2025

Habitat Research Report

BORDERLANDS
RESEARCH ◆ INSTITUTE

CONSERVING THE LAST FRONTIER

OUR MISSION:

Conserving the natural resources of the Chihuahuan Desert Borderlands through research, education, and outreach.

Since 2007, the Borderlands Research Institute has encouraged effective land stewardship of the ruggedly beautiful terrain of the Chihuahuan Desert. By providing land managers with the most current scientific information, the Borderlands Research Institute is helping to conserve one of the most biologically diverse regions of the world.

Housed at Sul Ross State University, the Borderlands Research Institute builds on a long-lasting partnership with private landowners, the university's Range and Wildlife Program and cooperating state, federal, and non-governmental organizations. Faculty scientists and the graduate students they mentor are conducting groundbreaking research on every aspect of the desert landscape and the wildlife it supports.

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In a state that is 95% privately owned, the future of Texas wildlife and working lands rests squarely in the hands of private land stewards. Ranching and production agriculture remain essential to our state's prosperity, and although ownership patterns and practices have evolved over the past century, the commitment to caring for the land endures.

No program speaks more to the ranching community than our Habitat Research Program. By integrating grazing, ranch management, plant–soil interactions, and rangeland restoration, this work addresses the real challenges facing land stewards in the Trans-Pecos. The 2025 Habitat Research Report highlights that work—science grounded in West Texas landscapes, strengthened by partnerships with landowners, and enriched by the students learning alongside our faculty.

We are proud of the Habitat Research and Management Program and encourage you to review our preliminary findings and reach out to our team with any questions. Thank you for your continued support of the Borderlands Research Institute and for investing in the future of habitat conservation across the region.

Louis A. Harveson, PhD
Dan Allen Hughes, Jr., Endowed Director

Our Habitat Research and Management Program advances science-driven strategies that support working lands in the Chihuahuan Desert. This region is one of the most biologically diverse desert ecosystems in North America. Highly variable soils, elevation, and climate create unique vegetation communities that are essential for sustaining livestock production, wildlife habitats, watersheds, and overall ecosystem health. Yet many landowners face challenges such as soil erosion, drought, brush encroachment, and invasive species, which may prevent the land from meeting production and conservation goals. Our program partners with landowners to implement and evaluate habitat restoration practices tailored to address real-world problems. Through applied research, we test restoration techniques that enhance vegetation diversity, improve soil moisture retention, reduce erosion, and understand the interactions between livestock grazing systems and desert ecosystems. Our research is only possible through the continued support of private landowners and our conservation partners. Thank you for your commitment to the stewardship of the Trans-Pecos landscape.

Carlos "Lalo" Gonzalez, PhD
Nau Endowed Chair of Habitat Research and Management

BORDERLANDS RESEARCH ◆ INSTITUTE

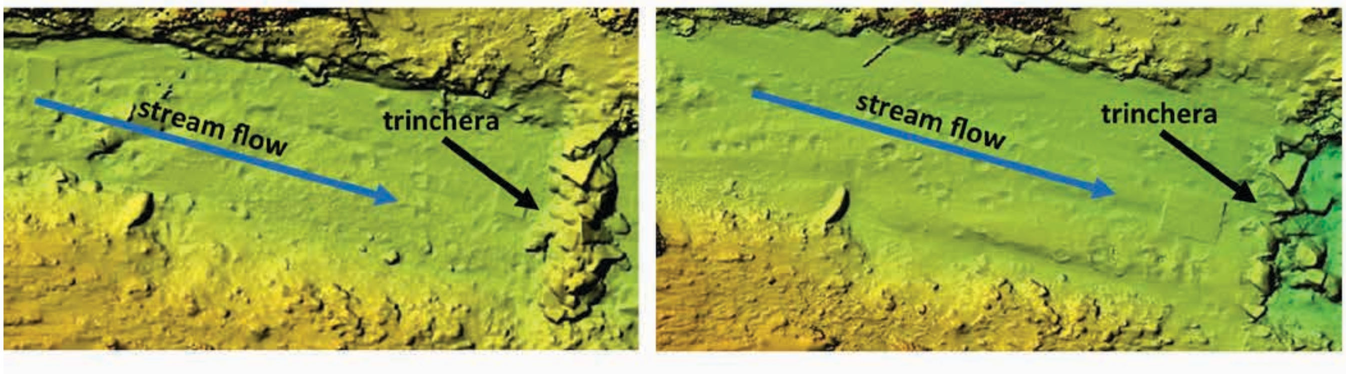
CONSERVING THE LAST FRONTIER

2025 Habitat Research Report

CONTENTS

New and old technologies: using remote sensing to monitor the effectiveness of trincheras

Gray Hancock, Justin T. French, Kevin Urbanczyk, J. Silverio Avila S., and Carlos E. Gonzalez



These two images show the results of a digital elevation model created from multiple cellphone photos compiled through the Structure from Motion 3D imaging process. Photos for the image on the left were collected at an ephemeral creek channel before rainfall events during Spring 2024. Photos for the image on the right were collected after rainfall events at the same location during Spring 2025. In the image on the right (post-rainfall), sediment accumulation is apparent upstream of the trinchera. All images were taken using an iPhone at ground level rather than by drone.

