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We promote the advancement of land stewardship through ranching, science, and education.

Searching for an Optimal Grazing Strategy
Phase I Outcomes from the Coloraditas Grazing Research and Demonstration Area

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INTRODUCTION

Grazing management is a primary way whereby ranch management impacts rangeland resources, wildlife habitat, and the long-term sustainability of livestock and wildlife enterprises. Stocking rate is a high-level driver of landscape use and defines livestock forage demand. The timing and localized intensity of livestock grazing are also influenced by choice of grazing method, which may change the impact on wildlife habitats, while creating temporary areas with no cattle presence as a haven for other species. Managers often seek an 'optimal' grazing strategy (a combination of stocking rate and grazing method) that allows for sustained livestock production while maintaining or improving conditions beneficial for wildlife populations. Establishment of optimal grazing strategies in extensive environments is a significant challenge.

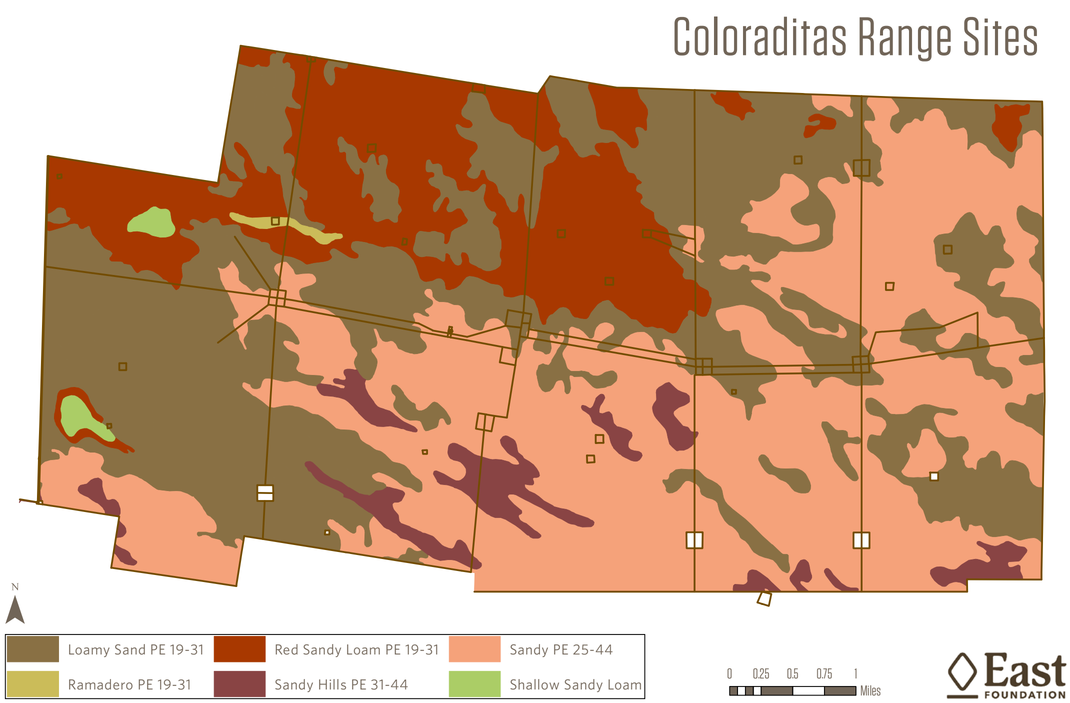

Figure 1. The Coloraditas Grazing Research and Demonstration Area encompasses 18,538 acres. A total of six ecological sites occur of which four occupy about 96% of the total area.

BACKGROUND

East Foundation established the 18,538-acre Coloraditas Grazing Research and Demonstration Area (CGRDA or 'Coloraditas') on the northern portion of the San Antonio Viejo Ranch as a living laboratory for ongoing, long-term studies of the interactions of livestock grazing management and wildlife populations on South Texas ranches. The area is subdivided into 10 pastures, and 96% of the unit is comprised of four major ecological sites (Figure 1). Wildlife populations are diverse, with species and abundance similar to the surrounding area.

