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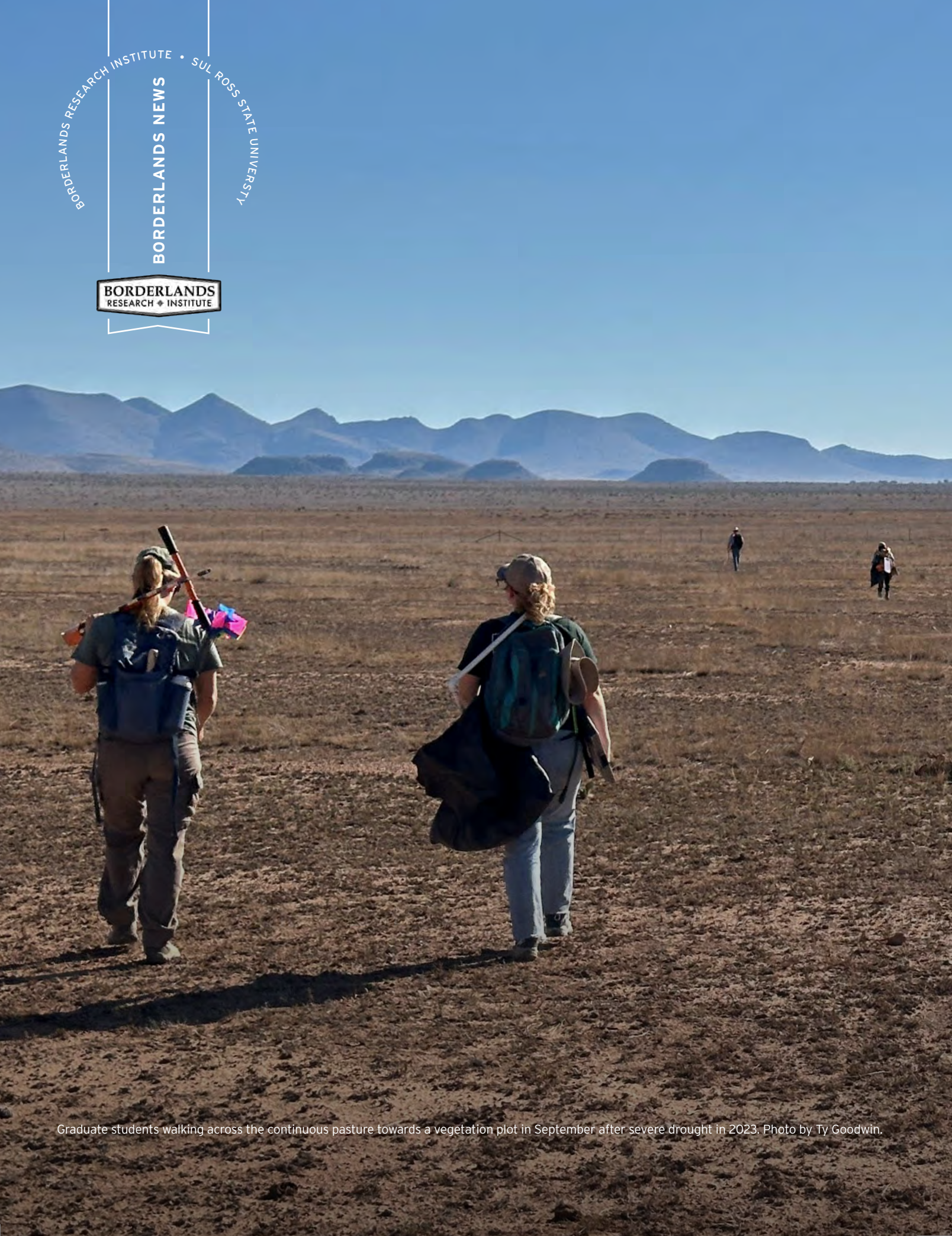
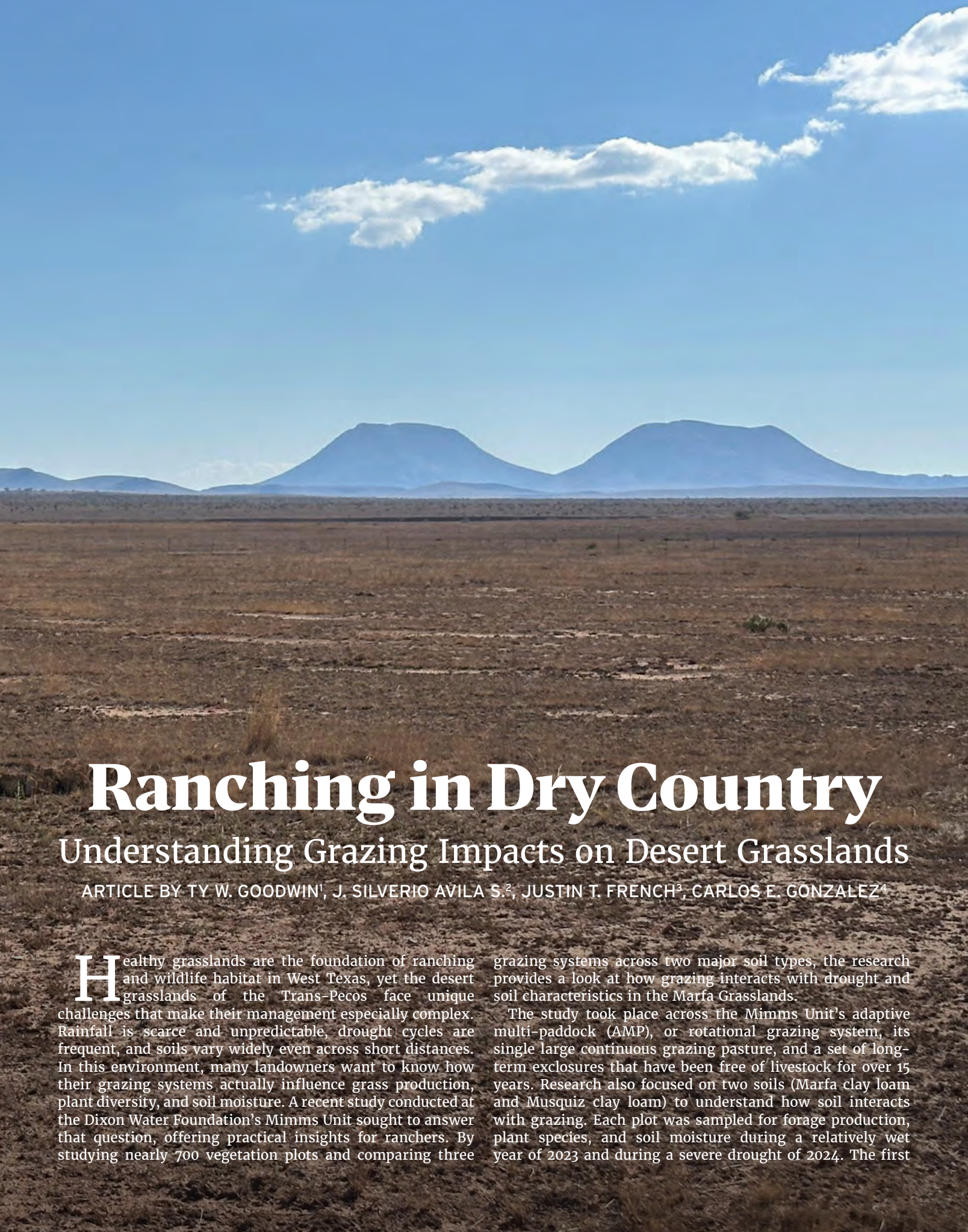


