Homework (answers)

Forage Demand

100 pairs
4 bulls (Jun 1 – Aug 15) 2000 lb
1200 lb cows (@ BCS 5.0-5.5)
Calves 3 months on July 1, 2008
Grazing season May 1 – Oct 31

	Animal Weights and AUE Values					
	May	Jun	Jul	Aug	Sep	Oct
Cow	1200	1200	1200	1200	1200	1200
Calf			300	370	440	510
Total	1200	1200	1500	1570	1640	1710
AUE	**1.2 (+)**	**1.2 (+)**	**1.5**	**1.57**	**1.64**	**1.71**

Average Animal Unit Equivalent (AUE) per pair = **1.47** AUE
Animal Unit Equivalent per bull = **2.00** AUE

How much **forage** do you need?

(100 pairs) × (**1.47** AU/pair) × (6 mo) = **882** AUM

(4 bulls) × (**2.00** AU/bull) × (2.5 mo) = **20** AUM

Total = 902 AUM

Bonus: How many acres of pasture (carrying capacity = 0.60 AUM/acre) would be needed to support this herd?

902 AUM ÷ 0.60 AUM/acre = 1503 acres

Homework (answers)

Forage Supply				
Pasture	**Site**	**Acres**	**Stocking Rate AUM/ac**	**AUM's**
1	Silty	250	0.50	**125**
	Limy Upland	50	0.40	**20**
2	Silty	150	0.40	**60**
	Sand	150	0.30	**45**
3	Sandy	300	0.50	**150**
4	Silty	100	0.50	**50**
	Sandy	200	0.40	**80**
5	Silty	400	0.60	**240**
			Total available AUM	**770**

One Animal Unit Month (AUM) of forage = 780 lb air dried

One Animal Unit Day (AUD) of forage = 26 lb air dried

One Animal Unit (AU) of beef = 1,000 lb of beef animal

Bonus: How long could 80 cow-calf pairs (1.5 AUE each) graze Pasture 5 to reach the point where they removed 0.60 AUM/acre from that pasture?

80 cow-calf pairs × 1.5 AUE = 120 AU

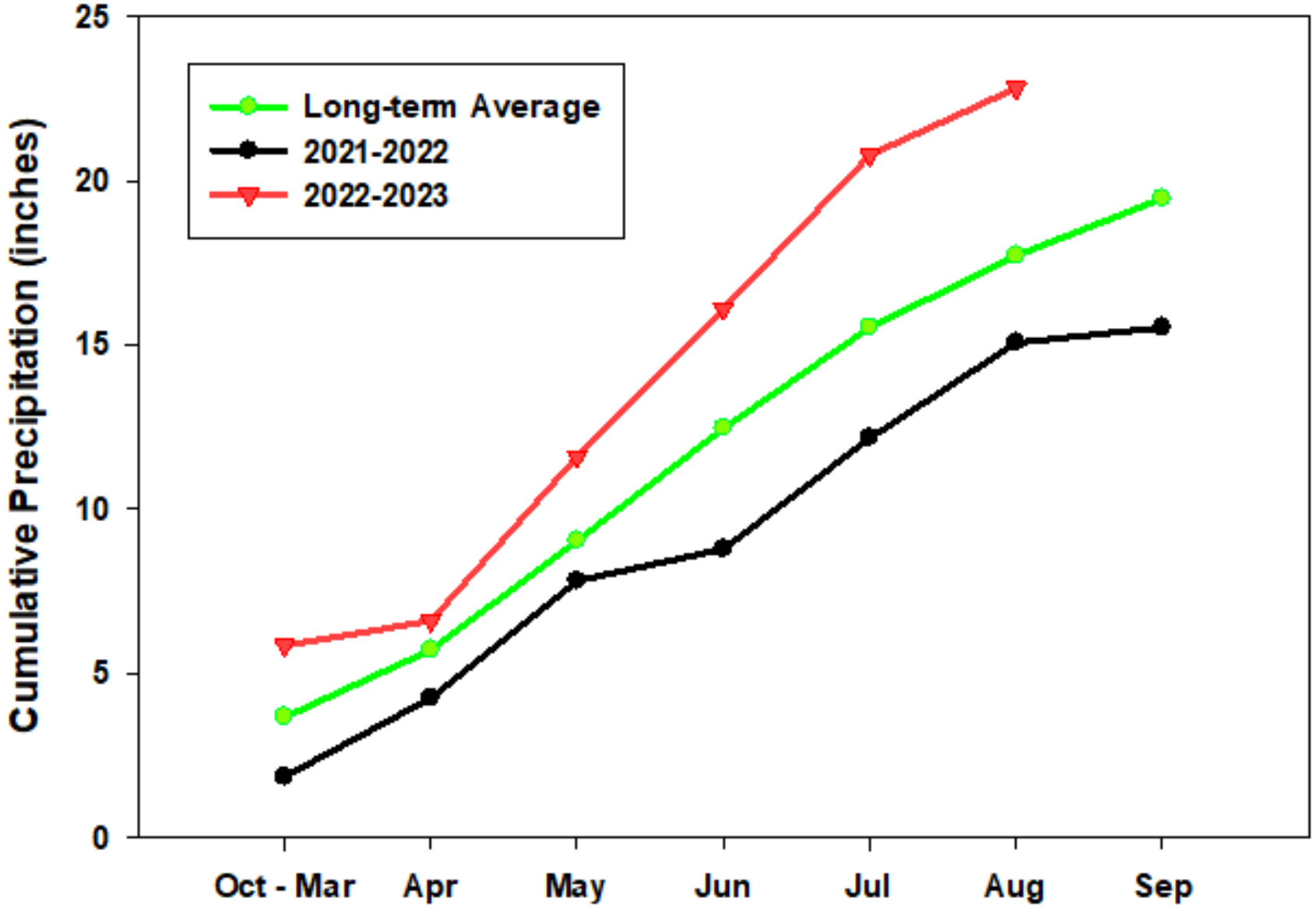
AUM in Pasture 5: 400 ac × 0.60 AUM/ac = 240 AUM

Length of time: 240 AUM / 120 AU = 2 months

GSL Precipitation (inches)

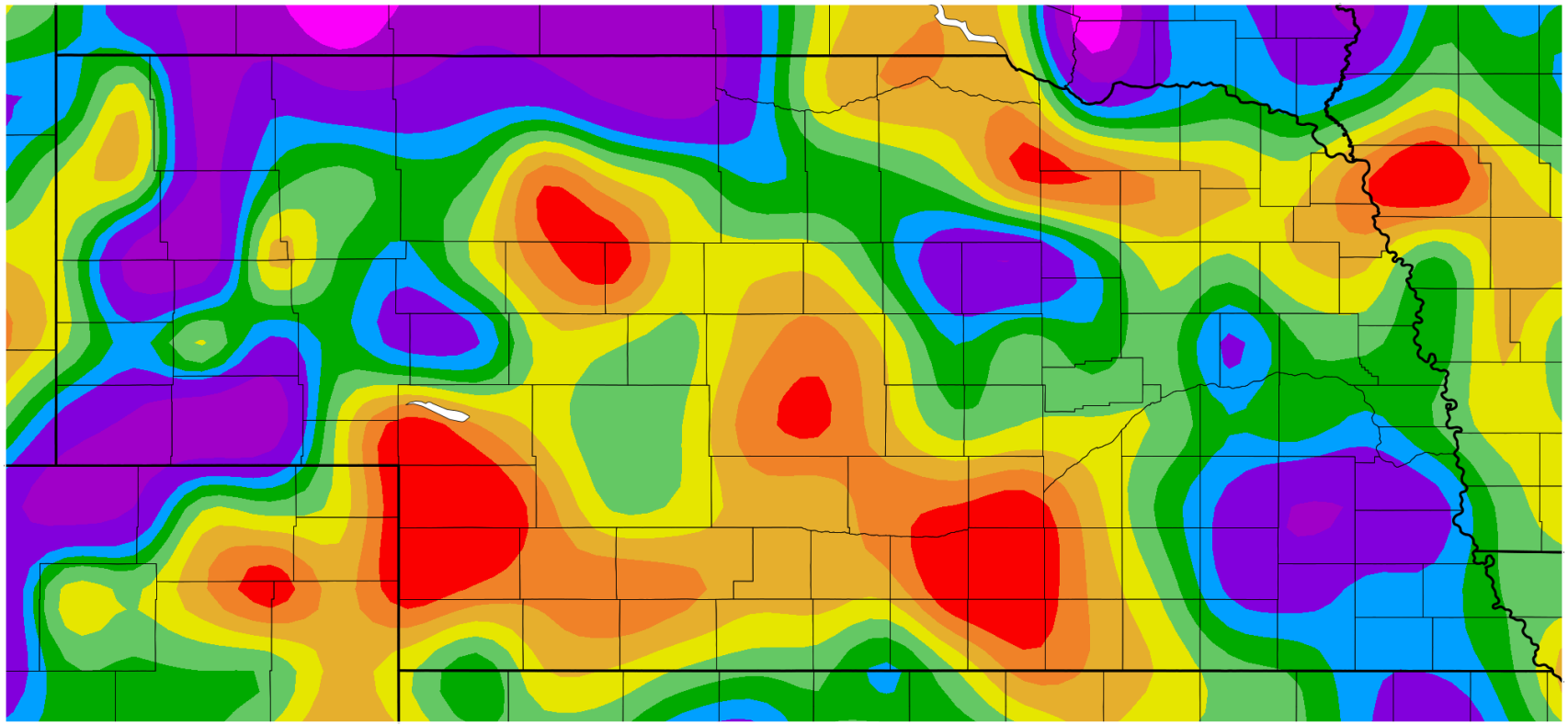
Month	Average	2021-2022	2022-2023	2022-2023 Cumulative
Oct. – Mar.	3.66	1.85	5.84	5.84
April	2.05	2.4	0.76	6.60
May	3.32	3.56	5.00	11.60
June	3.43	0.97	4.50	16.10
July	3.07	3.39	4.68	20.78
August	2.19	2.9	2.04	22.82
September	1.74	0.46		
Total	19.46	15.53		

GSL Cumulative Precipitation



GSL forage production of upland range at GSL by plant functional group, 2023.				
	Cool-season grasses & sedges	Warm-season grasses	Forbs	Total
	---------- lb/acre ----------			
2023	388	1055	359	1978
2007 – 2022 average	597	909	183	1828

Percent of Normal Precipitation (%)
7/1/2023 - 9/4/2023



25 50 70 80 90 100 110 120 130 150 175

Generated 9/5/2023 at HPRCC using provisional data.

NOAA Regional Climate Centers

Grazing Systems

Jerry D. Volesky
Range / Forage Specialist
West Central Res. & Ext. Center
402 West State Farm Rd
North Platte, NE 69101
(308) 696-6710
jerry.volesky@unl.edu

N EXTENSION

Ranch Practicum - 2023

Elements of Good Grazing Management

1. Stocking rate
2. Timing of grazing (season of use)
3. Distribution
4. Kind/class of livestock

Grazing System:

A specialization of grazing management which defines the periods of grazing and non-grazing.

Examples: short duration, deferred rotation, season-long continuous, etc.