Wind and rain can shape the conditions of the fragile Trans-Pecos rangelands. When vegetation cover is scarce, these forces displace topsoil, especially in undulating terrain, leading to erosion and the gradual loss of productive soils. Over time, this degradation limits the ability of rangelands to support native plants, wildlife, and herbivory processes. Understanding where and how soil erosion occurs helps land stewards place restoration structures in the right spots to improve soil health and vegetation recovery.

To explore new ways of monitoring erosion, we tested the use of fine-scale remote sensing imagery to measure soil accumulation in ephemeral streams of southern Brewster County. Our goal was to determine if imagery from a simple cellphone camera could accurately estimate the amount of soil captured by small erosion-control structures known as trincheras. We conducted a controlled test by adding 41 liters of soil to a drainage area and capturing a series of overlapping photos before and after using a cellphone. The photos were processed using a 3D imaging process called Structure from Motion to build 3D surface models of the site. Comparing the models enabled us to estimate the change in soil volume with an accuracy of over 80 percent.

Next, we applied this method to estimate soil accumulation in 100 trincheras across 20 ephemeral streams. Early results show that trincheras effectively trap and build up sediment, sometimes extending more than 50 feet upstream, creating localized “positive soil budgets” that improve water retention and vegetation growth. This change can be seen in the photos above. In this area of the creek, five trincheras were placed about 50 feet apart from each other, and approximately 222.8 cubic feet of soil sediment accumulated along this stretch following rains. Some stretches within this system accumulated even more sediment, with an estimated more than 600+ cubic feet. The amount of sediment accumulated will depend on the size of the stream and the contributing watershed. This approach provides a practical and low-cost tool for measuring the improvement in rangeland resilience over time resulting from erosion-control efforts.

DRONES AND RANGELAND MANAGEMENT

Rangeland science takes flight: UAVs in habitat and restoration monitoring

J. Silverio Avila S.

When most people think of drones, they might picture them being used for recreation, law enforcement, military operations, or even package deliveries. However, drones, also known as Unmanned Aerial Vehicles (UAVs), are now a vital tool for studying and managing natural resources.

It all has to do with remote sensing, our ability to gather landscape information with high resolution. Traditionally, rangeland habitat monitoring relied on ground-based methods: walking pastures, measuring plants, and recording observations by hand. Later, satellites and airplanes enabled scientists to observe larger landscapes and measure changes in vegetation, land cover, and wildlife habitats. These images are helpful, but their resolution is limited. For example, satellite images may capture areas as large as two basketball courts (9,680 sq ft) or as small as a king-sized bed (43 sq ft) in a single pixel.

Drones, on the other hand, can fly below 400 feet, allowing operators to capture images with a resolution as fine as half an inch, or about the size of a blueberry. This enables researchers to monitor changes in greater detail than ever before. For example, drones can help us detect how grasses respond to different grazing systems, monitor the success of habitat restoration projects, and even track patterns of soil erosion.

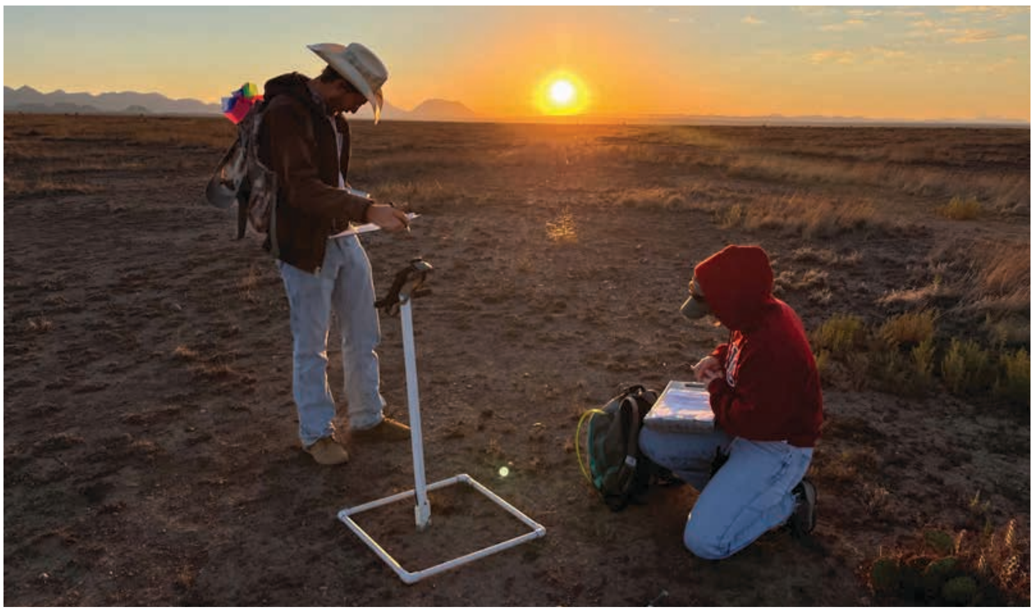
This year, the Borderlands Research Institute began a new chapter in drone research. We acquired a fixed-wing drone that can take off and land vertically, covering up to 2,100 acres in a single day while still producing images with blueberry-sized resolution. With this powerful tool, we will study how vegetation shifts after grazing, the impacts of herbicide treatments, soil runoff and accumulation, and the fine-scale habitat choices wildlife make through the seasons.

