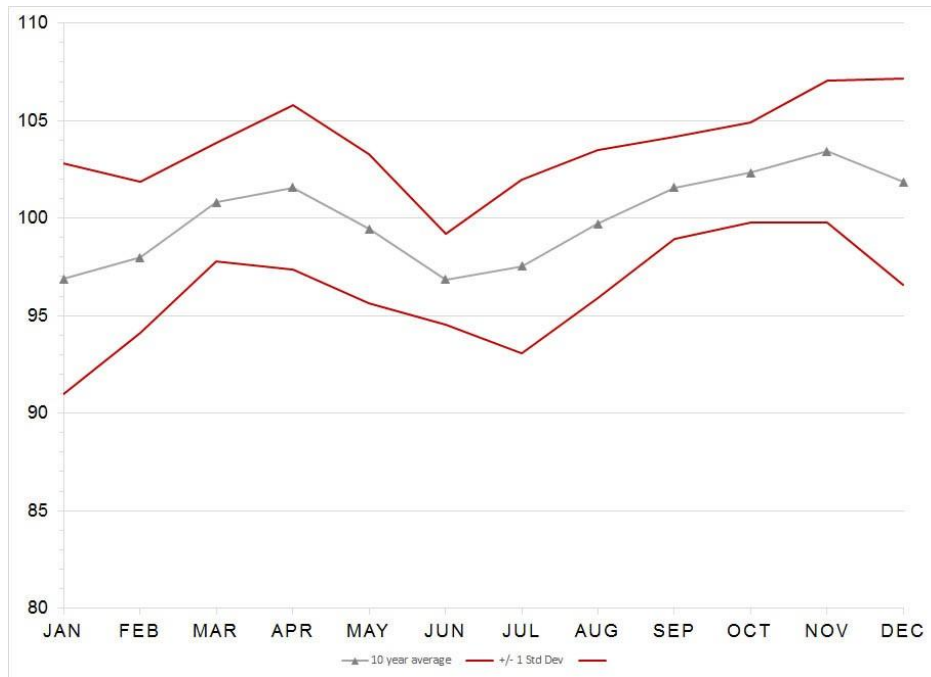
In a year that the price of NHTC cattle is not expected to make up for the cost of the program and inputs, steers will be sold at feedlots and sale barns. When selling at auction, cattle will be transported to the Ogallala or Bassett sale barn depending on markets. Some years a feedlot might bid lower prices and it may be more profitable to utilize another market. Heifer calves will be different to market since they are less desirable in a feedlot. Therefore, they will be marketed toward yearling operators first, then sale barns, and finally if no other choice is available they will be sold to a feedlot directly. The yearling operations are going to be key in selling heifers because they can take advantage of the young calves' growth potential. Feedlots do not want heifers as much as steers particularly because of having to deal with cycles and accidental breedings. Cull cows and replacements will primarily be sold to sale barns and to feedlots if age and lack of feeding potential are not a concern.

A primary goal for the operation is to sell calves when the market is higher and take advantage of premiums associated with hormone-free beef. Our cattle will be USDA's Non-Hormone Treated Cattle Program (NHTC) Furthermore, by utilizing the PREVAC+ program through Zoetis, calves will fetch at least \$20 more per head than un-preconditioned cattle. The calves will be fed out if prices are unusually unprofitable. Futures markets will be utilized when selling cattle to be able to take advantage of higher prices and the benefit of locking in prices ahead of time. In order to be able to predict when to market and what strategies to use for the current and future years it will be essential to diligently watch the markets and current events that affect prices throughout the year.

### **Partial Budget**

According to data from the University of Nebraska-Lincoln, shown in figure 12, prices are typically highest for calves in April which is why fall calving will be advantageous for the ranch. Consumers also currently have a high demand for hormone-free beef, so prices will be greater for cattle sold from LNU Ranch. This trend will help sustain higher prices and premiums for the calves that are produced.

**Figure 12.** Annual and Seasonal Price Patterns for Cattle (Brooks 2015)



The final budget projected a net income of \$149,340. Most of the income comes from selling weaned calves. Other sources of income are cull cows, recreation and leasing of facilities. Main costs are feed and other costs are fuel, labor, and overhead costs like depreciation.

**Annual Budgets**

When weaning 180 steers, the market will bring around or over \$150/cwt. Heifers will naturally be lighter and bring less value at around \$140/cwt. Bulls will be leased annually for around \$1500/hd. Cull cows will be sold at the beginning of April to take advantage of high market prices. After factoring in weaned steers, weaned heifers, cull cow sales, the gross income is \$303,680. The total herd cost, including overhead costs, is \$453,020. However, our total cash income was \$89,264. With all the cost taken out of the gross income and other cash income, the net total income is \$149,340.

**Figure 13-A. System Budget**

<b>System Budget</b>				<b>Herd Total</b>
<b>Revenue</b>	<b>Number</b>	<b>Weight</b>	<b>Price</b>	<b>Total</b>
Weaned Steers	180	600	150 \$ / cwt	162,000
Weaned Heifers	129	550	140 \$ / cwt	99,330
Wintered Steers				
Wintered Heifers				
Stocker Steers				
Stocker Heifers				
Fed Steers				
Fed Heifers				
Cull Cow Sales	40	1,200	70 \$ / cwt	33,600
Fed Cull Cow Sales				
Cull Bull Sales	17		\$ / cwt	
Cull Replacement Sales	7	1,000	125 \$ / cwt	8,750
<b>Gross Income</b>				<b>303,680</b>

**Figure 13-B. Variable Costs**

<b>Variable Costs</b>				<b>Herd Total</b>
<b>Animal Purchases</b>	<b>Number</b>	<b>Price</b>		<b>Total</b>
Replacement Females		1,600	\$ per head	
Bulls	17.0	1,500	\$ per head	25,500
<b>Total Animals Purchased</b>				<b>25,500</b>
<b>Feed</b>				<b>Total</b>
Pasture Grazing (growing sea)	3,229.50	AUM @	50.00 per AUM	161,475
Pasture Grazing (dormant sea)	1,603.20	AUM @	30.00 per AUM	48,096
Corn Stalks		acre @	15.00 per acre	
Hay	547.56	ton @	100.00 per ton	54,756
Salt & Mineral	14.60	ton @	1080.00 per ton	15,768
Protein Supplement	19.17	ton @	280.00 per ton	5,368
Corn		bushel @	5.00 per bushel	
<b>Total Feed</b>				<b>285,463</b>
<b>Other Variable</b>				<b>Total</b>
Labor				23,000
Fuel				14,000
Veterinary and Medical				18,000
Cull Cow Marketing				1,120
Cull Bull Marketing				476
Cull Replacement Marketing				196
Weaned Calf Marketing				8,652
Wintered Calf Marketing				
Stocker Marketing				
Feedlot Marketing				
Operations Interest	Calculations: Operations interest rate times feed and other variable expenses except marketing divided by two.			8,687
<b>Total Other</b>				<b>74,131</b>
<b>Total Variable Costs</b>				<b>385,094</b>

**Figure 13-C. Fixed Cash Costs**

<b>Fixed Cash Costs</b>		<b>Herd Total</b>
<b>Depreciables Input Costs</b>	<b>Repairs</b>	<b>Total</b>
Breeding Herd Housing	2000	2,000
2 Pickups	1200	1,200
Tractor	800	800
Other Equipment (stock trailer, etc.)	1000	1,000
	<b>Total Ownership</b>	<b>5,000</b>
<b>Overhead and Management</b>		<b>Total</b>
Real Estate Tax		
Insurance		2,000
Professional Fees		850
Management		
Other		
	<b>Total Overhead</b>	<b>2,850</b>
	<b>Total Fixed Cash Costs</b>	<b>7,850</b>
	<b>Total Cash Costs</b>	<b>392,944</b>
	<b>Net Cash Income</b>	<b>(89,264)</b>
<b>Non-Cash Costs</b>		<b>Herd Total</b>
<b>Depreciables Costs</b>	<b>Depre- ciation</b>	<b>Opportunit y</b>
Breeding Herd Housing	2,475	5,000
2 Pickups	5,400	3,000
Tractor	4,000	3,500
Other Equipment (stock trailer, etc.)	6,200	3,500
<b>Opportunity</b>		
Real Estate Opportunity	Investment rate times real estate value	
Livestock	Investment rate times livestock value	27,001
	<b>Total Non-Cash Costs</b>	<b>60,076</b>
<b>Total Cash and Non-Cash</b>		<b>Herd Total</b>
	<b>Total Costs</b>	<b>453,020</b>
	<b>Net Total Income</b>	<b>(149,340)</b>

## **Part 5: Grazing Management, Forage Allotment, and Drought Plan**

### **Cattle Composition**

Cattle will have a breed composition of 50% red angus and 50% simmental. From April to September there will be 368 mature non lactating cows. After calving out both cows and first-calf heifers, there will be 400 mature lactating cows from October to March. For replacement heifers, 40 will be sufficient to maintain the herd size. At weaning there will be approximately 360 calves from the 400 lactating cows and bred heifers. After weaning, 180 steer

calves will be kept for yearling production and sold at a later date. Every year around 16 bulls will be leased for January and February. With these bulls, cows and replacement heifers will be bred in January and February, leading to calving in October and November.

There will be several herds, including 180 weanling to yearling steers, 40 replacement heifers, and a breeding herd of 400 head. The breeding herd will be divided into separate herds of cows and first-calf heifers after breeding season.

### **Grazing Systems**

The pastures on our ranch will be rest - rotated every year having cattle graze each pasture at least once and then allowing it to rest the rest of the year. This allows forage to maintain vigor and energy reserves, while supporting a healthy root system and long term productivity. The exception to one time grazing is the harvested subirrigated pastures that will be grazed after they will be cut for hay after sufficient regrowth is available, along with summer pastures, which will be subject to grazing up to four periods with rest between. Grazing more than once will be important to keeping our grasses in a vegetative, palatable, and nutritious state.

In this system, each pasture will be rotationally grazed for a variable amount of time with varying pasture sizes. Recovery period is the remainder of the year in spring, summer, and fall, while in the summers recovery time ranges from one week to one month. The herds will be grazed on pasture year round, and given supplement when available forage is not sufficient, particularly during the winter or a drought. Throughout the year 35 pastures will be occupied at least once through a 12 month period. Changes may be made to a rotation if required due to many various reasons (significant blowout, drought, fire, severe weather, cattle diseases, etc.)

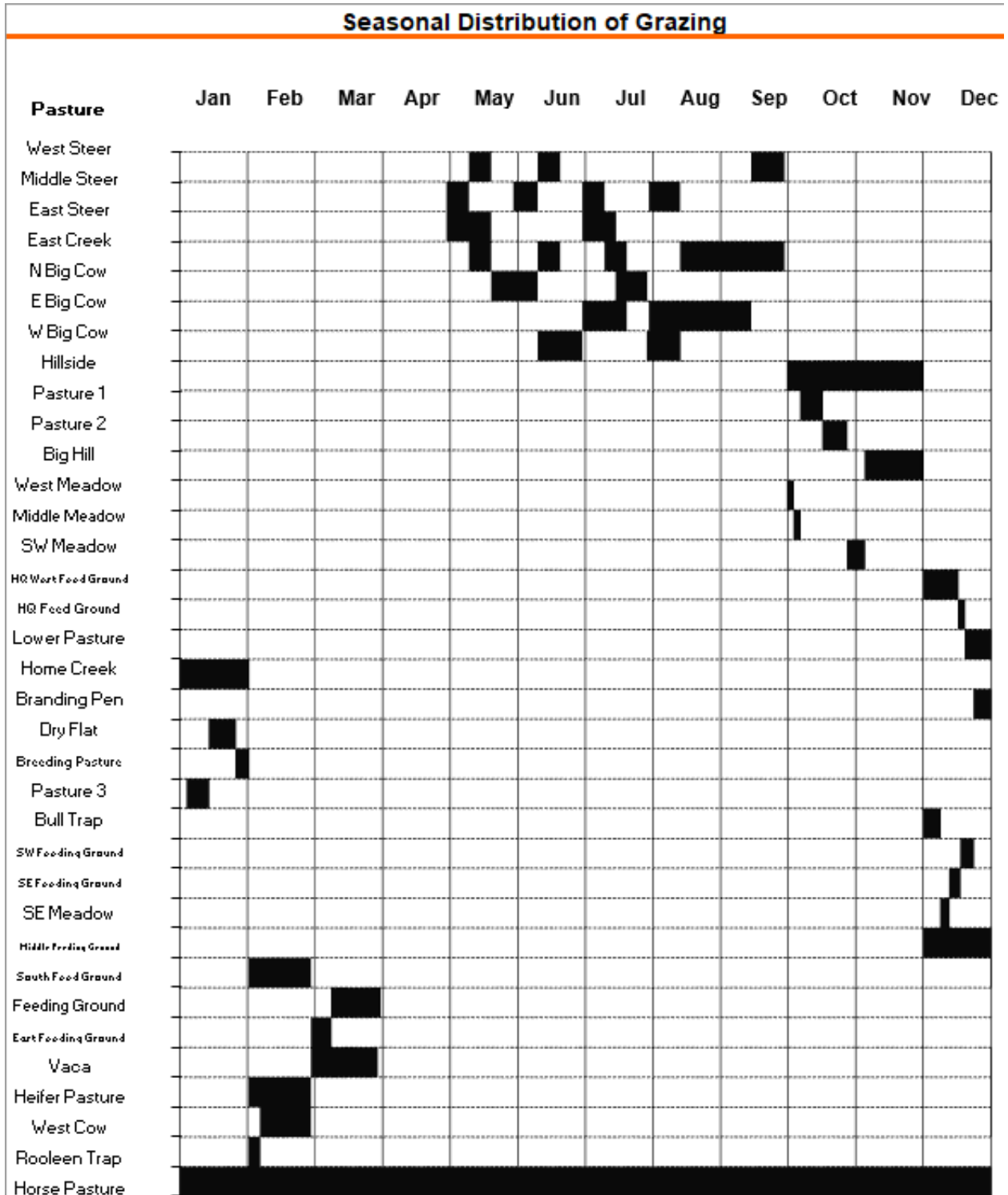
During the fall, winter, and spring, a grazing efficiency of 25% with a moderate stocking rate is targeted. As the cattle are on pastures for longer periods of time, it is assumed that 25% is lost to trampling and wildlife, while 50% is left for plant health. However, in the summer months, a grazing efficiency of 30% with a moderate stocking rate will be targeted, as these grasses will have periods to recover with no grazing.

### **Forage Allotment Summaries**


While the grazing and hay records (GHR) spreadsheet is beneficial for calculating an estimate of forage use, it doesn't accurately reflect the usage in real life. The GHR spreadsheet does not allow for using up all of the AUM's in each pasture as was calculated in the forage

balance spreadsheet. With proper management, the operation should be able to use up the AUMs much more efficiently than the GHR spreadsheet shows.

