2022

ANNUAL REPORT

CORONA RANGE AND LIVESTOCK RESEARCH CENTER

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

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This report has been prepared to aid Science Center staff in analyzing the results of 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.

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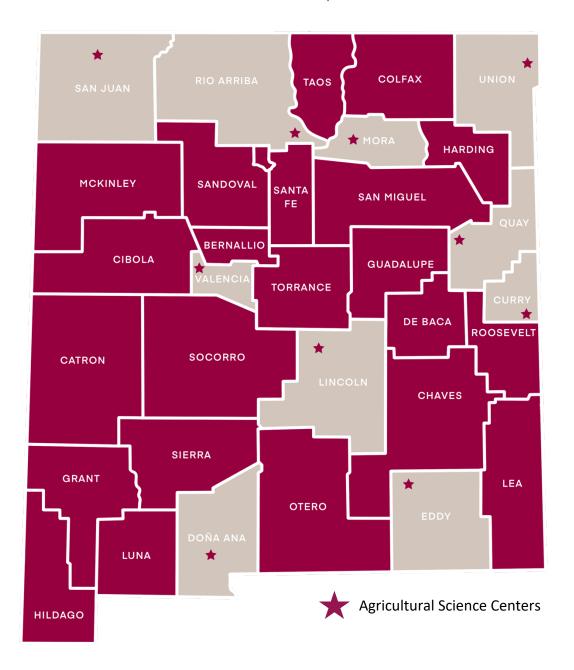# Agricultural Science Center Locations Map

★ Agricultural Science Centers

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Executive Summary

The Corona Range and Livestock Research Center substantially increased its active role in grant proposal development. Particularly in the area of greenhouse gas and carbon management. These are new areas of work for the center that show promise for future research opportunities. Likewise, the center continues to support a strong nutrition, reproduction, and health research program but this year it has expanded its research portfolio with wildlife and range monitoring research. It is exciting to have a wide variety of faculty and students utilize the vast natural resources of the CRLRC. The center was involved in targeted outreach events to producers looking to advance their use of technology for management and reproduction. Corona was highly involved in the development of the public/private partnership developed between NMSU/ACES and ReproLogix. The success of this partnership, in the first year, was due to the outreach work conducted by the CRLRC and associated faculty and their connections with producers interested in advanced reproductive technologies.

Research Projects

Effects of simulated browsing on soil-plant water dynamics in relation to sapling size and density - Investigators: Y. Almalki, A. Fernald (PI), A. Cibils

Influence of a lifetime regimen of a modified-live viral or killed viral vaccine against bovine viral diarrhea virus on beef cattle performance - Investigators: Emily Melchior (Doctoral Student), John Wenzel, Shad Cox, Richard Dunlap, John Wenzel, Shanna Ivey, and Eric Scholljegerdes

Influence of arthropod and habitat characteristics on foraging site selection of pinyon jays in southern New Mexico - Investigators: Bianca Sicich, Martha Desmond (PI), and Fitsum Abadi

The influence of Synovex-C growth implants at weaning with different supplementation levels on performance and ovarian parameters in developing beef heifers - Investigators: T. N. Andrews, R. A. Cushman, A. P. Snider, G.A. Perry, S. H. Cox, R. L. Dunlap, C. Anderson, M. K. Chavez, K. L. Gallacher, E. A. Melchior-Tiffany, A. B. Selman, E. J. Scholljegerdes, and A. F. Summers

NMSU carbon management and soil health initiative at Corona - Investigators: Lara Prihodko, Shad Cox, Hatim Geli, Niall Hanan, Sam Smallidge, Casey Spackman. Rajan Ghimire[1]

Evaluation of high-resolution commercial satellite data for rangeland vegetation assessments – Investigators: Robert Wojcikiewicz (PES, NMSU), Niall Hanan (PES, NMSU), Julius Anchang (PES, NMSU), Brian Skow (Riverside Research)

Effects of simulated browsing on soil-plant water dynamics in relation to sapling size and density

Investigators: Y. Almalki, A. Fernald (PI) (afernald@nmsu.edu), A. Cibils

Project Overview: One-seed juniper dominates a large area of land in NM. The previous research on the NMSU Corona Ranch on controlling one-seed juniper reinvasion using small ruminants showed long lasting growth suppression effects. This project is evaluating the influence of simulated browsing of one seed juniper on plant and soil water dynamics. Specifically, this research determines if simulated browsing treatments free up superficial soil moisture for understory vegetation growth during two monsoon seasons.

