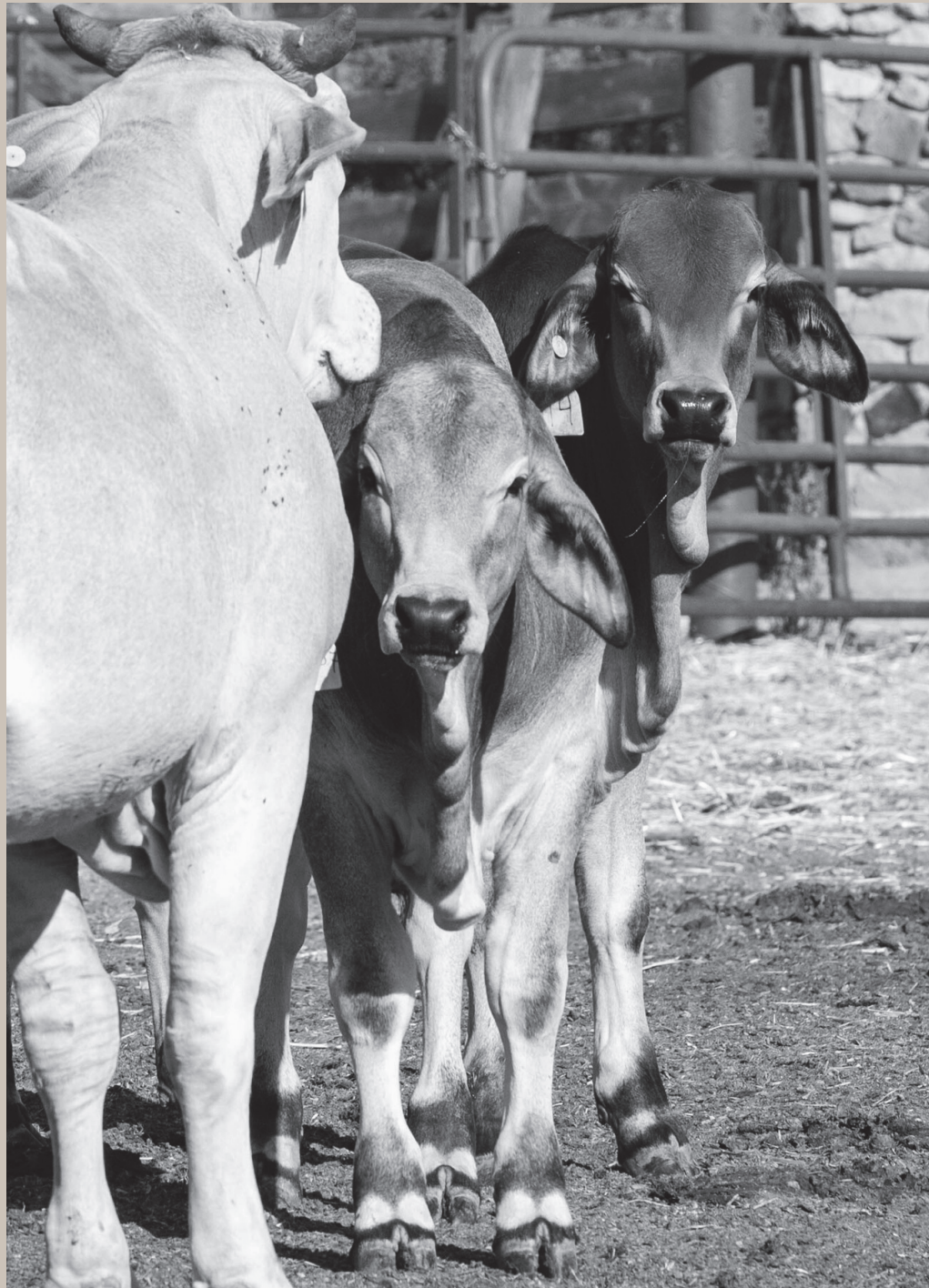


CHIHUAHUAN



ANNUAL REPORT

2021

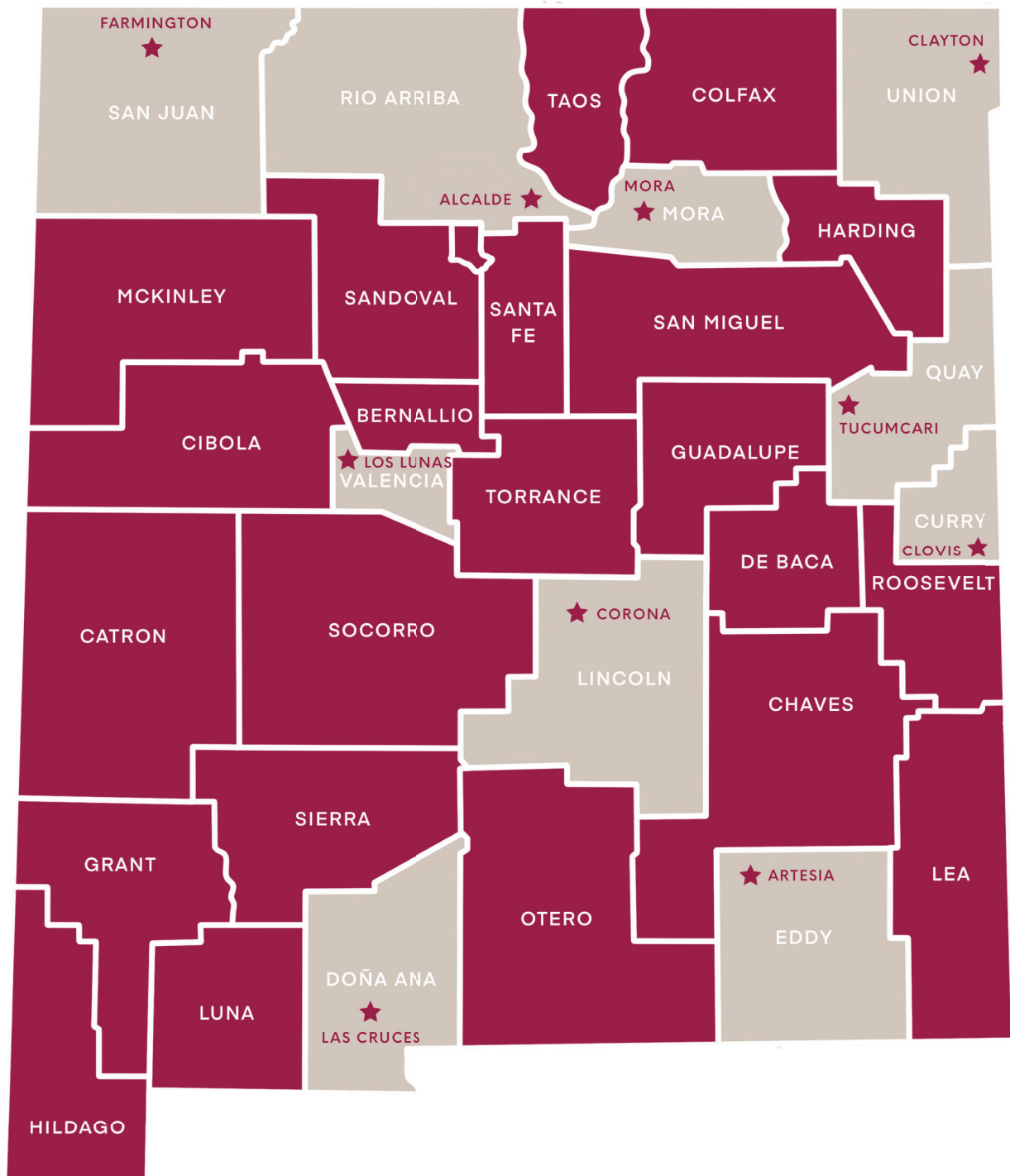
The NMSU Agricultural Experiment Station supports research that is addressing real-world problems. Research is at the core of NMSU's mission to improve upon the lives of people globally.

<https://chihuahuansc.nmsu.edu/>

MISSION

New Mexico State University operates the Chihuahuan Desert Rangeland Research Center (CDRRC) is to protect and ensure the availability of its resources for teaching, research, and extension endeavors that benefit the citizens of New Mexico as originally declared by Congress in 1927. The CDRRC conducts educational, demonstrative, and experimental development with livestock, grazing methods, and range forage, including investigation of the sustainability and management of natural resources and environmental ecosystems.