Graduate students walking across the continuous pasture towards a vegetation plot in September after severe drought in 2023. Photo by Ty Goodwin.



Ranching in Dry Country

Understanding Grazing Impacts on Desert Grasslands

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Healthy grasslands are the foundation of ranching and wildlife habitat in West Texas, yet the desert grasslands of the Trans-Pecos face unique challenges that make their management especially complex. Rainfall is scarce and unpredictable, drought cycles are frequent, and soils vary widely even across short distances. In this environment, many landowners want to know how their grazing systems actually influence grass production, plant diversity, and soil moisture. A recent study conducted at the Dixon Water Foundation's Mimms Unit sought to answer that question, offering practical insights for ranchers. By studying nearly 700 vegetation plots and comparing three grazing systems across two major soil types, the research provides a look at how grazing interacts with drought and soil characteristics in the Marfa Grasslands.

The study took place across the Mimms Unit's adaptive multi-paddock (AMP), or rotational grazing system, its single large continuous grazing pasture, and a set of long-term exclosures that have been free of livestock for over 15 years. Research also focused on two soils (Marfa clay loam and Musquiz clay loam) to understand how soil interacts with grazing. Each plot was sampled for forage production, plant species, and soil moisture during a relatively wet year of 2023 and during a severe drought of 2024. The first

For ranchers managing land in the Trans-Pecos, this study underscores the importance of adapting grazing plans to soil and climate conditions. No single grazing system is best for every situation.

conclusion from the study was that rainfall overwhelmingly determines how grasslands respond in this region. Total forage production dropped by about half from 2023 to 2024 as rainfall fell from roughly 10 inches to only about 3 inches. No grazing system, whether rotational or continuous, was able to compensate for this extreme moisture shortage. In dry years, plants simply do not have the water required to regrow, meaning differences in grazing systems become far less pronounced. For ranchers who already adjust stocking rates based on rainfall, this finding reinforces field experience: grazing management matters, but water availability matters more.

Although drought overshadowed many grazing effects, the study found that well-managed grazing increased plant species richness. Both the rotational and continuous grazing systems consistently supported twice the grass species than the ungrazed exclosures, regardless of year or soil type. Exclosures had the lowest species diversity in every comparison. This supports long-standing ecological theory that moderate disturbance, such as grazing, promotes healthier and more diverse plant communities than eliminating livestock. In practical terms, this means that keeping cattle on the landscape, when done correctly, helps maintain resilient grasslands. Grazing stimulates regrowth, prevents a single species from dominating, and promotes a mosaic of vegetation that benefits both livestock and wildlife.

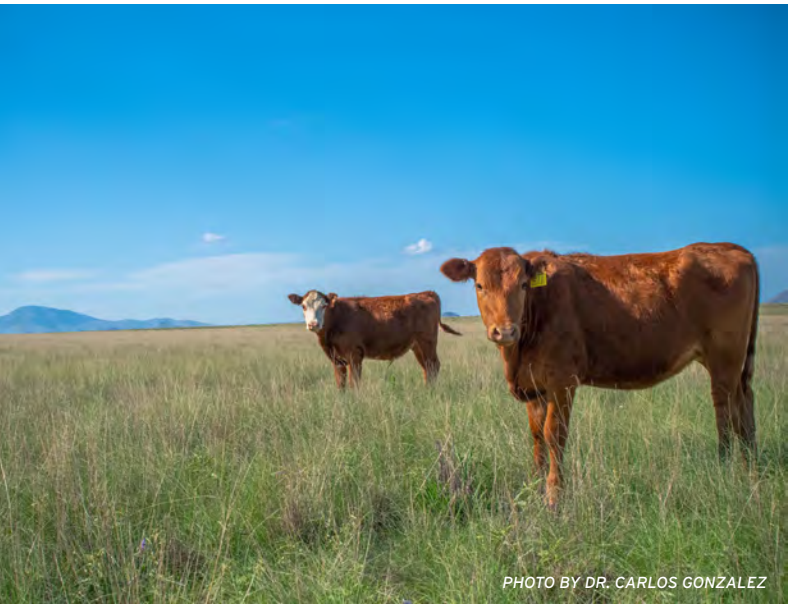


PHOTO BY DR. CARLOS GONZALEZ

Dixon Water Foundation's hereford yearlings on the Mimms Unit in West Texas during the midst of the rainy season.