Grazing Systems: History

Pre- 1900: Continuous grazing

Early 1900's: 2 to 5 pastures - - deferment or rest period important

1950's: Voison (France) - Pasture rotations

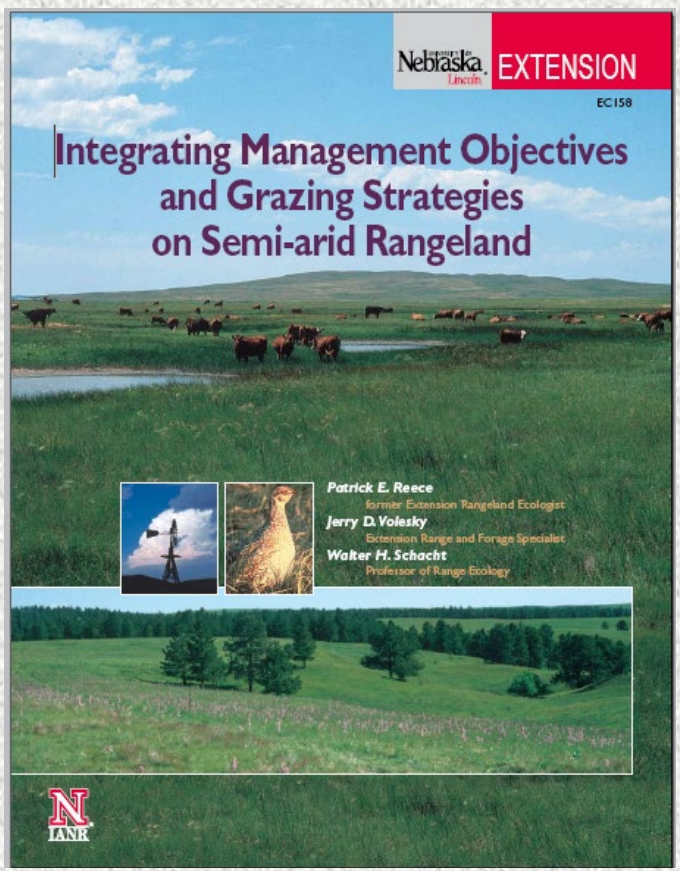
1960-1970's: Savory (South Africa) – Short duration grazing (SDG) (Holistic approach)

1980's: Gerrish – Management intensive grazing (MIG)

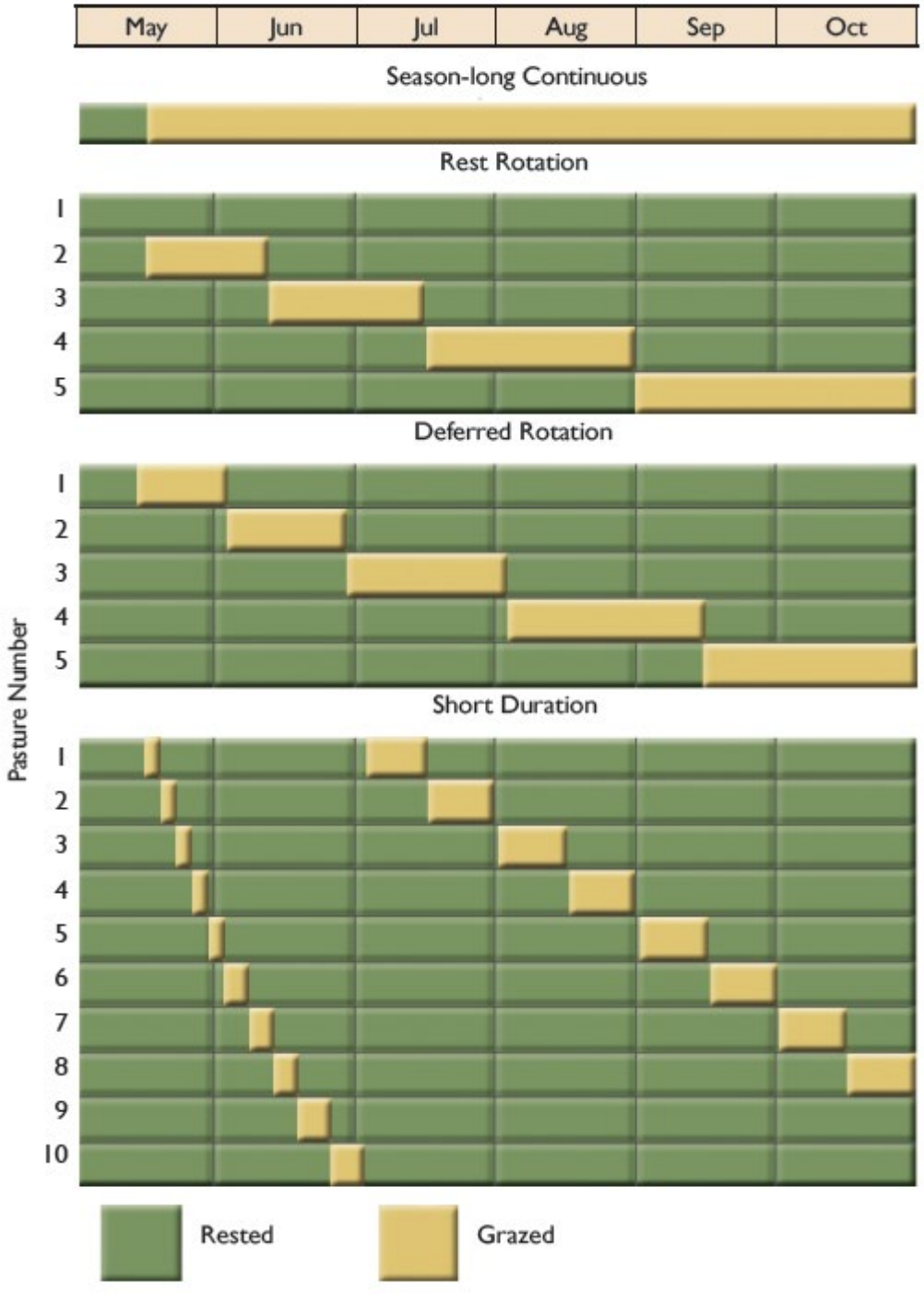
2000's: Ultra-high stock density grazing, mob grazing, regenerative grazing

Grazing Systems

- **Allow us to:**
  - **Manipulate grazing distribution**
  - **Control timing of grazing (season of use)**

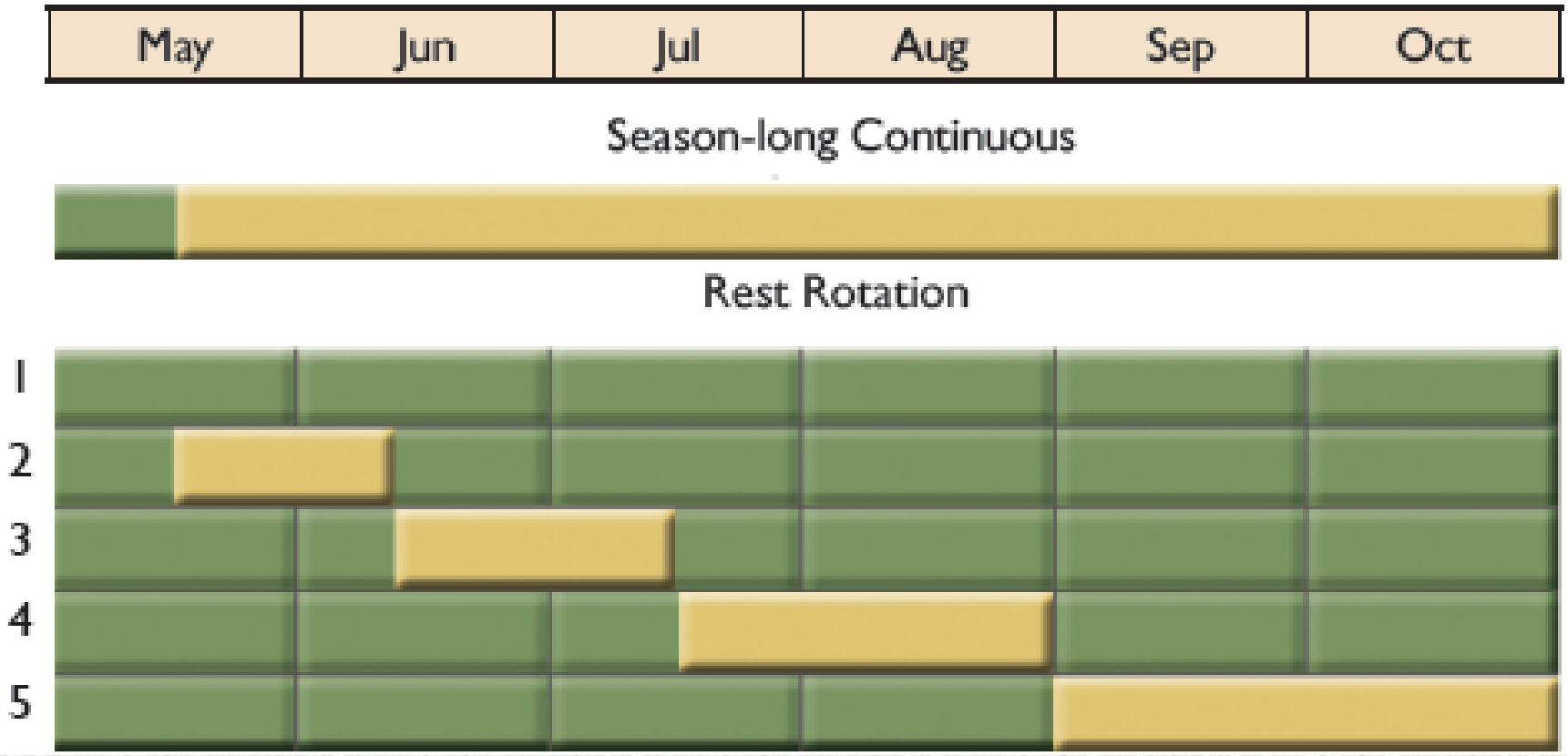

Nebraska
Lincoln
EXTENSION
EC158
Integrating Management Objectives and Grazing Strategies on Semi-arid Rangeland
Patrick E. Reece
former Extension Rangeland Ecologist
Jerry D. Volesky
Extension Range and Forage Specialist
Walter H. Schacht
Professor of Range Ecology
IANR

Page 14


May
Jun
Jul
Aug
Sep
Oct
Season-long Continuous
Rest Rotation
Deferred Rotation
Short Duration
Pasture Number
1
2
3
4
5
6
7
8
9
10
Rested
Grazed

