



**College of Agricultural, Consumer
and Environmental Sciences**
New Mexico State University



2022 Annual Report



BE BOLD. Shape the Future.
**College of Agricultural, Consumer
and Environmental Sciences**



Preamble



The College of Agricultural, Consumer, and Environmental Sciences (ACES) annual report provides an overview of accomplishments during 2022, including impacts, productivity and goals for each unit, area and program. These accomplishments reflect our work in teaching, research and extension. I would like to thank the ACES staff, faculty and students for their efforts this year and their ongoing teamwork in achieving objectives for the College of ACES. It is our college's pride, honor, and commitment to serve all New Mexicans and to preserve, maintain, and make progress as the land grant institution of our beloved state.

Rolando A. Flores Galarza
Dean and Chief Administrative Officer
College of Agricultural, Consumer
and Environmental Sciences
New Mexico State University

Special Thanks

We gratefully acknowledge the combined efforts of the College of ACES, faculty, staff and students, as well as the 2022 ACES Annual Report Committee, including: Laura Bittner, Efren Delgado, Shelby Herrera, Julie Hughes, Marcus Krohn, Heber Lara, Jay Lillywhite, Karim Martinez, Claire Montoya, Amy Muise, Karlei Olivarez, Yesenia Palma, Manoj Shukla, LaJoy Spears, and Claudia Trueblood

Table of Contents

| | |
|---|-----------|
| ACES Mission | 3 |
| Executive Summary..... | 4 |
| 2022 ACES Awards..... | 5 |
| Academic Programs/Student Services | 8 |
| Executive Summary..... | 8 |
| ACES-APO 2022 Accomplishments..... | 9 |
| Highlights..... | 11 |
| Agricultural Experiment Station | 14 |
| Executive Summary..... | 14 |
| 2022 AES Funding Sources..... | 17 |
| Special Projects Update..... | 17 |
| On-Going Sustainability Initiatives..... | 19 |
| AES Performance Metrics..... | 20 |
| Impact Highlights..... | 21 |
| Cooperative Extension Services | 27 |
| Executive Summary..... | 27 |
| Food and Fiber Production and Marketing..... | 30 |
| Water Conservation..... | 33 |
| Family Development and Health of New Mexicans..... | 35 |
| Environmental Stewardship..... | 43 |
| <i>Anna, Age Eight Institute</i> | 46 |
| Center of Excellence in Sustainable Food and Systems | 52 |
| Executive Summary..... | 52 |
| The College of ACES..... | 53 |
| 2022 Center Efforts..... | 53 |
| Outreach..... | 55 |
| CESFAS Faculty Impacts..... | 57 |
| 2023 Goals for CESFAS..... | 60 |
| Equity, Inclusion and Diversity Initiative | 61 |
| Executive Summary..... | 61 |
| Highlights from 2022..... | 62 |
| Global Initiatives Program & Aggies Go Global | 63 |
| Executive Summary..... | 63 |
| Indian Resources Development | 66 |
| Executive Summary..... | 66 |
| IRD Enhances Student Success and Social Mobility via Outreach..... | 67 |
| IRD Works Closely with Those Whom it Serves..... | 68 |
| IRD Serves as Connector and Promotor of Diversity..... | 69 |
| Ag Modernization | 72 |
| ACES Organizational Chart | 75 |

ACES Mission

The ACES College is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through research, teaching and extension.



ACES Executive Summary, 2022

This year has been a time of great progress and successful initiatives in our college. Academic Programs continued to adapt and position ACES academics for future impact and success, including recruitment and retention activities and preparing ACES graduates for success. Agricultural Experiment Station research programs addressed critical issues for New Mexico, identified by the ACES pillars: Food & Fiber Production and Marketing, Water Use and Conservation, Family Development and Health of New Mexicans, and Environmental Stewardship, pursuing research specific to each region of the state. The Cooperative Extension Service met needs around the state related to agriculture and natural resources, positive youth development, community development and the health and wellness of New Mexico families, including increased competitive funding awarded to faculty. The Anna, Age 8 institute helped build the capacity of each New Mexico county to strengthen local governmental and nongovernmental services and systems of health, safety, education, job readiness, and resilience. The Center of Excellence in Sustainable Food and Agricultural Systems continues to make great progress in supporting and enhancing post-harvest valued-added agriculture in New Mexico. Indian Resources Development worked with Tribal communities around the state to share information about educational opportunities; establish paid internship and research opportunities; and help build connections between tribes, higher education institutions and non-profits, as well as providing strategic planning and training related to workforce development. Finally, ACES Global Initiatives facilitated students' international travel, welcomed students from Mexico and hosted international conferences.

2022 ACES Awards

The ACES Awards Selection Committee voted on the 2022 faculty and staff nominations that were submitted for our distinguished awards. The award winners are listed below.

Charles Tharp Farms Distinguished Service Award

John Townsend

Fabiola Cabeza de Baca Diversity in Extension Award

Lourdes Olivas

Distinguished Cooperative Extension Agent Award

Cassandra Vanderpool

Malone Farms Distinguished Off Campus Staff Award

Edward L. Morris

Distinguished County Extension Agent Award

Boe Lopez

Mobley Family Endowed Distinguished Research Award

Jennifer H. Gifford

Distinguished Professional Staff Award-On Campus

Carlos Herrera

Team Award

Behavioral Health and Wellness

Distinguished Professional Staff Award-Off Campus

Shelly Morris

Outstanding 4-H Agent Award

Wayne Shockey

*Distinguished Teaching Award
Early Mid-Career - **Brian Schutte***

*Advanced Career - **Sergio Soto-Navarro***

HRTM Industry Leadership Award

Edward Linderman

Fabián García Founders' Award

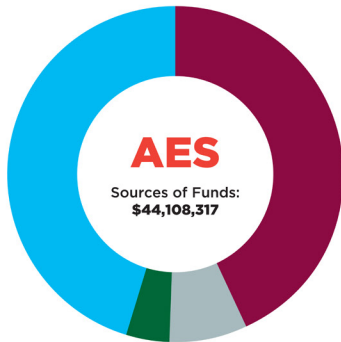
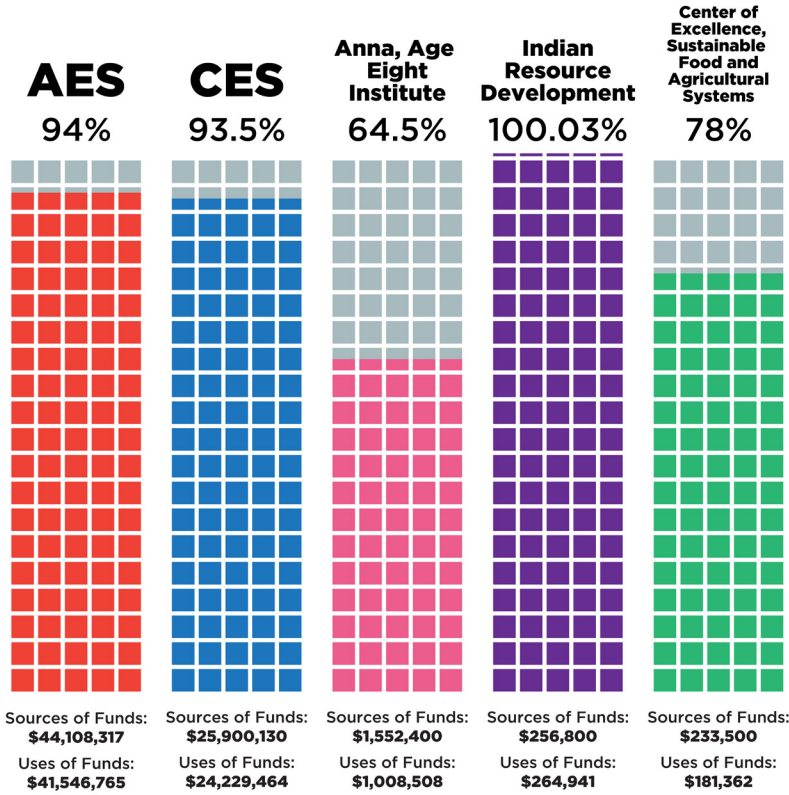
Jay Lillywhite

Outstanding Global Work Award

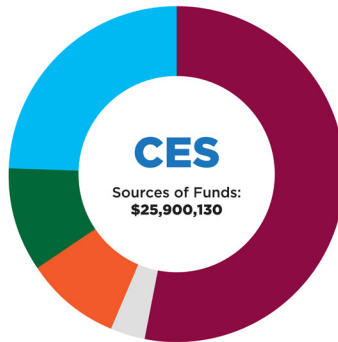
John W. Campbell

Awardees selected by the Departments:

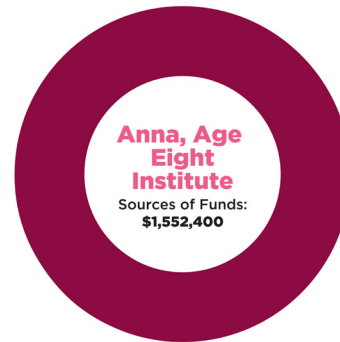
College of ACES
Report of Actuals
Las Cruces Campus FY2021-2022



- State Appropriations: \$19,083,700
- Sales and Services: \$3,300,685
- Federal Appropriations: \$1,806,294
- Grants and Contracts: \$19,917,638



- State Appropriations: \$13,750,300
- Sales and Services: \$880,931
- County Appropriations: \$2,388,455
- Federal Appropriations: \$2,579,307
- Grants and Contracts: \$6,301,137



- State Appropriations: \$1,552,400

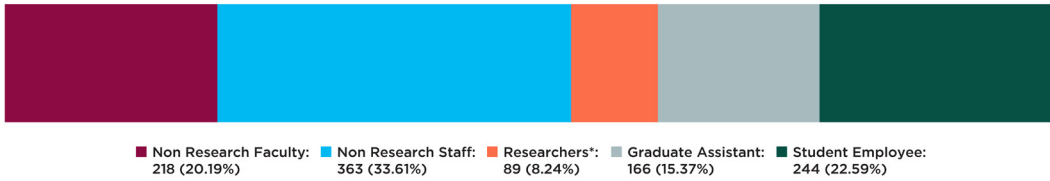


- State Appropriations: \$256,800

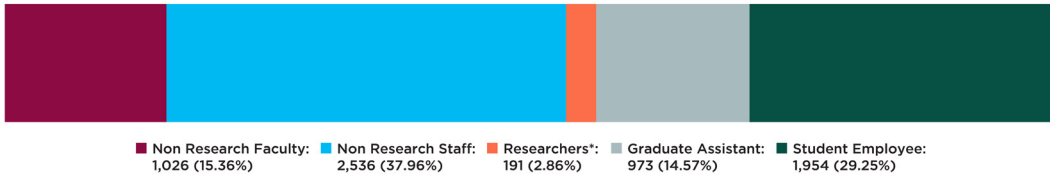


- State Appropriations: \$233,500

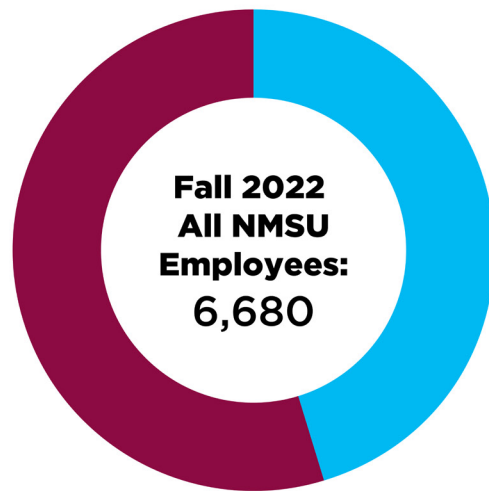
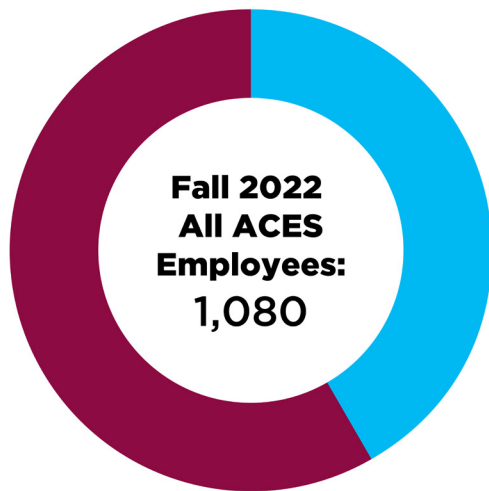
College of ACES Employee Demographics



