



Effects of Grazing and Browsing on Subtropical Grassland Vegetation



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Background

- Most native subtropical grasslands like those found on Timberlake Biological Field Station have evolved to tolerate (or even thrive with) frequent disturbances, including herbivory by native grazers (bison) and browsers (whitetail deer), lightning fires, and controlled burns performed by Native Americans⁽¹⁾.
- More recently, grazers like bison have been replaced by cattle, whitetail deer populations have increased, and fires have become less frequent; these factors tend to accelerate the elimination or homogenization of subtropical grasslands worldwide via native invasive forbs and introduced grasses outcompeting native grasses⁽²⁾.
- The effects of grazing/browsing have on plant community health are largely determined by their intensity and timing⁽³⁾.
- Understanding these effects is crucial for future maintenance and restoration of this site (Figure 2) and others like it in the Lampasas Cut Plains ecoregion (Figure 1).

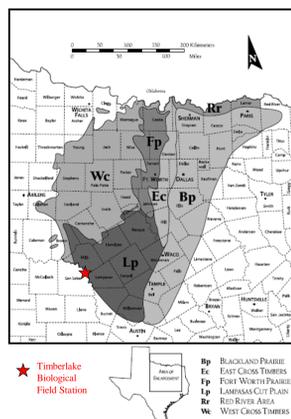


Figure 1: Map of North Central Texas ecoregions¹



Figure 2: Map showing Timberlake Biological Field Station (by Dr. Sudman)

Methods

- Percent coverage and composition were estimated for each plot (Figure 3).
- Dominant and codominant species were estimated and identified using Diggs et. al.
- In each plot, four equidistant transects were placed; on each transect, two 0.5m x 0.5m quadrats were placed at random points.
- Number of species and number of individuals per species were counted in each quadrat (Figure 4).
- Biomass was recorded using a Platemeter F200 in 21 random spots per plot (Figure 5).

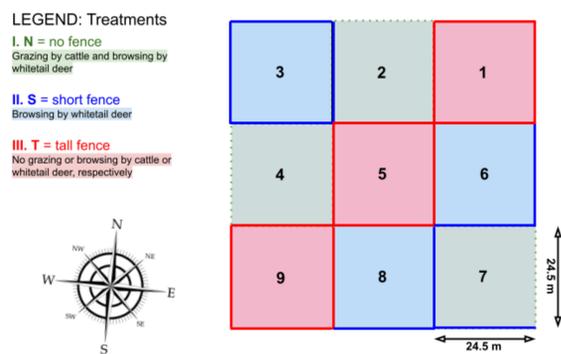


Figure 3: Exclosure layout showing Latin Square experiment design with plot and treatment legend



Figure 4: Transect being placed in a tall-fenced plot for establishing quadrats to count species and individuals



Figure 5: Using a Platemeter in a short-fenced plot to determine biomass

Results

Table 1: Average estimated composition of plots

Treatment	%Bare	%Forb	%Grass	%Woody*
I.	3.67	19.33	75.33	1.67
II.	3.67	40.33	54.33	1.67
III.	5.33	60.00	32.22	2.67

Standard error ranged from 2-5% for all means. *trees, shrubs, cacti

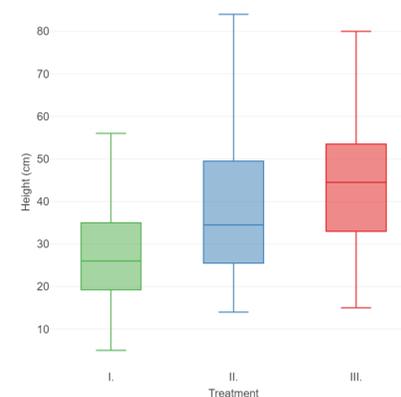


Figure 5: We found a significant difference in height medians between all treatments. Standard deviation is shown in all boxplots.

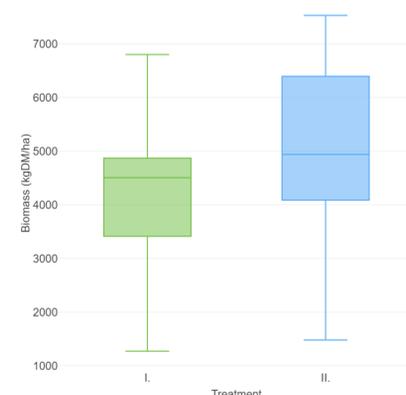


Figure 6: We found a significant difference in biomass between treatments I. and II.. Treatment III. was not considered as most samples were immeasurable.

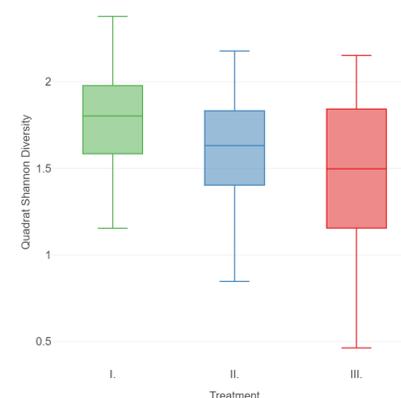


Figure 8: We found a significant difference in quadrat Shannon Diversity between Treatments I. and II./III. but not between Treatments II. and III.

Discussion

- Plots grazed/browsed by cattle and deer had less biomass and shorter vegetation compared to those browsed by deer and exclusion plots, respectively.
- Grass dominance was directly related to type of herbivores present and can be promoted by cattle grazing⁽⁴⁾; forb dominance was inversely related to herbivore presence; woody growth was highest in exclusion plots; this may be due to browsing habits of whitetail deer⁽⁵⁾.
- Plants in cattle-grazed plots exhibited more diversity and evenness than those without cattle grazing while deer browsing had no significant effect on this variable; this may be because cattle are larger and cause more disturbance.
- Most dominant spp. were natives that are often found in greater numbers at disturbed sites⁽¹⁾. In fenced (cattle excluded) plots, dominant grasses included introduced species.
- Early successional plant communities establish sooner and are more diverse after disturbance compared to late successional ones; the unfenced community had high diversity and will likely change in the future.

Conclusion

- While cattle are not a replacement for native bison nor fire⁽²⁾, our results suggest that controlled cattle grazing may affect community composition and increase diversity.
- However, continued monitoring of this site is needed as succession continues.
- We also recommend further research on the effects of other disturbances (i.e. fire, mowing) on this grassland.

References

1. Diggs et al., 1999, *Illustrated Flora of North Central Texas*
2. Buisson et al., 2018, *Biological Reviews*
3. McIntyre et. Al, 2003, *Journal of Applied Ecology*
4. Graziella H.M.S. & Gerhard E.O., 2021, *Austral Ecology*
5. Quinton et al., 1979, *Journal of Range Management*

Acknowledgments

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