Drones are opening new windows into West Texas rangelands, giving us sharper eyes in the sky to better conserve and manage these landscapes for the future.

FORAGE PRODUCTION AND PLANT DIVERSITY

Grazing practices and soil type shape forage production and species composition in the Marfa grasslands

Ty W. Goodwin, Justin T. French, J. Silverio Avila S., and Carlos E. Gonzalez



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

Grasslands are among the most important working landscapes in the world, supporting livestock production and ecological diversity. They also provide ecosystem services such as carbon storage, soil stabilization, and water infiltration. Therefore, maintaining the health of grasslands is crucial for sustaining both livestock operations and wildlife habitats.

Livestock grazing can influence nearly every aspect of a grassland ecosystem, from plant growth and species composition to soil structure and nutrient cycling. Depending on how it is applied, grazing can either promote vegetation diversity and soil health or contribute to degradation and loss of productivity. Two common grazing management systems are rotational grazing, where livestock are periodically moved between pastures, and continuous grazing, where animals graze the same area throughout the year. Each has benefits and challenges.

Additionally, soils play an important role in shaping how grasslands respond to grazing. Differences in soil influence water infiltration, nutrient availability, and plant community composition. When soils are degraded through compaction, erosion, or loss of organic material, grasslands may shift toward less desirable vegetation states. Healthy soils can buffer the impacts of drought and grazing pressure, allowing plant communities to recover more quickly.

Recognizing the close connection between soils, vegetation, and grazing management, this project aimed to explore how grazing systems interact with soil type to influence grassland dynamics. Specifically, we compared grass species cover, annual forage production, species composition, and soil moisture across three grazing systems—rotational, continuous, and no grazing—on two soil types. Using random stratified sampling, 690 quarter-square-meter plots were established across Marfa clay loam (MCA) and Musquiz clay loam (MZA) soils, where volumetric soil moisture was recorded to evaluate interactions among soil type, grazing system, and rainfall (Figure 1).

Between 2023 and 2024, forage production declined across nearly all systems (Figure 2), reflecting a severe reduction in annual rainfall from 10 inches in 2023 to only 3 inches in 2024. On MCA soils, rotationally grazed areas were the most productive in 2023, averaging 718 lbs/acre, but dropped sharply to 177 lbs/acre the following year. Forage production in continuously grazed pastures increased from 200 lbs/acre to 235 lbs/acre, while forage production in ungrazed areas fell from 389 lbs/acre to 252 lbs/acre. On MZA soils, production was generally lower in 2024 than in 2023: rotational areas declined from 270 lbs/acre to 109 lbs/acre, continuous grazing from 330 lbs/acre to 171 lbs/acre, and ungrazed areas from 598 lbs/acre to 103 lbs/acre.

Plant diversity also varied with soil type and grazing system. In 2023, MCA soils supported the highest number of unique species under the rotational system (12 species), while areas with MCA soils and no grazing had the fewest (5 species). By 2024, overall diversity declined on MCA soils but remained greatest under continuous grazing (8 species). On MZA soils, continuous grazing supported the most species in 2023 (14), while in 2024, rotational and continuous systems supported 8 unique species, compared to 5 in the ungrazed areas.

No single grazing system consistently outperforms another. Instead, each offers advantages under different rainfall and soil conditions. Rotational grazing appeared to benefit productivity in wetter years, while continuous systems maintained steadier soil moisture and diversity during drought. Extended dry periods reduce forage growth and can diminish the benefits of rest-and-recovery cycles in any grazing system.