NMSU Employee Demographics



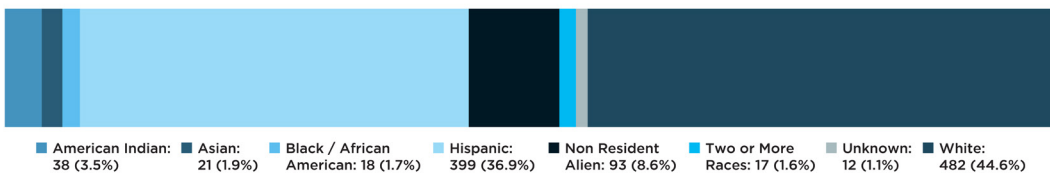
*Researchers are identified as faculty with IPEDS Primary Function of "Primary Research" or staff with a Primary Position Title indicating research.



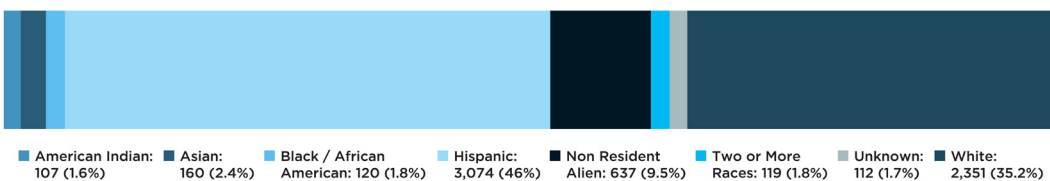
Female: 629 (58.2%)
Male: 451 (41.8%)

Female: 3,645 (54.6%)
Male: 3,035 (45.4%)

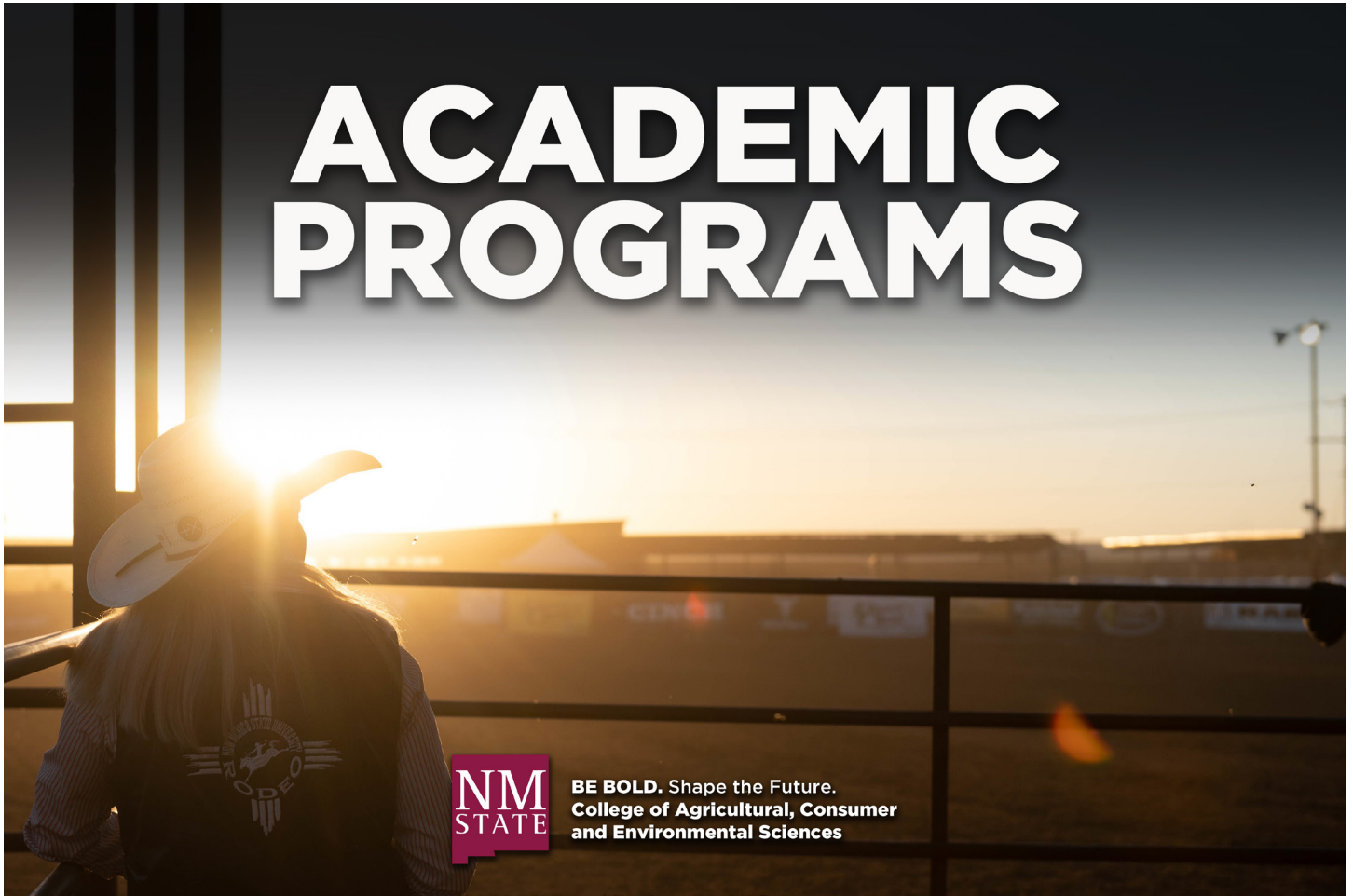
College of ACES Employee Demographics



NMSU Employee Demographics



ACADEMIC PROGRAMS



BE BOLD. Shape the Future.
**College of Agricultural, Consumer
and Environmental Sciences**

Executive Summary

In 2022, activities of the ACES Academic Programs Office (ACES-APO) continued to focus on student recruitment, retention, preparation and placement, with an emphasis on leveraging previous advancements. Definitive goals were to increase enrollment, instill an attitude of excellence in our College, strengthen stakeholder relations, and broadly promote ACES and its academic programs. This year also brought the opportunity to begin the process of taking actions to ensure the effectiveness and relevancy of ACES academics in the foreseeable future, and as such 2022 represented a tipping point in beginning to adapt and position ACES academics for future impact and success.

ACES-APO 2022 Accomplishments

Support of NMSU Strategic Goals (see also Support of EID Initiative below).

The ACES-APO directly supported Goal 1, Enhance Student Success and Social Mobility, through active student recruitment on a state, region, national and international level. Recruitment activities included a wide range of events, updating the ACES Academics homepage, utilization of the ACES Ambassadors, improving timely follow up with leads and promoting ACES student experiences. Utilizing Keystone Education Group, we enhanced the presence of ACES academic programs globally, generating more than 2,000 student leads from 138 countries.

BE BOLD. Shape the Future.
New Mexico State University

Quick Links - Type a Keyword

What interests you?

Animals Plants Food

Natural Resources Health & Well-Being Business & Industry

Education & Communication Applied Biology Agriculture

Contact Us Scholarships Student Opportunities NMSU Rodeo Team Graduate Programs Academic Departments

ACES Academic Programs Home Page

Beyond student recruitment and promotion of academics, ACES-APO worked to help students and faculty develop professionally, which also directly supported Goal 1. Expanding student success efforts (such as assigning a new instructor to the orientation/mentoring course), bringing CAASS advisors to ACES, facilitating good study habits, bringing career events to ACES, and supporting students for the AFA Leadership Conference are a few examples of student success support. In association with the ACES Fall Convocation, four faculty workshops were offered: EID, Student Accommodation, Academic Conduct, and Mental Health. During 2022, ACES-APO represented the College at many internal and external events.

ACES-APO also supported Goal 3, Amplify Extension and Outreach, via our Agricultural Education and NMSU Rodeo programs, which are housed in this office. Participation of high school students in FFA continued to grow and exceed expectations, with more than 4,300 students statewide, which is indicative of expanded offerings and impact of these youth programs. NMSU Rodeo had a successful 2022: the women's team placed first in the region, men's team placed second, and Head Coach Brice Baggarley was named Region Coach of the Year.

In support of Goal 4, Build a Robust University System, ACES-APO made improvements to student registration and audit processes, improved timeliness of scholarship awards, began an assessment of the College's academic portfolio, managed the College's promotion and tenure system/process, and supported development of the new Ag Modernization Phase 1 and 2 facilities. The ACES-APO continues to focus on providing ACES with excellent customer service, which supports a College environment in which students, faculty and staff can thrive.

Participation in Land-Grant Missions

ACES-APO partnered with CES to increase awareness of ACES academic programs across the state via newsletters, posters, postcards and personal contact. County CES offices serve as local contact points to develop student leads; thus, an ACES Ambassador was assigned as a liaison to each CES district to facilitate communication. Additionally, ACES-APO supported efforts related to the CES 4-H Aggie Next Step program. In support of the research mission, ACES-APO worked with AES regarding graduate student issues, including response to the NIFA Civil Rights audit.