**Figure 14.** Seasonal distribution of grazing



**Figure 15.** Summary of hay supplementation

<b>Fed Hay Summary</b>													
Total tons of hay fed by livestock class. Includes hay fed while on pasture and drylot.													
Livestock Class	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Livestock Class Total
Cow-calf pairs	29.4	1.0									15.0	313.8	359.2
Dry cows													
Bred heifers (replacement 18-24 months)													
Yearling heifers (replacement 12-17 months)	1.9												1.9
Heifer calves (replacement 4-12 months)													
Weaned steer/heifer calves (4-12 months)													
Yearling steers/heifers (12-17 months)	2.7	0.1								1.4	1.4	4.0	9.5
Bulls	1.3												1.3
Horses													
<b>Monthly Totals</b>	<b>35.3</b>	<b>1.1</b>								<b>1.4</b>	<b>16.4</b>	<b>317.8</b>	<b>371.9</b>

**Figure 16.** Summary of forage demand

<b>Pasture Forage Demand Summary (AUM)</b>													
Total AUM from grazing by livestock class.													
Livestock Class	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Livestock Class Total
Cow-calf pairs	480	480	480							480	480	480	2880
Dry cows				368	368	368	368	368	368				2208
Bred heifers (replacement 18-24 months)			32	32	32	32	32	32	32				227
Yearling heifers (replacement 12-17 months)	32	32								32	32	32	160
Heifer calves (replacement 4-12 months)			24	24	24	24	24	24	24				168
Weaned steer/heifer calves (4-12 months)		108	108	108	108	108	108	108	108				864
Yearling steers/heifers (12-17 months)	144	144	144							144	144	144	864
Bulls	26	26											51
Horses	6	6	6	6	6	6	6	6	6	6	6	6	75
<b>Monthly Totals</b>	<b>688</b>	<b>796</b>	<b>795</b>	<b>539</b>	<b>539</b>	<b>539</b>	<b>539</b>	<b>539</b>	<b>539</b>	<b>662</b>	<b>662</b>	<b>662</b>	<b>7497</b>

**Figure 17. Stocking rate summary**

<b>Stocking Rate Summary</b>											
Pasture	Acres	Total AUM / Pasture			AUM/ac			AUD/ac			Response Index Score
		Planned	Used	Left	Planned	Used	Left	Planned	Used	Left	
Hillside	396	285	282	3	0.72	0.71	0.01	22	22	0	0
Lower Pasture	80	58	57	1	0.72	0.71	0.01	22	22	0	0
Branding Pen	223	161	156	4	0.72	0.70	0.02	22	21	1	0
Dry Flat	238	171	171	0	0.72	0.72	0.00	22	22	0	0
Horse Pasture	132	79	75	4	0.60	0.57	0.03	18	17	1	0
Home Creek	203	146	140	6	0.72	0.69	0.03	22	21	1	0
South Feed Ground	445	267	267	0	0.60	0.60	0.00	18	18	0	0
Breeding Pasture	153	92	91	1	0.60	0.59	0.01	18	18	0	0
Vaca	223	134	117	17	0.60	0.53	0.07	18	16	2	0
Bull Trap	214	128	126	2	0.60	0.59	0.01	18	18	0	0
West Steer Pasture	643	386	368	17	0.60	0.57	0.03	18	17	1	0
Middle Steer Pasture	608	365	362	3	0.60	0.60	0.00	18	18	0	0
East Steer Pasture	710	426	423	3	0.60	0.60	0.00	18	18	0	0
Big Hill	733	440	435	5	0.60	0.59	0.01	18	18	0	0
Rooleen Trap	154	92	88	4	0.60	0.57	0.03	18	17	1	0
East Creek	528	380	377	3	0.72	0.71	0.01	22	22	0	0
West Cow	1340	965	908	56	0.72	0.68	0.04	22	21	1	0
North Big Cow	715	429	423	6	0.60	0.59	0.01	18	18	0	0
West Big Cow	708	425	423	1	0.60	0.60	0.00	18	18	0	0
East Big Cow	580	348	283	65	0.60	0.49	0.11	18	15	3	0
Heifer Pasture	1091	655	595	60	0.60	0.55	0.05	18	17	2	0
Pasture 3	253	152	148	3	0.60	0.59	0.01	18	18	0	0
Pasture 2	298	179	174	5	0.60	0.58	0.02	18	18	1	0
Pasture 1	276	166	158	8	0.60	0.57	0.03	18	17	1	0
HQ West Feed Ground	118	71	68	2	0.60	0.58	0.02	18	18	1	0
HQ Feed Ground	20	12	11	1	0.60	0.57	0.03	18	17	1	0
Feeding Ground	42	25	17	8	0.60	0.41	0.19	18	13	6	0
Middle Feeding Ground	58	35	33	2	0.60	0.56	0.04	18	17	1	0
SW Feeding Ground	116	84	83	1	0.72	0.71	0.01	22	22	0	0
SE Feeding Ground	91	66	64	2	0.72	0.70	0.02	22	21	1	0
East Feeding Ground	20	12	7	5	0.60	0.36	0.24	18	11	7	0
SW Meadow	179	129	126	3	0.72	0.71	0.01	22	21	0	0
West Meadow	78	56	47	9	0.72	0.61	0.11	22	18	3	0
Middle Meadow	81.5	59	47	11	0.72	0.58	0.14	22	18	4	0
SE Meadow	71.5	51	51	0	0.72	0.71	0.01	22	22	0	0
<b>Total</b>	<b>11819</b>	<b>7526</b>	<b>7204</b>	<b>322</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>
<b>Pasture Avg.1</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>0.64</b>	<b>0.61</b>	<b>0.04</b>	<b>20</b>	<b>18</b>	<b>1</b>	<b>0.0</b>
<b>Ranch Avg.1</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>0.64</b>	<b>0.61</b>	<b>0.03</b>	<b>19</b>	<b>19</b>	<b>1</b>	<b>---</b>

<sup>1</sup> Pasture average is calculated from the AUM/ac or AUD/ac of each pasture. Ranch average is calculated from total ranch acres and total AUM's used.

### Drought Contingency Plan

Planning ahead for a drought, the ranch must reserve forage that will last for an extended period of time. Therefore, as a part of the grazing plan, extra AUMs will remain in each pasture to allow for flexibility in the case of limited precipitation. If grass requirements are not being met, the store of harvested hay will be fed and rolled out behind a truck during that period. There will be around 3,500 large round bales stored every year. There will be no reserved pastures, however the stocking rate may be lowered to accommodate lower production. When the feed stockpile falls below 50% original stock and the drought is predicted to continue, the ranch will



begin culling cows, beginning with those that do not perform as well or have negative temperaments. Following that, if the feed stock falls below 35%, with more predicted drought, another more significant culling will be executed, following the same guidelines for choosing cull cows.

In order to monitor precipitation and drought, we will install rain gauges and use updated weather information online, while setting several trigger dates to keep in mind. These dates include April 1, May 1, June 1, July 1, and August 1. At the beginning of April, precipitation must be compared to the long-term average. If it is less than 65% of this, we will reduce our stocking rate by 10-15%. In May, prediction models will be referenced. If conditions are not expected to improve, hay will be fed. On May 1, if precipitation is only 50-75% of the long-term average, the herd will begin to be culled. By July 1, our meadows and cool season grasses will have completed most of their growth. At this point they should be monitored and livestock numbers and supplementation should be adjusted as needed. However, warm-season pastures have not completed their growth. If moisture is still below average levels, or there are high temperatures with average rainfall, we will again cull our herd to reduce stocking rate by another 10% (Tusler).

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# *RANCH PLAN*

GUDMUNDSEN SANDHILLS LABORATORY  
WHITMAN, NEBRASKA

ASCI 851 Group 8

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# *INTRODUCTION*

## PURPOSE OF THE PLAN

The purpose of a plan is to achieve goals and objectives through purposeful implementation of decisions and events. A plan that includes these goals and objectives is usually developed beforehand. Throughout the application of the plan, the situation must be monitored. Monitoring is used to observe and collect information, and to determine how it affects the goal or objective. This plan and monitoring must be controlled, to exercise the appropriate actions in regulating progress towards the goal or objective. The current plan is then evaluated based on monitoring and the controlling effort. Evaluating the plan, then gives the opportunity to replan the initial series of events to achieve the goals or objectives at hand. The plan is then played out again in this series of events, to achieve a successful ranch plan.

The plan will be implemented by using the resources and strategies listed throughout the objectives to accomplish the goals of the ranch. Ranch forage resources will be used to produce marketable beef and bred replacement heifers while maintaining rangeland productivity. An event center and lodging capabilities will comprise a non-cattle enterprise to enhance the operation.

## RANCH DESCRIPTION

### *Introduction*

Gudmundsen Sandhills Laboratory (GSL) is a commercial Red Angus cow-calf ranch and event center located in the heart of the Nebraska Sandhills near Whitman, NE. With 11,600 acres of upland native rangeland and 1,200 acres of sub-irrigated and wetland meadow, the ranch is a prime environment for raising cattle. The existence of a huge conference building and a dorm offer unique opportunities for hosting guests and providing a facility for events. See Map 1.1 below for the original pasture layout.

### *Facilities and Infrastructure*

GSL is uniquely set up to host events and house visiting guests. The Wagonhammer Education Center includes a 300-person conference room, two offices, and a kitchen. With the ability to sleep 12 people, the dormitory includes 6 bedrooms, men's and women's bathrooms, a kitchen, and a laundry facility. Three residences at GSL provide housing for ranch employees.

To support ranch operations, there is a large shop, an 8-stall calving barn, and 4 additional storage shops. There are two working facilities with hydraulic chutes, one located at the home place, and one near the south meadow. Fencing is 4 or 5 strand barbed wire with wood hedge posts. All pastures have at least one water source, and most livestock tanks are windmill operated.

### *Equipment Inventory*

GSL kept most of the original equipment on the ranch. See Table 1.1 below for the current equipment inventory.

**Table 1.1. GSL equipment list**

Count	Equipment
-------	-----------



1	2017 F-350 King Ranch flatbed
2	2012 F-150 XL flatbed
1	1987 Model 120G Road Grader
1	Case IH tractor Model BF 14HC
1	Emerson 6 bale Processor/Mover
1	Emerson 2 bale processor
1	Case IH140 T4 Maxxum tractor
1	Polaris Ranger UTV
3	ATVs
1	24' featherlite stock trailer
1	Skidloader
1	Portable panels
2	Cake feeders
3	16-ton overhead grain bins

*Cattle Inventory*

**Table 1.2. Cattle owned by GSL**

<b>GSL Cattle Inventory</b>	
Mature April-calving cows	400
Replacement heifers	60
Yearling heifers	196
<b>Total Cattle at GSL</b>	<b>656</b>

*Human Resources*

GSL employs three full-time employees that live on the ranch. A summary of these positions is provided below. Additionally, haying will be contracted out and GSL will offer a student internship.

**Table 1.3. GSL Employment Positions**

<b>Position Title</b>	<b>Position Summary</b>
Ranch Operations Manager	<ul style="list-style-type: none"> <li>• Full time ranch operations including cattle processing, facility maintenance, and feed management.</li> </ul>



	<ul style="list-style-type: none"> <li>• Works with the secretary/event center coordinator to balance cattle operations and events hosted at the Wagonhammer.</li> </ul>
Ranch Operations Technician	<ul style="list-style-type: none"> <li>• Full time ranch operations including cattle processing, facility maintenance, and feed management.</li> </ul>
Ranch Operations Secretary & Event Center Coordinator	<ul style="list-style-type: none"> <li>• Ranch secretary focused on maintaining cattle and business records.</li> <li>• Event center coordinator scheduling events, directing logistics, and maintaining the dorm and Wagonhammer facilities.</li> <li>• Cattle and event marketing through the website and social media.</li> </ul>
Calving Season Intern	<ul style="list-style-type: none"> <li>• During calving season, GSL offers a full-time temporary internship for students seeking calving and ranch experience.</li> </ul>

## RANCH GOALS AND OBJECTIVES

### *Livestock Production Goal*

**Table 1.3. Livestock Production Goal**

<b>Goal</b>	<b>Maintain a resilient cowherd that optimizes rangeland forage utilization to increase cow performance, preweaning and postweaning calf performance, and herd adaptability.</b>
Objective 1	Utilize EPDs in bull selection to select for milk production of 20 lbs and a mature body weight of 1100-1200 lbs to produce replacement heifers that perform best with the given environment and forage resources.
Objective 2	Cows are not nutritionally stressed, with BCS average at least 5 and pregnancy rates at least 90.
Objective 3	Heifer calves are fertile with at least 50% calving in the first 21 days.
Objective 4	Achieve a minimum of 90% weaning rate in the cowherd.
Objective 5	Steer weaning weight of 550 lb and heifer weaning weight of 500 lb with a calving distribution of 50% in the first 21 days.

### *Ecosystem Health Goal*

**Table 1.4. Ecosystem Health Goal**

<b>Goal</b>	<b>Maintain rangeland and meadows to support high forage production and quality that supports cattle and diverse wildlife populations.</b>
-------------	--

Objective 1	Utilize grazing management through stocking rate (upland = 0.65 AUM, meadow = 2 AUM) and variation in timing of grazing in each pasture to promote a diverse plant composition.
Objective 2	Harvest efficiency of 25% by cattle, leaving 50% biomass for plant health, and 25% accounted for in trampling and wildlife.
Objective 3	Focus on unwanted plant species (ie. cheatgrass and sandburrs) reduction in highly disturbed areas and barnyards to promote higher forage production in the rangeland pastures and increase ranch aesthetic.
Objective 4	Assess rainfall and timing during critical forage growth periods, such as April and May, to determine stocking rate adjustments and whether alternative forage sources need to be utilized.

*Quality of Life Goal*

**Table 1.5. Quality of Life Goal**

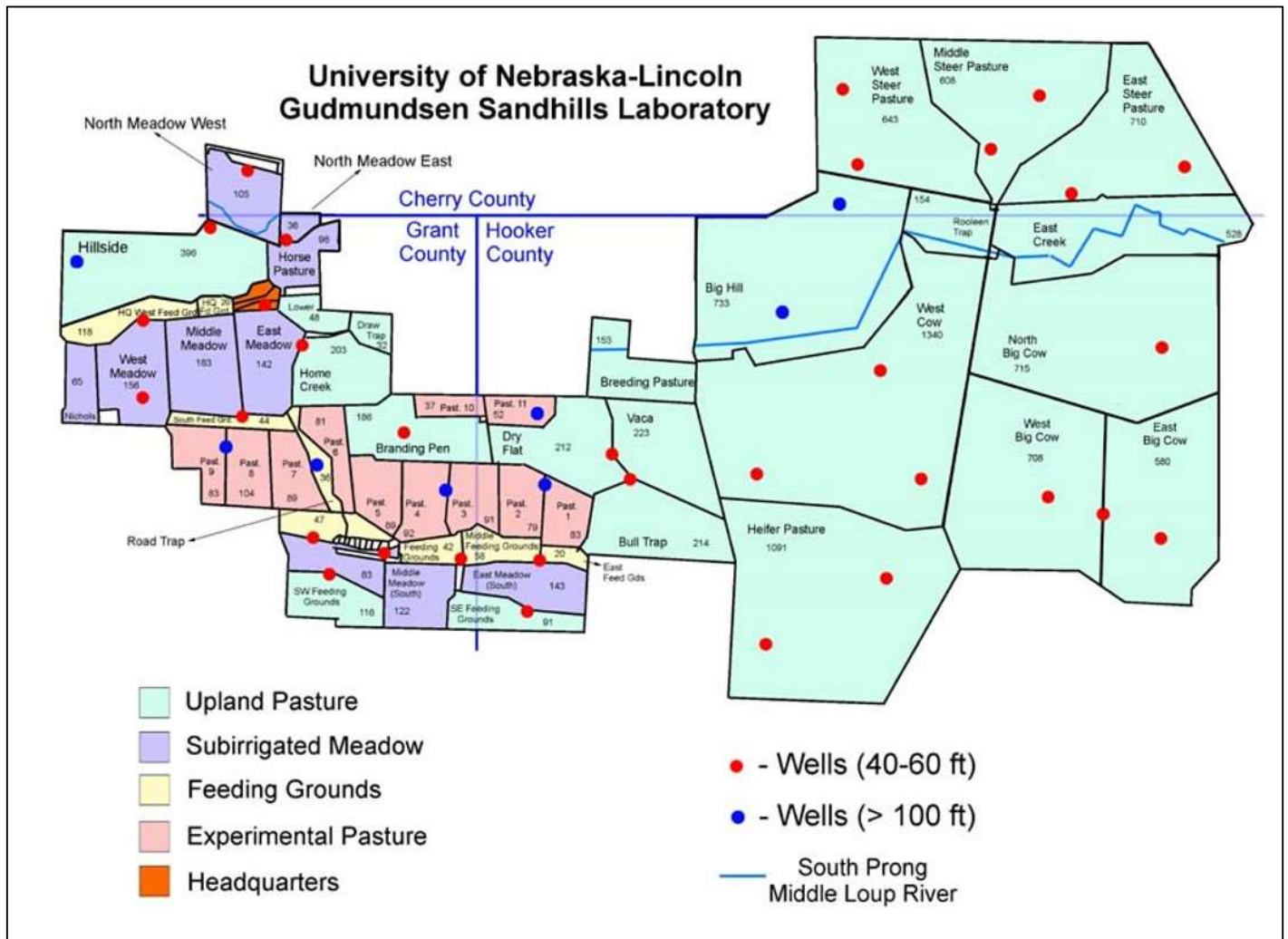
<b>Goal</b>	<b>Supply a fulfilling and sustainable lifestyle for current and future generations to be successful in contributions to the beef industry and achieve financial viability.</b>
Objective 1	Encourage and provide the means for employees to attend beef-related workshops, training, and conferences to maintain current industry knowledge and relevant certifications, as well as network.
Objective 2	Maintain an annual ranch breakeven, including labor costs for all employees, at minimum.
Objective 3	Provide benefits, such as housing, utilities, and beef, for employees to live comfortably and have a financially secure future.
Objective 4	Provide flexibility for time off and rotate holiday shifts to allow employees to spend time with family.