Meeting the Needs of New Mexico: Encroachment of one seed juniper generally results in relative decreases in herbage and grass cover. Accordingly, it has become a management challenge for ranchers and land managers.

Impact: Frequent simulated browsing showed effective increases in available soil water under the saplings in the first year (wet season), but it did not in the second year (dry season). This research will produce the information needed for the NMSU Brush and Weeds Management Program on the effectiveness of targeted grazing prescriptions. In turn, this will improve management decisions and strategies by selecting the appropriate tools for controlling one-seed juniper.

Influence of a lifetime regimen of a modified-live viral or killed viral vaccine against bovine viral diarrhea virus on beef cattle performance

Investigators: Emily Melchior (Doctoral Student), John Wenzel, Shad Cox, Richard Dunlap, John Wenzel, Shanna Ivey, and Eric Scholljegerdes (ejs@nmsu.edu)

Project Overview: Bovine viral diarrhea virus (BVDV) is a major viral pathogen affecting the cattle industry. Control of BVDV occurs through preventative vaccination or elimination of persistently infected animals. However, an evaluation of the longevity of cows vaccinated during pregnancy and the health of their offspring has not been conducted. Vaccination treatment had little influence on the calf's ability to mount an immune response. These four studies indicate that both KV and MLV vaccination programs can be used to protect against BVDV without negatively impacting cow longevity, calf growth performance, and calf immunocompetence.

Meeting the Needs of New Mexicans: This series of experiments is important to New Mexico beef producers because it provides needed information regarding vaccine options for beef cows and provides assurance that calf performance will not be negatively impacted by the choice of a vaccine.

Impact: This research will assist producers in making health management decisions for their beef herd. Properly developed health management protocols that include vaccination against Bovine Viral Diarrhea Virus, which costs the beef industry over $1.5 billion per year.

Influence of Arthropod and habitat characteristics on foraging site selection of pinyon jays in Southern New Mexico

Investigators: Bianca Sicich, Martha Desmond (PI, email: mdesmond@nmsu.edu), Fitsum Abadi

Project Overview: The pinyon jay (Gymnorhinus cyanocephalus) is a main disperser of pinyon pine (Pinus edulis) seeds in the western United States. According to Breeding Bird Survey data, their populations have declined by 83.5% since 1967. The reasons for declines are not completely understood given the paucity of published research on pinyon jays. Current research has focused on breeding habitat preferences with little emphasis on factors such as foraging, roosting, and caching. This study focused on factors that may influence pinyon jay foraging habitat selection. Three pinyon jay flocks in Lincoln and Torrance Counties, NM were observed at 126 foraging locations in 2021 and 2022. Arthropod data were collected via sweep and beat netting at these locations and 126 paired random locations. Habitat data were collected using line-point intercept and Robel pole methods.

Meeting the Needs of New Mexico: This project benefits New Mexico citizens because it aims to protect an endemic western bird species that is also crucial to the pinyon-juniper habitat. The pinyon jay is a well-known species of the pinyon-juniper landscape, and it is loved by birders and non-birders alike. This species is the main long-distance disperser of pinyon pine nuts, an economically and environmentally important tree in New Mexico. By contributing to the research gaps in pinyon jay conservation, this project will help ensure this species can be enjoyed by all generations to come.

Impact: This project will add to the current knowledge of pinyon jay habitat preferences and needs. This is an understudied, threatened species that are facing quick population declines, so this research must be done now. The health of pinyon jay populations reflects the health of pinyon-juniper habitats as well, and efforts to protect the jays will translate into an overall improvement in this ecologically, economically, and aesthetically important habitat.

The influence of Synovex-C growth implants at weaning with different supplementation levels on performance and ovarian parameters in developing beef heifers

Investigators: T. N. Andrews[1], R. A. Cushman[2], A. P. Snider[2], G.A. Perry[3], S. H. Cox[4], R. L. Dunlap[4], C. Anderson[1], M. K. Chavez[1], K. L. Gallacher[1], E. A. Melchior-Tiffany[1], A. B. Selman[1], E. J. Scholljegerdes[1], and A. F. Summers[1]

[1]Department of Animal and Range Sciences, New Mexico State University, Las Cruces, NM
[2]USDA-ARS, Meat Animal Research Center, Clay Center, NE
[3]Texas A&M AgriLife Research, Overton, TX
[4]Corona Range and Livestock Research Center, New Mexico State University, Corona, NM