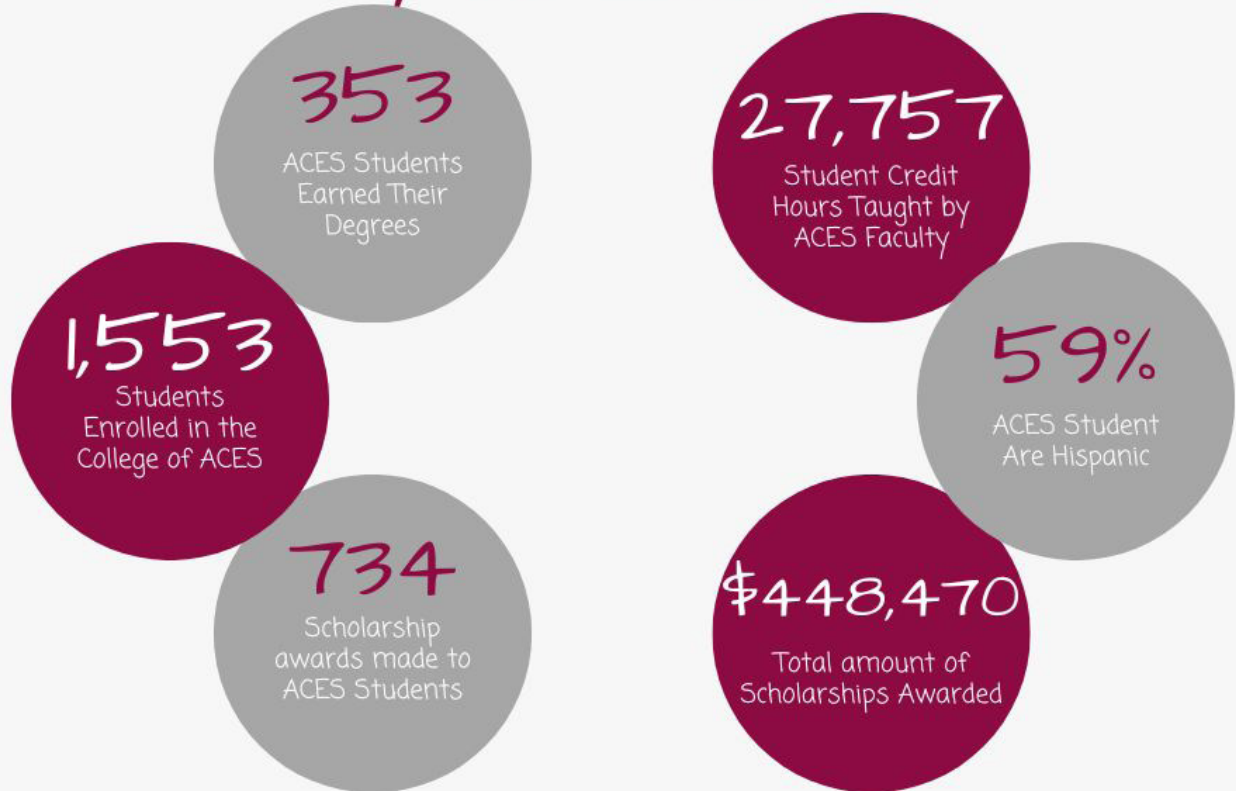
Support of ACES EID Initiative

Work continued to establish a MANRRS chapter in ACES, and a core group of students and faculty advisors have been identified. A values statement for ACES-APO was developed. A faculty workshop on DEI was offered. Imagery in GTH is being adapted to better reflect the ACES commitment to EID. ACES-APO supported response to the Civil Rights audit regarding graduate programs.

Groundwork for Change

Actions were initiated to ensure the future effectiveness and relevancy of ACES academics. Specific actions included: restructure of ACES Academic website, targeted recruiting of Mexican and other Spanish-speaking students, definition of ACES-APO's role in graduate recruiting, development of a values (EID) statement, start of a MANRRS chapter, change in welcoming (branding) ceremony, analysis of the ACES academic portfolio, alignment of ACES academics with NM economic and community needs, development of ACES career events, increased role of ACES Ambassadors in student recruitment, assignment of credit for interdisciplinary work, etc. Again, these are initial steps to modernize curricula and increase enrollment, create a positive EID climate and enhance student and faculty success. 2022 represented a tipping point in adapting ACES academics for future impact and success.

By the Numbers



Highlights

Our Departments

The Department of Animal and Range Sciences awarded over \$3,750 in scholarships in Animal and Range Sciences to FFA members who placed first or second as individuals in horse, livestock, and wool evaluation as well as veterinary science and pasture and range evaluation.

The Department of Hotel, Restaurant, and Tourism Management doubled graduate program enrollment, and the work of the Marriott Hospitality Futures Center here in the College of ACES is centered around student success and outreach, creating a 100% placement in 2022 for the HRTM internship program.

Our Students

The ACES Student Awards Committee reviews student nominations every semester to select students that have worked hard to be successful students and contribute to the College of ACES during their time here. We are proud to congratulate the recipients of these distinguished awards during our Sam Steel Ceremony each semester.

NMSU Alumni Outstanding Senior (UG)

- Jillian Hughes – ANSC – Fall 2022
- Liam St. Hilaire – PLEN – Spring 2022

Dean's Award of Leadership Excellence For Undergraduates

- Matthew Martinez – AEAB – Fall 2022
- Anne Everett – ANSC – Spring 2022

Dean's Award of Leadership Excellence for Graduates

- Rebekah McCarty – AXED – Fall 2022

Dean's Award of Excellence for Undergraduates

- Faith Diamanti – HRTM – Fall 2022
- Diamantina Aldaba – ANSC – Fall 2022
- Ryan Fullerton – PLEN – Fall 2022
- Yong Banks – EPWS – Fall 2022
- Paden McDermid – AEAB – Fall 2022
- Sarah Shank – FWCE – Fall 2022
- Alexis Montgomery – AEAB – Spring 2022
- Keeley Wagley – ANSC – Spring 2022
- Fisher Easley Smith – AXED – Spring 2022
- Conrad Brooks – EPWS – Spring 2022
- Jacali Baeza – FWCE – Spring 2022
- Kalee Retana – HRTM – Spring 2022

Dean's Award of Excellence for Graduates

- Sharlae Garcia – AXED – Fall 2022
- Srijana Dura – PLEN – Fall 2022
- Halee Prather – AEAB – Fall 2022
- Jane Trujillo – FWCE – Fall 2022
- Gracie Hooten – AEAB – Spring 2022
- Jesus Ogaz Parada – FCSC – Spring 2022
- Zack Farley – FWCE – Spring 2022

Outstanding Departmental Students

- Dzaki Sukarno – AEAB – Fall 2022
- Amadeus Barto – ANSC – Fall 2022
- Hanna Littleton – EPWS – Fall 2022
- Brent Applebaum – FWCE – Fall 2022
- Nathalia Lozano – HRTM – Fall 2022
- Sean Rau – PLEN – Fall 2022
- Amy Bowditch – AEAB – Spring 2022
- Ryan Olson – AEAB – Spring 2022
- Joyce Anne Cooper – ANSC – Spring 2022
- Austin Polk – AXED – Spring 2022
- Emilee Montoya – EPWS – Spring 2022
- Fernanda Arreola – FCSC – Spring 2022
- Marizabella Vasquez Aceves – FWCE – Spring 2022
- Teddi Garcia – HRTM – Spring 2022
- Liam St. Hilaire – PLEN – Spring 2022

Highest Honors

- Ryan Fullerton (PLEN) – Fall 2022
- Sheila Adkins (FCS) – Spring 2022

Graduated with Honors

- Alexis Arellano – FCSC – Fall 2022
- Yong Banks – EPWS – Fall 2022
- Courtney Danner – FCSC – Fall 2022
- Hannia Gamboa – FCSC – Fall 2022
- Mackenzie Kieltyka – ANSC – Fall 2022
- Nathalia Lozano – HRTM – Fall 2022
- Alisa Schott – FCSC – Fall 2022
- Sarah Shank – FWCE – Fall 2022
- Rachel Waite – FCSC – Fall 2022
- Eden Taylor – AEAB – Spring 2022
- Betty Anne Bussell – HRTM – Spring 2022
- Laura Acosta – FCSC – Spring 2022
- Emily Aguirre – ANSC – Spring 2022
- Fernanda Arreola – FCSC – Spring 2022
- Molly Austin – ANSC – Spring 2022
- Jacali Baeza – FWCE – Spring 2022
- Tatolane Baniball – FCSC – Spring 2022
- Dakota Belcher – AXED – Spring 2022
- Amy Bowditch – AEAB – Spring 2022
- Conrad Brooks – AEAB – Spring 2022
- Emily Chavez – ANSC – Spring 2022
- Jonathan Consford – PES – Spring 2022
- Joyce Anne Cooper – ANSC – Spring 2022
- Madison Cross – PES – Spring 2022
- Amelia Crossley – PES – Spring 2022
- Thomas Edmonds – FCSC – Spring 2022
- Anne Everett – ANSC – Spring 2022
- Natalie Franco – PES – Spring 2022
- Teddi Garcia – HRTM – Spring 2022
- Kaitlyn Harwell – AEAB – Spring 2022
- Anna Maria Marquez – ANSC – Spring 2022
- Nathan Martinez – PES – Spring 2022
- Guillermo Nunez – FCSC – Spring 2022
- Ryan Olson – AEAB – Spring 2022
- Tishell Payne – ANSC – Spring 2022
- Luis Pena – ANSC – Spring 2022
- Jazmine Renteria – FCSC – Spring 2022
- Phoebe Rychener – ANSC – Spring 2022
- Alexia Sanchez Primo Ferreyra – FCSC – Spring 2022
- Jaydn Sayre-Adona – ANSC – Spring 2022
- David Shaklee – FCSC – Spring 2022
- Liam St Hilaire – PES – Spring 2022
- Montana Thatcher – FCSC – Spring 2022
- Angelica Vargas – FCSC – Spring 2022
- Keeley Wagley – ANSC – Spring 2022
- Sage Wilks – ANSC – Spring 2022

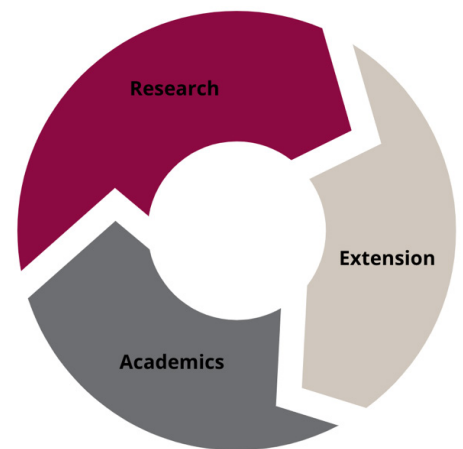
AGRICULTURAL EXPERIMENT STATION



BE BOLD. Shape the Future.
College of Agricultural, Consumer
and Environmental Sciences

Executive Summary

The Agricultural Experiment Station (AES) is the principal research unit of ACES. The AES system consists of scientists who work on facilities at the NMSU main campus in eight academic departments and at 12 agricultural science and research centers throughout the state. The AES system supports fundamental and applied science and technology research to benefit New Mexico's citizens in the economic, social, and cultural aspects of agriculture, natural resource management, and family issues. AES scientists develop research programs that address key needs identified by advisory committees and local stakeholders. Each Agricultural Science Center (ASC) responds to specific research needs under New Mexico's varied geographical and environmental conditions. These research efforts sustain and support New Mexico's diverse environment, farms, ranches, forests, and rural and urban communities.



AES is part of the NMSU land-grant tripartite system with a mission to teach, conduct research, and provide extension and outreach to communities.

AGRICULTURAL EXPERIMENT STATION SYSTEM

Agricultural Science Centers

- Alcalde Sustainable Agricultural Science Center
- Artesia Agricultural Science Center
- Chihuahuan Desert Rangeland Research Center
- Clayton Livestock Research Center
- Clovis Agricultural Science Center
- Corona Range and Livestock Research Center
- Fabian Garcia Research Center
- Farmington Agricultural Science Center
- Leyendecker Plant Science Center
- Los Lunas Agricultural Science Center
- John T. Harrington Forestry Research Center at Mora
- Rex E. Kirksey Agricultural Science Center at Tucumcari

Research Departments

- Agricultural and Extension Education
- Agricultural Economics & Agricultural Business
- Animal & Range Sciences
- Entomology, Plant Pathology, & Weed Science
- Family and Consumer Sciences
- Fish, Wildlife & Conservation Ecology
- Plant and Environmental Sciences
- School of Hotel, Restaurant & Tourism Management

NMSU AES consists of 12 agricultural research and science centers and eight academic departments within ACES.



NMSU AES consists of 12 agricultural research and science centers, VERL, and eight academic departments within ACES.

Agricultural Science and Research Centers

Sustainable Agricultural Science Center at Alcalde

Located in north-central New Mexico to serve as a resource for small-scale producers (most farms in the area are under 100 acres). Research programs focus on jujube cultivars, cover cropping in winter and spring, and acequia irrigation.