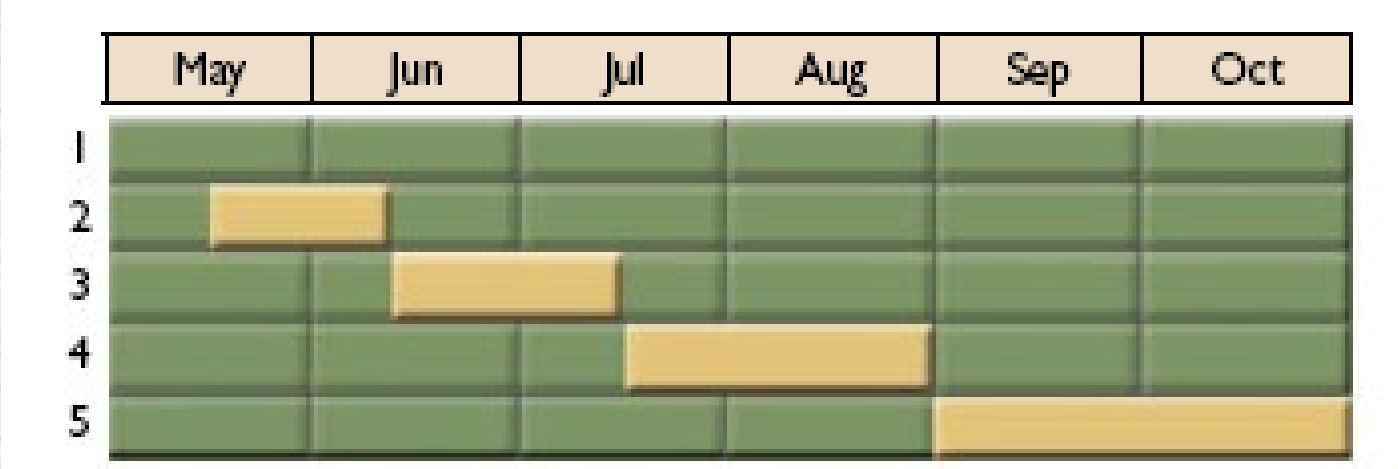
Season-long Continuous

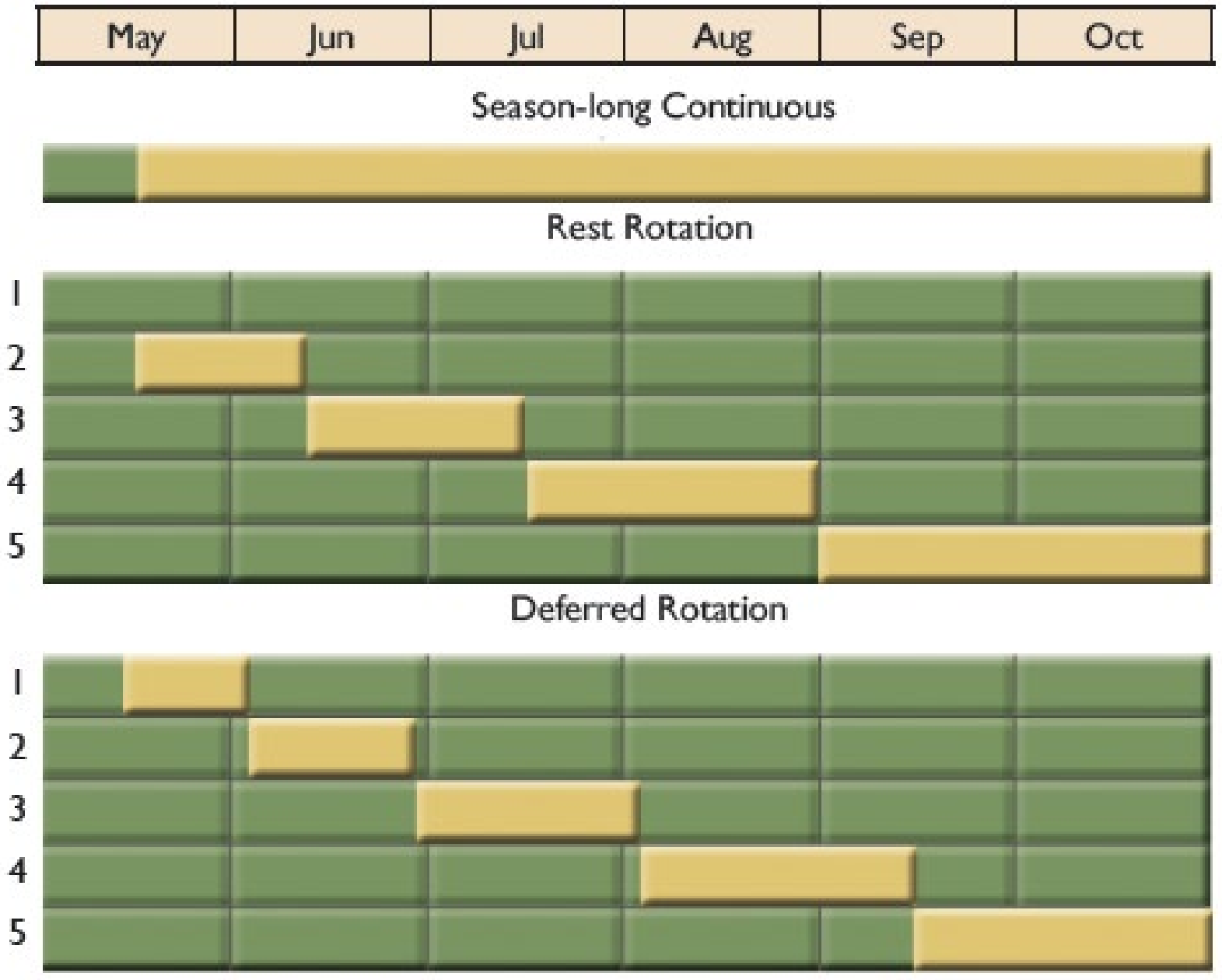
- Easiest to manage – only decide how many head for how long.
- May have less than desirable grazing distribution
- Risk of range damage in preferred areas.
- Cattle performance is very good with proper stocking rate.


May
Jun
Jul
Aug
Sep
Oct
Season-long Continuous
Rest Rotation
1
2
3
4
5

Rest Rotation

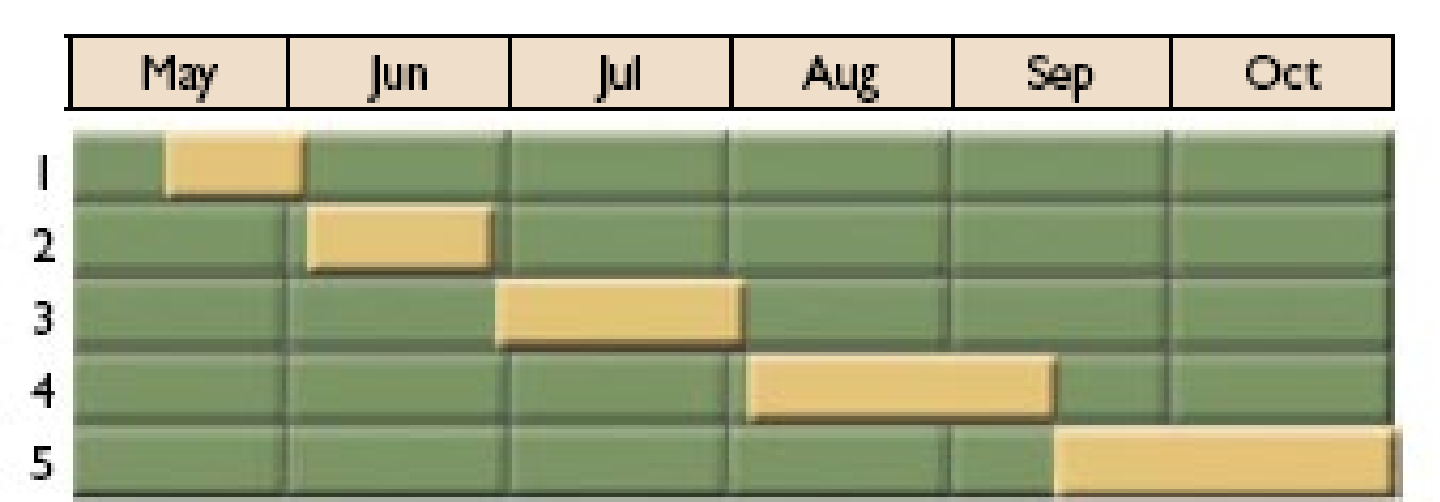
- One pasture rested 1 (or more) full year.
- Increase in vigor for rested pasture.
- Proportionally higher stocking rate on other pastures.
- Grazed pastures may have better grazing distribution.




May
Jun
Jul
Aug
Sep
Oct
Season-long Continuous
Rest Rotation
1
2
3
4
5
Deferred Rotation
1
2
3
4
5

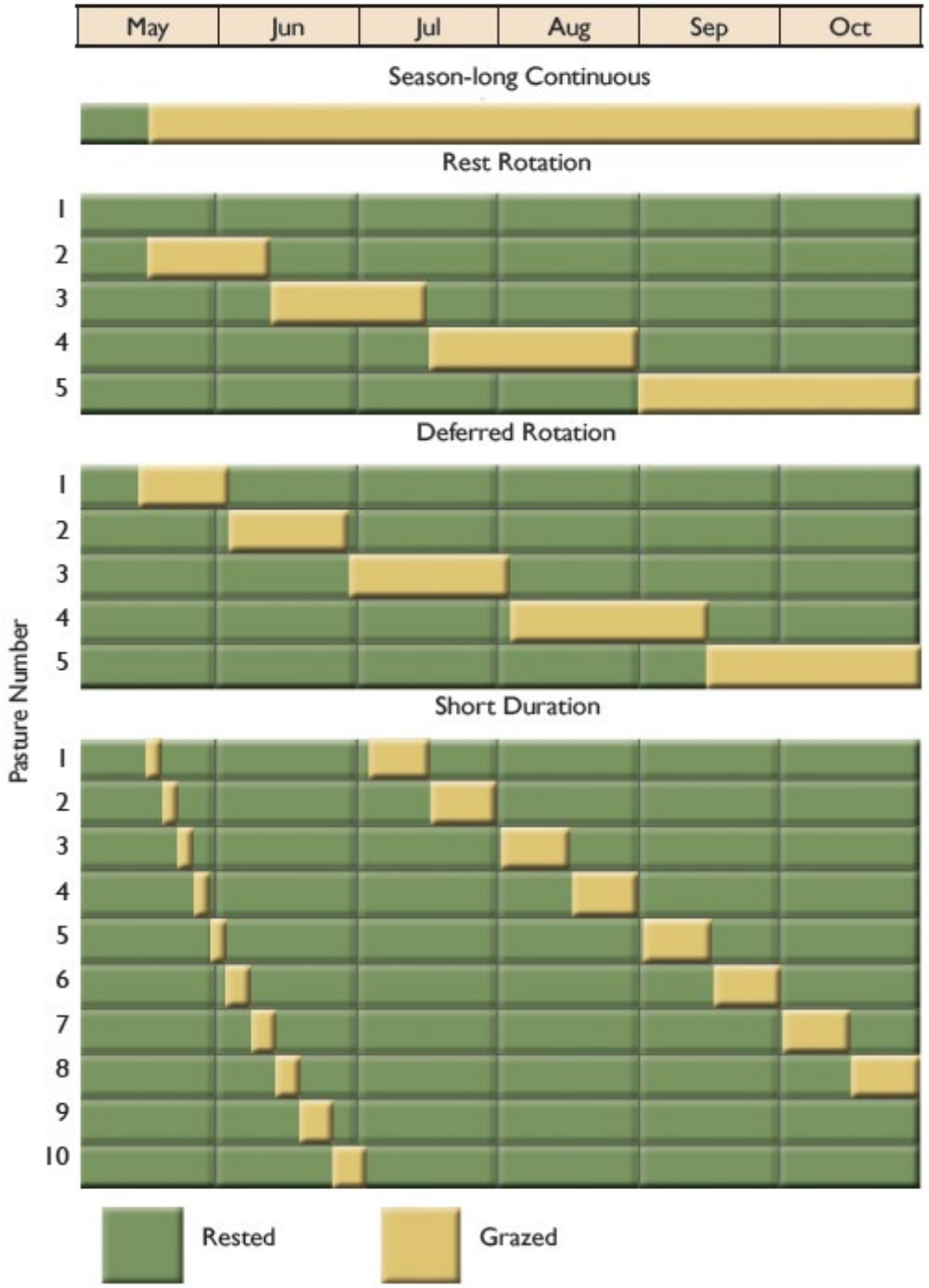
Deferred-Rotation

- Each pasture grazed 1 time per year.
- Increase in vigor for late-spring and early summer deferred pastures.
- Well suited for range grasses that benefit from seasonal rotation in grazing.
- Good grazing distribution.