*Industry Perception Goal*

**Table 1.6. Industry Perception Goal**

<b>Goal</b>	<b>Spread awareness of the benefits and necessity of agriculture by contributing to a positive image of the beef industry and rural America.</b>
Objective 1	Achieve ecosystem health goal to display an aesthetic landscape that portrays a good beef cattle ranch perception for guests at the event center and dorm.
Objective 2	Utilize social media and a website to highlight daily ranch activities along with educational material.
Objective 3	Target social media populations outside of the Nebraska Sandhills to expand the audience and avoid preaching to the choir.
Objective 4	Share the ranch aesthetic using professional photos taken at weddings and other events.

**Map 1.1. Original map of GSL pastures and wells.**







# *FORAGE RESOURCES*

## FORAGE RESOURCE DESCRIPTION

### *Forage Resource Description*

Gudmundsen Sandhills Laboratory comprises 11,045 acres of upland native range, with pasture size varying up to 1,340 acres. Additionally, there are 3 subirrigated meadows at GSL that add up to 1,015 acres. Each of these meadows is further divided into several pastures. Annual forage production in the meadows averages around 4,500-5,500 lb/acre of air-dried forage. Each meadow is hayed in July with around 3,500-4,500 lb/acre being cut. Each of the three meadows are hayed in a deferred rotation with one pasture rested from haying each year. This goal of this resting is to allow the warm season species a break from cutting during their prime growing season. Meadows that are not hayed will be grazed to take advantage of the forage. Meadow regrowth amounts to around 1,200-2,000 lb/acre and is utilized as fall and winter grazing. Table 2.1 provides the forage availability for the meadow pastures. The subirrigated meadows are cool season dominated with quackgrass, Kentucky bluegrass, redtop bent, smooth brome, creeping foxtail, and timothy presence. Warm-season grasses are also present and include big bluestem, switchgrass, indiangrass, and prairie cordgrass. Sedges and rushes are especially present in the wetter areas of the meadows.

See Table 2.2 for forage available in the upland pastures. Most of the upland pastures are located on the opposite side of the ranch from the home place and facilities. The upland range pastures are a warm-season and cool-season mix including a wide variety of species. Primary warm-season species include prairie sandreed (*Calimovilfa longifolia*), sand bluestem (*Andropogon hallii*), little bluestem (*Schizachyrium scoparium*), blue grama (*Bouteloua gracilis*), and hairy grama (*Bouteloua hirsute*). These species growing season is around July, reaching peak production in August. Cool-season species include needle and thread (*Hesperostipa comata*), Kentucky bluegrass (*Poa pratensis*), and Scribner's rosettegrass (*Panicum oligosanthos var. scribnerianum*) which grow mainly around May and reach peak production in June. A small additional growth window occurs in the fall when it cools down. There are also sedges, forbs, and shrubs present in the upland areas. Plant production in the upland pastures averages about 2,000 lb/acre/yr of air dried forage. However, the ranch is situated in a semi-arid environment with an average annual rainfall of 17-22 inches. Timing of this rainfall during critical growing points can influence plant production and affect biomass, as well as forage quality. Because of highly variable inter- and intra-annual precipitation, stocking rates can be affected and change each year.

### *Forage Supply*

**Table 2.1 Subirrigated Meadow Pastures**

Pasture	Acres	Forage Type	Stocking Rate	Total AUM Available	Grazing Season/ Use
North Meadow (West)	105	Cool Season Dominated	2	210	Fall/Winter/ Hay
North Meadow (East)	36	Cool Season Dominated	2	72	Fall/Winter/ Hay
South Meadow (West)	83	Cool Season Dominated	2	166	Fall/Winter/ Hay

South Meadow (Middle)	122	Cool Season Dominated	2	244	Fall/Winter/ Hay
South Meadow (East)	143	Cool Season Dominated	2	286	Fall/Winter/ Hay
Home Meadow (West)	156	Cool Season Dominated	2	312	Fall/Winter/ Hay
Home Meadow (Middle)	163	Cool Season Dominated	2	326	Fall/Winter/ Hay
Home Meadow (East)	142	Cool Season Dominated	2	284	Fall/Winter/Hay
Nichols Division	65	Cool Season Dominated	2	130	Fall/Winter/Hay

**Table 2.2 Native Upland Range Pastures**

Pasture	Acres	Forage Type	Stocking Rate (AUM/ac)	Total AUM Available	Grazing Season/Use
Pasture 1	83	Warm/Cool Season mix	0.65	54	Spring
Pasture 2	79	Warm/Cool Season mix	0.65	51	Spring
Pasture 3	91	Warm/Cool Season mix	0.65	59	Spring
Pasture 4	92	Warm/Cool Season mix	0.65	60	Spring
Pasture 5	89	Warm/Cool Season mix	0.65	58	Spring
Pasture 6	81	Warm/Cool Season mix	0.65	53	Spring
Pasture 7	89	Warm/Cool Season mix	0.65	58	Spring
Pasture 8	104	Warm/Cool Season mix	0.65	68	Spring
Pasture 9	83	Warm/Cool Season mix	0.65	54	Spring
Branding Pen	223	Warm/Cool Season mix	0.65	146	Calving
Dry Flat	264	Warm/Cool Season mix	0.65	173	Calving
Hill Road trap	36	Warm/Cool Season mix	0.65	24	Summer

Hillside	396	Warm/Cool Season mix	0.65	257	Summer
Junk Hill	203	Warm/Cool Season mix	0.65	133	Calving
Dorm Lot	48	Warm/Cool Season mix	0.65	31	Summer
Triangle Piece	32	Warm/Cool Season mix	0.65	21	Summer
South Feed Ground	44	Warm/Cool Season mix	0.65	29	Summer
HQ West Feed Ground	118	Warm/Cool Season mix	0.65	77	Winter
Day Lot	20	Warm/Cool Season mix	0.65	13	Winter
Big Hill	733	Warm/Cool Season mix	0.65	476	Summer
Rooleen Trap	154	Warm/Cool Season mix	0.65	100	Summer
West Cow	1340	Warm/Cool Season mix	0.65	871	Summer
Heifer Pasture	1091	Warm/Cool Season mix	0.65	709	Summer
Feed Ground	42	Warm/Cool Season mix	0.65	27	Winter
Middle Feed Ground	58	Warm/Cool Season mix	0.65	38	Winter
East Feed Ground	20	Warm/Cool Season mix	0.65	31	Winter
North of South Meadow Pens	47	Warm/Cool Season mix	0.65	31	Summer
SW Feed Ground	116	Warm/Cool Season mix	0.65	76	Winter
SE Feed ground	91	Warm/Cool Season mix	0.65	60	Winter
West Steer Pasture	643	Warm/Cool Season mix	0.65	418	Summer
Middle Steer Pasture	608	Warm/Cool Season mix	0.65	395	Summer
East Steer Pasture	710	Warm/Cool Season mix	0.65	462	Summer
East Creek	528	Warm/Cool Season mix	0.65	343	Summer
North Third	715	Warm/Cool Season mix	0.65	468	Summer



West Third	708	Warm/Cool Season mix	0.65	460	Summer
East Third	580	Warm/Cool Season mix	0.65	377	Summer
Horse Pasture	96	Warm/Cool Season mix	0.65	62	Winter
Breeding Pasture	153	Warm/Cool Season mix	0.65	100	Summer
Vaca	223	Warm/Cool Season mix	0.65	146	Calving
Bull Trap	214	Warm/Cool Season mix	0.65	140	Summer

## **GRAZING STRATEGY**

### *Grazing Strategy Overview*

All pastures at Gudmundsen Sandhills Lab will be grazed with the goal of a 25% harvest efficiency aiming to leave 50% of biomass and account for 25% lost to trampling and wildlife. GSL will aim for a conservative stocking density to add flexibility and conserve resources during drought years. Detailed maps of pasture rotations and AUM removed are provided in part five “Forage Management and Drought Contingency.”

### *Cow Grazing Management*

Except during calving and breeding seasons, all mature cows will run together as one herd. During calving season, the first calf heifers will calve in a lot and be paired out into the Horse Pasture. All mature cows will calve in the Vaca, Dry Flat, Branding Pen, and Junk Hill pastures using the Sandhills calving method. For example, the heavies will start in the Vaca, and as the calving season progresses, pairs will remain in the Vaca with the remaining heavies being moved to the Dry Flat. This would be repeated through the other calving pastures, resulting in four groups of pairs at the end of calving season. Post-calving and branding, the cow pairs will go east to the spring and summer upland pastures (see Map 2.1) where they will remain until weaning around October 1. Weaning will take place at the south place with cows on the meadow and heifer and steer calves held on the feed ground. After weaning, the cows will go back out to upland pastures and the steer calves will graze the south meadow until shipping.

### *Replacement Heifer Grazing Management*

Replacement heifers will be sorted at weaning and will graze the north and home meadow regrowth through the winter. The Hill pasture will be used during the breeding season, and the south meadow upland feed ground pastures will be grazed until pregnancy detection. After pregnancy detection, meadow regrowth will be utilized until calving. These first-calf pairs will join the second-calf cows in the summer range for the breeding season. Depending on forage availability for the specific year, the pastures utilized may vary. To implement strategic supplementation focused on the young cows, first-calf cows will remain separate from the mature herd through the breeding season. Depending on market conditions, replacement heifers may be sold bred or prior to breeding. Therefore, the number of heifers may vary each year and



excess AUM will be left on the pastures. However, the ultimate goal will be to sell bred heifers and retain only the 60 needed for replacements.

## **PASTURE IMPROVEMENTS**

### *Fencing*

Most of the current fencing will be kept throughout the ranch. However, in pastures 10 and 11 there are small electric fence plots that will be taken out. The fence separating pasture 10 and the Branding Pen will be removed. The Branding Pen pasture will then be 223 acres. The fence that is separating pasture 11 and the Dry Flat will also be removed. The Dry Flat pasture will then be 264 acres. The objective is to combine these smaller pastures with the calving pastures to increase capacity and more fully utilize the land (See Map 2.2).

### *Livestock Water*

Water is sufficient in all pastures, and therefore no changes are planned.

### *Weed Control*

At GSL, pastures and meadows will be monitored for undesirable plant species such as cheatgrass, thistles, and sandburrs near headquarters. Thistles will be manually removed to ensure the root is severed. To control other plant species along roads and near the headquarters, an herbicide will be spot sprayed when needed. Early grazing may be utilized to target cheatgrass before it matures.

### *Blowout Control and Prevention*

At GSL, strategies are utilized to prevent any issues before they occur. To prevent bigger blowouts and to control blowout situations, cattle will be blocked off from grazing these areas of concern to allow grass stabilization. If needed, these areas may be seeded to encourage more rapid grass growth. Stocking density will be appropriately adjusted to prevent overgrazing and overuse of pastures that may lead to more blowouts. During times of supplemental hay feeding, cattle will be fed on hillside roads to increase hay buildup and prevent roads from eroding in the rain or wind.

### *Cattle Distribution*

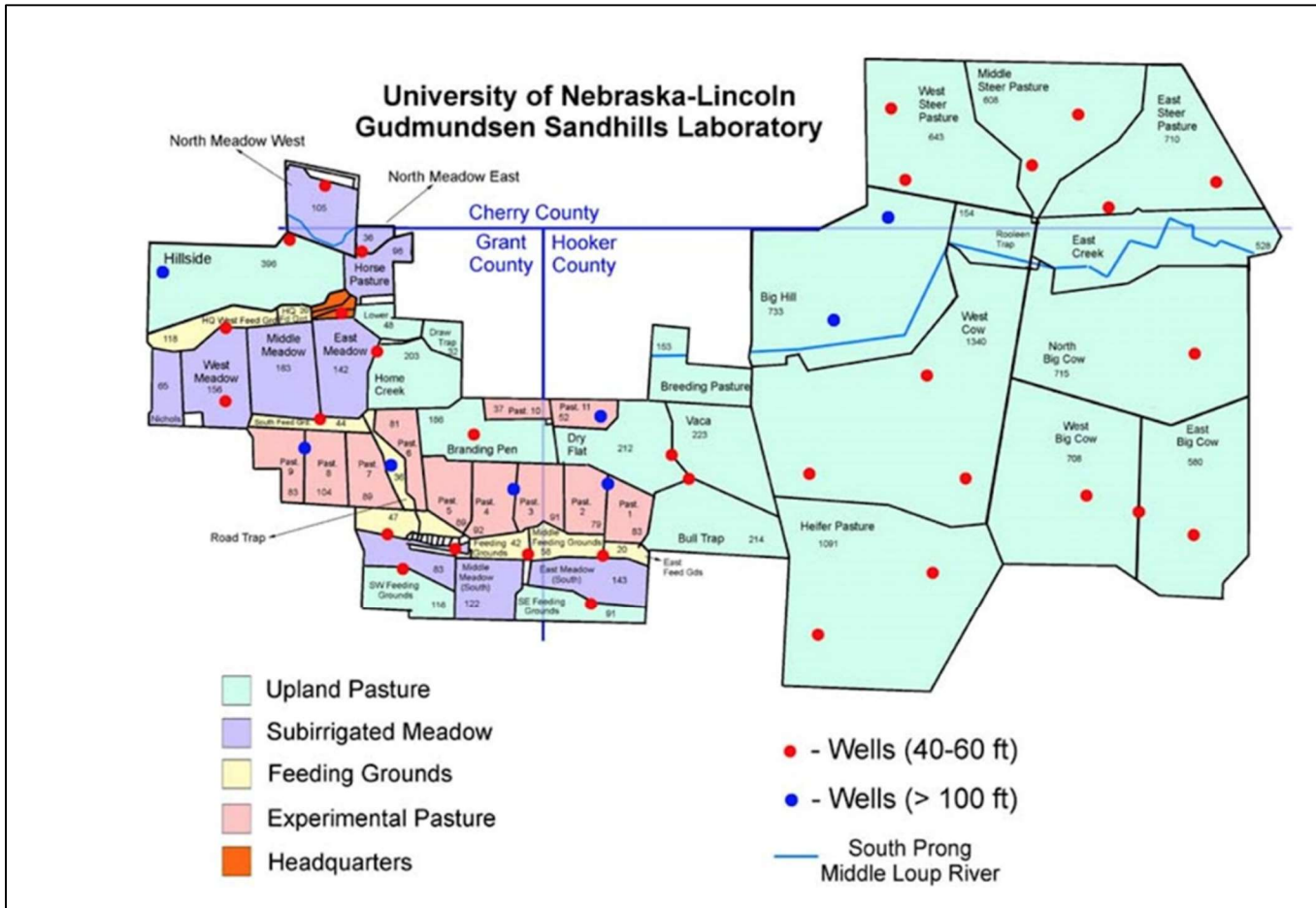
Cattle distribution and pasture utilization will be optimized in pastures by accurately determining stocking rates and timing of grazing rotations to prevent overgrazing. The EDIT Jornada website will be incorporated as a planning resource to estimate forage production across the ranch and aid in stocking rate determination. Strategies such as location of supplementation, including salt blocks or cake, will be utilized to focus under-grazed areas. These strategies are in line with the goals of the ranch to utilize grazing management through stocking rates and promote a diverse plant composition.