Artesia Agricultural Science Center

With a unique location in a heavy agricultural production area of New Mexico, research focuses on high-value crops, entomology, and crop performance testing.

Chihuahuan Desert Rangeland Research Center

A near-campus research facility used for demonstrations of long-term grazing methods, range forage, and sustainable management of natural resources and environmental ecosystems.

Clayton Livestock Research Center

Research focuses on improving the health of newly received cattle and conducting finishing studies. This center is the only feedlot research facility in the western US.

Clovis Agricultural Science Center

Research focuses on dryland crop varieties to improve water use efficiency in semi-arid lands, while also serving as the hub for carbon management research at NMSU.

Corona Range and Livestock Research Center

A working ranch research facility with a focus on sustainability. In 2021, 39 wind turbines were installed in a partnership with Pattern Energy.

Farmington Agricultural Science Center

Weather in the Four Corners region is variable, and research at this center focuses on crop varieties and growing season. A unique partnership with the Navajo Agricultural Products Industry (NAPI) provides a strong connection to local agricultural producers.

Fabian Garcia Research Center/ Leyendecker Plant Science Center

A wide range of plant breeding research takes place at these NMSU main campus experimental farms, including New Mexico chile pepper variety research.

Los Lunas Agricultural Science Center

Located centrally in New Mexico near Albuquerque, which allows for specialized urban horticulture programming. The research focus is on backyard gardens, guar varieties, and experimental wine making.

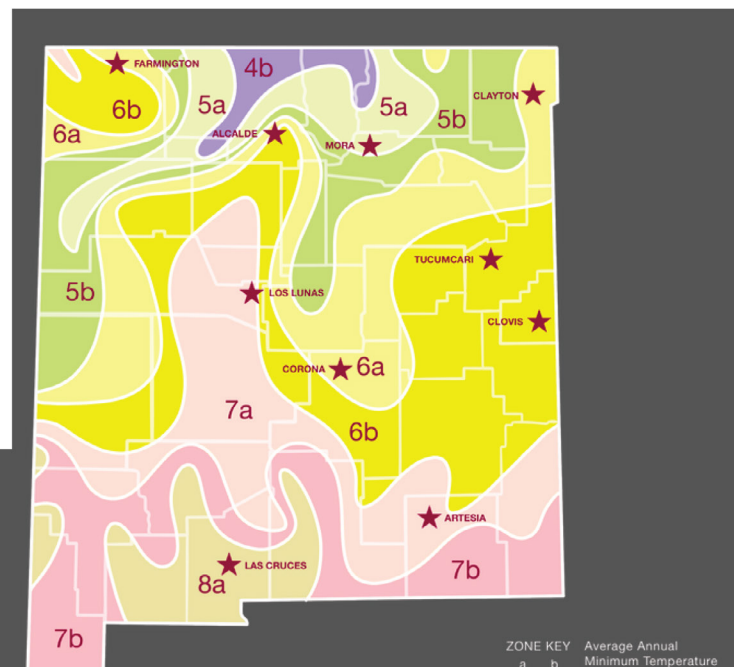
John T. Harrington Forestry Research Center at Mora

The only research center in the southwest US focusing on forest nursery technologies, tree improvement, and ecophysiology of young forest trees to facilitate ecological restoration.

Rex E. Kirksey Agricultural Science Center at Tucumcari

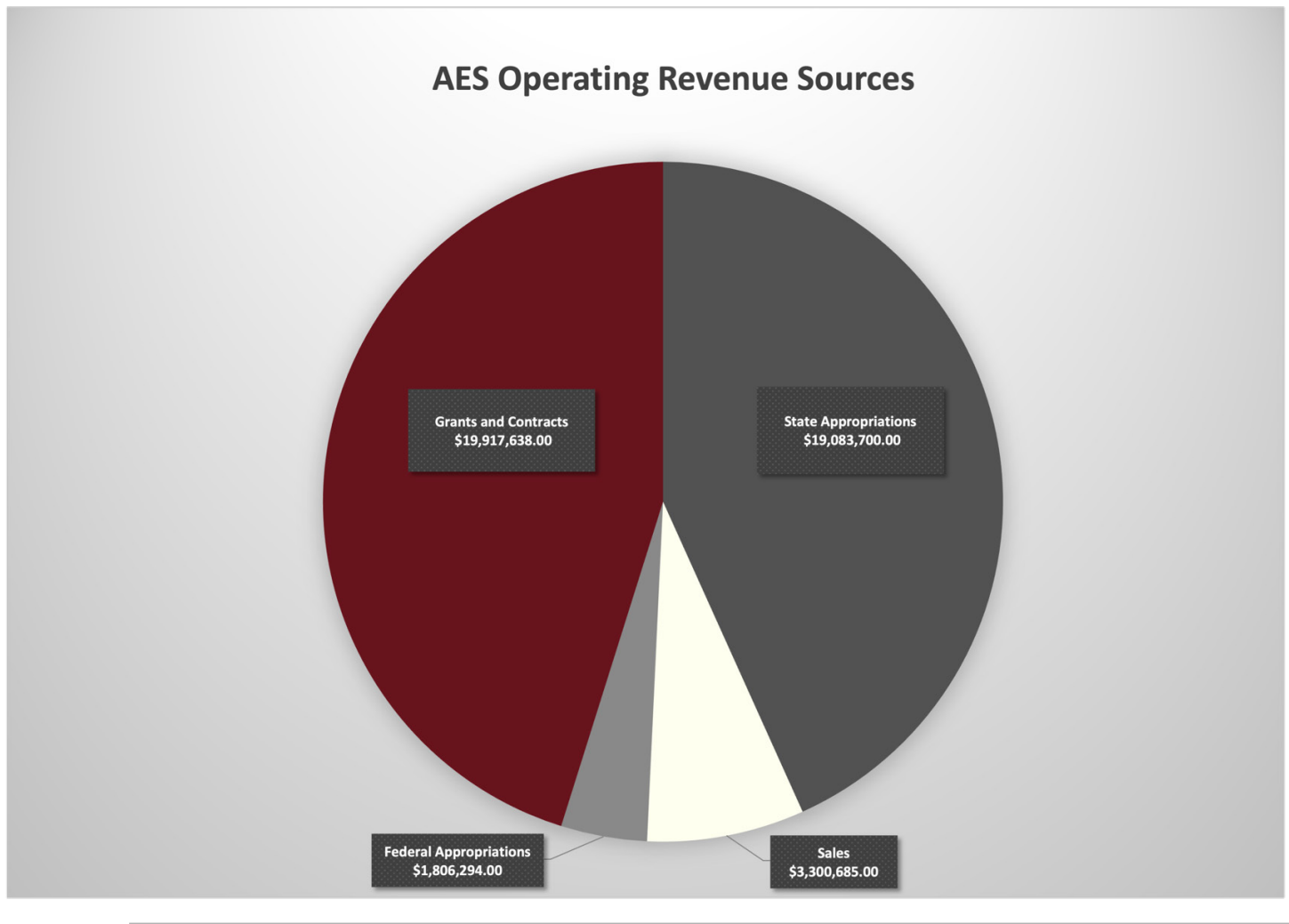
One of the few centers with the capability to conduct both crop and livestock research. Research focuses on dryland cropping systems and bull tests to improve beef herd genetics.

New Mexico has a unique climate, with three crop production regions, 10 plant hardiness zones, five defined watersheds, and 126 distinct soil types. Therefore, agricultural production varies around the state. Each ASC produces research that provides best practices specific to agricultural producers in their climate zone.



2022 AES Funding Sources

The AES total amount of operating revenue was \$44.1 million. The College of ACES continues to lead NMSU in grants awarded and expended; ACES personnel work hard to ensure New Mexico’s investment in AES is matched by more than a 1:1 ratio.



Special Projects Update

ZiaMet Weather Station

NMSU’s current weather monitoring network consists of 97 weather stations around the state. With the expansion of Phase II, an additional 118 stations will be installed by June 2023, which will increase the total network to 215 weather stations. New Mexico is becoming a national leader in weather monitoring systems. Data from these stations are used by farmers for crop irrigation, crop planting, and determining optimal conditions for pesticide applications. The data also help support gaps in National Weather Service data, which often leave out parts of rural New Mexico.

Wildlife Disease Ecology Position (FY22 state appropriation)

The Department of Fish, Wildlife and Conservation Ecology was approved to advertise for an Assistant Professor of Wildlife Disease Ecology in Fall 2022. This position is designed to strengthen the teaching and research capacity of NMSU, and thereby the state of New Mexico, as it relates to understanding the ecology of disease in wildlife, their spread in populations, changes resulting from altered environments, and their transmission to domestic animals and the public. A search committee of members from multiple departments and a representative from the New Mexico Department of Game and Fish reviewed all applications and conducted preliminary interviews with a subset of individuals. From this subset three candidates have been invited to campus for an in-depth interview in March 2023, with anticipation of an offer to the top candidate in early April 2023.

National Impact Database (NIDB)

NMSU AES successfully submitted 14 impact statements that will become available for public viewing. These impacts can be used to elevate land-grant research across the U.S., and in previous years NMSU AES has had impact statements selected to be used in NIDB summaries and stories and used for leveraging land-grant funds from Congress. Click below to visit the NIDB and use the search filters to find NMSU AES impact stories.

<https://landgrantimpacts.tamu.edu/impacts/search>

Carbon Management and Soil Health

This initiative engages farmers, ranchers, and minority and Native American communities on carbon management and soil health research, outreach, and extension activities. The impacts include improving knowledge of carbon sequestration and soil health in arid and semi-arid regions, enhancing climate resilience in the Southwest, and developing climate change mitigation practices applicable to 40% of the globe (arid and semi-arid regions of the world). The Clovis ASC serves as the hub for carbon management and soil health activities for the AES, while the Los Lunas, Mora and Corona Research Centers are also involved in the initial stages of this project.

The Clovis ASC demonstration plots on carbon management have been established; baseline samples were collected in fall 2022; data analysis is in progress. Two Li-COR GHG monitoring systems were purchased one will be established at the Clovis ASC and the other at the Corona Range and Livestock Research Center. (These systems will collect and store data on environmental factors such as carbon.) Additionally, a Gasmeter GHG analyzer was purchased to supplement the Li-COR system.

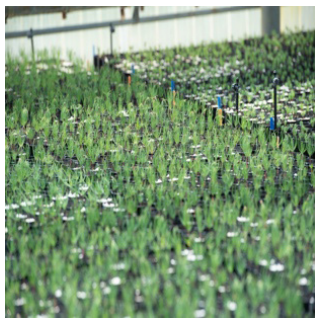
The Los Lunas ASC cover crop plots will be sampled in 2023 and the Mora Forestry Research Center will begin revegetation work in summer 2023.

On-Going Sustainability Initiatives



Creation of Center for Dryland Resilience

This Center would transform understanding and management of natural capital in drylands under environmental change, a critical challenge at the interface of science and society. This would allow for research on and promotion of the sustainability of New Mexico's ecosystems through enhanced monitoring efforts, data mobilization, and sustainable solutions that improve the resilience of ecosystems statewide while training the next generation of environmental and data science professionals.



New Mexico Reforestation Center (NMRC)

This Center will help meet reforestation needs by producing five million seedlings per year, establishing programs to support the reforestation pipeline (from seed collection to planting), and helping to develop and support forest-based economic growth. The NMRC will also support climate-smart tree planting projects in urban environments to assist with carbon management, air quality, and provision of shade to cool urban surfaces, as well as support education, research, and outreach activities regarding reforestation.