CONCEPTS

Development of a grazing strategy is contingent on the goals of management. Our objective is to devise grazing strategies that allow for sustained, economically viable livestock production while maintaining or improving rangeland productivity and supporting diverse wildlife populations. These objectives are not exclusive; managing for good long-term range condition should benefit wildlife and livestock.

CLASSICAL METHODS OF ESTABLISHING STOCKING RATES ARE BASED ON EXPECTED ANNUAL FORAGE GROWTH, AND THE AMOUNT OF THAT FORAGE THAT CAN BE CONSUMED BY LIVESTOCK (CARRYING CAPACITY).

Leaving residual forage is important for soil protection and plant health; a target of 50% of annual growth is the most common recommendation. It is also generally assumed that of the forage that disappears, only half is consumed by livestock. Therefore, the 'take half, leave half' approach to setting stocking rates aims to set livestock grazing demand at 25% of annual forage growth, this is also described as 25% harvest efficiency by livestock.

The challenge with this approach to setting stocking rate is reliance on forage growth data that are difficult to acquire and highly variable across a ranch and across years. If the grazing strategy is based on long term averages, then for any given year the ranch may be overstocked (forage growth was below average) or understocked (forage growth exceeded expectation). If excess growth accumulates, to be consumed when new growth is below expectation, then a fixed stocking rate at the long term mean of forage production is a viable strategy. If there are some 'storage losses', then a downward adjustment in stocking rate might be necessary to offset these losses. This is thought to be a 'conservative' stocking strategy, in which carryover accumulation, discounted for losses, is enough to offset low production years and allow grazing to continue without rangeland degradation from overgrazing.

Establishing healthy stocking rates allows us to do what's right for the land and the life that depends on it.

RESEARCH OUTCOMES

The Phase I study at the CGRDA used two stocking rates based on average growth expectation (35 acres per animal unit or ac/AU) or a more conservative stocking

Table 1					
Item[a]	35 ac		50 ac		
	Continuous	*Rotational*	*Continuous*	*Rotational*	*SE*
October to June Growth, lbs/ac	1023	737	779	775	379
June to October Growth, lbs/ac[b]	-374	-178	-203	-329	325
October – Standing Forage, lbs/ac[c]	499	852	697	805	145

Table 1. Forage growth and residual standing forage from pastures stocked at 35 or 50 acres per animal unit using continuous or deferred rotation grazing methods on the Coloraditas Grazing Research and Demonstration Area, San Antonio Viejo Ranch. Measures are averages over the duration of the study.

[a] There were no effects of stocking rate, grazing method, or their interaction ($P > 0.09$).

[b] Measures of June – October growth were not different from zero ($P > 0.2$).

[c] Tendency for grazing method effect ($P = 0.09$).

rate to allow more forage carryover as a buffer against future risk (50 ac/AU). Each stocking rate was used in conjunction with a continuous grazing method (cattle stayed in the same pasture yearlong) or a one-herd, three-pasture deferred rotation method where cattle were moved among pastures, so that at any given time two pastures were deferred from grazing and one was grazed.

Some details of precipitation and forage dynamics from this study have been reported here. Tables 1 and 2 summarize forage and livestock measurements averaged across the years of this trial for each stocking rate and grazing method.

Forage growth was measured by placing cages at multiple locations in each pasture to allow growth to be evaluated without disappearance from cattle grazing. The outcomes suggest that the stocking rates selected were (on average) appropriate to their objectives. The 35 ac/AU stocking rate was slightly higher than that suggested by forage growth (October-June), but within the range of measurement error. The lighter stocking rate was slightly below the capacity suggested by the average observed forage growth.

Pounds weaned per acre were increased at the more aggressive stocking rate, but all other measures were similar when averaged across years. There was a tendency for overall forage standing crop to be greater in the rotationally grazed pastures, because of the periodic deferral of grazing in two of the three pastures at each stocking rate. However, these averages for forage and cattle production measures hide the reality of large year-to-year changes.