NMSU Agricultural Experiment Stations



★ Station Locations

Notice to Users of This Report

This report has been prepared to aid Science Center staff in analyzing the results of the various research projects from the past year and to record data for future reference. These are not formal Agricultural Experiment Station Report research results. The reader is cautioned against drawing conclusions or making recommendations as a result of the data in this report. In many instances, data represents only one of several years' results that will ultimately constitute the final formal report. Although staff members have made every effort to check the accuracy of the data presented, this report was not prepared as a formal release. None of the data is authorized for release or publication without the written prior approval of the New Mexico Agricultural Experiment Station.

Any reference in this report to any person, or organization, or activities, products, or services related to such person or organization, is solely for informational purposes and does not constitute or imply the endorsement or recommendation of New Mexico State University, or any of its employees or contractors. NMSU is dedicated to providing equal opportunities in areas of employment and academics without regard to age, ancestry, color, disability, gender identity, genetic information, national origin, race, religion, serious medical condition, sex, sexual orientation, spousal affiliation, or protected veteran status as outlined in federal and state anti-discrimination statutes. The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico. ACES academic programs help students discover new knowledge and become leaders in environmental stewardship, food and fiber production, water use and conservation, and improving the health of all New Mexicans. The College's research and extension outreach arms reach every county in the state and provide research-based knowledge and programs to improve the lives of all New Mexicans.

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Meeting the Needs of New Mexico

The Agricultural Experiment Station (AES) system is the research arm of New Mexico State University's (NMSU) College of Agricultural, Consumer, and Environmental Sciences (ACES), consisting of scientists on the main campus and at agricultural science centers (ASCs) throughout New Mexico. The 12 ASCs support fundamental and applied research under New Mexico's varied environmental conditions to meet the agricultural and natural resource management needs of communities in every part of the state. ASCs consist of two types: 1) facilities without resident faculty, which serve as research support field laboratories for campus-based faculty, and 2) off-campus facilities with faculty stationed at the centers that also serve, in part, as research support field laboratories for campus-based faculty.

Teachers, researchers, and students from across campus benefit from the center. The Department of Animal and Range Sciences oversees the facility with help from a steering committee of scientists from the College of Agriculture and Home Economics and the College of Arts and Sciences. The center is part of the Jornada Basin Long-Term Ecological Research project -- a National Science Foundation Ecology Network. Current research efforts include:

- Evaluating continuous and seasonal grazing strategies at different intensities to determine effects on livestock performance as well as plant cover and composition.
- Evaluating performance of breeds of cattle concerning quality and quantity of forage in a hot, arid environment.
- Determining the influence of range conditions on wildlife populations.
- Autecology of plant species.
- Assessing competition and other interactions between common plant species.
- Ascertaining the role of small herbivores in a desert environment.

In addition to research conducted by the Department of Animal and Range Sciences, faculty and graduate students from other NMSU departments are conducting research at the Center. Currently, much of the research is in conjunction with the Long-Term Ecological Research program, which is part of a nationwide program funded by the National Science Foundation. The CDRRC is used for teaching, demonstration, and research projects with livestock, grazing methods, and range forage, including investigations into the sustainability and management of natural resources and environmental ecosystems. Due to its location and isolation, the CDRRC also is used by researchers from NMSU's Physical Science Laboratory (PSL), the U.S. Department of Defense, and private corporations for testing drones, telemetry, and radio interference.

Executive Summary

The Chihuahuan Desert Rangeland Research Center (CDRRC) is in Doña Ana County, New Mexico, at the southern end of the Jornada Plain. Now divided by Interstate 25, the Center encompasses almost 100 square miles, with one-fourth of the land west of the Interstate. Land on the Center varies widely, with elevations from 4,000 ft. on the Rio Grande flood plain on the west side to 5,840 ft. at the top of Summerford Mountain in the Doña Ana Mountains on the east side. The nearly level plains of the north and central parts of the Center are on the Jornada del Muerto basin, with several small playa areas where water collects after rainfall. Soils range from sandy loams to clays overlying caliche hardpan.

Several vegetation types occur at the center. Creosote bush dominates the upper slopes of the mountains and the hills along the river. At lower elevations, the creosote bush type grades into the mesquite type that grows on sandier soils, and into the tarbush type on heavier soils. The plains area, once dominated by black grama, today has been invaded by mesquite. These mesquite stands are interspersed with snakeweed and many species of grasses and forbs.