Corona Energy Initiative

Wind Turbines and commercial-scale 2MW Solar Array with battery storage: 39 wind turbines have been in full operation at NMSU's Corona Range and Livestock Research (CRLRC) as part of Pattern Energy's Western Spirit Transmission area project, which consists of 377 turbines, or a total of 1,050 megawatts. Additional opportunities to develop a solar array are forth coming and will continue to provide renewable energy to rural central New Mexico.



Digital Agriculture

Preparing farms/ranches for the future: US agriculture and ranching systems are on the cusp of major changes driven by climate, socioeconomic, and demographic changes in rural communities. The goal is to increase agricultural efficiency using multiple-source digital information (MSDI), data science, sensor development, and artificial intelligence (AI). Building capacity in drone development, as well as utilization and optimization for agriculture, is one of our focus areas.



Heritage Farm, the Path toward the Future

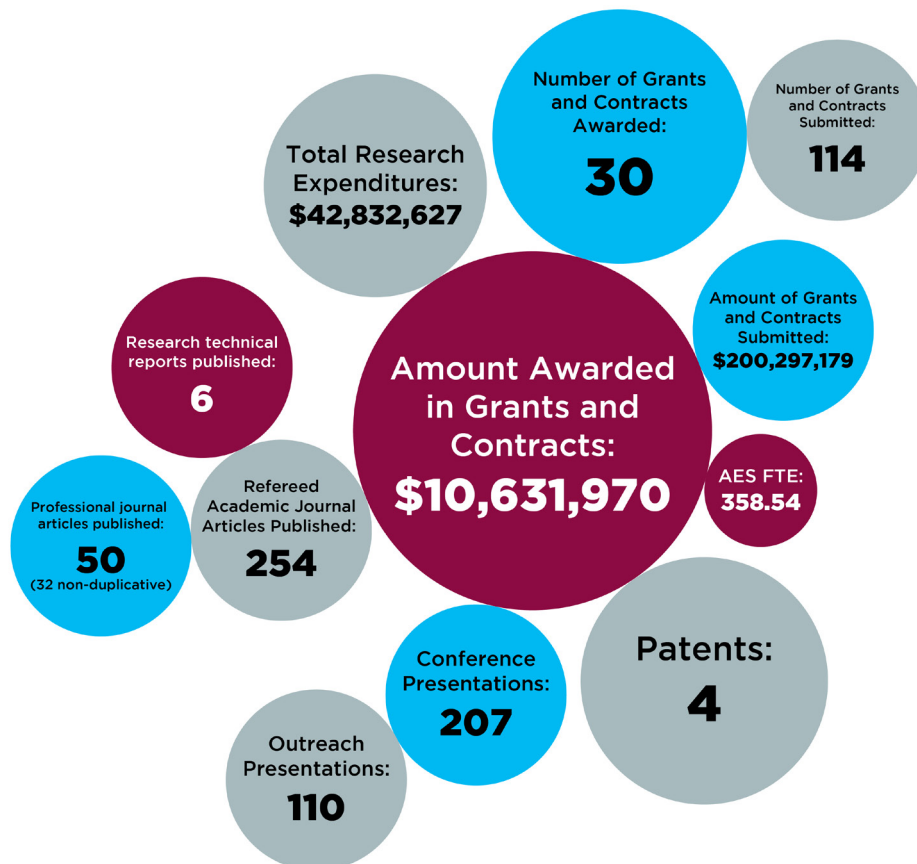
Increasing agricultural literacy and hands-on learning are combined in this initiative to develop an on-campus platform that connects communities of learners to the modern agricultural enterprise. This initiative will develop on-campus lands to engage the public in the origin of their food through curated demonstrations of the many facets of agriculture while providing students with the opportunity to engage in emerging agricultural technologies.



Carbon Capture Initiative

New Mexico has many historically underserved farmers and ranchers that will be able to use carbon sequestration to receive payment for future carbon credits. In addition to capturing and storing carbon in trees, crops, and soil organic matter, adding basalt rock dust to agricultural soils is an emerging method to sequester carbon. The irrigated soils of New Mexico, like those at the Navajo Agricultural Products Industry (NAPI), are well-suited for this method.

AES Performance Metrics



Impact Highlights

New Mexico State University’s College of Agricultural, Consumer, and Environmental Sciences (ACES) has a mission to improve the lives of New Mexicans, the nation, and the world through research, teaching, and extension. AES research programs focus on four identified critical issues for New Mexico. These critical issues are the ACES Pillars, which help guide planned programs and research focus. The pillars are Food & Fiber Production and Marketing, Water Use and Conservation, Family Development and Health of New Mexicans, and Environmental Stewardship.

Food and Fiber Production Marketing

Pregnancy complications are the leading cause of maternal, fetal, and neonatal morbidity and mortality in farm animals and humans, typically originating from improper embryo implantation. A greater understanding of embryo implantation and placental development is needed to alleviate pregnancy loss and adverse health outcomes for mother and offspring. With our innovative model, we deliver treatments into the uterus to investigate fetal-maternal interactions controlling placental development and have continued to generate a comprehensive analysis of parameters unfeasible to obtain or characterize in humans. Our efforts have provided a greater understanding of CXCL12 (a protein coding gene) and its regulation of placentation and pregnancy success.

Researcher: **Ryan Ashley**, *Department of Animal and Range Sciences*

Agriculturists play a vital role in providing a safe and secure food system. To do so, agricultural stakeholders must engage in emergency preparedness and planning scenarios to enhance capabilities for the food and agriculture sector. As a result, with help from faculty, staff, Extension personnel, and agricultural stakeholders affiliated with the Southwest Border Food Protection and Emergency Preparedness Center, we developed a tabletop exercise simulating a hypothetical foreign animal disease (FAD) outbreak, cyber-attack, and response to news and media output. The tabletop gained international traction where we were invited to speak at a similar international conference targeting miscommunication.

Researcher: **Shannon Norris-Parish**, *Department of Agricultural Extension and Education*

Monitoring livestock health and spatial grazing patterns on rangelands is challenging. Cattle, sheep, and goats were tracked with GPS equipment in Arizona and Australia. All livestock species remained closer to water and travelled less each day during hot periods. Real-time tracking may be a tool to identify periods when livestock may experience heat stress. Forage utilization was higher in hot spots than cold spots based on analyses of GPS tracking. Managers may be able to use real-time tracking to identify and respond to uneven



NMSU Range MS student Kelsey Nelson placing a GPS tracking collar on Corriente cow at Deep Well Ranch, Prescott, Arizona

grazing distribution before resource degradation occurs. These new technologies can improve livestock welfare and rangeland sustainability.

Researcher: **Derek Bailey**, *Department of Animal and Range Sciences*

Profitable chile and onion production in New Mexico is challenged by escalating costs for hand hoeing. To develop strategies for reducing hand hoeing in New Mexico's principal vegetable crops, we assessed cultural and chemical strategies for controlling weeds. Our results indicated specific cover crops and herbicides that suppress weeds and reduce hand hoeing in chile. For onion, we identified a novel herbicide application that is more effective, less expensive, and introduces fewer environmental risks than the conventional herbicides. These practical, non-manual strategies for managing weeds in chile and onion can increase profits for farmers in New Mexico.

Researcher: **Brian Schutte**, *Department of Entomology, Plant Pathology, and Weed Science*

Pasture based cow-calf operations common throughout the Southwest are continuously searching for profitable and sustainable management options to overcome a variety of environmental challenges. Horn flies constitute one such threat that requires managerial intervention to avoid economic losses which are estimated to exceed \$1 billion annually. Recently, the Veterinary Entomology Research Laboratory investigated the impacts of rainfall and intake rates on pour-on and feed-through efficacies, respectively. This research supports the development of a fully comprehensive understanding of these popular filth fly control products that will contribute to the development of holistic management plans for cattle growers, helping secure food production and health of New Mexicans and surrounding regions.



Researcher: **Brandon Smythe**, *Department of Animal and Range Sciences*

The food industry is one of the largest global markets. Food manufacturing accounts for about 14% of all U.S. manufacturing employment. The impact of modern food manufacturing methods is evident in today's food supply. Food scientists, the industry, and policymakers are determined to improve the food supply to support a healthier and growing population. By 2050 food production must increase 70% to feed 9 billion people. Consequently, science-based improvements in food science and food systems are critically significant. NMSU FCS scientists have cooperated with the chile, pecan, and cotton industries on funded grants to utilize agro-industrial byproducts to extract alternative plant proteins and antioxidants that can be used as ingredients in the food and aquaculture industry.

Researcher: **Efren Delgado**, *Department of Family and Consumer Sciences*

Water Use and Conservation

An NMSU scientist continues to conduct mission-critical research on water's critical role in economic, agricultural, and environmental systems. Coupling socio-economic and physical models leads to improved management of systems that benefits water users and environmental resources. Efforts are ongoing to, for example, assess carbon literacy and net socio-economic benefits associated with crops, grazing, forestry, and urban activities. This research contributes to improved understanding of informational needs and management opportunities, and the benefits of designing effective, efficient, and sustainable land-use plans and policies.

Researcher: **Brian Hurd**, *Department of Agricultural Business and Agricultural Economics*

Declining water resources and changing climate are the two major challenges facing New Mexico. Agricultural Science Center at Clovis is evaluating a desert crop, guar, to diversify the system. It is a stress tolerant, low water using, low input, soil building, economically viable, industrial crop. If 25% of guar can be produced locally, it will create a steady supply and stabilize the guar gum market. In addition, it can reduce water, fertilizer, and pesticide use. Our research has shown it can be grown for guar gum, soil health, or forage with minimal inputs. It is a viable rotational crop for the region.

Researcher: **Sangu Angadi**, *Department of Plant and Environmental Sciences*

Identification of opportune/cover crops to replace fallow in the arid and semi-arid cropping systems will have a potential production impact on more than 200,000 acres, accounting for approximately 27% of total agricultural production area in the New Mexico; the impact can be much more substantial when applied to similar environments globally. Opportune cropping to achieve higher resource use efficiency (especially water and nutrients) and productivity will not only generate higher farm-level income to producers but can also promote broader marketing and economic opportunities in New Mexico.

Researcher: **Murali Darapuneni**, *Department of Plant and Environmental Sciences*

Significant brackish groundwater (BGW) reserves in New Mexico may reduce stress on the fresh water supply. A hidden benefit of BGW is a potential to increase concentrations of total plant phenolics (TPs) that are beneficial to human health, as previously shown with laboratory salts. At 15 days in greenhouse conditions, CaSO_4 -dominated BGW desalination concentrate and NaCl -dominated lab solutions at 8 dS/m increased TPs in *Lactuca sativa* (leaf lettuce) by 20%. The increase represents potential economic gain of $\$1\text{-}2^{\text{ft}^2/\text{year}}$ that could motivate growers to use BGW as a freshwater surrogate and change the perception of salinity from threat to opportunity. Critical research in this area is ongoing.

Researcher: **Geno Picchioni**, *Department of Plant and Environmental Sciences*

Family Development and Health of New Mexicans

Visual communication in agricultural classrooms is not widely studied. Many agricultural courses offer hands-on experiences such as welding, student teaching, agricultural photography, or graphic design. However, these courses are supplemented with lecture-based theories and knowledge development. When students are in classrooms, visual communications

assist in student learning and information retention. To further gain an understanding for the needs and student preferences of visual communications used in classrooms, a researcher is developing a preliminary study to determine the current preferences of agricultural communication students when it comes to seeing visuals in course lectures. This study will provide further insight into the needs of students to improved knowledge retention as well as future training areas needed for higher education.