Deferred rotation example schedule

* Each year, pastures move up 1 step from the time period they were grazed the previous year.	Year				
	2018	2019	2020	2021	2022
May 15 – Jun 5	Past. 1	Past. 2	Past. 3	Past. 4	Past. 5
Jun 5 – Jul 5	Past. 2	Past. 3	Past. 4	Past. 5	Past. 1
Jul 5 – Aug 10	Past. 3	Past. 4	Past. 5	Past. 1	Past. 2
Aug 10 – Sep 18	Past. 4	Past. 5	Past. 1	Past. 2	Past. 3
Sep 18 – Nov 1	Past. 5	Past. 1	Past. 2	Past. 3	Past. 4


May
Jun
Jul
Aug
Sep
Oct
Season-long Continuous
Rest Rotation
1
2
3
4
5
Deferred Rotation
1
2
3
4
5
Pasture Number
Short Duration
1
2
3
4
5
6
7
8
9
10
Rested
Grazed

Short Duration
(Intensively Managed)

- Each pasture grazed 1 or more times per year.
- Inputs for fence and water developments.
- Plans can include significant flexibility (use dates, stocking and grazing of specific pastures, etc.).
- Excellent grazing distribution.

Short Duration
(Intensively Managed)

- **Key Elements:**
  - **Number of grazing periods per year**
  - **Avoiding multiple grazing events (re-grazing) on an individual plant**
  - **Length of grazing periods**
  - **Length of recovery period**

Short Duration
(Intensively Managed)

- **Short-duration grazing: most often planned to have 2 or more grazing periods per year.**

- **Some intensively managed systems have pastures grazed only once per year.**

Key Principle

Grazing Rotations (cycles)

- **On arid and semi-arid grasslands:**
  - **There is NO advantage to more than 1 grazing period during the primary growing season – (but, may include early spring 'flash' graze and / or a dormant season grazing period)**

Key Principle

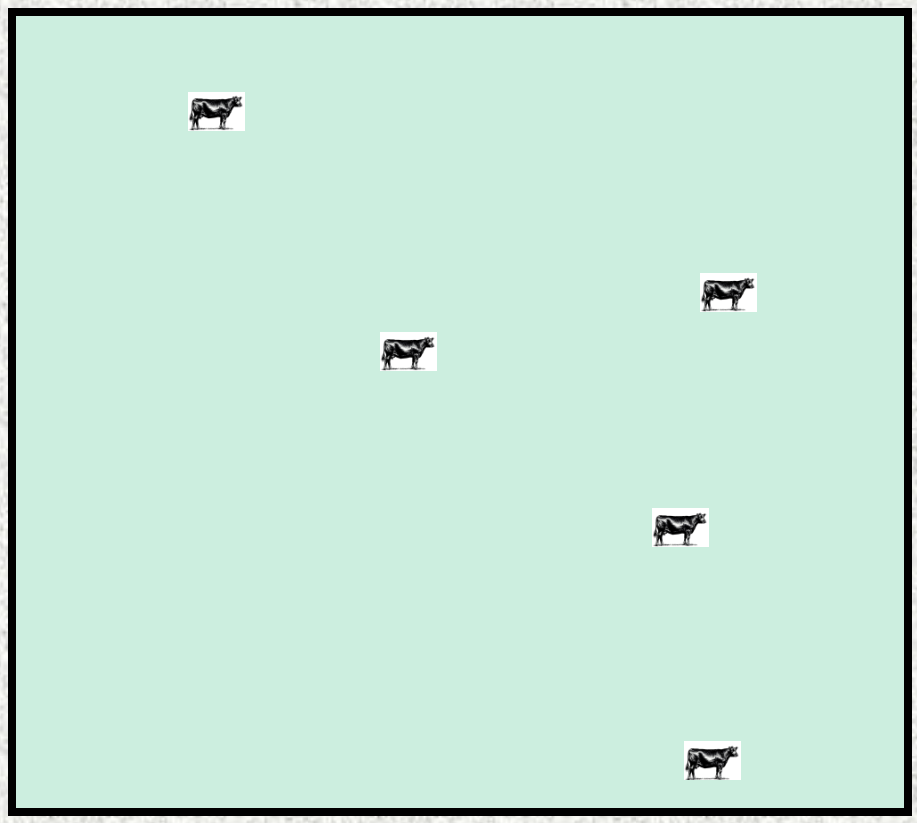
Grazing Rotations (cycles)

- **On irrigated, subirrigated, or high rainfall grasslands:**
  - **Two or more grazing periods can be effectively used to capitalize on regrowth potential of the forage.**

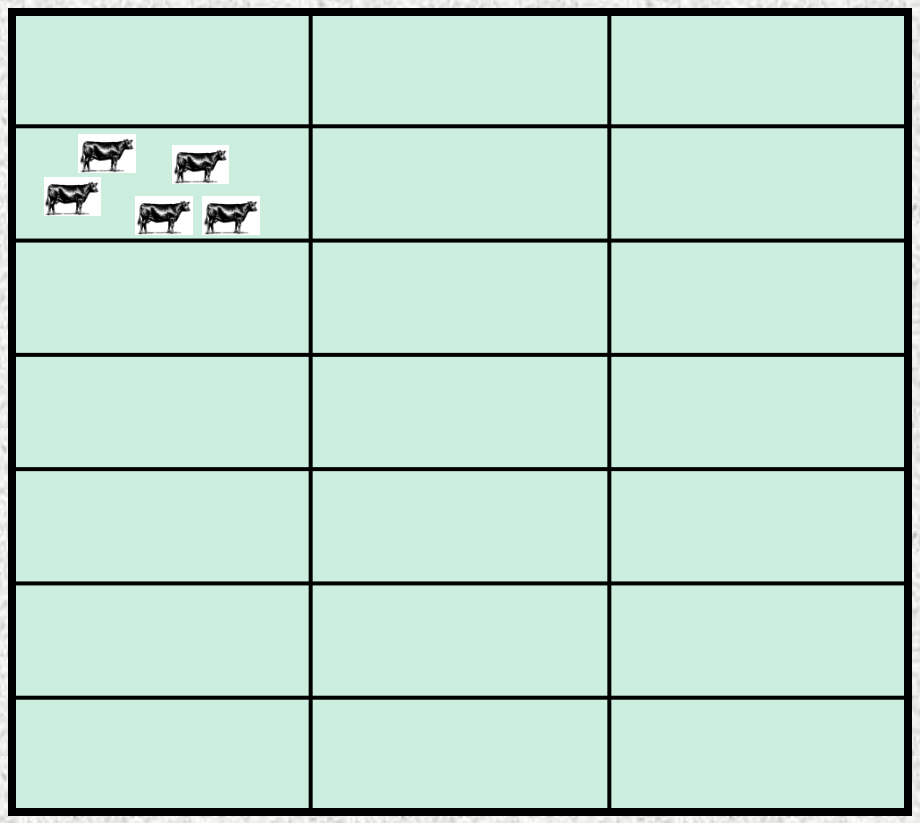
Low Stocking Density

High Stocking Density
(Mob grazing)

Low Stocking Density



High Stocking Density



<u>Stocking density</u>: head/acre (or lb beef/acre) at any point in time
<u>Stocking rate</u>: head/acre over a given *period of time* (time factor)

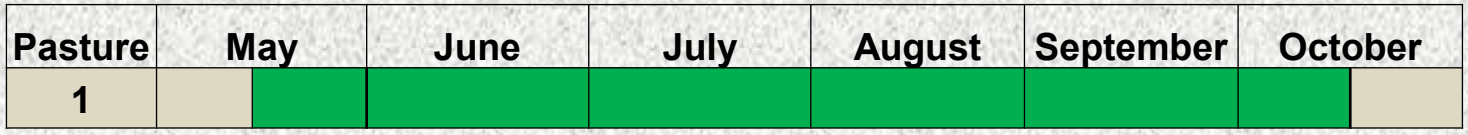
*** 5 head for 21 days for both pastures (entire unit) = same stocking rate**

Upland Range Grazing Period Length

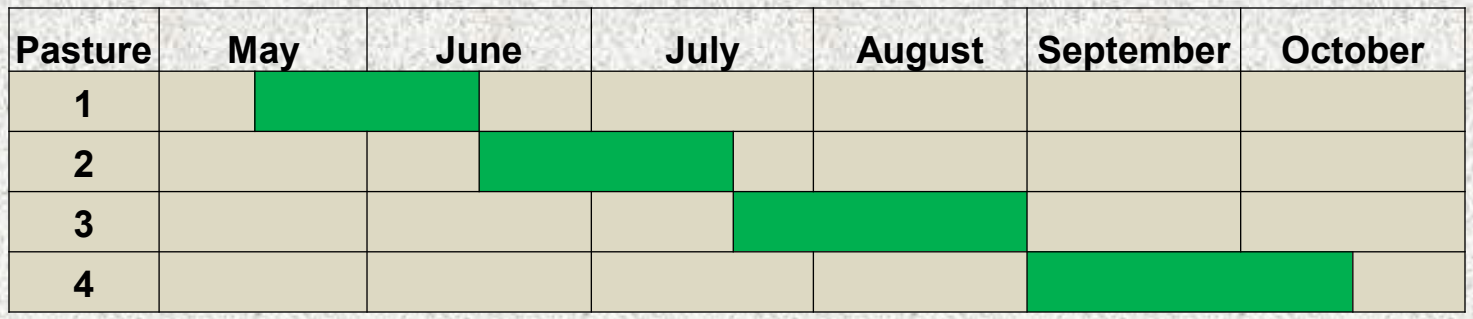
Grazing period length	Grazing system treatments	Stocking rate (AUM/acre)	Stocking density (AU/acre)
150	Continuous grazing –moderate	0.75	0.15
150	Continuous grazing –heavy	1.13	0.23
37	4-pasture DR – moderate	0.75	0.60
37	4-pasture DR – heavy	1.13	0.90
3	50-pasture rotation – moderate	0.75	7.50
3	50-pasture rotation – heavy	1.13	11.25
- -	Control (non-grazed)	- -	- -