Wildlife populations on the Center are rich and varied. Among the larger mammals are mule deer, pronghorn antelope, gemsbok, bobcat, coyote, badger, and fox. Mountain lions have been sighted. There are also many rabbit and rodent species. Several bird species migrate throughout the area, but a large number also live and nest on the rangeland. Species such as roadrunners, hawks, and occasionally golden eagles are seen on the Center. Many lizard and snake species also inhabit these lands.

Although the COVID-19 pandemic restricted general access and activities on the CDRRC during 2020, 2021 saw an increase in approved research that was conducted on CDRRC lands. This included rangeland cattle grazing studies and plant ecosystem restoration studies. Additionally, approved LTER-associated research continued at the base of Mt. Summerford, continuing long-term ecosystem studies, some of more than 30 years' duration. The LTER research was conducted by members of various NMSU departments and researchers from such other institutions as the University of New Mexico. The CDRRC also collaborated with research studies being conducted at the Corona Range and Livestock Research Center and the Clayton Livestock Research Center.

2021

RESEARCH RESULTS

ECOLOGY AND MANAGEMENT OF THE INVASIVE SPECIES LEHMANN LOVEGRASS

Investigator(s): Erik Lehnhoff

OVERVIEW

Herbicide was applied in 2017 and 2018 to evaluate lovegrass control and beneficial impact on native black grama. Also the interactions of lovegrass and black grama are being evaluated under experimentally induced drought conditions. Soil microbial community composition of rhizosphere and bulk soil from lovegrass and black grama are being investigated. Nematode diversity associated with black grama and lovegrass is being assessed.

NM PROBLEM ADDRESSED BY RESEARCH

Lehmann lovegrass is invasive in the southwestern USA. It can outcompete native grasses, reducing forage value of rangelands. It also has the potential increase fire frequency across desert rangelands.

RESEARCH IMPACTS

Research will potentially elucidate methods to manage lovegrass while not damaging desirable native species. Studies on below ground properties such as associations with beneficial and pathogenic microbes are explored. Also, a new species of nematode has been discovered associated with lovegrass.

NOVEL STRATEGIES TO INCREASE SUSTAINABILITY OF BEEF PRODUCTION SYSTEMS IN THE WESTERN UNITED STATES

Investigators: Glenn Duff, Santiago Utsumi, Sheri Spiegel, et al.

Sustainable Southwest Beef Coordinated Agricultural Project

OVERVIEW

The Southwest Beef CAP is a collaboration of researchers, extension specialists, and K-12 educators who are evaluating the sustainability outcomes of three strategies hypothesized to improve sustainability of beef production originating on ranches of the US Southwest: heritage cattle genetics, precision ranching, and alternative finishing options. The CDRRC is one of three partnering ranches producing study cattle on rangeland to be finished on grain in the Southern Plains, and piloting the precision ranching system.

NM PROBLEM ADDRESSED BY RESEARCH

For ranchers: Increasing impacts of climate change, vegetation regime shifts from grassland to shrubland, increasing input costs. For consumers: desire to purchase beef that is environmentally friendly. For communities dependent on rangelands: erosion of social networks with rancher / ranch family turnover or development of ranches to more intensive uses.

RESEARCH IMPACTS

- Improved knowledge of the performance of the three strategies with respect to sustainability goals in five domains (environment, productivity, economics, human condition, social) (*actual*)
- Informed policies regarding heritage breeds and precision system usage on public lands (*potential*)
- Shifts in consumer choice (*potential*)

RESTORENET

Investigator(s): Akasha Faist

OVERVIEW

In the summer of 2020 two field sites at the CDRRC were installed as part of a broader network of Ecological restoration treatments. RestoreNet is an multi-site and multi-institution project that spans the US southwest, our CDRRC sites are the Chihuahuan desert representatives.

NM PROBLEM ADDRESSED BY RESEARCH

Restoration success is often variable in dryland systems. RestoreNet is a distributed field trial network that assesses best restoration practices across the US Southwest.

RESEARCH IMPACTS

Potential impacts will include improved soil health and plant production of desirable grasses across the US southwest. This could have strong economic impacts if certain applications are more successful than others as they can be applied at broad scales across different ecosystems both within and outside of New Mexico.

JORNADA COLLABORATIONS

The following projects are collaborative efforts between the Chihuahuan Desert Rangeland Research Center and the LTER Jornada Range.