Overall, the results of this study highlight that grazing systems are not one-size-fits-all solutions. Their outcomes depend on goals, precipitation patterns, and soil types. Rather than selecting a single "best" system, managers should focus on clearly defined goals, ongoing monitoring, and adaptive strategies. In arid grasslands, moderate, well-managed grazing, guided by data and tailored to local context, remains essential for maintaining vegetation productivity, soil health, and long-term ecosystem resilience.

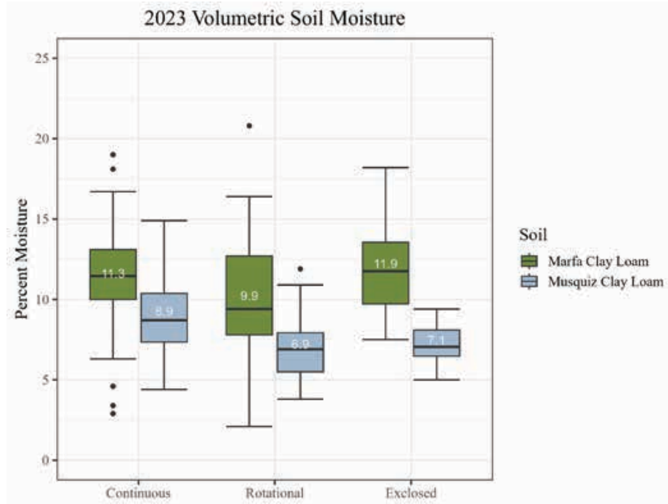


Figure 1: Volumetric soil moisture data collected between strata and grazing systems in 2023.

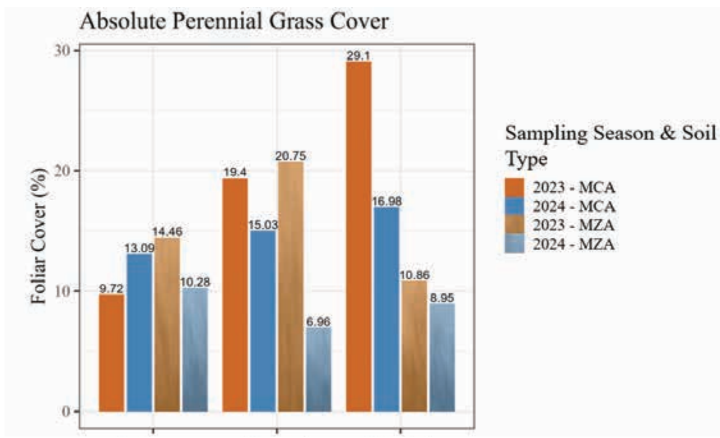


Figure 2: Perennial grass foliar cover observed in MCA and MZA soil types between years sampled. (The exclosed system consists of the non-grazed areas on the ranch, which we used as controls.)

FORAGE PRODUCTION

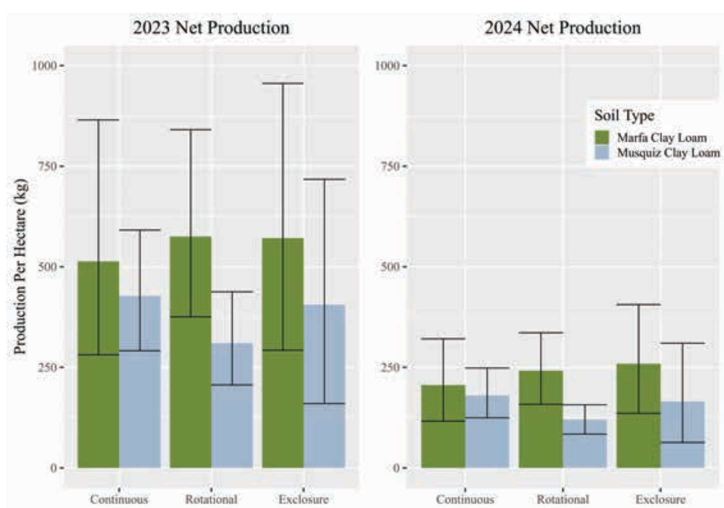


Figure 3. Differences in grass biomass production among grazing systems (rotational, continuous, and exclosed) shown across two soil types: Marfa clay loam and Musquiz clay loam.

RESTORATION AND LEHMANN'S LOVEGRASS

Restoration strategies for arid rangelands invaded by Lehmann's lovegrass

Andres Solorio-Pulido, Carlos E. Gonzalez, Justin T. French, Louis A. Harveson, and J. Silverio Avila S.

A field of almost entirely Lehmann's lovegrass. Photo by J. Silverio Avila S./AgriLife Extension.