## **FORAGE CROP SELECTION**

Forage crops will not be grown at GSL. The abundance of native range for grazing and hay production from the meadows provide sufficient, and often excess, livestock feed. Additionally, this location of the Sandhills is not well-suited to support forage crops. Therefore, it would be an unnecessary and non-economical enterprise. The only harvested forage will be the

meadow hay. Hay will be fed at a rate of about 11 lb/head to all heifer and steer calves during an estimated 10-day weaning period. Historically, bales have weighed an average of around 1,200 lb. Therefore, around 33 bales will be reserved for weaning. This is a generous estimation to account for waste. During calving season for the heifers, approximately 66 bales will be fed in the drylot. An additional 30 bales will be kept for the mature cows in anticipation of winter weather. The ranch will keep an additional 100 bales in reserve at all times in case of drought or additional supplementation needs. The rest of the hay harvested each year will be sold.

**Map 2.1. Current pastures at GSL.**





**Map 2.2. Pasture use for spring/summer, fall/winter grazing, and fencing modification. Fences will be removed within pastures 10 and 11. Fences will also be removed between pasture 10 and the branding pen, along with pasture 11 and the dry flat.**



*BREEDING,  
REPRODUCTION,  
HEALTH, & NUTRITION*

## SELECTION, REPRODUCTION, AND LIVESTOCK INVENTORY

### *Description of Herd*

The herd at GSL consists of 400 head of mature commercial red angus cows. This main herd will range from 4 to around 10 years of age. Approximately 60 cows (estimating 15%) will be culled each year and replaced by heifers from the previous year's calf crop. Heifer selection will be based on conformation and EPDs to build the genetics that will best fit the ranch goals and environment. An additional criteria will be that heifers are diagnosed early-bred at preg checking. At weaning, all heifer calves will be kept as replacements, bred, and sold after preg checking as bred heifers. All steer calves will be sold after weaning. Typically, a 30-45 day backgrounding period will take place utilizing meadow regrowth after weaning. However, depending on the year and market conditions, the steers may be sold immediately. All calves will be fence line weaned. Twenty cow bulls and 12 heifer bulls will be leased for three months to be used in a 45 day breeding season. This equates to a 1:20 bull to cow ratio and a 1:16 bull to heifer ratio. Because a synchronization protocol will be utilized, it is important that there are enough bulls to cover a large number of animals in heat at the same time. The first month the bull lease will be to get bulls used to the terrain and weather conditions, with the last two months for breeding cows and heifers. Employees will retain ownership of all horses on the ranch property, and the ranch itself will not own any horses.

### *Breeding Goals*

Our breeding goal is to maintain a highly fertile, structurally sound, and maternally strong cowherd. In achieving this goal, we will aim for production parameters that best balance inputs, such as feed costs, with outputs such as animal performance.

We will target a mature cow body weight of 1100-1200 lbs with peak milk production of 20 lbs per day. These values are moderate and will allow some flexibility in years of poor forage quality or limited resources. Mulliniks and Adams (2019) demonstrated that May-calving cows with milk production of 20 lbs and over entered the breeding season in a negative energy and metabolizable protein balance. Additionally, as milk production increased over 20 lbs in March-calving cows, negative energy was predicted to occur earlier in the breeding season. Therefore, with our April-calving herd, it is crucial to keep milk production low to reduce the extent of a negative energy balance or need to for supplementation.

Heifers will be expected to begin cycling and calve by two years of age. A strict culling protocol will be implemented for any heifer or cow calving after the 45-day point in the calving season. This selectivity will help increase the herd fertility and calf performance as well as uniformity (Funston et al., 2012). A body weight of 55% of mature body weight will be targeted.

The Sandhills present a very extensive rangeland system, and our cattle must be structurally sound and able to move in order to perform well. Hooves, legs, and overall conformation will be utilized as selection criteria in the 60 replacement heifers kept.

We will aim to wean an average calf body weight of 50% of cow body weight. On average, we will aim for 550 lb steers and 500 lb heifers. However, depending on forage quality, this may not apply due to early weaning scenarios. Calving ease will be emphasized, especially in the heifers to minimize labor and reduce occurrence of dystocia.



The breeding system will be a crossbred system of red angus bulls and the current GSL cows. The red angus breed will allow us to target a niche market and sell breed, source, and age verified calves through programs such as IMI Global. The Red Angus Association will conduct audits to check records and ensure age and source protocols are met. Adams Land & Cattle, LLC in Broken Bow, NE is a yard that will be the goal for marketing steers. Therefore, steer calves that fit their required and preferred qualifications will be the goal. Further details about the value-added program with Red Angus are covered in part four “Economics and Marketing.”

#### *Bull Source and Selection*

32 Red Angus bulls will be leased from Bullis Creek Ranch located near Wood Lake, Nebraska. Bulls will be leased for 3 months at a price of \$900/bull. Bulls will be given a breeding soundness exam before delivery. Upon delivery Bulls will be quarantined for a month on native range until breeding takes place. This gives our bulls time to adjust to the environment and be able to perform efficiently. After the lease is up, bulls will be delivered back to the leaser.

Typically, 20 cow bulls and 12 heifer bulls will be leased each year. These ratios of 1:20 and 1:16 will allow for extra bulls in case of injury and will provide more flexibility with the ability to split up herds during the breeding season. For example, the two- and three-year-old cows will be strategically supplemented during the breeding season and will be separated from the main herd. Additionally, these ratios will ensure bull power is sufficient for all synchronized animals. All leased bulls will range in age from 2 years + of age with an average weight from 1,600 to 1,800 lbs. The bulls will be structurally sound to be able to navigate the rangeland and move with the cow herd when grazing. The bulls’ temperament will be docile and able to be easily handled by employees. The bulls will also need to pass a breeding soundness exam before coming to the ranch. Any bulls delivered that are not structurally sound or are extremely aggressive will be sent back to the leasing company and exchange for replacements that meet our criteria. See *Table 3.1* for estimated EPDs based on the Red Angus Association averages.

**Table 3.1. Red Angus Bull EPD Goals**

	Calving Ease	BW	WW	ADG	Milk	ME	HPG	MARB	YG	CW	REA
Heifer Bulls	20	-2	70	.23	10	1	11	0.75	0.35	75	1.00
Cow Bulls	13	-2	75	.45	10	1	11	0.75	0.35	75	1.00
Red Angus Avg.	13	-1.7	61	.23	25	1	11	0.42	0.06	21	1.00

*Breeding and Calving Season*

In an effort to find a middle ground between the nutritional challenges of May-calving and weather-related challenges of March-calving in the Sandhills, we will target an April calving herd with heifers calving approximately 10 days before the cows. Heifers will calve in a lot to allow for a closer watch and ease of assistance if needed. The 10 day advantage over the cows will allow for concentrated labor and extra time for the heifers to recover and breed back after calving. While an April calving season is not expected to be perfect for all aspects of production, the earlier breeding season associated may have added flexibility due to higher forage quality and ability to breed back. See *Table 3.2* for approximate bull turnout and calving dates.

**Table 3.2 Breeding season dates and calving season dates**

	Breeding Season		Calving Season	
	Bulls In	Bulls Pulled	Start	End
<i>Heifers</i>	June 11	July 27	March 20	May 5
<i>Cows</i>	June 21	August 6	April 1	May 15

*Pasture Management*

See *Table 3.3* for the general pasture use during calving and breeding for each class.

**Table 3.3. Calving and breeding pasture management**

Herd	Pasture	Pasture Use
Mature Cows (4+ yrs)	Vaca	Calving
	Dry Flat	Calving
	Branding Pen	Calving
	Junk Hill	Calving
	West Third	Breeding
Young Cows (2 <sup>nd</sup> calf)	Vaca	Calving
	Dry Flat	Calving
	Branding Pen	Calving
	Junk Hill	Calving
Young Cows (1 <sup>st</sup> & 2 <sup>nd</sup> calf)	East Third	Breeding
Heifers	Calving Lot	Calving
	Hill Pasture	Breeding

**HERD PRACTICUMS**

*Methods of Identification*

At calving, each calf will receive an EID tag, permanent ID tag, and dam ID tag. At weaning, the Dam ID tag will be removed from heifer calves and replaced with a second permanent ID tag. Steer calves will have the dam ID removed at weaning. Visual ID tags and the



EID tags will assist in compliance with our source and age and breed verification program, and will be obtained through the program.

*Other Protocols*

In addition to receiving ear tags, birth weight and date will be recorded for every calf. Tissue samples and blood samples will be obtained from each calf for DNA and BVD. These samples will generally be taken at calving to allow time for parentage confirmation and ability to utilize EPDs in replacement heifer decisions.

*Vaccinations*

All vaccination and herd health protocols are adjusted yearly in consultation with the local veterinarian. Records of every treatment will be kept for all animals that are doctored.

**Table 3.4. Vaccination Protocols**

<b>Class of Cattle</b>	<b>Administration Time</b>	<b>Drug Name</b>	<b>Dosage (cc)</b>
Calves	Birth	Alpha 7	2
	Branding	5-way MLV+pasturella	2
	Summer	Cydectin	
	2 weeks prior to weaning	7-way clostridial	2
	2 weeks prior to weaning	5-way MLV+pasturella	2
	Weaning	5-way MLV	2
	Weaning	Haemophilus somnus	2
	Replacement heifers	December-January	Bangs
Breeding		PGF	
Pre-calving		ScourGuard	
Spring		Ivermectin pour-on	
30 days pre-breeding		IBR/BVD/PI3/BRSV/vibriosis/lepto	
30 days pre-breeding		7-way clostridial	
Fall		Ivermectin pour-on	
Cows		Pre-calving	ScourGuard
	Spring	Ivermectin pour-on	
	Pre-breeding	7-way clostridial	
	Pre-breeding	IBR/BVD/BRSV/Lepto MLV	
	Breeding	PGF	
	Fall	Ivermectin pour-on	
Bulls	Pre-breeding	Ivermectin pour-on	

Vaccine prevention clarifications and descriptions:

- Alpha 7 - clostridial diseases
- 5-way MLV plus pasturella - BVD 1, BVD 2, BRSV, parainfluenza, and pneumonia
- 7-way clostridial - clostridial diseases
- Haemophilus somnus - Histophilus diseases
- Bangs – brucellosis
- ScourGuard: calf scours

### *Breeding*

All cattle will be bred via natural service. However, a synchronization method, such as a shot of prostaglandin, will be utilized to increase uniformity, cyclicity, and calf value (Larsen et al., 2010). Other synchronization protocols may be attempted until the most effective approach is determined for this particular cowherd and environment. While AI may be a beneficial option to look into in the future, current labor availability limits the practicality at present. The summer schedule will need to be cleared as much as possible to allow for events hosted at the ranch event center.

### *Weaning*

Calves from young cows will generally be weaned October 1 and the main herd weaned October 10, but date of weaning may change due to limited forage quality and quantity. Calves will be fence-line weaned at the south place with calves in the corral and cows on the feed ground. Fence line weaning helps reduce stress and makes the transition into the feedlot easier on the calf (Enriquez et al., 2011). After weaning, the steer calves will be kept on the south meadow for approximately a month prior to shipping. The heifer calves will be moved to the home and north meadows.

### *Pregnancy Detection*

Pregnancy detection for the heifers will take place in September during normal forage quality years. Pregnancy detection for the cows will coincide with weaning in October. Pregnancy detection will be performed by the local veterinarian who will either detect by palpation or ultrasound, whichever technique they prefer. If environmental conditions trigger the drought plan, early weaning may be implemented as early as August.

### *Body Condition Evaluations*

Body condition score evaluations will be conducted on cows during 3 critical time points: pre-calving, pre-breeding, and weaning. Scores will be assigned by a trained technician on a 9 point scale with 1 being almost dead and 9 being obese. We will aim to have pre-calving BCS averages of 5-6 at all timepoints.

### *Livestock Handling*

Low stress livestock handling will be practiced every time people interact with the cattle or horses. This includes utilizing flags and pressure on cattle flight zones to calmly move and process them. Hitting cattle and yelling will not be permitted in normal handling situations. Additionally, use of a hotshot will be last resort if other attempts to move cattle are in vain. Cattle will be moved calmly on horseback or ATV when rotating through pastures. All ranch employees will be required to obtain and maintain BQA certification which will be paid for by

the ranch. All health protocols and drug administration will be done by experienced employees and in accordance to BQA guidelines.

## **NUTRITION PROGRAM**

### *Introduction*

As forage quality allows, all cattle will utilize rangeland forage as their primary feed source. During late gestation, hay will be fed to supplement the cows and provide forage when snow cover is an issue. All replacement heifers will be fed hay while in the drylot for calving. Hay quality samples will be taken after baling by lot. When forage quality does not meet the animal's requirements, strategic supplementation will be utilized to target the specific deficiencies within each class. Dried distillers cake-based supplement will be utilized to alleviate protein and energy deficiencies in all late gestation cattle. Additionally, the first and second calf cows will be supplemented with dried distillers cake during the breeding season.

### *Grazed Forage*

To ensure forage quality is meeting nutrient demands, rangeland and meadow forage will be tested at critical physiological timepoints such as late gestation, breeding, and weaning. Forage samples will be hand clipped with enough samples taken to provide a representative sample depending on pasture size.

### *Hay*

Meadow hay will be fed using a bale processor onto the ground. During weaning, calving, or other times cattle are fed in a lot, hay will also be fed via bale processor onto the ground. When preparing for blizzards, whole bales will be utilized to strategically contain cattle to protected areas of the hills and keep them sheltered from the storms. When feeding hay, a targeted 2.2-2.5% of body weight will be fed depending on the class of cattle and stage of production.