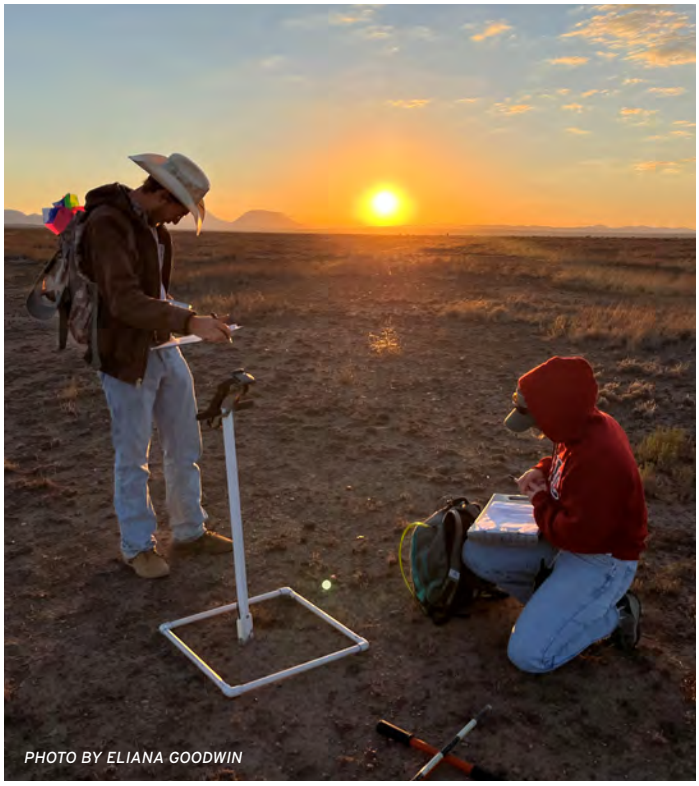
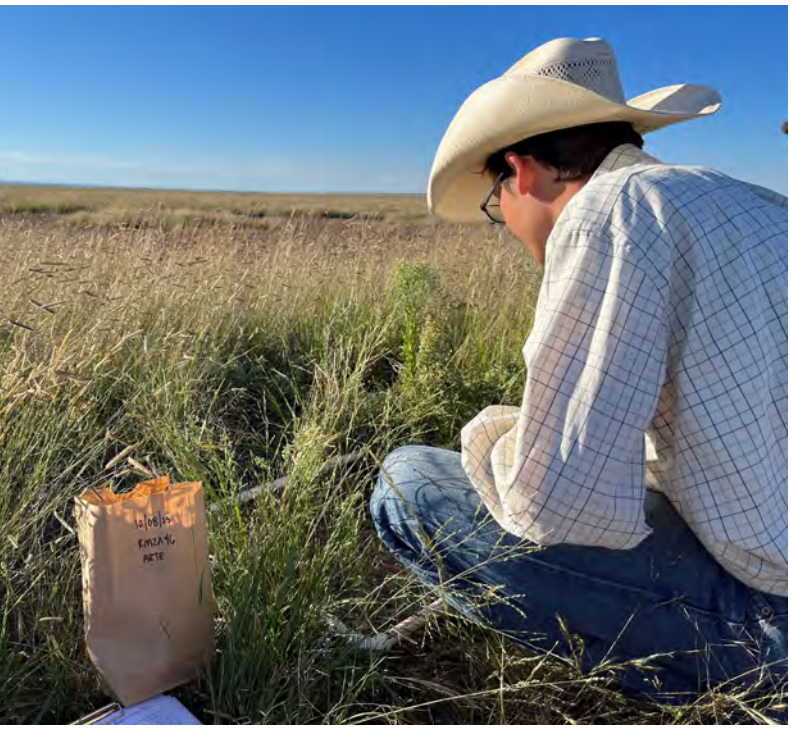


PHOTO BY ELIANA GOODWIN

Graduate student researchers Ty Goodwin (left) and Hayley Shultz (right) collecting volumetric soil moisture and vegetation composition between plots with different grazing systems.