Desert ecosystems within the Chihuahuan Desert are experiencing widespread ecological degradation due to the expansion of invasive grasses. One of the most problematic species is Lehmann's lovegrass, a perennial bunchgrass introduced from Africa for erosion control and forage production. Although it initially offered perceived benefits, Lehmann's lovegrass has spread aggressively across millions of acres, displacing native vegetation, altering fire regimes, and creating self-reinforcing feedback loops that hinder ecosystem recovery. These dynamics pose significant challenges for restoration practitioners seeking to reestablish native plant communities in arid rangelands.

Conventional restoration methods, such as native plant seeding or mechanical soil disturbance, often fail when applied individually. Seeding efforts may be ineffective due to low soil moisture, or intense competition from existing invasive grasses. Likewise, soil disturbance alone can inadvertently create open space for invasive species to recolonize. As a result, integrated approaches that combine treatments are increasingly viewed as essential to overcoming ecological thresholds that restrict recovery. Beyond improving vegetation outcomes, these methods can also enhance soil health, water infiltration, and nutrient cycling, processes critical to sustaining long-term restoration success.

This study was designed to evaluate the effectiveness of three restoration treatments: native seeding (S), soil disturbance (SD), and a combined seeding plus disturbance (SDS) approach. The seeds used for the seeding treatment were sourced from a locally adapted seed mix, and the soil disturbance treatment was applied using a small, motorized rototiller to mimic the effects of a tractor-pulled shallow disk. The research was conducted from 2022 to 2024 in Lehmann's lovegrass-dominated grasslands of the Trans-Pecos region of Texas. A total of 200 experimental plots (4 × 4 m) were established, and treatments were randomly assigned to ensure balanced comparisons. Vegetation was monitored across multiple seasons to assess how plant communities responded to both environmental conditions and restoration treatments (see photos to the left).

Results showed that the combined SDS treatment consistently outperformed either method alone. By October 2023, SDS plots supported 34 native plant species, the highest richness observed across treatments. These plots also exhibited reduced bare ground and increased litter cover, both of which are indicators of greater soil stability and moisture retention, critical for seedling establishment. Native plant cover and richness were greatest in SDS plots, highlighting the synergistic benefit of disturbing the soil to create microsites while simultaneously introducing native seeds.

Interestingly, the SDS treatment disrupted existing biological soil crusts, typically viewed as negative in drylands, but in this case, moderate disturbance proved beneficial. By reducing the dominance of Lehmann's lovegrass and creating openings for native seedlings, the treatment aligned with ecological theories of niche preemption and community assembly. Our results further supported this trend: over time, Lehmann's lovegrass became less associated with SDS plots, while native grasses such as blue grama and purple threeawn increased in abundance. These changes suggest that once native species gain a foothold, they may gradually compete more effectively with established invasives, fostering a positive trajectory for ecological recovery.

Although no treatment eliminated Lehmann's lovegrass, the SDS approach initiated a meaningful shift in community composition. Rather than achieving total eradication, a challenging goal in arid environments, the strategy promoted native resilience and diversity. By enhancing native recruitment, increasing litter, and reducing bare ground, the combined treatment may gradually weaken Lehmann's lovegrass dominance through natural successional processes.

In conclusion, integrating native seeding with moderate soil disturbance can significantly enhance the establishment of native plants and shift the vegetation structure toward a more balanced community. These findings highlight the importance of employing combined, process-oriented treatments to overcome ecological barriers posed by invasive species. For land managers and practitioners, the results offer a framework for restoring ecosystem function, improving resilience, and guiding recovery efforts across landscapes where non-native grasses continue to challenge native desert plant communities.

GRAZING SYSTEMS, SOIL, AND FUNGI

Effects of grazing systems and soil type on arbuscular mycorrhizal fungi

Asia Cornelius, Carlos E. Gonzalez, J. Silverio Avila S, Justin T. French, and Maureen Frank

Collecting vegetation and root samples using a quadrat to assess plant community composition and AMF colonization.

Arbuscular mycorrhizal fungi (AMF) are essential for plant health. These fungi colonize plant roots, enhancing water and nutrient uptake, and alleviating plant stressors. In the Chihuahuan Desert, extreme temperatures, low rainfall, and nutrient-limited soils make plant survival difficult; AMF help sustain plants that support wildlife and livestock.

Livestock grazing is the dominant land use in most rangelands, and management decisions can influence the ecological balance among fungi, soils, and plants. Rotational and continuous grazing systems are two strategies commonly used. Continuous grazing is a grazing management system in which livestock graze a single pasture year-round. While this method is less laborious, it may harm vegetation if overstocked. In contrast, rotational grazing allows for periods of rest and recovery for the vegetation. Understanding how grazing practices and soils shape AMF colonization helps guide sustainable management and conservation in these fragile ecosystems.