Project Overview: At two months of age seventeen heifers were administered a Synovex- C implant. At weaning, heifers were assigned to receive one of two levels of supplementation (High or Low) and half of the heifers were administered a second Synovex-C implant (No Implant or Implant), thereby creating four treatment groups: High Implant, High No Implant, Low Implant, and Low No Implant. The supplementation period lasted for 26 weeks and High and Low heifers were offered 4.54 kg/h/d and 2.72 kg/h/d, respectively, of 20% CP cube in the first 4 weeks. After acclimation, High and Low heifers were offered 2.95 kg/h/d and 1.59 kg/h/d, respectively, of 32% CP cube. At the end of the supplementation period, heifers underwent bilateral ovariectomies.

Meeting the needs of NM: Heifers are developed on native rangelands typically in New Mexico, however during the winter months the forage becomes dormant and lacks the nutritional requirements of the heifers. Due to the reduced nutrient content of the forage, heifers may struggle to attain 50% of their mature body weight which is necessary for puberty attainment. The use of growth implants will help heifers achieve 50% of their mature body weight and attain puberty. This project will better help develop heifers on native rangelands for NM stakeholders.

Impact: Based on the experiments being conducted growth implants improve heifer bodyweights, therefore helping heifers reach 50% of their mature body weight and attain puberty. Reports on the impact of growth implants on heifer pregnancy rate have varied, thereby we are currently investigating the effect of growth implants on the ovary.

NMSU Carbon Management and Soil Health Initiative at Corona

Investigators: Lara Prihodko, Shad Cox, Hatim Geli, Niall Hanan, Sam Smallidge, Casey Spackman. Rajan Ghimire[1] (rghimire@nmsu.edu)

[1] R. Ghimire is the PI of the full project "Improving Climate Resilience Through Carbon Management and Soil Health Research, Outreach, and Education Activities"

Project Overview: The Corona Rangeland and Livestock Research Center (CRLRC) is one of four living laboratories being developed in the NMSU AES system to examine Carbon sequestration approaches for arid and semi-arid lands. At the CRLRC, researchers are installing a carbon monitoring system that will include multiple flux measurement systems (carbon, water, energy) with complimentary field measurement programs to develop a baseline understanding of carbon, water, and energy fluxes on working rangelands and evaluate management impacts on carbon sequestration potential. Data will be integrated and support research in the assessment and development of rangeland management compatible with C sequestration goals.

Meeting the Needs of New Mexico: New Mexico's rangelands cover approximately 90% of New Mexico's land area and significantly contribute to the state's economy and the livelihoods of New Mexicans through livestock production and the provision of ecosystem services. Management efforts focused on rangeland health (soils and vegetation) can play an important role in C sequestration in arid and semi-arid systems while supporting the economic productivity of these working lands. A better understanding of the potential for rangeland C sequestration in New Mexico is needed to understand their current and future contribution to the producer, land manager, and statewide environmental and economic targets.

Anticipated Impact(s): Developing a baseline understanding of carbon, energy, and water fluxes on working rangelands in New Mexico will provide information to ranchers and land managers on the current status and potential for carbon sequestration under different management scenarios. Collaborating Agricultural Science Centers (if applicable): Clovis, Los Lunas, Mora

Evaluation of high-resolution commercial satellite data for rangeland vegetation assessments

Investigators: Robert Wojcikiewicz (PES, NMSU), Niall Hanan (PES, NMSU), Julius Anchang (PES, NMSU), Brian Skow (Riverside Research)

Project Overview: NASA requested the investigators on this project evaluate commercial very high-resolution satellite imagery (Blacksky imagery @ ~1 m pixel resolution) for terrestrial ecosystem studies. This evaluation includes an assessment of Blacksky for retrievals of woody vegetation parameters, including identification of individual woody plants and landscape scale cover, tree heights, and tree canopy sizes, using independent data available in Sahelian West Africa (Senegal) and at the NMSU Corona Ranch. At Corona ASC the project focuses on mapping woody plants in low density-low stature drylands, where detection/delineation of individual canopies and heights is critical.