One of the more interesting outcomes of the research involved soil type. Marfa clay loams and Musquiz clay loams responded differently to grazing, revealing that the land's underlying soil dictates much of its ecological potential. On Marfa clay loam, neither rotational nor continuous grazing significantly changed forage production within vegetated patches, though both slightly reduced the overall proportion of ground covered by vegetation. These soils already hold more moisture, so vegetation tended to remain fairly consistent. In contrast, on Musquiz clay loam, shallower soils that retain less water, continuous grazing actually increased the proportion of land covered by vegetation. These findings counter the common assumption that continuous grazing always reduces cover. Soil moisture increased more under continuous grazing than under any other treatment, particularly in the Musquiz soils. This is likely due to a combination of reduced vegetation density (lower transpiration) and



Ty Goodwin collecting grass species to compare forage crop production from long term effects of grazing management.

increased infiltration. These results suggest that continuous grazing, when moderately stocked, can perform well on certain soil types and should not automatically be dismissed as inferior to rotational systems.

Across all treatments, forage production within vegetated areas, the biomass of grass produced per unit area, did not differ significantly among rotational grazing, continuous grazing, or the exclosures. This supports the long-held concept that under light to moderate stocking rates, grasses often exhibit compensatory growth. When plants are grazed but given time and moisture to recover, they often produce biomass similar to that of ungrazed plants. This is especially true in desert ecosystems where water is the limiting factor. The differences among grazing systems were therefore expressed not in how much biomass individual plants produced, but in how much of the landscape remained vegetated versus bare. In years with adequate rainfall, these differences may become more pronounced, but the 2024 drought muted many potential contrasts.

The study also explored how individual grass species respond to grazing pressures. Blue grama emerged as a dominant species in all systems, and areas where blue grama was especially strong tended to support fewer other species. Burrograss often appeared in patches with few or no additional grasses, particularly near the edges of vegetation bands. These patterns align with long-term observations of desert grasslands, where some species expand during drought while others diminish. Although statistical analysis in the study showed limited power to explain variation in species composition, the ecological patterns were still evident: grazing tended to increase species richness, drought tended to reduce it, and soil type shaped which species persisted.

When all these findings are viewed together, a clear message emerges for landowners. Grazing is not simply a disturbance; it is a tool. Both rotational and continuous grazing supported healthy levels of plant diversity; neither reduced forage production within vegetation bands, and continuous grazing even improved soil moisture on certain soils. Excluding livestock entirely did not provide ecological advantages and often reduced species richness. However, the effectiveness of any grazing system depends strongly on soil type and, most importantly, on rainfall. In wet years, the differences among grazing systems may become more pronounced, while in dry years, drought is the dominant driver of grassland behavior.

For ranchers managing land in the Trans-Pecos, this study underscores the importance of adapting grazing plans to soil and climate conditions. No single grazing system is best for every situation. Instead, the landowners and land together should guide management decisions. Rotational grazing may suit soils that respond well to rest, while continuous grazing may be appropriate for soils that benefit from lighter, more consistent pressure. Regardless of system, moderate stocking rates are key to maintaining plant health, and grazing plans must always be flexible during drought. Proper placement of water sources, careful monitoring of vegetation, and understanding soil properties all contribute to better outcomes.

Ultimately, our research highlights that sustainable ranching in the Chihuahuan Desert is not only possible, it is already happening. Grazing systems, when applied thoughtfully, can support biodiversity, maintain productive grasslands, and enhance soil function. While drought remains the greatest challenge, good management can help rangelands withstand dry periods and recover when rainfall returns. In a landscape shaped by moisture, soil, and time, the rancher's role is not simply to graze livestock but to manage the land as a dynamic, living system. This study provides valuable guidance for doing exactly that, helping ensure that the grasslands of the Marfa Highlands remain healthy and resilient for future generations.