All haying will be contracted and round bales will be produced. Hay quality will be obtained by testing 10-15 bales per pasture using a bale probe. Bales will then be stacked in rows in bale yards according to quality in order to allow ease of hay utilization based on quality needed. Current bale stackyards will be utilized to split up the hay, reduce fire loss risk, and allow for more organization flexibility.

### *Supplementation*

When forage quality declines below 7% crude protein (CP), a custom dried distillers cake will be supplemented to meet protein and energy requirements. The reason to supplement when the CP drops below 7% is because cattle cannot physically eat enough to meet the protein requirements (Adams et al., 1996). The cake will also contain a custom mineral and will be purchased by the ton from Central Valley Ag (Ainsworth, NE) and stored in overhead bulk grain bins at the south place. It will be fed onto the ground in range pastures via cake feeder on the back of a pickup. For cattle being supplemented in a lot or feed ground, the cake will be fed in bunks.

In general, the cake will be fed at a targeted ~3 lb per head per day during the last 60 of gestation for the mature cows. For the heifers during the last 60 days of gestation, they will be

fed at a targeted ~2.5 lb per head per day. However, to reduce fuel and labor costs, it will be only be fed 3 days a week on Monday, Wednesday, and Friday.

During the breeding season, the first and second calf cows will also be supplemented 2 lb per head per day. Stress factors such as low-quality forage create nutritional challenges during the breeding season for young cows with them having the inability to consume enough energy to meet their nutrient requirements for maintenance, lactation and growth. Thus, putting these cows in a negative energy balance during the breeding season increases the risk for body weight loss and reproductive failure. In previous years, pregnancy rates in May-calving cows at GSL have been less than 70%. Previous research at GSL has shown that metabolizable protein and energy are deficient in upland native range starting the first of July (Mulliniks and Adams, 2020). By moving these cows to April-calving, they still fall into a breeding season with low-quality forage and deficiencies. Other research has shown that strategic and nutrient targeted supplements can increase pregnancy rates and energy utilization in young cows while grazing dormant native range (Mulliniks et al., 2011). Supplementation with a high rumen undegradable protein supplement with increased fiber energy content such as DDGs may still be needed in young cows to help meet the requirement of metabolizable protein and energy, which may improve body weight and reproductive performance. The bulls that will be with these cows will also be supplemented, to ensure that all animals are consuming an adequate amount of supplement.

During the times that no cake is supplemented, the cattle will be offered just the mineral blend provided free choice in mineral feeders.

### *Feed Composition*

For a full nutrient composition of harvested and purchased feeds, see *Table 3.5*.

### *Rations and NRC Evaluation Reports*

The estimated diet for each group of cattle is summarized in *Table 3.6*. For a complete nutrient report of the diet for each class of cattle receiving cake, see *Tables 3.7, 3.8, 3.9, and 3.10*.

**Table 3.5. Nutrient composition of harvested and purchased feeds.**

	<b>DM %</b>	<b>CP %</b>	<b>RUP %, CP %</b>	<b>TDN %</b>	<b>NE<sub>m</sub> (Mcal/kg)</b>	<b>NE<sub>g</sub> (Mcal/kg)</b>	<b>Ca %</b>	<b>P %</b>	<b>Na %</b>	<b>Mg %</b>	<b>K %</b>	<b>Cl%</b>
Dried distillers cake	90	30.79	67.93	89	2.21	1.52	0.05	0.86	0.18	0.32	1.05	0.27
Meadow hay	88.79	8.79	23	52.9	1.07	0.51	0.5	0.18	0.04	0.19	1.75	0
Custom mineral blend	99	3.650	70	10	0	0	10	5	7.6	1.07	0.74	N/A

**Table 3.6. Annual diets by cattle group and time of year.**

<b>Cattle Class</b>	<b>Calving (March-May)</b>	<b>Breeding (June-July)</b>	<b>Summer/fall (Aug-Dec)</b>	<b>Weaning (Oct)</b>	<b>Late Gestation (Jan-March)</b>
Mature cows	Table 3.8/Range	Range	Range	Range	See Table 3.8
2 & 3 year olds	Table 3.8/Range	See Table 3.9	Range	Range	See Table 3.8
Replacement heifers	Meadow hay	Range	Range/Meadow	Range	See Table 3.7
Calves				Hay/Meadow	
Bulls		See Table 3.10			

**Table 3.7. Ration Composition for Heifers during Late Gestation estimating 5% waste.**

GSL  
0

Angus heifer, 900 lbs, BCS = 5.5  
March 1- May Late Gestation

Batch Size, lb 2000

Diet Dry Matter, % 89

Feed Ingredient	% DM	% As Fed	lb/Head	Batch,lb	Cumulative
<input checked="" type="checkbox"/> Meadow Hay	89.13	89.51	23.63	1790.15	1790.15
<input checked="" type="checkbox"/> Distillers Grains with Solubles, co	10.28	9.96	2.63	199.24	1989.39
<input checked="" type="checkbox"/> B-350 RCRC Mineral	0.59	0.53	0.14	10.61	2000.00
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<b>Total</b>		100.00	26.40	2000.00	

Finish or Mature Weight	1100	Genetic Potential	Low
Ionophore		Implant	
Initial BCS	5.5	Projected ADG	1.73
Length of Period, Days	60	Feed Intake, lb DM	23.5
Initial Weight, lb	900	Final Weight, lb	1004
Cost Per Day	\$2.04	Cost per Ton, As Fed	\$154.41

**Table 3.8. Ration Composition for Mature cows during Late Gestation estimating 5% waste.**

GSL  
0

Angus Mature cows, 1100 lbs, BCS = 5.5  
March 1- May Late Gestation

Batch Size, lb      2000

Diet Dry Matter, %      86

Feed Ingredient	% DM	% As Fed	lb/Head	Batch,lb	Cumulative
<input checked="" type="checkbox"/> Native Range, Jan-March	85.16	86.17	21.50	1723.45	1723.45
<input checked="" type="checkbox"/> Distillers Grains with Solubles, co	14.15	13.23	3.30	264.53	1987.98
<input checked="" type="checkbox"/> B-350 RCRC Mineral	0.69	0.60	0.15	12.02	2000.00
<input checked="" type="checkbox"/> -	-	-	-	-	-
<input checked="" type="checkbox"/> -	-	-	-	-	-
<input checked="" type="checkbox"/> -	-	-	-	-	-
<input checked="" type="checkbox"/> -	-	-	-	-	-
<input checked="" type="checkbox"/> -	-	-	-	-	-
<input checked="" type="checkbox"/> -	-	-	-	-	-
<input checked="" type="checkbox"/> -	-	-	-	-	-
<b>Total</b>		100.00	24.95	2000.00	

Finish or Mature Weight	1100	Genetic Potential	Low
Ionophore		Implant	
Initial BCS	5.5	Projected ADG	1.15
Length of Period, Days	60	Feed Intake, lb DM	21.5
Initial Weight, lb	1100	Final Weight, lb	1169
Cost Per Day	\$0.88	Cost per Ton, As Fed	\$70.37



**Table 3.9. Ration Composition for 2 and 3-year-olds during Breeding estimating 5% waste**

GSL 0	2 and 3-yr-olds, 1000 lb, BCS= 5.5 Breeding Season
Batch Size, lb	2000
Diet Dry Matter, %	37

Feed Ingredient	% DM	% As Fed	lb/Head	Batch,lb	Cumulative
<input checked="" type="checkbox"/> Native Range, July-August	92.37	96.97	72.00	1939.39	1939.39
<input checked="" type="checkbox"/> Distillers Grains with Solubles, co	7.08	2.83	2.10	56.57	1995.96
<input checked="" type="checkbox"/> B-350 RCRC Mineral	0.54	0.20	0.15	4.04	2000.00
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<b>Total</b>	100.00	74.25		2000.00	

Finish or Mature Weight	1100	Genetic Potential	Low
Ionophore		Implant	
Initial BCS	5.5	Projected ADG	0.44
Length of Period, Days	45	Feed Intake, lb DM	27.3
Initial Weight, lb	1000	Final Weight, lb	1020
Cost Per Day	\$1.90	Cost per Ton, As Fed	\$51.18

**Table 3.10. Ration Composition for Mature Bulls with the 2 and 3-year-old cows 5% waste**

GSL 0	Angus Mature Bulls with 2 and 3-yr olds, 1700 lb, B Breeding June 21- August 6
Batch Size, lb	2000
Diet Dry Matter, %	36

Feed Ingredient	% DM	% As Fed	lb/Head	Batch,lb	Cumulative
<input checked="" type="checkbox"/> Native Range, July-August	93.57	97.46	96.50	1949.30	1949.30
<input checked="" type="checkbox"/> Distillers Grains with Solubles, co	5.97	2.37	2.10	47.32	1996.62
<input checked="" type="checkbox"/> B-350 RCRC Mineral	0.46	0.17	0.15	3.38	2000.00
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<input checked="" type="checkbox"/>	-				
<b>Total</b>	100.00	88.75		2000.00	

Finish or Mature Weight	1700	Genetic Potential	Low
Ionophore		Implant	
Initial BCS	6.0	Projected ADG	2.73
Length of Period, Days	45	Feed Intake, lb DM	32.4
Initial Weight, lb	1700	Final Weight, lb	1823
Cost Per Day	\$2.23	Cost per Ton, As Fed	\$50.17



*ECONOMICS*  
&  
*MARKETING*

## CATTLE MARKETING PLAN

Open heifers and cull cows will be sold at the local livestock sale barn, such as Ogallala Livestock Auction. Steer calves will be sold directly to Adams Land and Cattle LLC, a feedlot that is currently trying to bring in more Red Angus cattle. Adams Land and Cattle LLC is approximately 119 miles from the ranch in Broken Bow, while Ogallala Livestock Auction is approximately 81 miles from the ranch. Bred heifers will be sold on Superior Livestock.

Bred cull cows as well as bred heifers will be sold after pregnancy checking in the beginning of October. However, if the market is low, these animals will be kept until more favorable market conditions such as in January or February. All open cows and heifers will be culled immediately after preg checking unless it would be profitable to attempt to rebreed for sale at a later date. Criteria for culling cows include open, crippled or lame, bad udders, and age. All bred heifers except the 60 kept for replacements will be sold. Open heifers will be sold as well. All steer calves will be sold after weaning.

GSL will Age, Source, and Breed verify through IMI Global. More details can be found on their website. <https://www.imiglobal.com/beef>. These value-added programs will be beneficial to added premiums for the bred heifers, as well as qualify for premiums with Adams Land and Cattle for the steers.

### *Goals & Objectives*

- Time bred heifer and cull cow sales to take advantage of high markets.
- Increase calf sale price with a minimum of \$3/cwt advantage through source and age verification and Certified Red Angus programs.
- Submit advertisements and flyers in catalogs and magazines to expand marketing avenues and build reputation.
- Utilize social media platforms and a website to advertise cattle to potential buyers.

**Table 4.1 Marketing Plan** (Prices from Superior Livestock for cull cows and bred heifer's prices were for the US while open heifers and steers was from Region 2, which includes the Great Plains and the North Rocky Mountain regions.)

<b>Marketing Plan</b>	<b>Target Market</b>	<b>Price Expectations</b>	<b>Goal/ Objective</b>	<b>Average Date</b>
Cull Cows	Ogallala Livestock Market	Expected: \$1100-\$1500 pre head	Cull the bottom 15% of the cows each year	October 15 <sup>th</sup>
Bred Heifers	Superior Livestock Auction	Expected:\$1100-\$1500 per head	Sell the bottom of the bred heifers each year	October 15 <sup>th</sup>
Open Heifers	Ogallala Livestock Market	Expected:\$145.00 - \$154.50 cwt	Sell any open heifers	October 15 <sup>th</sup>

Steer Calves	Adams Land and Cattle LLC	*Expected:\$168.00- \$175.00 cwt	Sell all steers calves	November 15 <sup>th</sup>
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\*certification program has historically increased returns by \$3/cwt  
(<https://redangus.org/marketing/tagging-programs/>)

**Table 4.2 Quantity and weight of livestock sold**

Livestock Class	Quantity	Weight	Quantity* Weight= Total lbs
Cull Cows	56	1200	67,200
Bred Heifers	116	875	101,500
Open Heifers	20	875	17,500
Steers	196	550	107,800

## EVENT CENTER MARKETING PLAN

### *Description of New Event Center*

The current Wagonhammer Education Center will be renovated into an event center, primarily focused on hosting weddings. The 300-person capacity venue will be available for other types of events as well. The ranch will also offer lodging year-round at the dorm with a 12-person maximum capacity.

### *Event Center Amenities*

The current lab will be converted into a kitchen and will have a commercial size sink and stove installed, as well as the addition of more refrigerators. This will provide the ability to cater meals for events. The current kitchen in the building will be turned into a bar with a walk-up window. In the meadow in front of the Wagonhammer, an outdoor venue with seating will be set up and decorated for wedding ceremonies. The building currently utilized as a feed shed next to the Wagonhammer will be used as storage for the venue decorations, tables, and seating. It will also have a partition to be used as a dressing room for weddings. Indoor receptions, food serving, and dancing will take place in the current auditorium in the Wagonhammer. The current office spaces will remain offices for the ranch employees.

Lodging will be provided in the dorm for a set rate per room. The dorm furniture and decorations will be updated to increase the ranch aesthetic. Both the Wagonhammer and Dorm will be available for guests year-round. However, the outdoor wedding venue will only be available May-October as weather permits.

### *Marketing Goals & Objectives*

- Provide an aesthetically pleasing environment for ranch weddings and other events.
- Use social media platforms and a website to advertise the venue with the goal of hosting 8 events per year.

- Increase awareness of the beauty of the Sandhills through the wedding photography generated.
- Provide lodging for guests throughout the year.
- Spread popularity of the venue through expanding the customer base by offering \$250 referral discounts.

### **PARTIAL BUDGET**

The partial budget is for implementing the event center, with catering offered, and lodging at the dorm. The kitchen renovation, outdoor wedding venue, and dorm renovation added costs would be one-time costs. The insurance and labor costs would be per event each year.

- Wedding Venue
  - Assuming 8 events per year (not necessarily weddings) at \$5000 per event
- Catering
  - Assuming 8 events per year, although guests will have the option to bring in their own food instead.
  - Assumes 150 people per event
  - \$150 fee + \$15 per person
- Dorm Lodging
  - Assumes a \$100 plus \$10 cleaning fee per room with all 6 rooms rented out during 8 events per year.
  - Fully furnished





## ANNUAL BUDGETS

The annual budget includes costs for 400 April-calving cows during late gestation and breeding, 136 retained heifers after weaning, 60 replacement heifers, and 32 leased mature bulls. Estimating a 1% cow death rate we will cull 56 cows per year. Estimating a 98% weaning rate, there will be approximately 392 calves weaned. Assuming 50% of the calf crop will be heifers, 196 heifers will be retained after weaning and exposed to bulls during the breeding season. The 60 retained heifers will be chosen from this group after pregnancy detection. The rest of the heifers (136) will be sold bred or open. The other half of the calf crop will be sold after weaning (196 steers). Bulls are leased to cut down on feed cost and labor. The feed costs are based off the rations in the “Breeding, Reproduction, Health, and Nutrition” section.