Objectives include: (1) Assessing BlackSky **image accessibility and usability** for terrestrial EO applications; (2) Evaluating **BlackSky archive data** for mapping individual tree/shrub crowns and woody canopy cover in drylands, and (3) Evaluating **BlackSky tasking** capabilities for 3-D retrievals of vegetation structure (crown areas and tree heights).
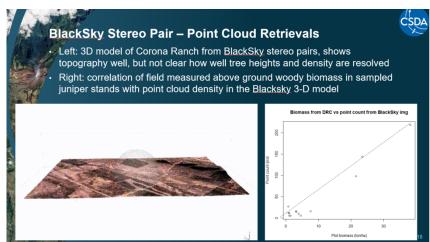

Figure 1: Dryland vegetation monitoring over the Corona Ranch using commercial satellite imagery (BlackSky)

Meeting the Needs of New Mexico: Enhancing the ability to monitor dryland vegetation structure has been particularly challenging before the recent emergence of commercial very high-resolution satellite imagery. This project is developing and demonstrating new approaches to vegetation 3-D structural retrievals that will contribute to the sustainable management of rangelands in New Mexico and global drylands, providing opportunities for farmers and ranchers to manage land for improved productivity and carbon sequestration.

Impact: We measured a sample of juniper plots using historical allometric relationships (Cibils et al.) to estimate above-ground woody biomass. We flew UAS imagery of the field plots to provide 3-dimensional canopy data for comparison to stereo-retrievals from Blacksky images. We compared field and UAS results to the BlackSky satellite imagery of the juniper stands. Improved high-resolution understanding of vegetation structure (cover/crown areas, height distributions) is critical for our understanding of terrestrial ecology, biodiversity, and function in global carbon, energy, water, and climate systems. With the results from this project, we were able to demonstrate Blacksky image capabilities for dryland vegetation monitoring, including an emerging potential for 3-D stereo retrievals correlated with above-ground carbon stocks.

Grants and Contracts

- Where's the Bovidae? Enhancing New Mexico's Animal Disease Traceability Capacity. Co-Principal Investigator. 2022. National Animal Disease Preparedness Response Program (NADPRP). $687,043 (In Review)
- USDA – NRCS – Climate Smart Commodities. 2022. Implementation of innovative climate-smart beef production practices in southwestern U.S. Co-PI ($4,929,484, not funded)
- Greener Cattle Initiative. 2022. Precision beef cattle management for the mitigation of greenhouse gases. PI ($461,706.00, not funded).
- USDA Farm of the Future. 2022. "Using innovative technologies to tackle carbon-food-energy-water challenges on farms and ranches: The New Mexico FOTF Testbed. Co-PI ($301,349 of a total budget of $1,500,000, not funded)
- Zoetis, $25,000 gift to support Cow Vaccine study.

Research Publications

- Rosasco, S. L., E. A. Melchior-Tiffany, C. J. Kassetas, S. H. Cox, R. L. Dunlap, J. A. Hernandez-Gifford, E. J. Scholljegerdes, R. A. Cushman, and A. F. Summers. 2022. Effects of administration of a growth promoting implant during the suckling phase or at weaning on growth, reproduction, and ovarian development in replacement heifers grazing native range. J. Anim. Sci. 100:1-11. doi:10.1093/jas/skac170
- COLLABORATIVE WITH TUCUMCARI AES: Lauriault, Leonard M., Mark A Marsalis, Shad H. Cox, and Glenn C. Duff. Seasonal mass, performance under grazing, and animal preference for irrigated winter cereal forages under continuous stocking in a semiarid, subtropical region. 2022. Grasses 1,1-11. https://doi.org/10.3390/grasses1010001
- COLLABORATION WITH TUCUMCARI AES: Lauriault, L., M., L. H. Schmitz, S. H. Cox, G. C. Duff, and E. J. Scholljegerdes. 2022. A comparison of native grass and triticale pastures during late winter for growing cattle in semiarid, subtropical regions. Agronomy 12:545-5560. doi:10.3390/agromony12030545
- Melchior, E. A. Influence of a lifetime regimen of a modified-live viral or killed viral vaccine against bovine viral diarrhea virus on beef cattle performance. 2022. New Mexico State University, Doctoral Dissertation.
- Emily Melchior, Collin Anderson, Shad Cox, Shanna Lodge Ivey, John Wenzel, and Eric Scholljegerdes. 2022. Evaluation of immune performance of calves born to cows vaccinated with a lifetime regimen of a modified-live or killed viral vaccine when challenged with bovine viral diarrhea virus. J. Anim. Sci. 100 (Suppl. 3): 1.
- Andrews, T.N., R.A. Cushman, A.P. Snider, S.H. Cox, R.L. Dunlap, C. Anderson, M.K. Chavez, K.L. Gallacher, E.A. Melchior-Tiffany, E.J. Scholljegerdes, and A.F. Summers. 2022. The influence of Synovex-C growth implants at weaning with different supplementation levels on growth performance and antral follicle counts in developing beef heifers. J.Anim. Sci. (in press)