AMF communities are sensitive to disturbance, with their abundance shifting in response to changes in soil properties or vegetation structure. Previous research suggests that AMF colonization may be higher under rotational systems; however, the effects vary depending on the local climate. This led to the observation of AMF colonization in blue grama, a dominant grass species in the Chihuahuan Desert, at the Dixon Water Foundation's Mimms Unit near Marfa, Texas. The Mimms implements both rotational and continuous grazing systems under the same stocking rates. Our team's study focused on two major soils: Marfa clay loam and Musquiz clay loam. We hypothesized that AMF colonization would be higher under rotational grazing than continuous grazing, and that colonization patterns would differ between the two soil types.

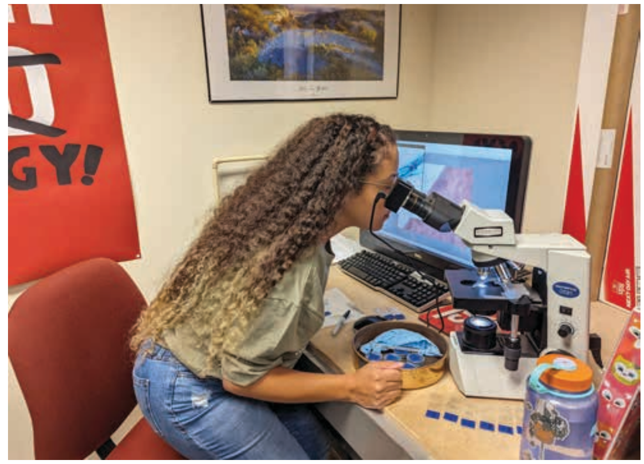
Results indicated no effect of grazing system, soil type, or their interaction on AMF colonization. Mean colonization across all treatments was approximately 9.5% lower than the 30% colonization reported for blue grama in other grasslands. Analysis of fungal structures showed that there were no differences in mycorrhizal structures (arbuscules, vesicles, hyphae, and coils) across all treatments. The prominence of hyphae suggests that AMF in this climate may prioritize hyphal networks under resource-limited conditions, thereby expanding access to water and nutrients during drought.

Several factors can explain the lack of strong treatment effects. Grazing intensity in the study was relatively low, which could have prevented differences from developing between rotational and continuous systems. Both grazing systems may have operated within a moderate disturbance threshold, allowing AMF to persist across treatments. The study was also conducted during a severe drought, which likely suppressed fungal colonization below typical levels.

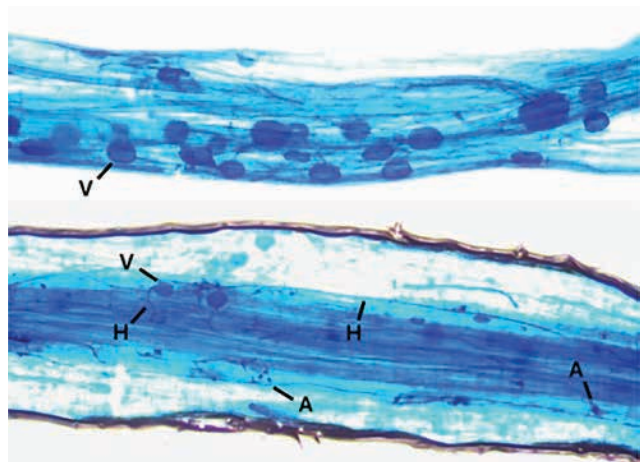
These findings suggest that, under conservative stocking rates, AMF colonization in desert grasslands are resilient to different grazing strategies. Maintaining low to moderate grazing pressure may be more critical than choosing a rotational versus continuous grazing system for supporting belowground processes. The prominence of hyphal structures under drought conditions suggests that AMF may have adapted to resource-limited conditions by allocating more resources to hyphal growth, possibly to enhance nutrient and water uptake.

Future research should incorporate longer-term experiments spanning multiple climatic cycles to better understand how land management influences AMF in desert grasslands. Incorporating molecular analysis to identify AMF species would provide a deeper understanding of how fungal communities respond to land management and climate. In addition, pairing AMF colonization data with aboveground vegetation and soil monitoring would help managers design grazing strategies that preserve rangeland productivity.

In conclusion, although the grazing system did not significantly influence AMF colonization, the study offers insight into the resilience of soil microbial communities under moderate grazing in arid environments. These results underscore the importance of maintaining sustainable stocking rates and considering long-term environmental variability in rangeland management.



Analyzing stained root samples under a microscope to evaluate AMF colonization.



Stained root segment of blue grama showing mycorrhizal structures.

Stained root samples were mounted on microscope slides for assessing AMF colonization.

Low-technology process-based restoration for rangelands: hydrology and vegetation response in the Chihuahuan Desert

Jason Crosby, Carlos E. Gonzalez, Justin T. French, and J. Silverio Avila S.