AS A RESULT OF DROUGHT, THERE WAS ZERO EFFECTIVE FORAGE GROWTH DURING THE SECOND HALF OF 2017 AND THE FIRST HALF OF 2018 (TABLE 3); FORAGE STANDING CROP DECLINED TO A LEVEL THAT WAS UNSUSTAINABLE FOR LIVESTOCK PRODUCTION.

Cow body condition scores and calf growth rates declined as forage reserves were depleted, and cattle were removed from the system mid-2018.

Table 2					
Item[a]	35 ac		50 ac		
	Continuous	*Rotational*	*Continuous*	*Rotational*	*SE*
Wean weight, lbs	507	458	498	501	51.4
Calf daily gain, lbs/day	1.88	1.60	1.79	1.76	0.12
Pounds weaned per acre[b]	11.49	9.66	7.56	7.87	1.40
Pounds weaned per cow	419	361	394	418	60.3
Cow condition[c] at branding	4.90	4.94	5.02	5.00	0.37
Cow condition at weaning	5.00	4.98	5.00	5.03	0.33
Pregnancy rate, %	75.2	72.8	69.3	84.9	8.5

Table 2. Cattle production metrics at one animal unit per 35 acres or per 50 acres stocking rates with continuous or deferred rotational grazing methods during Phase 1 of the Coloraditas Grazing Research and Demonstration project. Metrics represent average over the duration of the study.
[1] Body Condition Score, 1 to 9 scale where 1 is emaciated, 9 is obese.
[a] No stocking rate X grazing method interactions were observed (P > 0.24). No grazing method effects were observed (P > 0.54).
Unless otherwise noted, there were no differences due to stocking rate (P > 0.17).
[b] Difference due to stocking rate, P = 0.03.

Table 3									
Item[a,b]	2016		2017		2018		2019		
	35 ac	*50 ac*	*35 ac*	*50 ac*	*35 ac*	*50 ac*	*35 ac*	*50 ac*	*SE*
October to June Growth, lbs/ac	2202	2284	818	782	-175	-238	560	279	239
June to October Growth, lbs/ac	-1519	-1412	-154	-299	821	422	-174	174	209
October – Standing Forage, lbs/ac	812	911	446	474	927	737	659	926	185

Table 3. Measures of forage growth and residual standing forage from pastures stocked at 35 or 50 acres per animal unit during grazing (2016, 2017, through May of 2018) and following deferral (2019) on the Coloraditas Grazing Research and Demonstration Area, San Antonio Viejo Ranch.
[a] Year affected growth measures (P < 0.01) and October standing crop (P = 0.13).
[b] No differences among stocking rates (P > 0.53), and no year X stocking rate interactions (P > 0.45) observed.

It is important to note the large 'negative' forage growth from June to October 2016. These data were collected from exclosures; the disappearance was not from cattle grazing. This loss suggests that despite a large stockpile of forage that resulted from the prior year deferral of grazing, the residual amount was not carried forward efficiently and could not serve as a long-term buffer against future deficits in growth. This illustrates the reliance on production of current year's growth, and the relatively short-term capacity for forage stockpiling on these range sites.

WHEN THE TIMING AND AMOUNT OF PRECIPITATION WERE ADEQUATE, NEITHER STOCKING RATE WAS EXCESSIVE; WHEN IT BECAME DRY, NEITHER STOCKING RATE WAS LOW ENOUGH TO BE SUSTAINABLE, REGARDLESS OF GRAZING METHOD CHOSEN.

APPLICATION

When managers select a stocking rate, it implies a forecast of forage growth for that season or year. Because the 'average' is a measure of the 'expected value' of forage production, using this to establish stocking rates is reasonable. However, averages are comprised of a range of values, and the annual variability creates risk of system failure – no single year is necessarily 'average', particularly in South Texas which experiences frequent and reoccurring drought conditions.

SUGGESTED CITATION

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