Researcher: **Lacey Roberts-Hill**, *Department of Agricultural Extension and Education*

The Department of Innovative Media, Research and Extension designed and produced an interactive educational tool to teach proper cleaning and sanitizing on farms, as part of a program developed by Washington State Department of Agriculture (WSDA) Produce Safety Program, in collaboration with the University of Georgia. Freely available at farmsanitizing.nmsu.edu, this educational resource includes interactive lessons on the basic steps of cleaning and sanitizing surfaces, how to select and apply sanitizers, why it's important to monitor sanitizer concentrations, how to monitor sanitizers using test strips, and how to monitor sanitizers using the titration method.

Researchers: **Barbara Chamberlin and Pamela Martinez**, *Department of Innovative Media, Research and Extension*

Environmental Stewardship

Environmental flows are used to maintain the hydrological health, biological health, and water quality within river systems. These can be controversial, because in water-scarce regions, programs that establish environmental flows usually involve reallocating water from another productive use. Few peer-reviewed papers to date have investigated impacts on system-wide economic performance resulting from environmental flow regimes. We presented an original approach to address that gap by developing and applying a basin-scale hydroeconomic optimization model of North America's Middle Rio Grande Basin to explore impacts of environmental pulse flows on the region's economy and water stocks. Results show that climate change, in the form of highly variable inflows, has an impact on the total and marginal cost of implementing environmental pulse flows, amplified by the conjunctive nature of the system.

Researcher: **Greg Torell**, *Department of Agricultural Business and Agricultural Economics*

Invasive plant species in the US are estimated to cause damages of \$137 billion annually. Managing weeds without conventional herbicides, particularly glyphosate, is of growing interest in urban landscapes where consumers desire alternatives perceived as safer and more sustainable. 2022 research indicated that sequential applications of these herbicides increased injury and control of annual, and some perennial, weeds present in research plots consisting of traditional landscape-managed bermudagrass. Despite initial injury symptoms to the turf immediately after application, the bermudagrass quickly recovered, indicating the potential for the utilization of alternative herbicides in landscape settings.

Researcher: **Leslie Beck**, *Department of Extension Plant Sciences*



Research plots approximately 2 days following final application of herbicide alternative treatments. Image shows literal square lines dividing predominantly weed-free research treatments from plots within the trial and the surrounding areas that received no herbicide treatment applications and are visually weedy as a comparison. Bermudagrass injury in photograph recovered fully within 2 weeks of trial termination.

The propagation of antibiotic resistance genes (ARGs) in freshwater reservoirs threatens ecosystems and human health. Together with collaborators from China and the United Kingdom, an NMSU researcher looked at data from 60 reservoirs worldwide. During the cold season, small-sized reservoir waters rich in organic carbon, mobile genetic elements, and antibiotics had a higher pollution potential of ARGs. During the spring drought, sediments in large reservoirs located in densely populated areas were more conducive to dissemination of ARGs. The humanfood-chain ecosystem interface needs an improved understanding of ARG contamination mechanisms.

Researcher: **Wiebke Boeing**, *Department of Fish, Wildlife, and Conservation Ecology*

Irrigated crop production fields are facing severe soil health challenges in New Mexico. Through applied research, several soil health practices are being tested to assist producers to select appropriate strategies for improving soil quality. A long-term soil health research and demonstration site was established, and existing soil and crop management practices were also sampled to assess their impacts on soil health. The results of these studies will provide soil health information that will benefit crop producers, homeowners and gardeners, agricultural support professionals, and stakeholders in New Mexico. Improving soil health will lead to secured and increased yields and environmental conservation.

Researcher: **John Idowu**, *Department of Extension Plant Sciences*

Soil is foundational to the sustainability of New Mexican societies. Managing soil for social and natural ecosystems needs knowledge of baseline soil properties and conditions. NMSU researchers in the Department of Plant and Environmental Sciences have pioneered methods to rapidly and accurately produce relevant soil information in the field and using a geographic information systems approach. This research is foundational for federal and state land managers, agricultural producers, private ranchers, and foresters by providing the information necessary to assess site-specific land management decisions such as grazing intensity, brush management, or livestock rates.

Researcher: **Colby Brungard**, *Department of Plant and Environmental Sciences*

The family Buprestidae (Coleoptera) are beetles whose larvae cause serious damage to trees by burrowing and girdling the phloem. The resulting economic impact is estimated to be billions of dollars for the US. However, little information is available on the species that may occur in New Mexico. Therefore, NMSU EPPWS researcher created an annotated checklist of the jewel beetles of Doña Ana County, NM, based on records compiled from museum specimens, available literature, and field collections, documenting 79 species representing 21 genera and four subfamilies. This list will be extremely valuable baseline data in tracking these important insects in the state.

Researcher: **Scott Bundy**, *Department of Entomology, Plant Pathology, and Weed Science*

The Calf Canyon/Hermit's Peak wildfire became the state's largest fire in recorded history during summer 2022 burning more than half million square miles of land in northern NM. This fire became difficult to predict and manage due to the ongoing extreme drought and highly varying weather patterns this summer. While forecasters rely heavily on numerical weather models run on supercomputers for predicting weather, they trust on- the- ground weather observations from weather stations for verification. Such was the case this year during the state's largest wildfire that burned around the John T Harrington Forestry Research Center in Mora. The weather station in Mora provided critical information on the low dew point temperatures, telling them about the extremely dry air and likelihood of extreme wildfire behavior in the Mora Valley. While forecasters use many weather stations, our station in Mora played a role in giving firefighters and planners an edge during these types of wildfires. Weathers stations in the state are currently being expanded due to federal and state support.

Researcher: **Dave DuBois**, *Department of Plant and Environmental Sciences*



COOPERATIVE EXTENSION SERVICE



BE BOLD. Shape the Future.
College of Agricultural, Consumer
and Environmental Sciences

Executive Summary

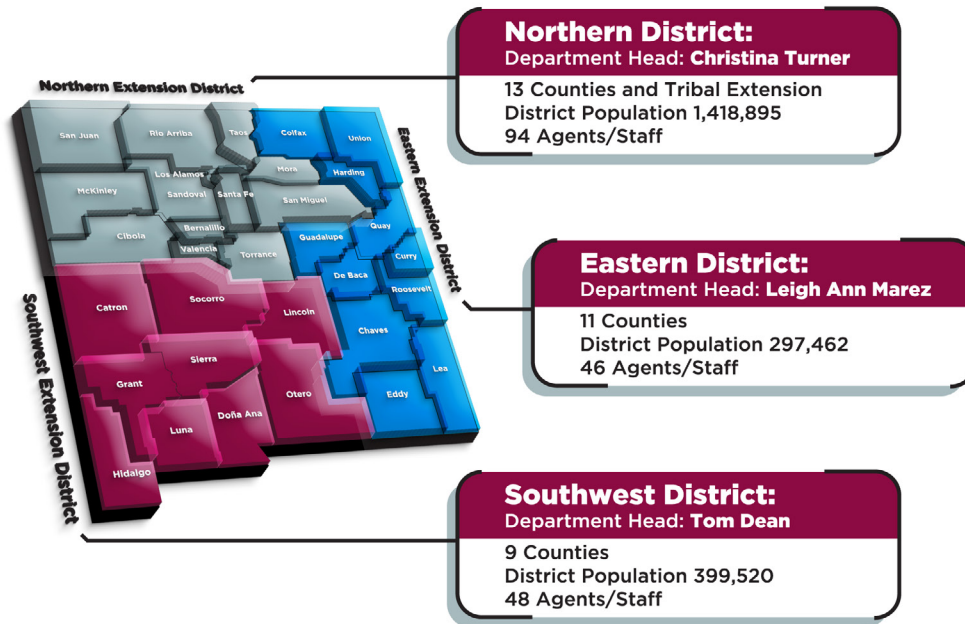
The New Mexico Cooperative Extension Service (CES) provides practical, research-based knowledge and programs to serve the citizens of New Mexico. This has been our mission for more than 100 years and will remain the crux of our efforts in the future. CES is a unique federal, state, and county partnership. CES has staff in all 33 counties and many Tribal areas in New Mexico, and collaborates with more than 1,000 organizations, state and federal agencies, other universities, and 10,000 volunteers.

We focus on collaboration to foster economic, educational, and community development, keeping the needs of our neighbors at the forefront of our work. While our mission endures, the delivery and areas of study evolve. In 2022, Extension efforts related to agriculture and natural resources, positive youth development, community development and the health and wellness of New Mexico families have been priorities.

Extension faculty also have increased their competitive funding for this year by more than 19 percent. These outreach efforts are a benefit to New Mexicans and amplify our Extension and Outreach as part of LEADS 2025.

Extension work will continue to evolve, and specialists and agents will seek additional resources to remain responsive and advance our diverse programs and research in areas we have identified as critical to our state's future. The programs highlighted here are just a sample of the amazing work done across the state this past year to improve the lives of New Mexicans.

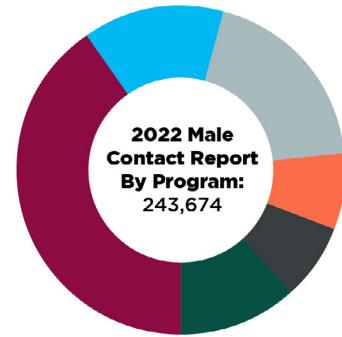
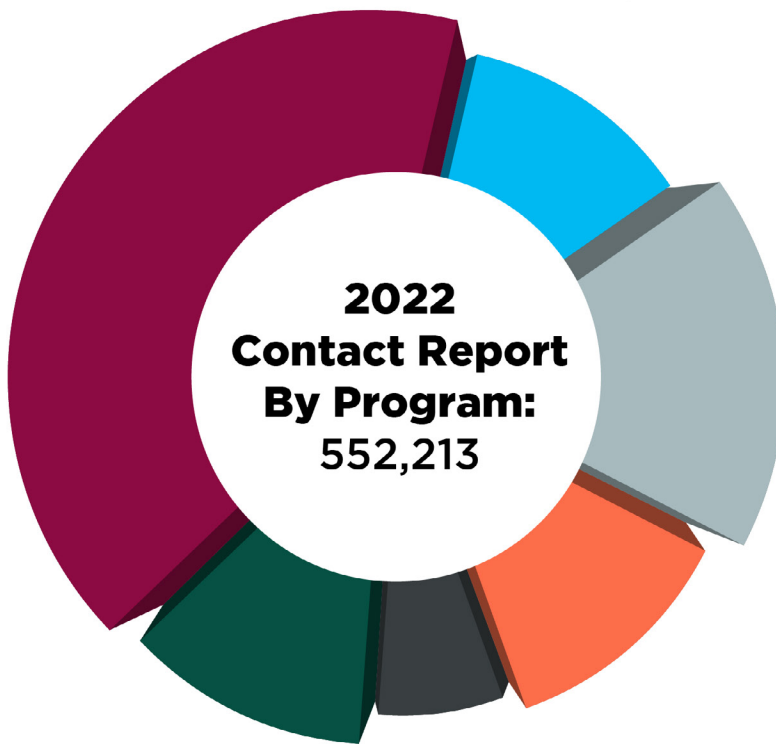
Cooperative Extension District Departments