Process-based practices include using structures such as wattles (like the one pictured above) as erosion-control treatments that slow water, trap sediment, and allow vegetation to reestablish naturally. By restoring the process, we assist the landscape to do the work. Instead of asking, "What structure do we build?", process-based restoration asks, "What natural process is missing, or damaged, and how do we restore it?"

In the Trans-Pecos of West Texas, prolonged dry periods, higher temperatures, and historical land uses have reduced grass cover, allowing woody plants like creosote bush to dominate the landscape. Once grass is replaced by shrubs, the land sheds water more quickly, loses soil, and necessitates restoration inputs.

This project tested simple, low-cost techniques to restore vegetation and improve water retention on a creosote-dominated site. The area was grubbed to remove brush, seeded with native grasses and forbs, and straw wattles were installed along the contour to slow runoff and capture sediment. Some wattles were enhanced with brush from the grubbed shrubs to provide shade and cooler soil temperatures, while others received biochar to help retain moisture.

During the first growing season, rainfall was minimal, with less than three inches of total precipitation, resulting in low plant growth. Even so, areas that naturally collected and held more water supported noticeably higher plant cover and diversity than drier spots. Treatments that combined wattles with brush or biochar showed slightly better plant establishment than wattles alone, suggesting that shading and moisture retention can make a difference under harsh conditions.

Overall, the most important takeaway is that where restoration occurs matters as much as what technique is used. Selecting areas where water naturally slows or the land gently slopes can significantly enhance success. Pairing these locations with simple structures, such as wattles, adding organic material, and timely seeding provides the best chance for vegetation recovery.

For landowners across the Trans-Pecos, the message is hopeful: restoration doesn't have to be complicated or expensive. Start by reading the land, pick spots where water lingers, use simple materials to slow flow, and align efforts with expected moisture. Process-based restoration meets the desert on its own terms, working with water, soil, and time to rebuild rangeland function, support wildlife and grazing, and strengthen resilience.

CURRENT STUDENTS AND ONGOING PROJECTS

SJ GILBERT

SJ grew up camping in the Appalachian Mountains and spending summers along the Atlantic coast, developing an early love for the outdoors and a lifelong fascination with plants. From identifying native flora to propagating houseplants and outdoor gardening, she has always been drawn to botany and the ways plant life shapes ecosystems. She earned a Bachelor of Science in Biology at Sul Ross State University, where she began developing her skills in ecology and field research. Now calling Alpine home, SJ is excited to contribute to habitat restoration projects with BRI and to serve as the teaching assistant for Wildland Plants.

Long-term vegetation change under rotational and continuous grazing in the Marfa grasslands

Desert grasslands rely on limited, unpredictable rainfall, making them highly susceptible to land-use changes and drought. Decades of heavy grazing have led to increased bare soil and shrub encroachment, while reducing the abundance of perennial grasses. SJ's research examines long-term vegetation dynamics under continuous and rotational grazing by comparing historical and current data. Through vegetation and soil analyses, her work helps identify how grazing shapes desert grasslands and supports strategies that promote sustainable, resilient rangelands for both people and wildlife.

LUKE CHRISTENSEN

Luke grew up in Oklahoma, where hunting, fishing, and camping instilled in him a lifelong appreciation for the outdoors. After receiving a degree in Environmental Sustainability at the University of Oklahoma, he worked as a research technician. He first visited Sul Ross State University as an undergraduate and was introduced to the Borderlands Research Institute, which inspired him to return for his master's degree. Luke also serves as an engineer officer in the Texas National Guard, having previously served for five years in the Oklahoma National Guard. After graduation, Luke hopes to work for a state wildlife agency or in a military natural resources division.

From dusk to dawn: seasonal patterns in scaled quail roosting ecology in a desert ecosystem

Little is known about how scaled quail choose where to roost throughout the year. To explore how roost site selection changes with the seasons, we are outfitting scaled quail with GPS transmitters that record their exact nighttime locations. In addition, drones are being used to measure vegetation structure, topography, and even how much heat each site absorbs or reflects. By combining modern technology with traditional wildlife fieldwork, the team is creating a detailed map of what makes a good roosting spot for scaled quail. The results will help land managers design habitat restoration and grazing plans that support quail throughout the year.

KENDALL CHRISTENSEN

Kendall's love for rangeland ecosystems began at a young age through 4-H, where she participated in plant identification and rangeland judging competitions. During her undergraduate studies at Oklahoma State University, she developed a passion for soil–vegetation relationships, focusing on understanding ecosystems as a whole rather than in separate parts. Wanting to explore regions beyond the Great Plains, Kendall chose to pursue a master's degree at Sul Ross State University to expand her knowledge in a new environment. Her career goals include becoming a rangeland soil ecologist and working alongside land managers to protect natural resources.