### Budget Inputs:

## Budget Inputs

Breeding Herd				
<b>Breeding Females</b>	Herd size		400	Cows
	Average Cow Value	It is assumed that herd size remains stationary so replacements will equal cow culls and cow deaths. If too few replacements are purchased, the worksheet automatically retains heifers.	1,225	\$ / head
	Cows Culled per Year		56	Cows
	Cow Deaths per year		1	percent
	Number of Replacements Needed		60	
	Estimated Weaning Rate		98	percent
	Extra Heifers Retained for Breeding that Will Not Be Used as Replacements		136	head
	Culled Replacement Heifer Weight When Sold		875	pounds
	Culled Replacement Heifer Selling Price		170	\$ / cwt
	Cost of Marketing Culled Replacement Heifers		23	\$ / head
	Replacement Females Purchased		(<=60)	head
	Replacement Female Cost (if applicable)			\$ / head
	Cow Cull Weight		1,200	pounds
	Non-Fed Cull Cow Price		120	\$ / cwt
<b>Bulls</b>	Bulls Needed			32
	Bull Purchase Price		900	\$ / head
	Bull use (years)	(<10)	1	years
	Bull Death Loss Rate		0%	
	Cull Bull Price		0	\$ / cwt
	Cull Bull Weight		0	pounds
<b>Calves</b>	Calves Weaned	(<=392)	392	head/year
	Steer Weaning Weight		550	
	Heifer Weaning Weight			pounds
	Weaned Steer Price	(>=10)	175	\$ / cwt
	Weaned Heifer Price	(>=10)		\$ / cwt

Feed					
Name	Price per Unit Purchased	Priced Unit (tons, lbs. etc)	Fed Unit (tons, lbs. etc)	Fed Unit per Priced Unit	As Fed Price
Pasture Grazing (growing season)	45.00	AUM	AUM	1	45.00
Pasture Grazing (dormant season)	45.00	AUM	AUM	1	45.00
Hay	100.00	ton	lbs.	2000	0.05
Salt and Mineral	680.00	ton	lbs.	2000	0.34
Protein supplement	190.00	ton	lbs.	2000	0.10

Non-Feed Input Costs			Allocation Percentage				
Name	Cost per Year	Is This Cost Per Animal or for All Animals?	Breeding Herd (Optional)	Wintered Calf (Optional)	Stocker (Optional)	Feedlot (Optional)	Fed Cull Cow (Optional)
Labor	40,000.00	all animals	100%	0%	0%	0%	0%
Fuel	14,000.00	all animals	100%	0%	0%	0%	0%
Veterinary and Medical	18,000.00	all animals	100%	0%	0%	0%	0%
Cull Cow Marketing	\$23	per animal	100%	0%	0%	0%	0%
Cull Bull Marketing	\$0	per animal	100%	0%	0%	0%	0%
Cull Replacement Marketing	\$0	per animal	100%	0%	0%	0%	0%
Weaned Calf Marketing	\$23	per animal	100%	0%	0%	0%	0%
Wintered Calf Marketing	\$0	per animal	0%	100%	0%	0%	0%
Stocker Marketing	\$0	per animal	0%	0%	100%	0%	0%
Feedlot Marketing			0%	0%	0%	100%	0%

Depreciable Input Costs					Allocation Percentage				
Name	Current Value	Future Value	Future Value Horizon	Annual Repairs	Breeding Herd (Optional)	Weaned Calf Wintering (Optional)	Stocker (Optional)	Feedlot (Optional)	Fed Cull Cow (Optional)
Breeding Herd Housing	100,000	1,000	40	2,000	100%				
2 Pickups	60,000	6,000	10	1,200	100%				
Tractor	70,000	10,000	15	800	100%				
Other Equipment (stock trailer, etc.)	70,000	8,000	10	1,000	100%				

Interest	
Operations Interest Rate	5%
Opportunity Rate	5%

Overhead Costs			Allocation Percentage				
	Amount		Breeding Herd (Optional)	Weaned Calf Wintering (Optional)	Stocker (Optional)	Feedlot (Optional)	Fed Cull Cow (Optional)
Real Estate Value*			100%				
Real Estate Tax		per year					
Annual Insurance Premium	2,000	per year	100%				
Professional Fees	850	per year	100%				
Annual Management Charge		per year					
Other		per year					



**Leased Bull Budget:**

Bull Budget		(32 Bulls)		Herd Total	
<b>Income</b>					
	<u>Amount</u>	<u>Weight</u>	<u>Price</u>	<u>Total</u>	
Cull Bull Sales	32.00 head @		\$ -		
<b>Gross Income</b>					
<b>Variable Costs</b>					
<b>Breeding Costs</b>					
	<u>Number</u>		<u>Price</u>	<u>Total</u>	
Bulls	32.00		\$ 900 per head	28,800	
<b>Bull Feed</b>					
	<u>Amount per Year</u>		<u>Per Animal or Total</u>	<u>Price</u>	<u>Total</u>
Pasture Grazing (growing season)	6 AUM		per animal	@ 45.00 per AUM	8,640
Pasture Grazing (dormant season)	AUM		per animal	@ 45.00 per AUM	
Hay	lbs.		total	@ 0.05 per lbs.	
Protein Supplement	472.5 lbs.		total	@ 0.10 per lbs.	45
Salt and Mineral	33.75 lbs.		total	@ 0.34 per lbs.	11
<b>Total Feed</b>					<b>8,696</b>
<b>Other Variables</b>					
			<u>Allocation</u>	<u>Total</u>	
Cull Bull Marketing			- per animal		
Operations Interest	Operations interest rate times feed and other variable expenses except marketing divided by two.			217	
<b>Total Non-feed</b>					<b>217</b>
<b>Total Variable Costs</b>					<b>37,714</b>
<b>Net Expense</b>					<b>37,714</b>

**Replacement Herd Budget:**

Replacement Budget		196 Head*		Herd Total	
<b>Feed Costs</b>					
	<u>Amount per Year</u>		<u>Per Animal or Total</u>	<u>Price</u>	<u>Total</u>
Pasture Grazing (growing season)	6.1 AUM		per animal	@ 45.00 per AUM	53,802
Pasture Grazing (dormant season)	4.4 AUM		per animal	@ 45.00 per AUM	38,808
Hay	lbs.		total	@ 0.05 per lbs.	-
Protein Supplement	lbs.		total	@ 0.10 per lbs.	-
Salt and Mineral	lbs.		total	@ 0.34 per lbs.	-
<b>Total Feed Costs</b>					<b>92,610</b>

## Breeding Herd Budget:

### Breeding Herd Cash Budget (400 Cows)

<b>Revenue</b>				<b>Herd Total</b>	<b>Per Cow</b>	<b>Per Calf</b>
	<b>Number</b>	<b>Weight</b>	<b>Price</b>	<b>Total</b>		
Weaned Steer Value	196	550	175.00 per cwt	188,650		
Weaned Heifer Value	-	-	per cwt			
Cull Cow Sales	56	1,200	120.00 per cwt	80,640		
Replacements Culled	136	875	170.00 per cwt	202,300		
<b>Gross Income</b>				<b>471,590</b>	<b>1178.98</b>	<b>2406.07</b>
<b>Variable Cash Costs</b>				<b>Herd Total</b>	<b>Per Cow</b>	<b>Per Calf</b>
<b>Breeding Costs</b>				<b>Total</b>	<b>Total</b>	<b>Total</b>
Bulls			(This amount is the "Net Expenses" from the "Bulls" tab)	37,714	94.28	192.42
Replacements Purchased			\$ per head			
<b>Animal Purchases</b>				<b>37,714</b>	<b>94.28</b>	<b>192.42</b>
<b>Cow Feed</b>				<b>Total</b>	<b>Total</b>	<b>Total</b>
	<b>Amount per Year</b>	<b>Per Animal or Total</b>	<b>Price</b>			
Pasture Grazing (growing season)	7.5 AUM	per animal	@ 45.00 per AUM	135,000	337.50	688.78
Pasture Grazing (dormant season)	3.6 AUM	per animal	@ 45.00 per AUM	64,800	162.00	330.61
		per animal				
Hay	85,068.00 lbs.	total	@ 0.05 per lbs.	4,253	10.63	21.70
Salt and Mineral	4846.5 lbs.	total	@ 0.34 per lbs.	1,648	4.12	8.41
Protein Supplement	99,063 lbs.	total	@ 0.10 per lbs.	9,411	23.53	48.02
Replacement Heifer Feed			(From Replacement Spreadsheet)	92,610	231.53	472.50
<b>Total Feed</b>				<b>307,722</b>	<b>769.31</b>	<b>1,570.01</b>
<b>Other Variable</b>				<b>Total</b>	<b>Total</b>	<b>Total</b>
	<b>Amount</b>	<b>Unit</b>	<b>Allocation</b>			
Labor	40,000	all animals	100%	40,000	100.00	204.08
Fuel	14,000	all animals	100%	14,000	35.00	71.43
Veterinary and Medical	18,000	all animals	100%	18,000	45.00	91.84
Cull Cow Marketing	23	per animal		1,288	3.22	6.57
Cull Replacement Marketing	-	per animal				
Weaned Calf Marketing	23	per animal		4,508	11.27	23.00
Operations Interest			Calculations: Operations interest rate times feed and other variable expenses except marketing divided by two.	9,668	24.17	28.86
<b>Total Non-feed</b>				<b>87,464</b>	<b>218.66</b>	<b>425.78</b>
<b>Total Variable Cash Costs</b>				<b>432,900</b>	<b>1,082.25</b>	<b>2,188.21</b>

<b>Fixed Cash Costs</b>				<b>Herd Total</b>	<b>Per Cow</b>	<b>Per Calf</b>
<b>Depreciables Input Costs</b>	<b>Repairs</b>	<b>Allocation</b>		<b>Total</b>	<b>Total</b>	<b>Total</b>
Breeding Herd Housing	2,000	100%		2,000	5.00	10.20
2 Pickups	1,200	100%		1,200	3.00	6.12
Tractor	800	100%		800	2.00	4.08
Other Equipment (stock trailer, etc.)	1,000	100%		1,000	2.50	5.10
			<b>Cash Ownership</b>	<b>5,000</b>	<b>12.50</b>	<b>25.51</b>
<b>Overhead and Management</b>	<b>Amount</b>	<b>Allocation</b>		<b>Total</b>	<b>Total</b>	<b>Total</b>
Real Estate Tax	-					
Annual Insurance Premium	2,000	100%		2,000	5.00	10.20
Professional Fees	850	100%		850	2.13	4.34
Annual Management Charge	-					
Other	-					
			<b>Total Overhead</b>	<b>2,850</b>	<b>7.13</b>	<b>14.54</b>
			<b>Total Fixed Cash Costs</b>	<b>7,850</b>	<b>19.63</b>	<b>40.05</b>
<b>Total Cash Costs</b>				<b>440,750</b>	<b>1,101.88</b>	<b>2,228.26</b>
<b>Net Cash Income</b>				<b>30,840</b>	<b>77.10</b>	<b>177.81</b>
<b>Non-Cash Costs</b>				<b>Herd Total</b>	<b>Per Cow</b>	<b>Per Calf</b>
<b>Depreciables Input Costs</b>	<b>Depreciation</b>	<b>Opportunity</b>	<b>Allocation</b>	<b>Total</b>	<b>Total</b>	<b>Total</b>
Breeding Herd Housing	2,475	5,000	100%	7,475	18.69	38.14
2 Pickups	5,400	3,000	100%	8,400	21.00	42.86
Tractor	4,000	3,500	100%	7,500	18.75	38.27
Other Equipment (stock trailer, etc.)	6,200	3,500	100%	9,700	24.25	49.49
<b>Opportunity</b>	<b>Amount</b>	<b>Allocation</b>				
Real Estate		100%				
Livestock	25,220	100%		25,220	63.05	128.67
			<b>Total Non-Cash Costs</b>	<b>58,295</b>	<b>145.74</b>	<b>297.42</b>
<b>Total Cash and Non-Cash</b>				<b>Herd Total</b>	<b>Per Cow</b>	<b>Per Calf</b>
			<b>Total Costs</b>	<b>499,045</b>	<b>1,247.61</b>	<b>2,525.68</b>
			<b>Total Net Income</b>	<b>(27,455)</b>	<b>-68.64</b>	<b>(119.61)</b>

### Total System Budget:

<b>System Budget</b>				
<b>Revenue</b>	<b>Number</b>	<b>Weight</b>	<b>Price</b>	<b>Herd Total</b>
Weaned Steers	196	550	175 \$ / cwt	188,650
Weaned Heifers				
Wintered Steers				
Wintered Heifers				
Stocker Steers				
Stocker Heifers				
Fed Steers				
Fed Heifers				
Cull Cow Sales	56	1,200	120 \$ / cwt	80,640
Fed Cull Cow Sales				
Cull Bull Sales	32		\$ / cwt	
Cull Replacement Sales	136	875	170 \$ / cwt	202,300
			<b>Gross Income</b>	<b>471,590</b>

<b>Variable Costs</b>				<b>Herd Total</b>
<b>Animal Purchases</b>				<b>Total</b>
Replacement Females			\$ per head	
Bulls	32.0	900	\$ per head	28,800
<b>Total Animals Purchased</b>				<b>28,800</b>
<b>Feed</b>				<b>Total</b>
Pasture Grazing (growing season)	4,387.60	AUM @	45.00 per AUM	197,442
Pasture Grazing (dormant season)	2,302.40	AUM @	45.00 per AUM	103,608
Hay	42.53	ton @	100.00 per ton	4,253
Salt and Mineral	2.44	ton @	680.00 per ton	1,659
Protein supplement	49.77	ton @	190.00 per ton	9,456
<b>Total Feed</b>				<b>316,419</b>
<b>Other Variable</b>				<b>Total</b>
Labor				40,000
Fuel				14,000
Veterinary and Medical				18,000
Cull Cow Marketing				1,288
Cull Bull Marketing				
Cull Replacement Marketing				
Weaned Calf Marketing				4,508
Wintered Calf Marketing				
Stocker Marketing				
Feedlot Marketing				
Operations Interest	Calculations: Operations interest rate times feed and other variable expenses except marketing divided by two.			9,885
<b>Total Other</b>				<b>87,681</b>
<b>Total Variable Costs</b>				<b>432,900</b>

Fixed Cash Costs		Herd Total
<u>Depreciables Input Costs</u>	<u>Repairs</u>	<u>Total</u>
Breeding Herd Housing	2000	2,000
2 Pickups	1200	1,200
Tractor	800	800
Other Equipment (stock trailer, etc.)	1000	1,000
	<b>Total Ownership</b>	<b>5,000</b>
<u>Overhead and Management</u>		<u>Total</u>
Real Estate Tax		
Insurance		2,000
Professional Fees		850
Management		
Other		
	<b>Total Overhead</b>	<b>2,850</b>
	<b>Total Fixed Cash Costs</b>	<b>7,850</b>
	<b>Total Cash Costs</b>	<b>440,750</b>
	<b>Net Cash Income</b>	<b>30,840</b>
Non-Cash Costs		Herd Total
<u>Depreciables Costs</u>	<u>Depre-ciation</u>	<u>Opportunity</u>
Breeding Herd Housing	2,475	5,000
2 Pickups	5,400	3,000
Tractor	4,000	3,500
Other Equipment (stock trailer, etc.)	6,200	3,500
<u>Opportunity</u>		
Real Estate Opportunity	Investment rate times real estate value	
Livestock	Investment rate times livestock value	25,220
	<b>Total Non-Cash Costs</b>	<b>58,295</b>
Total Cash and Non-Cash		Herd Total
	<b>Total Costs</b>	<b>499,045</b>
	<b>Net Total Income</b>	<b>(27,455)</b>





*FORAGE MANAGEMENT*

*&*

*DROUGHT PLAN*

## Description of Grazing Management

### *Forage Demand Overview*

The Gudmundsen Sandhills Ranch consists of a 400-head commercial Red Angus, April-calving cow herd with 32 bulls that are leased for the breeding season. Depending on the year, all of the heifer calves born each year will be kept for replacement heifers after weaning (196 for this year). Following pregnancy checking, the number of cows culled are replaced with the same number of bred heifers. A 15% cull rate and a 30% heifer replacement rate will be used, along with a 98% weaning rate. This year, 60 bred replacements have been retained. Remaining bred heifers and open heifers will be sold following pregnancy detection in September. All cows and heifers are bred by natural service for 45 days with 1 shot of prostaglandin the day of bull turnout. This synchronization protocol is implemented to increase uniformity and cyclicity within the herd. Heifers are bred 10 days earlier than cows to allow for concentrated labor during calving and extra time for the heifers to recover and breed back.