DR = deferred-rotation
Heavy stocking rate is 1.5X moderate stocking rate

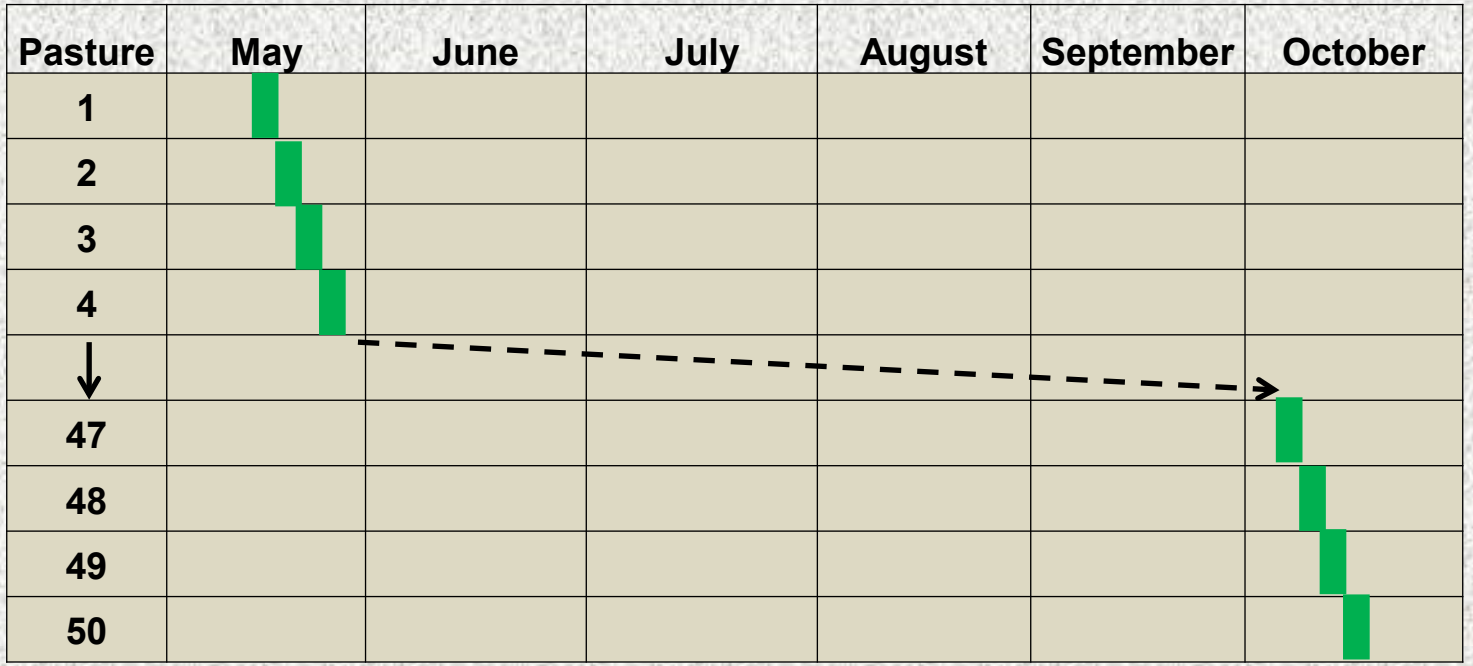
Continuous (150 days)



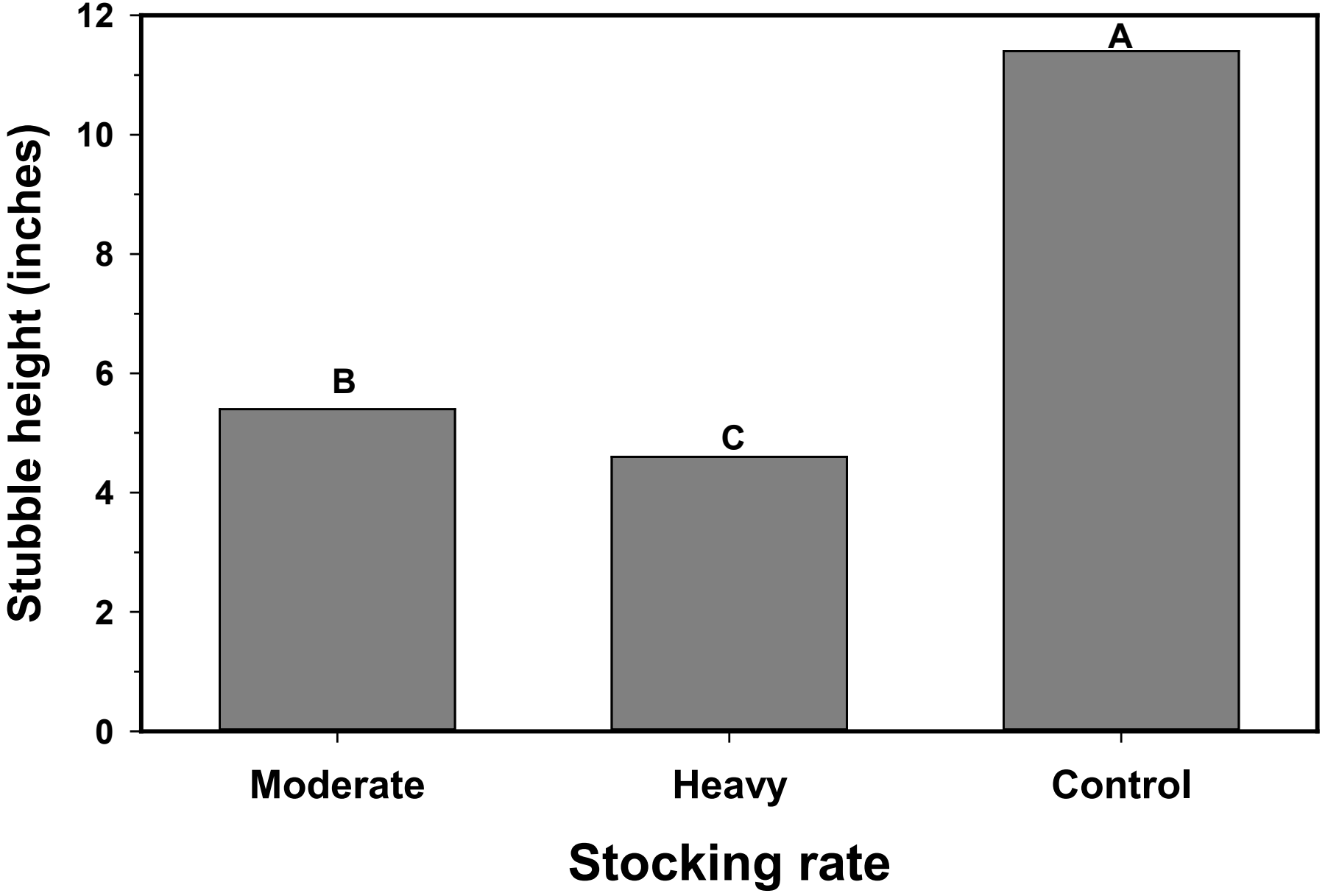
4-pasture deferred rotation (37 days)