Project Investigator	Title
John Anderson	NPP GRG precipitation
Dave Lightfoot	Grasshopper flush quadrats at NPP sites (LTER II)
Deb Peters	LTER II plant net primary production in 5 dominant vegetation zones at 15 sites
Enrique Vivoni	LTER-I Transects soil water content measurements
Enrique Vivoni	LTER II soil water content - NPP sites
Brandon Bestelmeyer	Jornada Small Mammal Exclosure Study
John Anderson	LTER-I transect vegetation plant line intercept study
John Anderson	LTER-I fenceline vegetation plant line intercept study
Bob Schooley	Lagomorph demography: Rabbit survey
John Anderson	Jornada LTER Weather Station
John Anderson	Jornada LTER evaporation pan data
John Anderson	Wetfall and Dryfall deposition chemistry data
John Anderson	Upper Trailer tipping bucket rain gauge (TBRG) data
Greg Okin	Particle deposition at Jornada NPP sites and the Geomet site using Atmospheric Dust Collector
Erica Rosenblum	Convergent Evolution And Divergent Selection: A Comparative Study Of Lizard Coloration In Southern New Mexico
Brandon Bestelmeyer/Bob Schooley	[Ecotone small mammal study] Demography, Resource use and Genetic Structure of a Small Mammal Population in the Chihuahuan Desert: Feedbacks Between Rodents and the Dynamics of Grassland-Shrubland Ecotones
John Anderson	Tipping bucket rain gauge precipitation - NPP sites
Dawn Browning	Perennial Plant Phenology on NPP Sites
Greg Okin	BSNE dust collection at NPP, JER Pasture 13, Geomet sites
John Anderson	Annual photos of LTER-II NPP plots
Ashley Asmus	Nutrient Network (NutNet) at 3 NPP grassland sites
John Anderson	NPP site instrumentation on a wireless network
Bob Schooley	Camera trapping of mammals and line-point-intercept (LPI) methods to measure vegetation cover on Ecotone Study
Enrique Vivoni	Instrumentation of 18 playas to monitor water depth during flooding events
Nicole Pietrasiak	Application of an Area-Based Quality Index (ABQI) to Assess and Manage Biological Soil Crusts in the Hot Deserts of the Western U.S.
Erik Lehnhoff	Biotic and abiotic drivers of Lehmann lovegrass invasion
Curtis Monger	CO2 fluctuations in a desert soil at Study 011 C-SAND site
Erik Lehnhoff	Factors influencing the spread of Lehmann lovegrass and its impacts at the Jornada Experimental Range: Control and restoration
John Anderson	LTER Standalone Tipping Bucket Rain Gauges (TBRG) at former Biodiversity Study
	Revision of soil map for Jornada Basin
John Anderson	Jornada LTER plant species list
Niall Hanan	Understanding shrub encroachment and shrub species distributions across the Jornada Basin: Quantifying the underlying demographic processes
Akasha Faist	RestoreNet: Distributed Field Trial Network for Dryland Restoration- Chihuahuan Desert
Scott Ferrenberg	Dryland shrub demography in response to climate and pollinator activity
Scott Ferrenberg	Disentangling the role of nurse plants in structuring microbial and vegetation communities in drylands

Outreach/ Community Engagement

- 2021 CDRRC Field Day
- RGSC 452 -Vegetation Measurements and Assessment lab
- RGSC 460 Advanced Rangeland Management and Planning lab

Faculty and Staff



Dave Lowry
Superintendent



Andrew Cox
Ranch Manager

Cooperators/Collaborators

Agricultural Science Centers

1. Clayton Livestock Research Center
2. Rex E Kirksey Agricultural Science Center

Institutions

1. Jornada Long Term Ecological Research
2. USDA-ARS Jornada Experimental Range
3. Texas A&M University
4. Asombro Institute for Science Education
5. BlueSTEM AgriLearning Center
6. Kansas State University

*Not reflective of all collaborating institutions.

Extension

1. Extension Animal Sciences and Natural Resources

Other Partners

1. Jacki Beacham
2. Paul De Ley
3. Nicole Pietrasiak
4. Evergreen Livestock & Ranching (S Dakota, Arizona, Mexico)
5. TNC Dugout Ranch (Utah)
6. Rancho Corta Madera (California)
7. Hartzog Angus
8. Walker Angus
9. Cornerstone Ranch
10. TFET LLC

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