**Table 5.1 Breeding season dates and calving season dates**

	Breeding Season		Calving Season	
	Bulls In	Bulls Pulled	Start	End
<i>Heifers</i>	June 11	July 27	March 20	May 5
<i>Cows</i>	June 21	August 6	April 1	May 15

**Table 5.2 Herd Inventory**

GSL Cattle Inventory	
Mature April-calving cows	400
Replacement heifers	196
Bred Replacement heifers retained	60
Leased Bulls	32

## Pasture Forage Demand Summary (AUM)



Total AUM from grazing by livestock class.

Livestock Class	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Livestock Class Total
Cow-calf pairs				180	487	507	481	559	551				2764
Dry cows	422	469	615	270	32					273	537	473	3092
Bred heifers (replacement 18-24 months)	59	53	12				17	101	73	59	57	59	492
Yearling heifers (replacement 12-17 months)			130	138	139	147	143	61					759
Heifer calves (replacement 4-12 months)													
Weaned steer/heifer calves (4-12 months)	112	117	13							173	193	102	711
Yearling steers/heifers (12-17 months)													
Bulls						18	43	6					67
Horses	6	6	6	6	6	6	6	6	6	6	6	6	72
<b>Monthly Totals</b>	<b>600</b>	<b>646</b>	<b>776</b>	<b>593</b>	<b>665</b>	<b>678</b>	<b>691</b>	<b>733</b>	<b>630</b>	<b>512</b>	<b>793</b>	<b>641</b>	<b>7956</b>

### *Grazing Systems*

#### **Meadows**

There are 3 sub-irrigated meadows at GSL that add up to 1,015 acres. Each of these meadows is further divided into several pastures. Annual forage production in the meadows averages around 4,500-5,500 lb/acre of air-dried forage. Each meadow is hayed in July with around 3,500-4,500 lb/acre being cut. Each of the three meadows are hayed in a deferred rotation with one pasture rested from haying each year. This goal of this resting is to allow the warm season species a break from cutting during their prime growing season. Meadows that are not hayed will be grazed to take advantage of the forage. Meadow regrowth amounts to around 1,200-2,000 lb/acre and is utilized as fall and winter grazing. The meadow pasture that is not hayed each year will be utilized in the fall as a grazing pasture removing 25-30% of available forage. Winter grazing by the 190 replacement heifers and 60 bred heifers will be utilized. Steer calves will also be kept on meadows after weaning for approximately 45 days or until sold. There will be excess meadow regrowth during the average year. This will be utilized to add flexibility with additional forage for the main cowherd if needed during drought years.

Meadows have been traditionally hayed in July and will continue to be done in order to achieve the most yield. After hay needs have been met at the ranch and a year's supply of hay is retained, excess hay will be sold for extra profit.

#### **Fall and Winter Grazing**

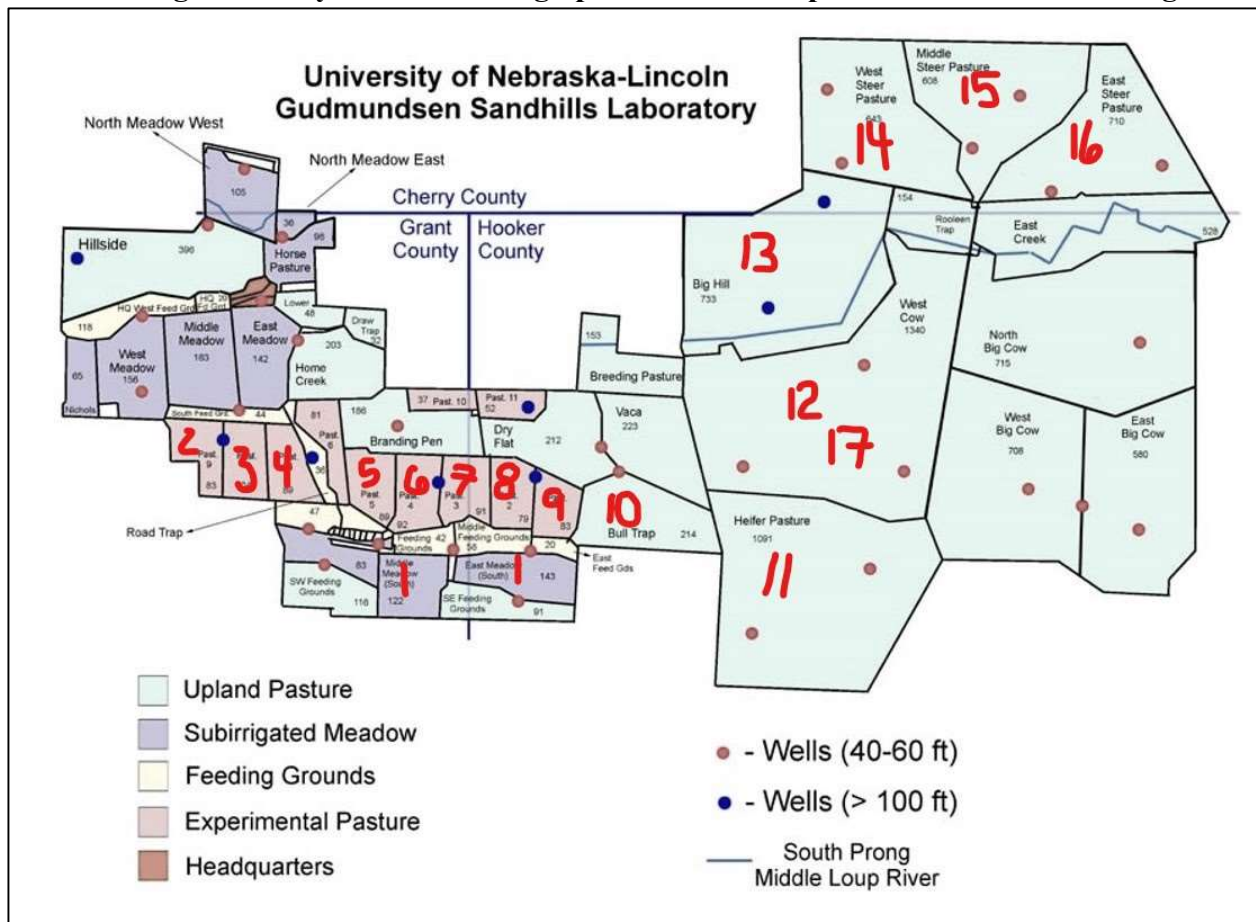


The fall/winter grazing will occur from mid-October to late March. The grazing system implemented for the pastures will be rotational grazing. For any rotation, whether it is fall/winter grazing, summer/spring grazing or meadow, all animals will be rotated on 4-wheelers. Stocking rates are higher due to being during the dormant season, and animals will stay in pastures until the desired utilization rates are achieved.

The main mature cowherd will utilize range pastures year-round. The exception will be during calving if storms are in the forecast. During these events, hay will be fed for two reasons. It will ensure the cows have adequate intake in the snow. Additionally, it will be strategically fed against hills to encourage cattle to stay protected and provide warm bedding for calves. This hay is accounted for on the fed hay summary and estimates 30 days of feeding 30 lbs per cow.

After preg checking and during fence line weaning, calves will be in the south feed grounds with cows on the south meadow. After around 7 days of weaning, the 60 replacement heifers and the dry bred cows will be utilized in a high intensity grazing rotation through pastures 1-9. See Map 5.1 for the winter rotation plan from weaning until calving season. The steer and heifer calves will be sorted at weaning.

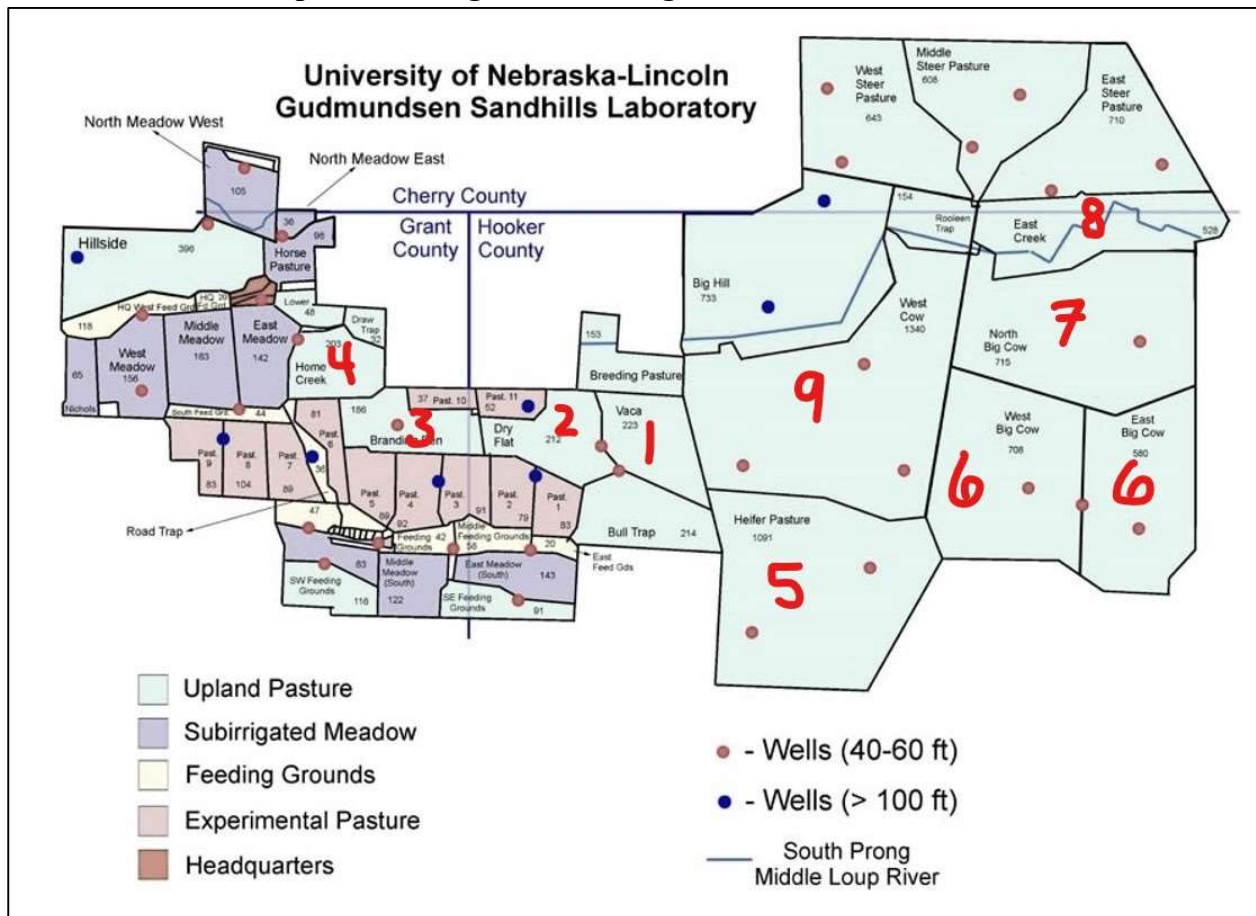
**Map 5.1. Order of pasture rotations from weaning until calving. Weaning on 1. Short duration high intensity rotation through pastures 9-1 except for 6. 10-17 until calving.**



## Spring and Summer Grazing

In the spring, when calving takes place, the Sandhills Calving method will be utilized for the mature cow herd. This method minimizes disease spread between older and younger calves by allowing uniform calves to be together and ensuring that cows calve in a clean pasture. This contributes to a healthier environment to reduce pathogens. This method will be used in the following pastures: Vaca, Dry Flat, Branding Pen, and Junk Hill. For example, the mature cows will start in the Vaca, and as the calving season progresses, pairs will remain in the Vaca with the remaining cows being moved to the Dry Flat. This process will be repeated through the other calving pastures, resulting in four groups of pairs at the end of calving season. There will be a cutoff during the calving season where the early groups in the Vaca and Dry Flat will be branded and moved to the Heifer pasture. The remaining groups in the Branding Pen and Junk Hill will be branded later at the headquarters and then moved out to pasture. During breeding, all cows will be brought in to receive a prostaglandin shot and the 2- and 3-year-olds will be sorted separately from the main herd. All cows will then go back out to pasture with bulls, but the two herds will allow for protein supplementation of the young cowherd. See Map 5.2 below for visualization of the rotations from calving until weaning.