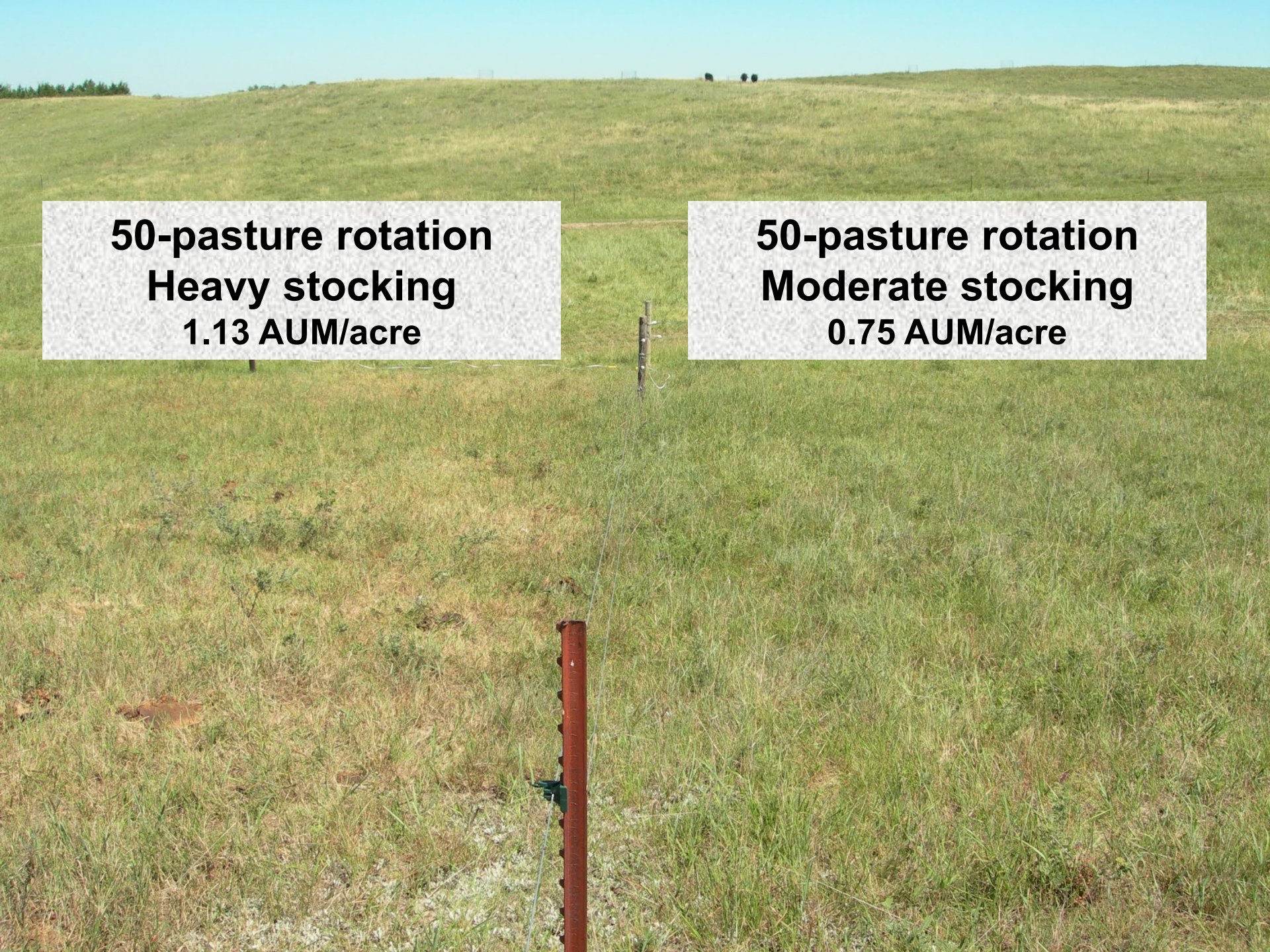


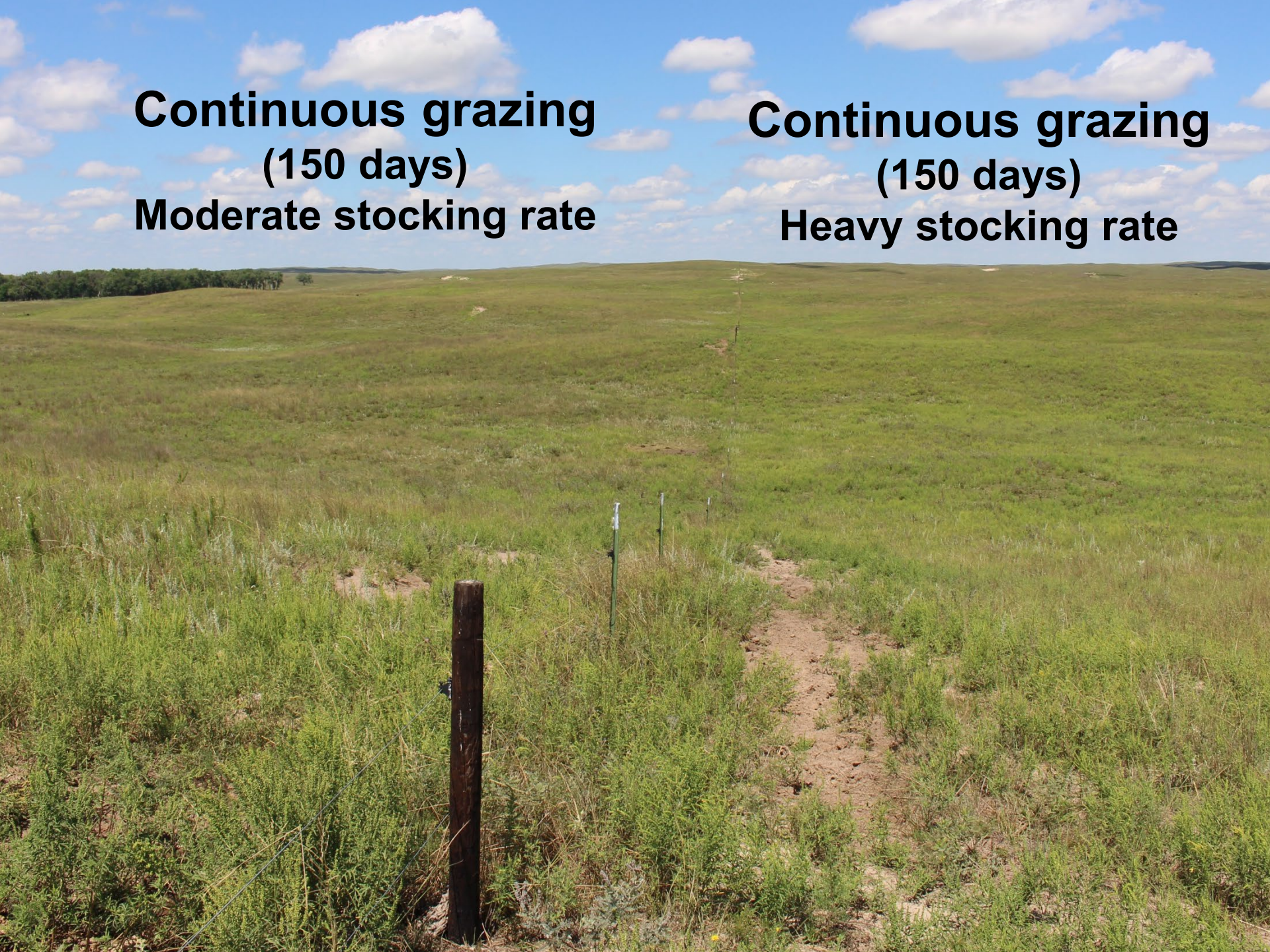
50-pasture rotation (3 days)



Average end of grazing period residual stubble height by stocking rate, 2010 - 2017.

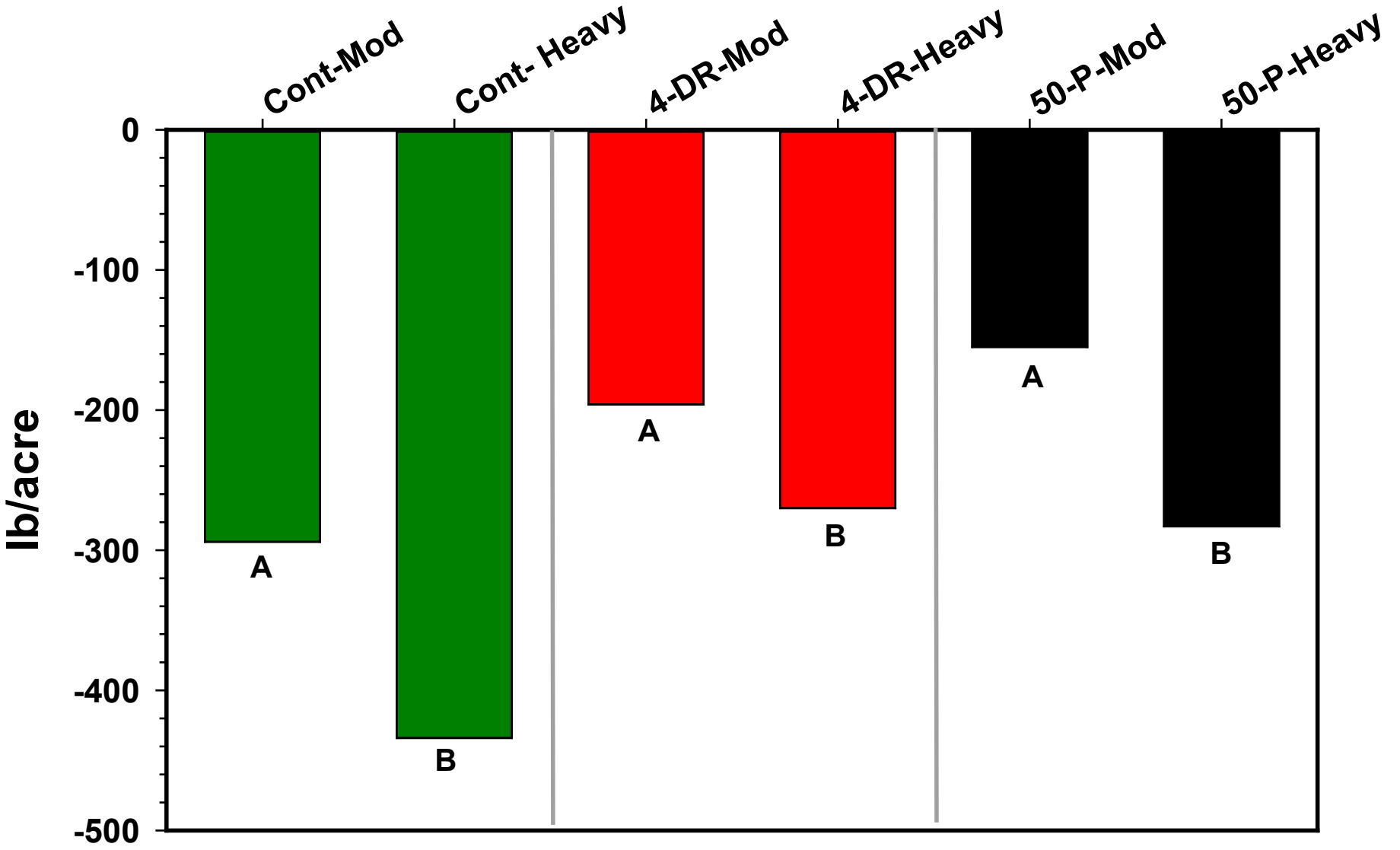



50-pasture rotation
Heavy stocking
1.13 AUM/acre
50-pasture rotation
Moderate stocking
0.75 AUM/acre


Continuous grazing
(150 days)
Moderate stocking rate
Continuous grazing
(150 days)
Heavy stocking rate