Cooperators and Collaborators

NMSU Affiliated
- Dr. Eric Scholljegerdes, NMSU, ANRS
- Dr. Adam Summers, NMSU, ANRS
- Dr. Craig Gifford, NMSU, EASNR
- Dr. Marcy Ward, NMSU, EASNR
- Dr. Casey Spackman, NMSU, EASNR
- Dr. Glenn Duff, NMSU, ANRS
- Dr. Martha Desmond, NMSU, FWCE
- Dr. Sam Fernald, NMSU, ANRS/WRRI
- Dr. Lara Prihodko, NMSU ANRS/ACES-AES
- Dr. Niall Hanan, NMSU, PES
- Dr. Ryan Ashley, NMSU, ANRS
- Dr. John Campbell, NMSU, ANRS
- Dr. Jack Thomas, NMSU, ANRS
- Dr. John Wenzel, NMSU, ANRS
- Dr. Shanna Ivey, NMSU, ANRS
- Dr. Clint Loest, NMSU, ANRS
- Dr. Frannie Miller, NMSU, AgEcon
- Dr. Chris Allison, NMSU, EASNR
- Dr. Paul Gutierrez, NMSU, CES/Ag Econ
- Dr. Theresa Laverty, NMSU FWCE

Other University/State/Federal and Tribal
- Dr. Bruce Carpenter, TAMU, AgriLife-Extension
- Dr. Robert Cushman, USDA-ARS, Meat Animal Research Center
- Dr. Dean Fish, Santa Fe Ranch Foundation
- Danica Cooke, Wildlife Biologist BLM

Industry
- Dr. JP Pollreisz, Zoetis
- Dr. Gary Sides, Zoetis
- Dr. Clay Burson, Purina
- Dr. Jason Russell, Zinpro
- Kevin Millner, Zoetis
- Daniel Ceballios, Zoetis
- Jason and Katy McDonald, Fess Parker Cattle Co.
- Leanne Sanders, IMI Global
- Dina Chacon-Rietzel, New Mexico Beef Council
- Dr. Jennifer Frey, NMSU FWCE
- Judy Bock Upper Hondo SWCD (District)

Outreach Activities

- Staff at the CRLRC also raise and market show goats for state and regional youth. These purpose-bred animals are raised solely for youth stock showers to provide them with an affordable high-quality animal to start their show career.
- Personnel from CRLRC sponsored and manned a booth at the National Cattlemen's Beef Association annual meeting and NM Joint Stockman's. Likewise, Superintendent and Ranch manager held integral roles at the NM Wool Show and Eastern NM State Fair
- United States Beef Academy. Program sponsored by NMSU Department of Animal and Range Sciences, NMSU Cooperative Extension, Zoetis, Purina, Zinpro, IMI Global, Texas A&M, and the University of Tennessee. Directed by Drs. John Wenzel, Eric Scholljegerdes, Adam Summers, Craig Gifford, Marcy Ward, and Shad Cox. The project is held at the Corona Range and Livestock Research Center. 25 Attendees. May 15 through 21, 2022.
- Technology for Ranch Management. Program sponsored by Cooperative Extension, Sustainable Southwest Beef, and Corona Range and Livestock Research Center. Directed by Dr. Craig Gifford. 30 Attendees. October 21, 2022
- Sheep and Goat reproductive technologies. Program sponsored by the Department of Animal and Range Sciences, ReproLogix, and Corona Range and Livestock Research Center. Directed by Dr. Adam Summers and Shad Cox. 15 Attendees. November 17, 2022.

Advisory Committee

- Barbara Sultemeier – Chair
- Dr. James Miller
- Scott Shaefer
- Tom Perkins
- Tony Johnson
- Kyle Traylor
- Kendall Wilson

Personnel

- Shad Cox, Superintendent Corona Range, and Livestock Research Center
- Richard Dunlap, Ranch Manager
- Eric Scholljegerdes, Professor, Animal and Range Sciences, Research Coordinator, Chair of steering committee
- Vacant, Assistant Ranch Manager