Historic Trends in Livestock Stocking Rates and Precipitation on Santa Rita Experimental Range

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Introduction

To what extent have long-term changes in livestock stocking rates been driven by management decisions to achieve sustainability versus simple fluctuations in precipitation and the resulting forage production?

Methods

The relationship between trends in stocking rates and fluctuation in precipitation were compared to evaluate the relative influence of management decisions in contrast to fluctuations in precipitation.

- Choose five pastures along an elevation gradient.
- Summarized livestock stocking rates for the pastures as Animal Unit Years per hectare (AUY •ha $^{-1}$) from 1916 to 2004.
- Calculated the mean annual precipitation using the three nearest rain gauges. Linear regression was used to estimate values when data was missing.
- Missing values for stocking rate occur because the historic data has not yet been located.

Results and Discussion

Grazing

- Stocking rates have fewer AUY •ha^{-1} in the drier (lower elevation) pastures.
- Beginning in 1940, stocking rate decline 25 to 50%, with the least declines in the driest pasture (Pasture 5N).
- By 1972, seasonal and yearly rotation of stocking occurs in most (except Pasture 1).

Precipitation

- There was no distinct change in amount or inter-annual variability of precipitation associated with the decline in stocking that began in 1940.

The independence of stocking rate changes and precipitation patterns supports the idea that stocking rates have largely been driven by changes in management practices in order to achieve sustainable livestock use.

Specifically, standards for allowable use of yearly forage production were near 70% to the 1940s, and were reduced to 50 to 60% in the 1950-1960s, and further reduced to 40-50% in the 1970s (Ruyle 2003).

References

Ruyle George B. 2003. Rangeland Livestock Production: Developing the Concept of Sustainability on the Santa Rita Experimental Range. In, McClaran, M.P., Ffolliott, P.F., and Edminster, C.B. (tech. coords.). Santa Rita Experimental Range: 100 years (1903 to 2003) of accomplishments and contributions; conference proceedings; 2003 October 30-November 1; Tucson, AZ. Proceedings RMRS-P-30. USDA Forest Service, Rocky Mountain Research Station. Pages 34-47.

Acknowledgements

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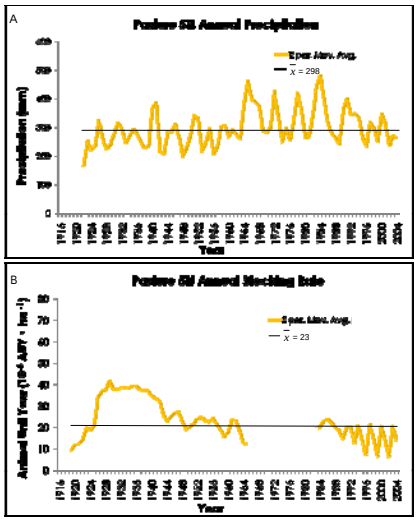
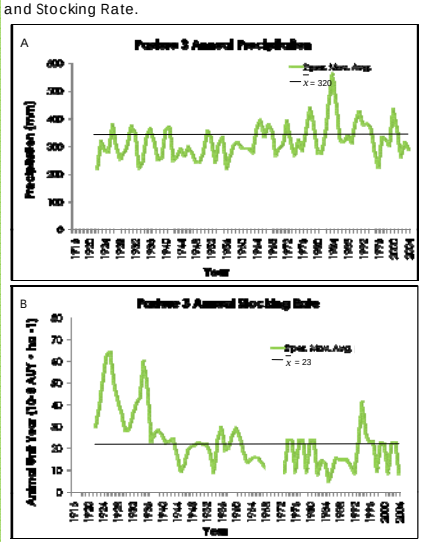
Special thanks to Mark Heitlinger who provided pictures and Mitch McClaran who worked late on his birthday because of this poster.

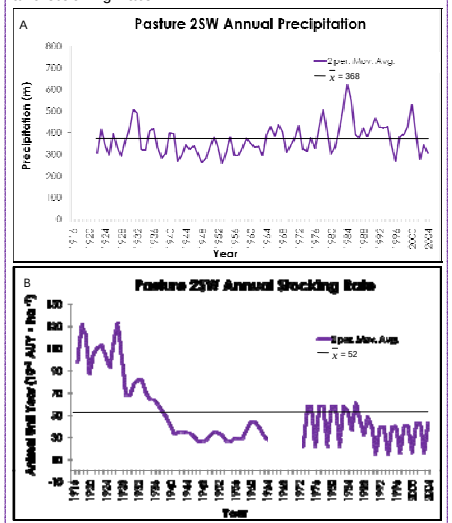
Figures 1A and 1B Pasture 5N Annual Precipitation and Stocking Rate.

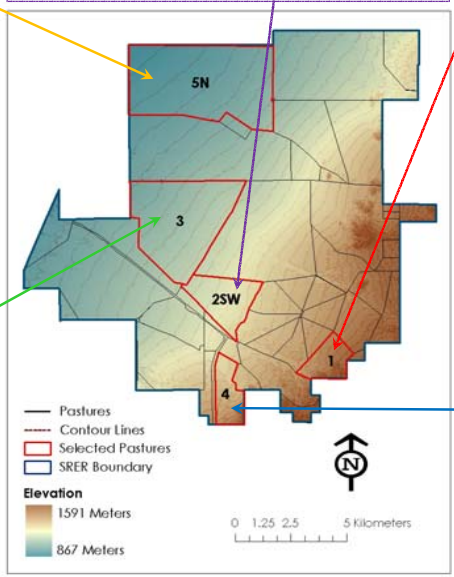


Figures 2A and 2B Pasture 3 Annual Precipitation and Stocking Rate.

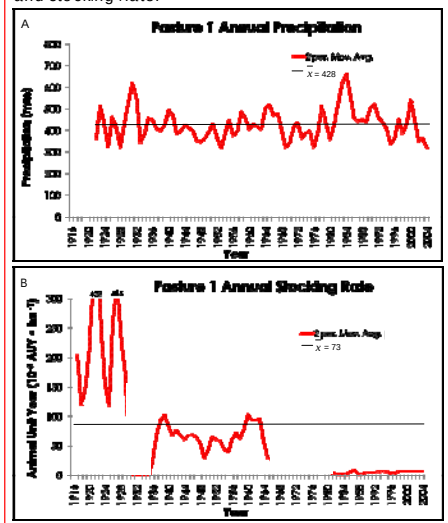


Figures 3A and 3B Pasture 2SW Annual Precipitation and Stocking Rate.





Figures 4A and 4B Pasture 1 Annual Precipitation and Stocking Rate.



Figures 5A and 5B Pasture 4 Annual Precipitation and Stocking Rate.