Continuous grazing: interdunal site

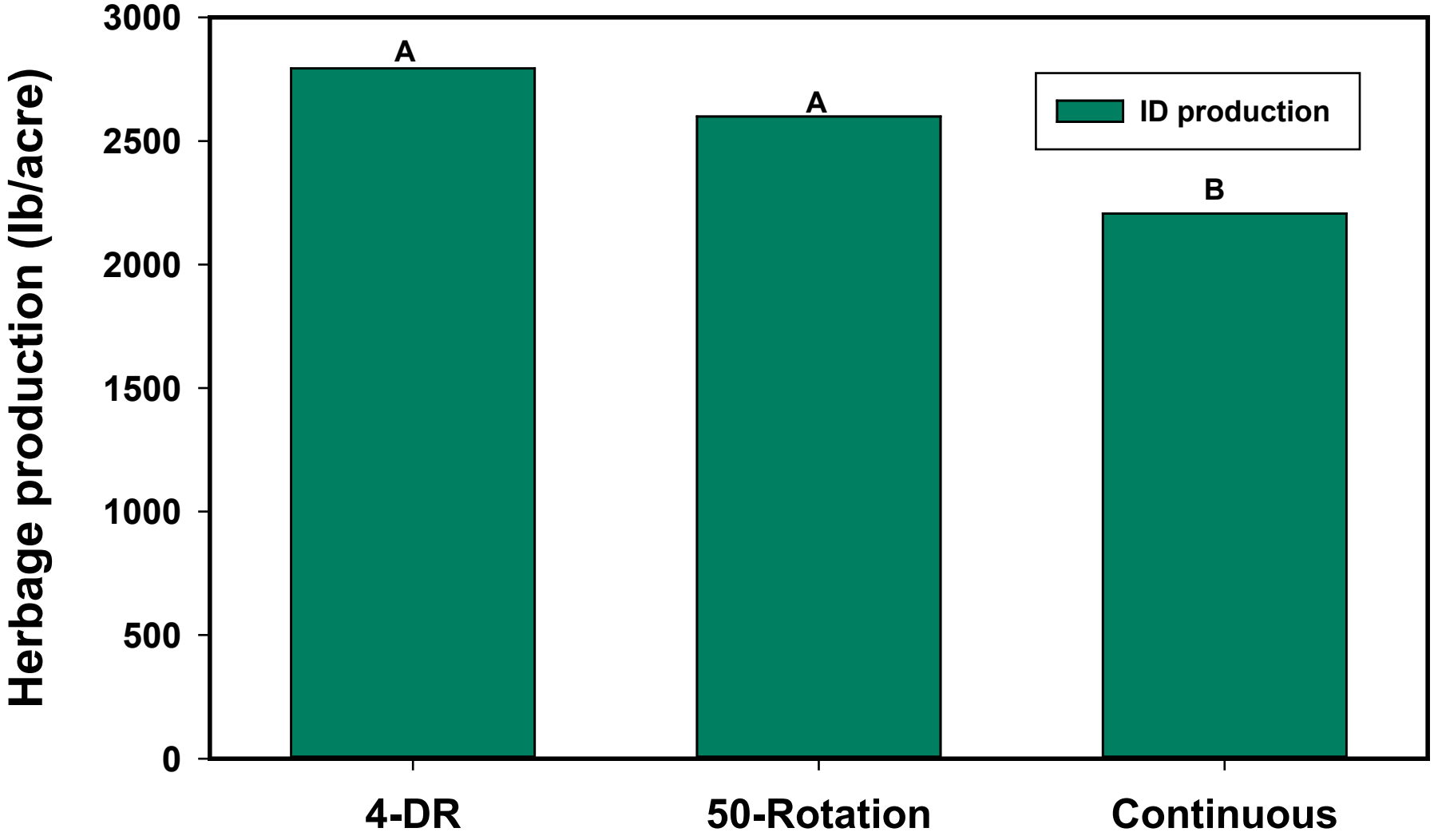
Continuous grazing: interdunal site



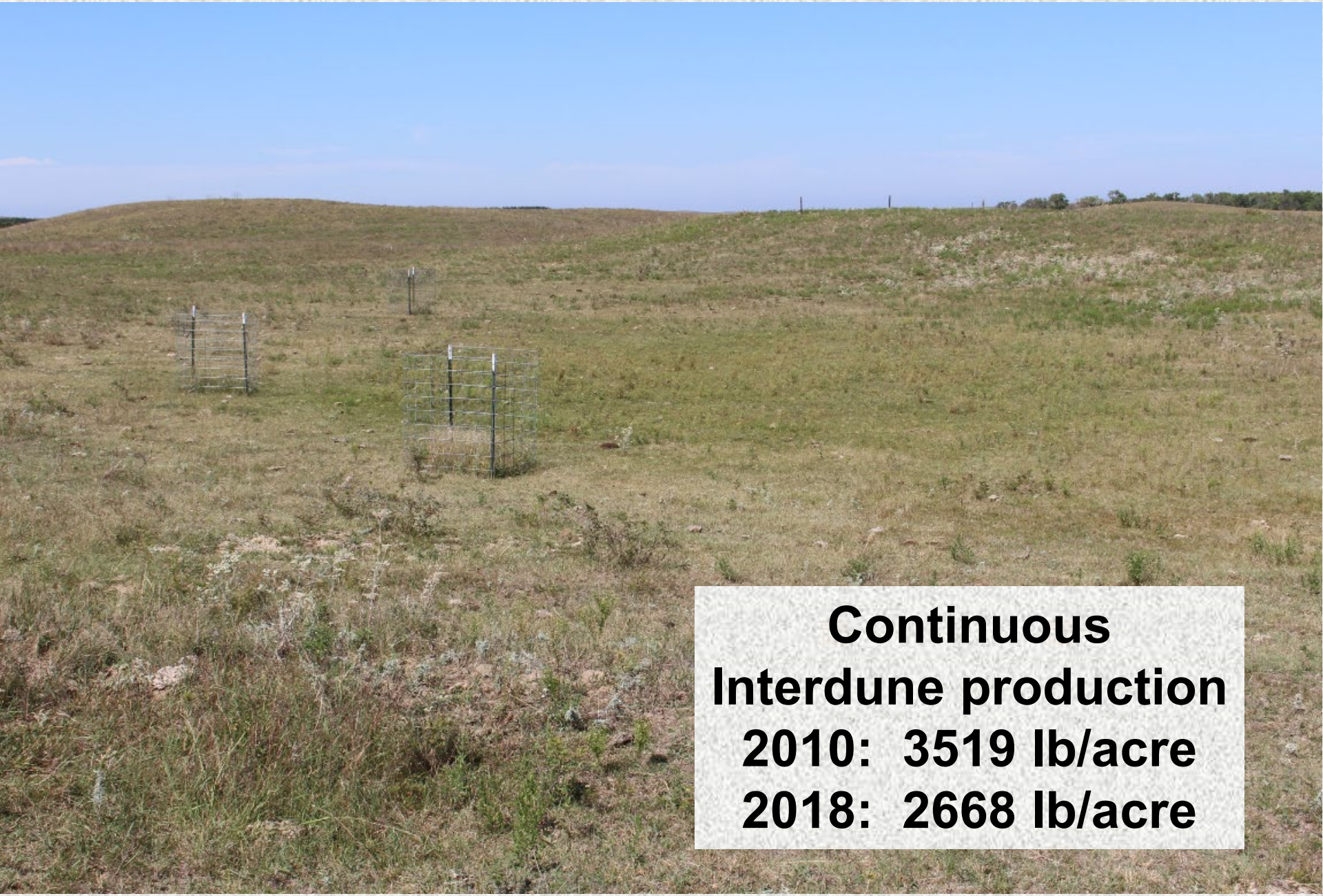
Difference in herbage production between 2010 and 2018.

[AB] **Within grazing system, production difference between 2010 and 2018 with unlike letters differ (P<0.05).**

Herbage production of inter-dune (ID) sites across years and stocking rates.



[AB] Grazing treatment production with unlike letters significantly differs (P<0.05).


Continuous
Interdune production
2010: 3519 lb/acre
2018: 2668 lb/acre

Conclusions:

- Higher stocking rates resulted in shorter end of grazing period residual stubble heights.
- 3-day grazing periods (50-P-R) resulted in similar stubble height across topographical positions
- 150-day grazing periods (Cont) resulted in greatest variability of stubble height and shorter stubble height in interdunes.

Conclusions:

- Spring/early-summer precipitation appears to be the greatest driver of annual production.
- Compared to baseline production (2010), higher stocking rates resulted in a greater reduction of production compared lower stocking rates.
- However - - negative impacts of higher stocking rates were much less than expected.
- Interdune sites in the continuous treatment had the greatest reduction in production compared to 3-day (50-P-R) and 37-day (4-DR) treatments.

Intensively Managed

Mob-Grazing, Ultra-High Stock Density
Length of grazing period ➔ Very Short!

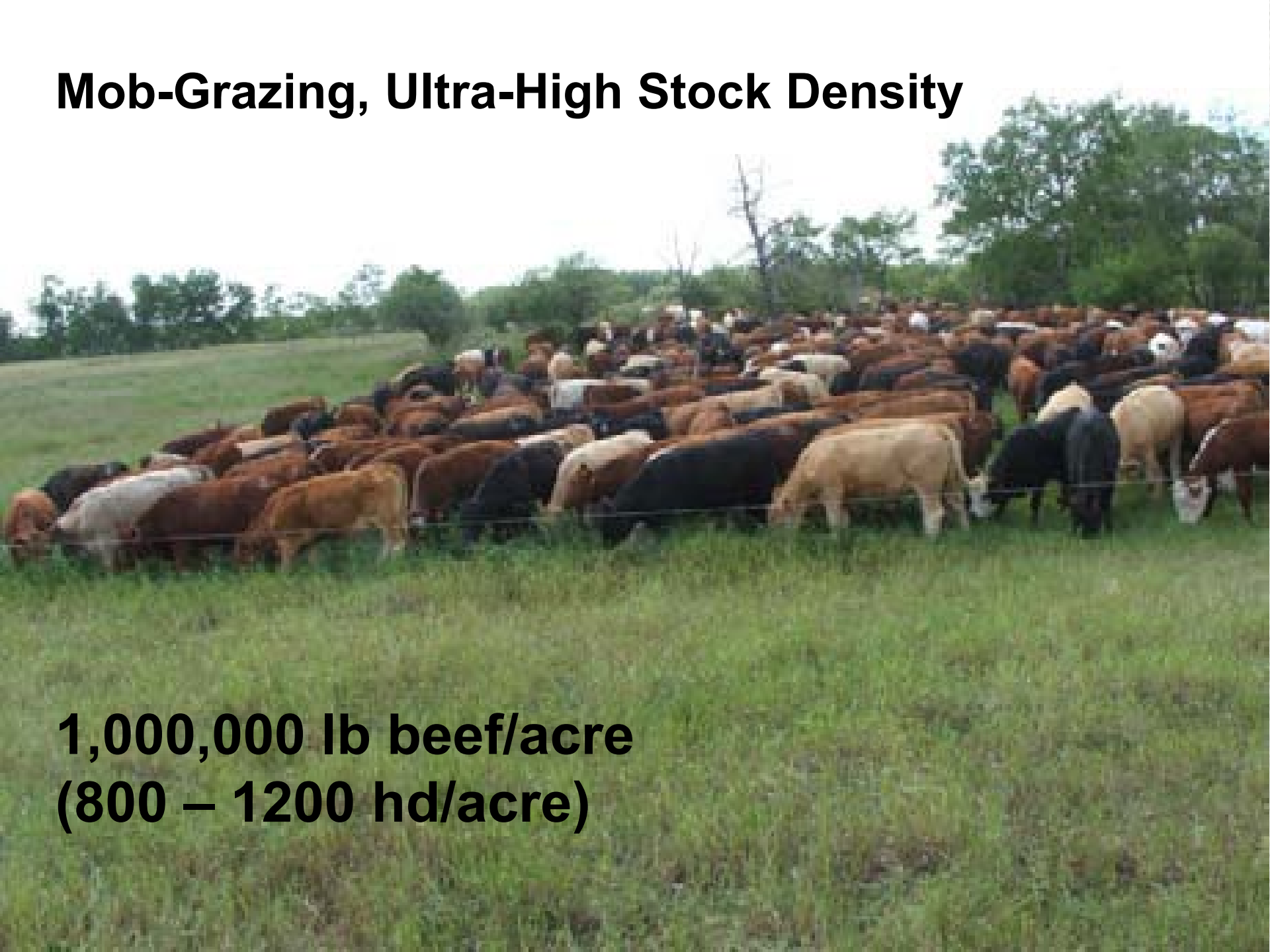
<u>Stocking Density</u>:
40,000 lb beef/acre (400 AU/acre) (30 – 60 hd/acre)

to

1,000,000 lb beef/acre (1000 AU/acre) (800 to 1200 hd/acre)

Mob-Grazing, Ultra-High Stock Density
(200,000 lb beef/acre, 200 – 300 hd/acre)

Mob-Grazing, Ultra-High Stock Density



1,000,000 lb beef/acre
(800 – 1200 hd/acre)

Ultrahigh Stocking Density Grazing (Mob)

Building soils

- Increased organic matter
- Increased fertility

Uniform fecal and urine deposition

Increased pasture productivity

Increased species diversity

Increased harvest efficiency

Increased animal production per acre

Meadow Grazing Systems Study

Treatments	Stocking rate (AUM/acre)	Stocking density (lb/acre)	Grazing days/ season
Mob grazing (120 paddocks)	3.0	200,000	0.5
4-pasture rotation (1X–over in 60 d) (4-PR-1)	3.0	6,400	15
4-pasture rotation (2X-over in 80 d) (4-PR-2)	3.0	4,800	20
Continuous	3.0	1,500	60
Control (non-grazed)	- -	- -	- -
Haying	- -	- -	- -

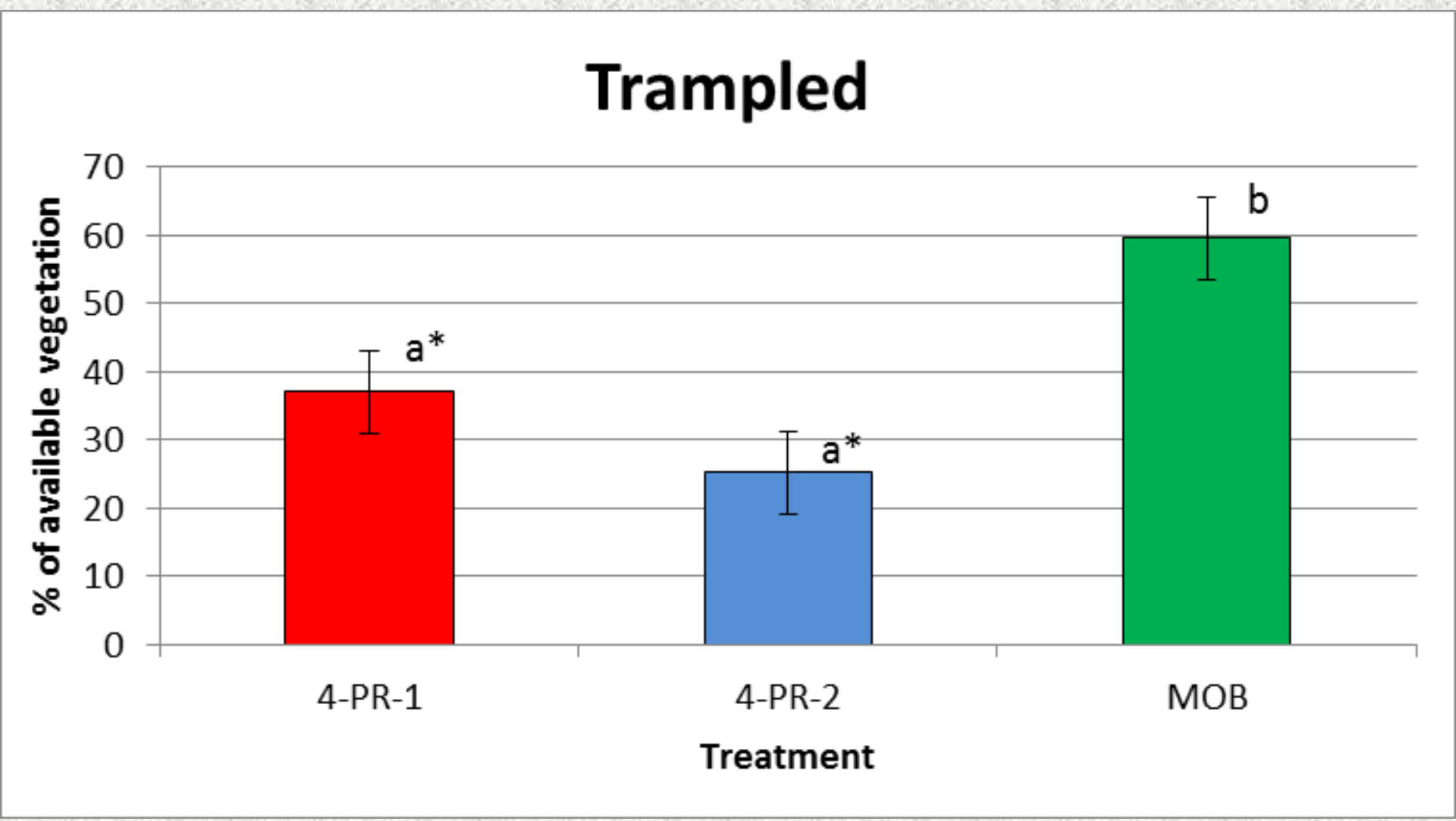
*Grazing period: ~ May 22 – Aug. 10 for 4-PR-2 and Jun 10 to Aug. 10 for other grazed treatments.