CHRISTIAN LEWIS

Raised in Houston, Christian's frequent camping, fishing, and hunting trips with his father were welcome escapes from the towering concrete and bright city lights. Many of those trips explored the numerous eco-regions of Texas, but West Texas was his favorite. Determined to merge his love for the outdoors with his interest in natural sciences, Christian pursued an Environmental Science degree with a focus in Sustainability from Sam Houston State University. While there, he worked as an undergraduate research assistant for the Freshwater Streams and Rivers lab. He is now pursuing an MS in Range and Wildlife Management at Sul Ross State University.

Restoring the desert from the ground up: soil, water, and life in the permian basin

Kendall's research focuses on developing restoration strategies for plugged oil and gas pads, where compacted soils and caliche surfaces severely limit infiltration, root development, and nutrient cycling. These conditions result in poor water retention, which prevents native vegetation from reestablishing itself. To overcome these limitations, Kendall is testing native seeding, biochar additions, incorporation of organic matter, and soil moisture retention techniques, seeking to identify combinations of soil amendments and water retention approaches. The results will offer guidelines for restoring native plant communities. In systems as arid as the Chihuahuan Desert, the key to restoration success lies beneath the surface, where soil and water relationships support vegetation communities.

Quantifying rangeland vegetation structure through unmanned aerial systems

Over time, habitat fragmentation, climate stochasticity, and unsustainable management practices have reduced rangelands' ability to resist disturbance, support biodiversity, and maintain ecological functions. One crucial management component is understanding the spatial arrangement of vegetation. The spatial patterns of plants influence key ecosystem processes, including water retention, nutrient cycling, and soil erosion. Remote sensing is transforming this field by improving sampling efficiency and reproducibility. Christian's project uses drones to collect data and analyze the spatial structure of vegetation in rotational and continuous grazing systems. By comparing patterns across grazing systems, this research will help identify how management influences landscapes in the Chihuahuan Desert.

JULIE MYERS

Julie grew up in San Antonio and often spent time outdoors exploring the Texas Hill Country. Determined to turn her love for the outdoors into a profession, Julie attended Sul Ross State University in Alpine, where she earned a BS in Wildlife Management in 2020. During her undergraduate years, Julie was actively involved in the Borderlands Research Institute's Undergraduate Mentorship Program, where she gained extensive hands-on experience conducting field research and learning from professionals. Today, she proudly serves as the Pecos County Wildlife Biologist with the Texas Parks and Wildlife Department while pursuing a master's degree in Range Management at Sul Ross State University.

JARED SCHNIERS

Jared grew up in the rural town of Rowena, Texas. As a child, he spent summers helping his grandparents on the farm, growing cotton, wheat, and milo. After graduating from Angelo State University, he worked for the Natural Resources Conservation Service as a Range Management Specialist in the Texas Big Bend region. Jared has over 15 years of experience assisting landowners with conservation efforts in Brewster, Jeff Davis, and Presidio counties. In 2024, he joined the Borderlands Research Institute as the Alamito Creek Conservation Initiative Coordinator and is concurrently pursuing a master's degree in Natural Resource Management at Sul Ross State University.

Energy and ecology: restoration ecology strengthens desert ecosystems

Plugged and abandoned oil and gas well pads are slow to recover and often become dominated by invasive species, leaving compacted, barren surfaces that struggle to support native vegetation. This project will evaluate restoration strategies on plugged well pads using the rip-and-flip method, which breaks up compacted caliche and inverts soil layers to improve rooting depth and water infiltration. Sites are seeded with locally adapted native grasses and forbs and receive soil treatments including biochar and organic matter, and moisture-retention treatments like Hydretain and erosion control blankets. Vegetation and insect communities will be monitored to assess how these groups respond under different restoration strategies.

Low-tech restoration in arid rangelands: evaluating filter dams for soil and vegetation recovery

Ephemeral and intermittent streams dominate the hydrology of arid landscapes, but they are highly vulnerable to land disturbance and altered flow patterns. These impacts can cause channel incision, floodplain disconnection, and habitat loss. This study evaluates low-tech, process-based restoration practices designed to enhance soil moisture and promote native vegetation on degraded rangelands in the Chihuahuan Desert. Specifically, filter dams made from wood and rock will be installed across eroded channels to slow runoff and capture sediment. By mimicking natural processes, these structures are expected to enhance water retention, reduce erosion, and increase vegetation cover in treated areas.

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Photos courtesy of Dana Karelus/BRI (front cover), J. Silverio Avila S. (back cover), and BRI staff, faculty and students.
BRI staff editors include Julie Rumbelow, Cindi Meche, Bill Adams, and Lydia Saldaña.

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