**Map 5.2. Order of rotations for main cowherd from calving to weaning. 1-4 will be calving. 5 will be post-branding and pre-breeding. 6 will be breeding for mature cows and 2-3 year old cows. 7-9 will be post-breeding until weaning.**

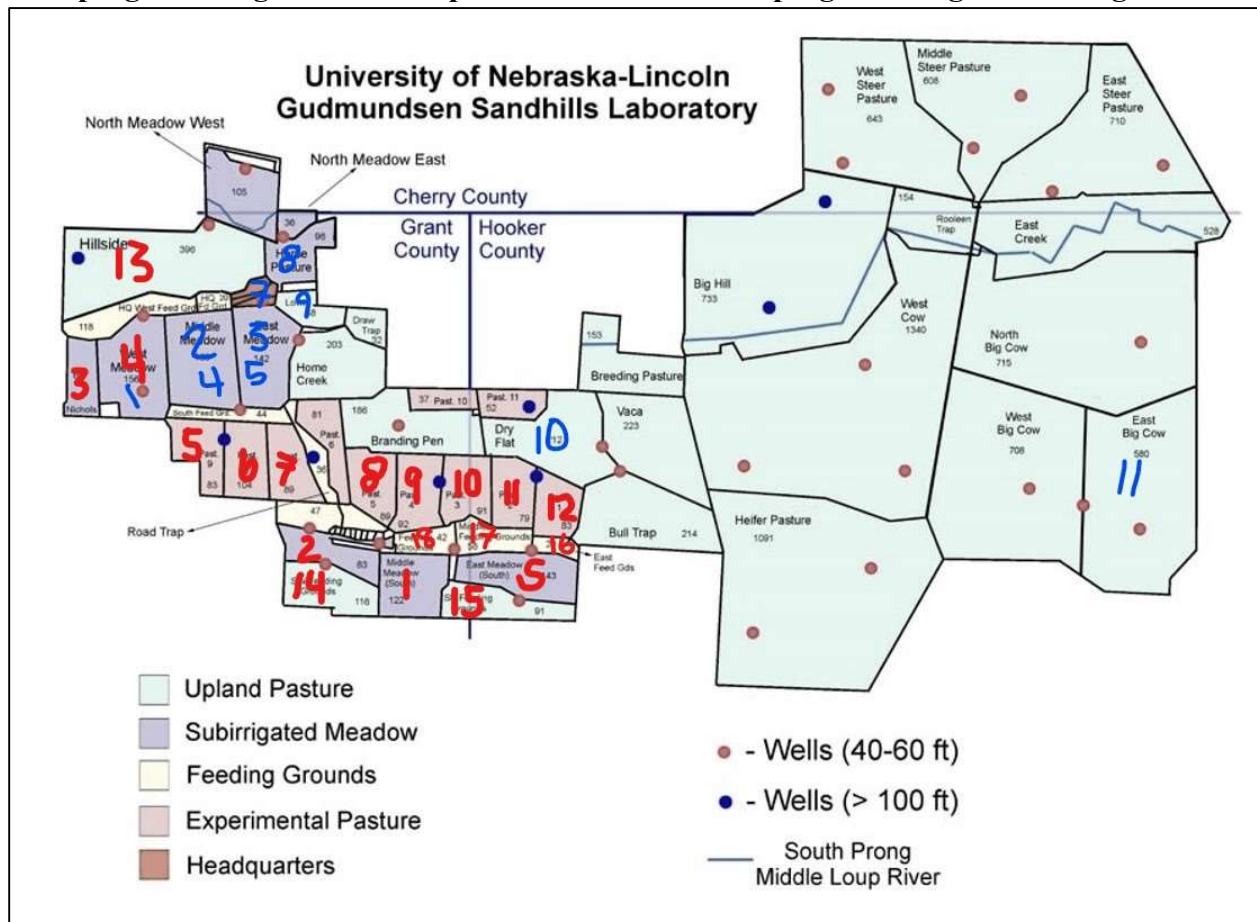


## Replacement Heifer Program

Following weaning, all heifer calves will grazing the south meadow and home meadow through the winter. In the spring, they will enter a short-term high intensity rotation through pastures 9-1 except for pasture 6. All heifers will then be put in the Hill pasture with 10 bulls for the 45 day breeding season. Following breeding, the SW and SE feed ground pastures will be grazed until preg checking the first of September. Depending on market conditions and forage availability, all open heifers and bred heifers not being kept as replacements will be sold following preg checking. If it appears to be beneficial to retain the heifers longer, meadow regrowth will be utilized.

The 60 replacement heifers to be kept will graze the home meadow through the winter until calving. During calving, heifers will be dry lotted and fed approximately 20 lb hay per head. After calving, pairs will be moved to the Horse Pasture. After branding, the 60 pairs will grazing the Dorm Lot and Dry Flat until being moved to the East third for breeding season following a prostaglandin shot. See Map 5.3, with red rotations being the 190 heifers and blue rotations being the 60 bred replacements being kept.

**Map 5.3. Replacement heifer and bred heifer rotations. Red = 190 heifers from weaning until preg checking. Blue = 60 replacement heifers from preg checking to breeding.**



## Drylot Fed Hay Records

This sheet can be used to record hay fed to livestock when that hay is the primary roughage source; such as in drylot or feed trap. Hay fed as a supplement while grazing in a pasture should be recorded on individual pasture sheets.

Livestock Class	Location	Number	Hay Fed (lb/hd/d)	Begin Date	End Date	Days	Total Hay Fed ( T )	Hay AUM
Bred heifers (repl.)	Calving lot	60	25.0	07-Mar-21	15-Apr-21	39	29.3	74.0
Bred heifers (repl.)	Calving lot	20	25.0	15-Apr-21	30-Apr-21	15	3.8	9.5
Bred heifers (repl.)	Calving lot	5	25.0	30-Apr-21	07-May-21	7	0.4	1.1
Dry cows	Calving Pastures during storm	400	30.0	01-Apr-21	30-Apr-21	29	174.0	440.0
Weaned str./hfr. calves	South Feed Grounds	392	11.0	01-Oct-21	10-Oct-21	9	19.4	49.1
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
						0	0.0	0.0
<b>Grand Total</b>							226.8	573.7

### Harvest Efficiency

Stocking rate can be adjusted in the pastures and meadows in order to correspond to the growing season, such that stocking rate will be increased during winter grazing in order to remove more biomass if necessary. All pastures at Gudmundsen Sandhills Lab will be grazed with the goal of a 25% harvest efficiency aiming to leave 50% of biomass and account for 25% lost to trampling and wildlife during the growing season. Depending on precipitation, harvest efficiency may be increased. GSL will aim for a conservative stocking density to add flexibility and conserve resources during drought years. During winter months, stocking rate may be higher due to forage being dormant. This is reflected on the stocking summary sheet below. The summary also illustrates that some pasture may not be grazed every year in an effort to reserve forage for drought. Alternatively, all pastures could be grazed but with much lighter stocking rates.



## Stocking Rate Summary

Pasture	Acres	Total AUM / Pasture			AUM/ac			AUD/ac			Response Index Score
		Planned	Used	Left	Planned	Used	Left	Planned	Used	Left	
Past. 1	83	54	52	2	0.65	0.62	0.03	20	19	1	0
Past. 2	79	51	52	-1	0.65	0.66	-0.01	20	20	0	0
Past. 3	91	59	57	2	0.65	0.63	0.02	20	19	1	0
Past. 4	92	60	57	3	0.65	0.62	0.03	20	19	1	0
Past. 5	89	58	57	1	0.65	0.64	0.01	20	19	0	0
Past. 6	81	53	26	27	0.65	0.32	0.33	20	10	10	0
Past. 7	89	58	62	-4	0.65	0.70	-0.05	20	21	-1	0
Past. 8	104	68	68	0	0.65	0.65	0.00	20	20	0	0
Past. 9	83	54	52	2	0.65	0.63	0.02	20	19	1	0
Branding Pen	223	145	143	2	0.65	0.64	0.01	20	19	0	0
Dry Flat	264	172	156	16	0.65	0.59	0.06	20	18	2	0
Road Trap	36	23	22	2	0.65	0.60	0.05	20	18	1	0
Hill Pasture	396	257	265	-8	0.65	0.67	-0.02	20	20	-1	0
Junk Hill	203	132	128	4	0.65	0.63	0.02	20	19	1	0
Dorm Lot	48	31	28	3	0.65	0.59	0.06	20	18	2	0
Triangle Piece	32	21	20	1	0.65	0.61	0.04	20	19	1	0
Big Hill	733	476	481	-5	0.65	0.66	-0.01	20	20	0	0
Roolean Trap	154	100	0	100	0.65	0.00	0.65	20	0	20	0
West Cow	1340	871	876	-5	0.65	0.65	0.00	20	20	0	0
Heifer Pasture	1091	709	710	-1	0.65	0.65	0.00	20	20	0	0
Vaca	223	145	145	0	0.65	0.65	0.00	20	20	0	0
Bull Trap	214	139	158	-19	0.65	0.74	-0.09	20	22	-3	0
Breeding Pasture	153	99	158	-58	0.65	1.03	-0.38	20	31	-12	0
West Third	708	460	493	-33	0.65	0.70	-0.05	20	21	-1	0
East Third	580	377	369	8	0.65	0.64	0.01	20	19	0	0
North Third	715	465	430	35	0.65	0.60	0.05	20	18	1	0
West Steer	643	418	426	-8	0.65	0.66	-0.01	20	20	0	0
Middle Steer	608	395	410	-15	0.65	0.67	-0.02	20	21	-1	0
East Steer	710	462	0	462	0.65	0.00	0.65	20	0	20	0
East Creek	528	343	335	8	0.65	0.64	0.01	20	19	0	0
Horse Pasture	96	62	62	1	0.65	0.64	0.01	20	20	0	0
South Feed Ground	44	29	28	1	0.65	0.63	0.02	20	19	1	0
West Feed Ground	118	77	44	33	0.65	0.37	0.28	20	11	9	0
Day Lot	20	13	12	1	0.65	0.59	0.06	20	18	2	0
North of S. Meadow	47	31	0	31	0.65	0.00	0.65	20	0	20	0
S. Feed Ground	42	27	22	5	0.65	0.53	0.12	20	16	4	0
S. Middle Feed Ground	58	38	42	-4	0.65	0.73	-0.08	20	22	-2	0
S. East Feed Ground	20	13	12	1	0.65	0.61	0.04	20	19	1	0
SW Feed Ground	116	75	75	0	0.65	0.65	0.00	20	20	0	0
SE Feed Ground	91	59	61	-2	0.65	0.67	-0.02	20	20	-1	0
N. Meadow West	105	210	0	210	2.00	0.00	2.00	61	0	61	0
N. Meadow East	36	72	72	0	2.00	1.99	0.01	61	61	0	0
Home West Meadow	156	312	271	41	2.00	1.74	0.26	61	53	8	0
Home Middle Meadow	163	326	118	208	2.00	0.73	1.27	61	22	39	0
Home East Meadow	142	284	122	162	2.00	0.86	1.14	61	26	35	0
Nichols Meadow	65	130	134	-4	2.00	2.06	-0.06	61	63	-2	0
South West Meadow	83	166	172	-6	2.00	2.07	-0.07	61	63	-2	0
South Middle Meadow	122	244	248	-4	2.00	2.03	-0.03	61	62	-1	0
South East Meadow	143	286	223	63	2.00	1.56	0.44	61	48	13	0
Calving Lot	1	0	0	0	0.00	0.00	0.00	0	0	0	0
<b>Total</b>	<b>12061</b>	<b>9209</b>	<b>7956</b>	<b>1253</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>
<b>Pasture Avg.<sup>1</sup></b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>0.88</b>	<b>0.73</b>	<b>0.15</b>	<b>27</b>	<b>22</b>	<b>5</b>	<b>0.0</b>
<b>Ranch Avg.<sup>1</sup></b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>0.76</b>	<b>0.66</b>	<b>0.10</b>	<b>23</b>	<b>20</b>	<b>3</b>	<b>---</b>

<sup>1</sup> Pasture average is calculated from the AUM/ac or AUD/ac of each pasture. Ranch average is calculated from total ranch acres and total AUM's used.

**Forage Supply:**

Forage Supply				Available AUM
Pasture ID	No. Acres	Stocking Rate AUM/A	Grazing Adj	
Past. 1	83	0.65	1.2	65
Past. 2	79	0.65	1.2	62
Past. 3	91	0.65	1.2	71
Past. 4	92	0.65	1.2	72
Past. 5	89	0.65	1.2	69
Past. 6	81	0.65	1.2	63
Past. 7	89	0.65	1.2	69
Past. 8	104	0.65	1.2	81
Past. 9	83	0.65	1.2	65
Branding Pen	223	0.65	1.2	174
Dry Flat	264	0.65	1.2	206
Road Trap	36	0.65	1.2	28
Hill Pasture	396	0.65	1.2	309
Junk Hill	203	0.65	1.2	158
Dorm Lot	48	0.65	1.2	37
Triangle Piece	32	0.65	1.2	25
Big Hill	733	0.65	1.2	572
Roolean Trap	154	0.65	1.2	120
West Cow	1340	0.65	1.2	1045
Heifer Pasture	1091	0.65	1.2	851
Vaca	223	0.65	1.2	174
Bull Trap	214	0.65	1.2	167
Breeding Pasture	153	0.65	1.2	119
West Third	708	0.65	1.2	552
East Third	580	0.65	1.2	452
North Third	715	0.65	1.2	558
West Steer	643	0.65	1.2	502
Middle Steer	608	0.65	1.2	474
East Steer	710	0.65	1.2	554
East Creek	528	0.65	1.2	412
Horse Pasture	96	0.65	1.2	75
South Feed Ground	44	0.65	1.2	34
West Feed Ground	118	0.65	1.2	92
Day Lot	20	0.65	1.2	16
North of S. Meadow	47	0.65	1.2	37
S. Feed Ground	42	0.65	1.2	33
S. Middle Feed Ground	58	0.65	1.2	45
S. East Feed Ground	20	0.65	1.2	16
SW Feed Ground	116	0.65	1.2	90
SE Feed Ground	91	0.65	1.2	71
N. Meadow West	105	2	1.2	252
N. Meadow East	36	2	1.2	86
Home West Meadow	156	2	1.2	374
Home Middle Meadow	163	2	1.2	391
Home East Meadow	142	2	1.2	341
Nichols Meadow	65	2	1.2	156
South West Meadow	83	2	1.2	199
South Middle Meadow	122	2	1.2	293
South East Meadow	143	2	1.2	343
	12060			11051

### ***Drought Contingency Plan***

In the Sandhills where GSL is located, the average annual rainfall is 17 to 22 inches. A rain gauge at the ranch headquarters will be monitored daily to record all precipitation. To be able to plan for drought, the rainfall amounts will be evaluated each month starting in April and May. The average rainfall for these two months is anywhere from two to four inches. If the rainfall amount is less than two inches for these two months, then the drought plan will take effect on June 1<sup>st</sup>. The UNL drought monitor weekly reports will also be taken into consideration when adjusting trigger points for drought plan implementation.

Cow body condition score will be evaluated to determine if the cows and heifers will need to increase their body weight or if they have room to decrease their body weight. The end of June through the start of August is the breeding season, which means cows and heifers will need to be at an adequate body weight to breed back while also at peak lactation. Depending on how harsh the drought is that year, early weaning may be considered as this is the fastest way to decrease a cow's maintenance load. This early weaning will occur in September.

Due to conservative stocking rates well below the carrying capacity on meadows, regrowth will be available for use by the cowherd. Another alternative forage that can be provided is hay that was harvested in previous years. There is always a year's worth of hay put back in case of a drought, or extreme winter weather events. The stored hay will be evaluated on a bimonthly basis to ensure that the hay meets the animals' nutritional needs. Supplementation of distiller's grains-based cake and minerals will continue to be provided as planned even during a drought year. In addition, the pastures and meadows that are not utilized completely will be kept available for drought. To ensure that the pastures are not overgrazed during a normal year, grazing 25% of the forage available will be the initial plan. However, during a drought that may be decreased to only graze 20% to leave some residual forage and provide an opportunity to rotate through pastures again if needed.

Also, some additional cows may need to be culled to decrease the forage demand. Culling an additional set of cows will also occur at the same time as the early weaning. A list of up to 40% of the herd will be compiled as potential culls. These will be selected based on calving date, age, disposition, conformation, and udder score. If early weaning is implemented, pregnancy detection will also take place and some late bred cows may be culled as well. Early weaning can help reduce the overall maintenance of the cow with energy that was going towards milk production now going toward maintaining basic functions of the cow (Waterman et al., 2012).

Depending on drought severity and timing of rainfall, the ranch may opt to feed hay rather than destock. This will also be dependent on market conditions. Because GSL has a year's supply of hay stockpiled, it may be more profitable to feed through a lighter drought than incur the increased annual cost per cow and added expense of re-buying cows or developing more heifers.

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## **SUMMARY OF MANAGEMENT CHANGES FROM FIRST DRAFTS**

- Updated goals and objectives and included event center and lodging
- Updated employment position descriptions
- Correct forage quality months for meadow and upland
- Clarified deferred haying in meadows
- Updated meadow stocking rate
- Clarified undesirable plant species
- Expanded on breeding goals and selection criteria
- Added bull source info
- Included value-added program info
- Added livestock handling section
- Updated rations to reflect correct number of animals
- Added hay descriptions
- Clarified cattle prices for marketing plan
- Updated annual budget to reflect correct costs and cow numbers
- Updated grazing and hay spreadsheet cow numbers
- Added literature cited