Mob grazing

- 36 head
- Pasture area: 17 acres
- 120 rectangular paddocks, 0.14 acres
- Moved 2 times/day
- Target of 60% trampling

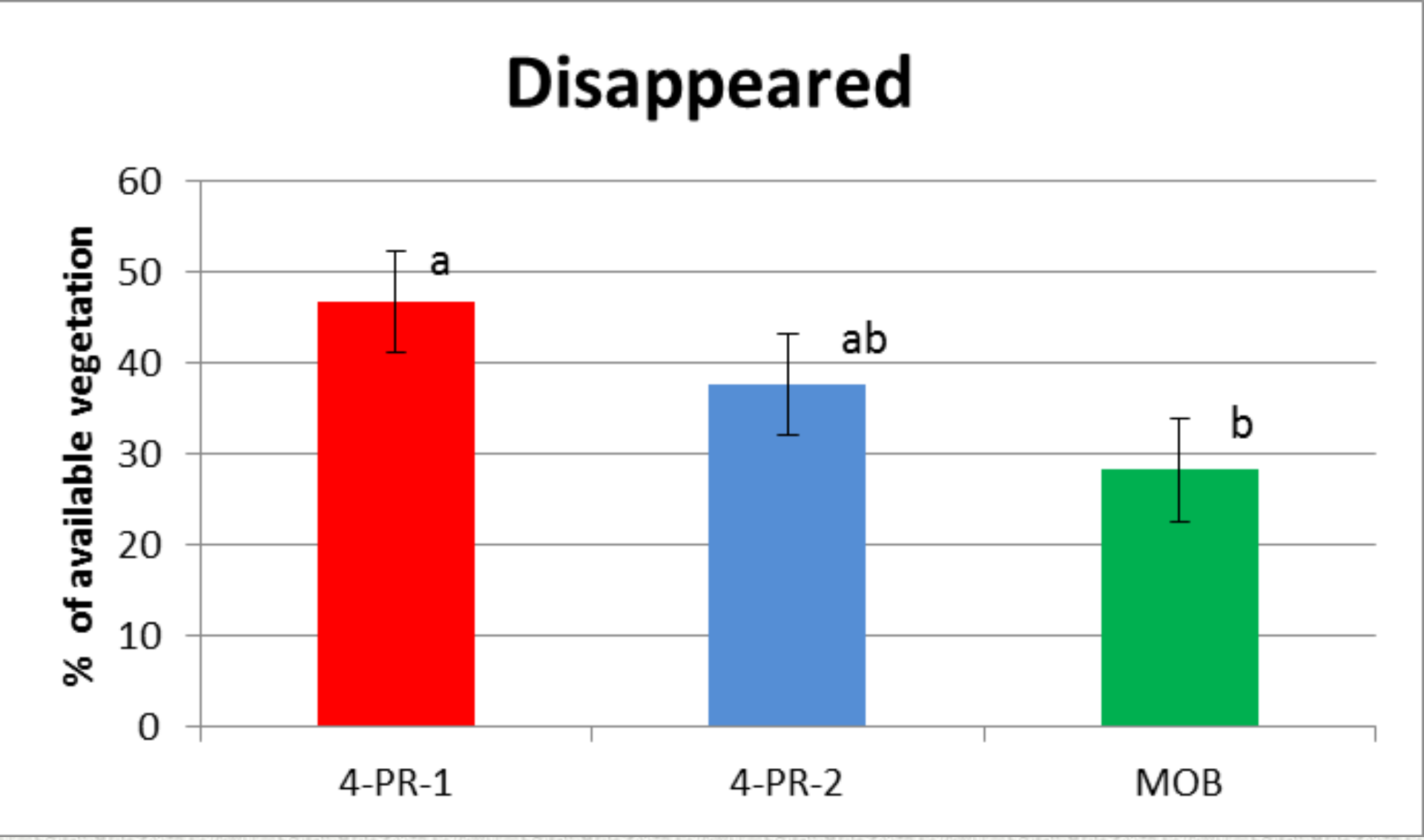
Objectives

- Forage utilization
- Harvest efficiency
- Herbage production
- Species composition
- Animal performance
- Animal activity
- Soil microbial biomass
- Soil carbon & nutrient status
- Litter decomposition
- Root growth



Percent trampled vegetation in 4-PR-1, 4-PR-2, and mob grazed pasture during 2010, 2011, and 2013. [ab] Treatments with like lowercase letters do not differ (P > 0.05).

Mob grazing occurred 1 week prior to photo



Vegetation disappearance (harvest efficiency / consumed) in 4-PR-1, 4-PR-2, and mob grazed pasture during 2010, 2011, and 2013.

[ab] Treatments with like lowercase letters do not differ (P > 0.05).

Animal Performance at BBR

In all years (2011-2017), average daily gain (ADG; lbs/head/day) for steers in the 4PR2 treatment was greater than that for steers in the 4PR1 and mob treatments (p= 0.0018).

Daily gain of steers in 4PR1 was greater than mob in all years except in 2013 and 2017, when there were no differences.

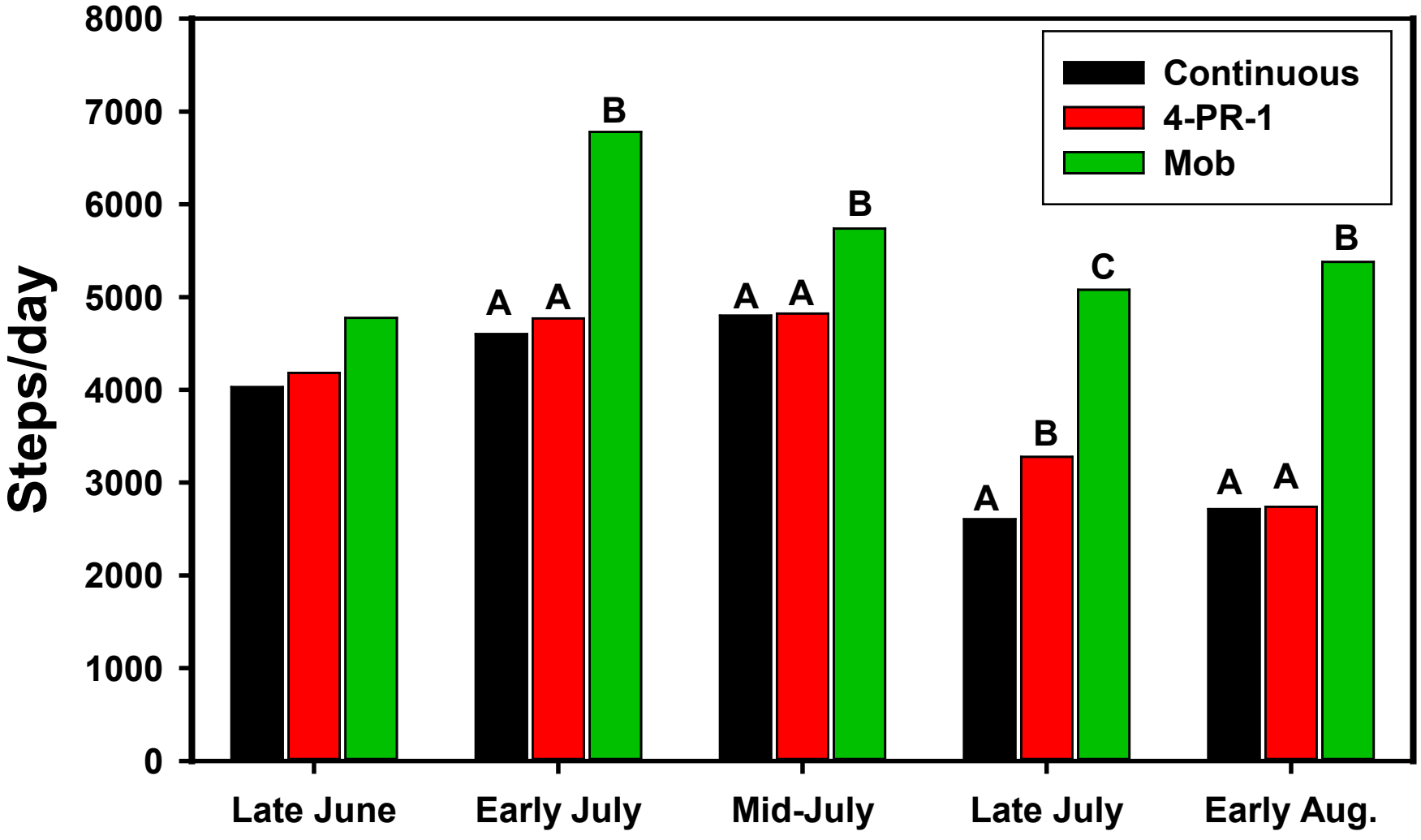
Average Daily Gain of Yearling Steers in 3 grazing treatments

	Year						
Treatment	2011	2012	2013	2014	2015	2016	2017
4PR1	0.70 Ba	0.70 Ba	0.68 Ba	1.23 Bb	0.18 Bc	0.57 Ba	0.29 Bc
4PR2	2.00 Aa	1.14 Ac	1.45 Ab	1.54 Ab	1.28 Ac	1.39 Abc	1.10 Ac
Mob	0.29 Cc	0.42 Cb	0.55 Bbc	0.95 Ca	-0.29 Cd	0.22 Cc	0.15 Bcd

[1] Different uppercase letter within columns differ (P < 0.10).
[2] Different lowercase letters within rows differ (P < 0.10).

Animal Activity
(2013)

Steer steps taken per day during late June through early August periods, 2013



[AB] Within time period, bars with like letters do not differ ($p > 0.05$)

Animal Activity

Soil Organic Matter at BBR

Overall soil properties did not differ among treatments and did not change over the 8 years of the study.

Carbon - Soil organic matter did not differ over the 8 years of the study.

Year	Depth (inches)	Mean SOM (%)	SE +/-
2010	0-4	2.6	0.83
	4-8	0.7	0.15
2018	0-4	2.8	0.36
	4-8	0.6	0.16

Soils

- **After 8 years (2017), no difference between treatments in Organic Matter, Carbon, Nitrogen, Phosphorus, or other soil components.**

Conclusions / Summary

- All grazed treatments had similar effects on botanical composition and aboveground plant production.
- Expect lower daily gains with mob grazing and single occupation 4-pasture rotation (4-PR-1) compared to other treatments.
- Even with high trampling levels (about 60%), there was no soil response.
- Minimizing trampling so that grazing efficiency (intake/consumption) is high appears to be the best strategy when mob grazing.

Questions