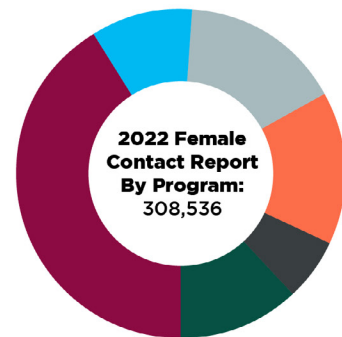
Cooperative Extension Specialist Departments

| | |
|--|--|
| <p>Animal Sciences and Natural Resources Department Head: Shanna Ivey 12 Specialists/Faculty/Staff</p> <p>Mission Statement: The Department of Extension Animal Sciences and Natural Resources is committed to providing the citizens of New Mexico with research-based, practical, and applied educational programming that meets the demands New Mexico has in the agricultural and natural resource communities.</p> | <p>Plant Sciences Department Head: Niall Hanan, Interim 26 Specialists/Faculty/Staff</p> <p>Mission Statement: The mission of the Extension Plant Sciences Department is to extend research-based knowledge and technology that enables our clientele to improve the quality of their lives and enhances the agricultural, economic, environmental, and social well-being of the state.</p> |
| <p>Economics Department Head: Steve Frazee, Interim 13 Specialists/Faculty/Staff</p> <p>Mission Statement: The 21st century presents many challenges and opportunities concerning our agricultural, natural, and human resources. Our mission is to enhance the well-being of the citizens of New Mexico, the nation, and the world through the cornerstones of teaching, research, and Extension programs.</p> | <p>4-H Youth Development Department Head: Laura Bittner, Interim 9 Specialists/Faculty/Staff</p> <p>Mission Statement: 4-H provides youth with opportunities to learn skills, gain knowledge, have fun, and make contributions in such areas as environmental education, community service, and current youth issues. As the world's largest youth organization, 4-H grows youth into capable, responsible, and caring individuals.</p> |
| <p>Family and Consumer Sciences Department Head: Efren Delgado 54 Specialists/Faculty/Staff (Includes 27 Nutrition Educators assigned throughout the state.)</p> <p>Mission Statement: The mission of the Department of Extension Family and Consumer Sciences (EFCS) is to improve the quality of life for the citizens of New Mexico by distributing research-based information on community and environmental health, food technology, nutrition and wellness, personal and family finance management, and family life and child development.</p> | <p>Innovative Media Research and Extension Department Head: Barbara Chamberlin 25 Specialists/Faculty/Staff</p> <p>Mission Statement: The mission of this educational research and design studio is to translate university-based research into high-quality educational media tools, such as games, apps, virtual labs, animations and videos. Ongoing faculty research on digital and interactive media topics informs development of effective tools and contributes to the larger body of knowledge.</p> |

Cooperative Extension Service Reaching our Clientele



- 4-H and Youth: 98,221 (40.3%)
- Animal Sciences and Natural Resources: 33,906 (13.9%)
- Community and Economic Development: 46,771 (19.2%)
- Family and Consumer Sciences: 18,598 (7.6%)
- ICAN: 18,389 (7.5%)
- Plant Sciences: 27,789 (11.4%)

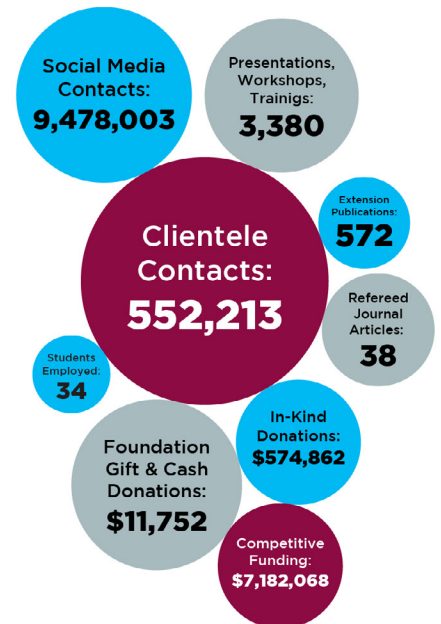


- 4-H and Youth: 127,572 (41.3%)
- Animal Sciences and Natural Resources: 30,897 (10%)
- Community and Economic Development: 48,916 (15.6%)
- Family and Consumer Sciences: 46,216 (15%)
- ICAN: 18,482 (6%)
- Plant Sciences: 36,453 (11.8%)

Cooperative Extension Service Extension Personal Contact by Ethnicity



CES by the Numbers



CES Reaching Our Clientele: Selected Highlights

Food and Fiber Production and Marketing

Dairy Workforce Development and Training Programs

New Mexico dairies are the largest in the nation, with an average herd size of 2,600 cows, more than 10 times the average U.S. herd size. NM dairy owners employ approximately one employee per 100 cows, predominantly foreign born, immigrant labor with little to no experience working with large herding animals or large agricultural equipment. In addition, Agriculture, Forestry and Fishing (AFF) ranks among the most dangerous industrial sectors, with an incident rate of 5.7 non-fatal occupational injuries per 100 FTEs and a rate of 23.2 fatal work injuries per 100,000 FTEs (BLS, 2018); about one-fifth of fatalities in 2019 were to foreign-born workers and roughly two-thirds of fatal work injuries were to foreign-born Latino or Hispanic workers.



Effective training and education of both current and future dairy employees is imperative for both safety, performance, animal and human well-being. However, limited effective educational opportunities exist to educate, train and certify a skilled and able dairy workforce.

In 2011, two dairy safety awareness training DVDs in English and Spanish were developed to raise safety awareness amongst dairy employees through better understanding of what it entails to work with large animals and large equipment; improve job performance with a better understanding of

the “why” vs. the “what” of work- and safety-procedures; and document employee safety training. Since 2011, about 6,000 copies have been distributed worldwide, and the International Rescue Committee (IRC) subsequently translated the DVDs into several other languages for refugee placement.

Most trainees were foreign born, with 52.4% from Mexico and 27.4% from Guatemala, Honduras and El Salvador (88% male and 12% female). About 6% had not received any education, while 28% had attended (some) elementary school, 24% (some) middle school, 29% (some) high school, and 13% (some) higher education. As anticipated, reading comprehension was the major challenge, making the video/audio delivery method critical.

In evaluating changes in knowledge of the trainees, pre-test to post-test scores changed from 74.2% to 92.5%. Interview results 3 to 6 months post-training indicated workers were applying the knowledge gained from the training in their work activities, as well as reporting safety hazards when identified. Findings suggest the individualized learning techniques as described are an

effective means to deliver safety awareness training content to dairy workers in remote and challenging work environments.

NMSU Dairy Extension has provided safety awareness training to about one-third of the NM dairy workforce. About 6,000 employees have directly been trained on dairy safety awareness and animal handling since the start of this initiative.

Robert Hagevoort, *Extension Dairy Specialist, Extension Animal Sciences and Natural Resources*

Increasing competitiveness of NuMex Odyssey NM-Type Green Chile

New Mexican chile acreage has decreased 73% in the last 25 years, largely due to the labor-intensive nature of the hand-harvested NM-type green chile crop. Mechanization of the crop is key to reversing acreage loss and ensuring the continued dominance of this cherished commodity.

A three-pronged strategy was developed to increase competitiveness of NM type green chile through mechanization. The first step was identification of best harvest machines. Secondly, field trials were implemented to determine best management practices for efficient mechanical harvest. Finally, through traditional breeding methods and mechanical harvest trials, the new cultivar ‘NuMex Odyssey’ was developed that provided higher mechanical harvest yield compared to standard NM green chile cultivars.

‘NuMex Odyssey’ was grown in commercial fields in the Hatch, NM area in 2022 with great success. We anticipate that this new cultivar will help spur NM-type green chile mechanization, thereby regaining lost chile acreage. New Mexico chile growers will gain about \$12,000 for each acre of green chile regained through mechanization.

Stephanie Walker, *Vegetable Specialist, Extension Plant Sciences*



New Mexico Ag/Livestock Incident Response Team (NM-ALIRT)

New Mexico Agriculture is a large contributor to the state's economy. Agriculture accounts for \$3.17 billion, with livestock and dairy contributing about \$2.371 billion in 2021, according to the 2021 Ag Census Statistics Bulletin produced by the NM Department of Agriculture. Protecting the NM livestock industry is not only important to the NM economy but also to the nation's food supply. Starting in 2007, the NM-ALIRT program has trained and equipped rural NM veterinarians to prepare them to respond to a large or suspicious livestock loss, or foreign animal disease intrusion, that happens anywhere in NM. Being prepared and responding quickly is the key to minimizing losses associated with a livestock event.

Since 2007, NM-ALIRT has responded to over 30 livestock events that were concerning to state animal health officials. In 2022, there were three responses, with the largest being a response to the death of 29 cows and 22 elk in southwest New Mexico. The death loss was investigated by NM-ALIRT, NMSU Extension, NM Game and Fish and the NM Veterinary Diagnostic Lab, with the culprit appearing to be a toxic plant not previously known to exist in the U.S. Seeds recovered from rumen contents of dead cattle and elk contained seeds that appear to be from the plant *Drymaria arenarioides*.

Further testing is ongoing to conclusively identify the seeds found in the dead cows and elk. The NM-ALIRT program is also supplying veterinarians to assist the NMLB and USDA with tuberculosis (TB) testing dairy cattle in NM. John Wenzel, DVM, interim associate department head and Extension Veterinarian for Extension Animal Sciences and Natural Resources, conducted the investigation of the dead cattle and elk and has assisted with the TB testing of over 115,000 head of cows. The NM-ALIRT veterinarians also participate in a Syndromic Surveillance program, with over 325 reports in 2022. Ongoing training and preparations continue to ensure the safety of the NM livestock industry.

John Wenzel, DVM, Interim Associate Department Head and Veterinarian, Extension Animal Sciences and Natural Resources

Agricultural and Natural Resources Extension Programs for Southern Pueblos

According to the 2017 USDA NASS-Agricultural census for New Mexico, 8,523 Native Americans have self-identified as agricultural producers. Due to their rural locations, Pueblo clientele do not always have access to resources. In collaboration with Pueblos, NMSU Tribal Extension provides educational and technical assistance to develop and deliver agricultural and natural resources Extension programs and increase agriculture and natural resources literacy that complements Pueblo values.

NMSU Tribal Extension provided 20 educational workshops in collaboration with the Sandoval and Cibola County agents; Pueblos of Acoma, Laguna, Isleta, Sandia, Santa Ana, and Kewa; and collaborations with partners including non-profits such as Flower Hill Institute, YAKANAL, and Trees, Water and People; NMSU Indian Resources Development; and other Pueblo-serving

entities, including the Indian Pueblo Cultural Center, NM/National AgrAbility programs, and SIPI.

The workshops focused on extending seasons, plant selection and propagation, greenhouse management, composting, herd health, fruit tree production, pruning, soil health, hands-on hoop house construction, rangeland assessments, and plant ID. The 371 participants learned strategies to improve their farming and ranch operations and incorporate best practices for their natural resources systems.

Additionally, 349 participants were reached through partnering events, including the Pueblo of San Felipe farmers' meeting, Pueblo of Zuni's food project meeting, the All Pueblo Council of Governors committee meetings, Quivira Coalition's Soil Health Workshop, NM Healthy Soil Work Group's Regenerative Ag Day, NM Recycle Coalition's Recycling Training and Annual Meeting, the SFIS Natural Resources Summit, the Native American Fish and Wildlife Society 34th annual conference, and the NM First and Native Farm Bill Coalition listening session. These partnerships provide Pueblo communities access to rural and undeserved clientele who otherwise have limited access to education, research and extension programs.

Charlene Carr, Agricultural Tribal Extension Agent, Northern District



Water Conservation

Aquaponics: Efficient and Sustainable Use of Aquatic Resources

Interest in aquaponics, an integrated sustainable food production system that combines aquaculture – the cultivation of aquatic animals, such as fish, shrimp, crayfish, or prawns, in tanks – and hydroponics – the growing of plants in water – continues to grow throughout the U.S. and New Mexico. The fish and plants are cultivated together in a recirculating ecosystem that utilizes natural nitrogen-fixing bacteria to convert fish/aquatic animal wastes into plant nutrients. The waste products of the aquaculture system serve as nutrients for the hydroponic system. Compared to soil-based agriculture, aquaponic systems use 90% less water, which makes aquaponics especially attractive in arid regions such as New Mexico, where water and arable soils are scarce.

In response to a growing demand for information and training about aquaponics, a four-part webinar series coupled with a follow-up one day in-person workshop, was developed and held in collaboration with Bernalillo County Extension Office and Santa Fe Community College's Controlled Environment Agriculture Program. Each week of the webinar series covered different

topics, including types of systems, fish culture, plant culture, pest management, water quality, and food safety. The virtual environment allowed people to attend who would otherwise have been unable to travel to our location. The 65 participants attended the webinars from 11 counties in New Mexico – Bernalillo, Chaves, Curry, Doña Ana, Luna, Lea, Quay, San Juan, Sandoval, Santa Fe, and Torrance – and from Colorado; Navajo County, Arizona; Ohio; Maryland and South Africa.

Upon completion of the webinar series, participants were surveyed to assess what they had learned and to obtain their input. Overall, 87% of those surveyed strongly agreed and 13% somewhat agreed that the information in the sessions increased their knowledge about the subjects; 71% strongly agreed that the knowledge they acquired made it more likely that they would either build and set up an aquaponics system or make changes and improvements to their existing system; and 87% strongly agreed that they would like to see other aquaponics-related workshops/courses in the future.



The in-person workshop was a resounding success, with strong demand for further such events. Surveys showed that 100% of attendees strongly agreed that the information from the workshop increased their knowledge about the aquaponics topics presented; 88% strongly agreed that the knowledge they acquired made it more likely that they would either build and set up an aquaponics system or make changes and improvements to their existing system; and 100% strongly agreed that they would like to see other aquaponics-related workshops/courses in the future.

Aquaponics is a sustainable food production system that provides fresh locally grown produce and fish, creating access to nutritious food and providing greater food security, an issue in many areas of New Mexico that experience food deserts. Aquaponics has the potential to increase economic, social, and environmental sustainability of New Mexico agriculture. These systems can enhance local economies and provide green job opportunities. The multiple crops produced allow small-scale farmers to diversify their incomes, which reduces risk of crop failure and increases revenue by providing products for

multiple markets. Three new permits have been issued in 2022, including one from Zuni Pueblo. **Rossana Salleneve, *Extension Aquatic Ecology Specialist, Extension Animal Sciences and Natural Resources***

Canjilon Creek Restoration Project

In Rio Arriba County, water is key to all aspects of life and the sustainability of small villages. There are several small creeks in Rio Arriba County that play a significant role in agricultural production in New Mexico, with many of the creeks contributing to the flow of water into the Chama and Rio Grande rivers.

Donald Martinez, the Rio Arriba Agricultural Agent, worked in collaboration with the New Mexico Water Resources Research Institute, NRCS and the Upper Chama Soil and Water Conservation District on several workshops on stream restorations. Martinez helped the organizations with identifying small creeks and tributaries around Rio Arriba County that could use restoration for the improvement of river health.

The Canjilon creek was selected for some installations of effective organic drop structures. In the village of Canjilon the creek flows strong in the spring and eventually dries mid-summer. The timing for irrigation has been critical, primarily for increased hay production and survival of small gardens. The most important goal of this project is to have a consistent flow of water through the village of Canjilon. Monitoring practices were implemented for water quality and temperature, and soon youth organizations will be involved in the monitoring portion of this project.

Livestock producers, anglers, recreationists, and village residents will be able to benefit from a constant water flow on the Canjilon creek. The water aquifer will recharge and help private and community wells be productive.

Donald Martinez, County Program Director, Agricultural Extension Agent, Rio Arriba County, Northern District

Family Development and Health of New Mexicans

Health and Wellbeing

Kitchen Creations: A Cooking School for People with Diabetes and Their Families

Diabetes costs New Mexico residents over \$2 billion each year. Over 16% of adults in New Mexico have diabetes and 32.5% have prediabetes. Individuals and families affected by diabetes regularly struggle with diet modifications that would help them manage their health and have limited access to nutrition and diabetes professionals.

The Cooperative Extension Service in 18 counties partnered with many community organizations to provide 16 Kitchen Creations diabetes cooking schools to 180 participants. Each series included up to 12 hours of group nutrition and cooking education from Registered Dietitian Nutritionists, Diabetes Care and Education Specialists, and Extension Agents. Participants received a manual with the information covered and diabetes cookbooks.



Each series included up to 12 hours of group nutrition and cooking education from Registered Dietitian Nutritionists, Diabetes Care and Education Specialists, and Extension Agents. Participants received a manual with the information covered and diabetes cookbooks.

Participants who completed program evaluations reported they were satisfied with the classes and understood the strategies to plan and prepare healthy meals, including reading food labels to find the amount of carbohydrates

in a serving; using more herbs and spices to flavor foods instead of salt and fat; and using the food groups and 50/50 or Diabetes Plate methods to plan balanced meals that control the amount of carbohydrates eaten at meals.

Diabetes education decreases healthcare costs and lost productivity at work. In 2022, Kitchen Creations programming has a potential cost savings of over \$216,000. In addition, Extension Agents report that Kitchen Creations increases the visibility and use of other Cooperative Extension Service programs. Participants are more aware of efforts made by the NM Department of Health Diabetes Prevention and Control Program, NMSU, and the American Diabetes Association to use funds to support the public in managing diabetes. **Cassandra Vanderpool, *Extension Associate II, Extension Family and Consumer Sciences***

Walk with Ease Activity Program

According to the National Institute on Aging, the benefits of being active for older adults allow them to keep and improve their strength, facilitating independence longer. Activity also improves balance and prevents falls and injuries from falls. It also helps to manage and prevents diseases like arthritis, heart disease, stroke, type 2 diabetes, osteoporosis, and eight types of cancer, including breast and colon cancer. It also controls blood pressure. An active lifestyle promotes better sleep and assists in maintaining a healthy weight. Regular activity can possibly improve or maintain some aspects of cognitive function, such as your ability to shift quickly between tasks or plan an activity as well as reduce feelings of depression. The recommended guideline is 150 minutes of moderate activity weekly.



Walk With Ease (WWE) is a national program from the National Arthritis Foundation that focuses on walking, an endurance cardiovascular type of activity. WWE is a six-week self-directed program designed to improve balance and strength, improve arthritis symptoms, increase strength, increase walking pace, and improve confidence in one's ability to manage arthritis symptoms. The target audience includes older adults, adults with arthritis, and adults living in areas with little or no access to arthritis programs, including adults in rural areas. To meet the need of increased activity for older adults in Bernalillo County, five six-week Walk With Ease cohorts were promoted and facilitated in 2022. Fifty participants engaged with 30 educational sessions. Participants were recruited through marketing, other chronic disease programs, and Crossroads for Women, a community partner assisting women coming out of incarceration.

All participants reported a deeper understanding of the concepts presented, indicated they would change their practices based on what they learned, and planned to continue walking after the class ended. Participants indicated the greatest program benefits included understanding how exercise will help ease arthritis pain; understanding the importance of and how to develop a walking plan; increased motivation to be more active; and meeting other people who experience similar issues.

Dianne Christensen, *Extension Home Economist, Bernalillo County, Northern District*

Foods and Moves App Suite

The Foods & Moves suite of four apps mobile is designed to help young children get the right kind of physical activity and increase their willingness to try new foods. The apps are based on research from different fields – early childhood, health, kinesiology, and behavior. Young children, under the care of parents, teachers and caregivers, engage in activities that build physical skills and motor performance, establish joy and imagination in movement, and provide opportunities for tasting new foods in a supportive setting. To contribute to these activities in a preschool setting, researchers identified a need for mobile app-based programs that present healthy scenarios for activity and exploration.

The Foods and Moves apps are part of the HEROs Study (Healthy Environments Study), which investigated ways to impact young children's health behaviors by encouraging preschoolers' willingness to try new foods and motor performance, both in childcare and family settings. In collaboration with researchers at Cornell University, Colorado State University, and University of Colorado Anschutz Medical Campus, the New Mexico State University Innovative Media, Research and Extension team developed Jungle Gym 1, Jungle Gym 2, Tasting Party Express and Spin-n-Move – available free on the Apple iOS and Google Play stores.

Published research about the development and impacts of Foods & Moves supports the efficacy of using mobile devices as a platform to offer nutrition and physical activity education for young children, with their caregivers or preschool teachers. The apps have been used and



tested in several programs and settings, including childcare settings, pre-schools, and homes. When played by children for 7 minutes they produced an average of 80% Moderate-to-Vigorous physical activity during play, equivalent or greater to physical activity from traditional physical education. Parents who used Jungle Gym 1 & Jungle Gym 2 with their children overwhelmingly (93%) felt that the apps were likely to increase physical activity, and the majority of parents (63%) felt that Tasting Party Express would help their children try new foods.

The Foods and Moves app suite provides research-based tools for families and childcare settings to encourage imaginative play and exploration of physical activity and healthy eating. Through the process of app development for this age group, the NMSU Innovative Media,

Research and Extension team also refined its user testing process for young children and made important findings regarding representation of characters from a Diversity, Equity and Inclusion standpoint, including findings about how children respond to monster vs human characters. Parents, teachers, and childcare workers can download the apps for free at the Apple Store or Google Play store.

Barbara Chamberlin, *Innovative Media, Research and Extension*

Financial Literacy

Living Well with Inflation Series

With consumer price rates reaching highs not seen since 1981, Cooperative Extension Service specialists and agents noticed an opportunity to help residents in the state learn more about inflation.

An Extension team of Bryce Jorgensen, Family Resource Management Extension specialist; Dianne Christensen, Bernalillo County Family and Consumer Sciences agent; and Extension agents from around the state created and conducted a four-part weekly webinar series called "Living Well with Inflation." The goal of the series was to provide practical strategies to manage the numerous impacts of inflation and leverage them toward positive growth in people'



lives. While the webinar was held in October 2022, recordings are still available at inflation.nmsu.edu.

With current rates for an average family of four, it now takes from \$500 to \$700 more per month to maintain the same standard of living. At the same time, half the population is unable to cover a \$400 emergency expense without borrowing money, which is now at a much higher interest rate. Nationally, 75% of the workforce lives paycheck to paycheck. Savings rates are at a 10-year low, and total household debt of \$16 trillion recently eclipsed levels last seen before the 2008 economic downturn. Helping individuals and families in New Mexico understand inflation and get control over their debt, spending and finances is a critical need in New Mexico.

Session one of the series explained inflation and how understanding the concepts can help to manage the impact. The second session focused on spending habits. The third and fourth sessions featured managing debt and investment topics, respectively.

On a post-series survey, the 240 participants agreed that the inflation series helped them to better understand the impacts of inflation on their lives. Participants also stated they had started using or planning to use tools and strategies mentioned in the series such as tracking and analyzing spending to cut costs where feasible; contacting utility companies to inquire about help; reviewing insurance policies for possible cost reductions; prioritizing purchases and reducing waste; using suggested websites and apps that help save money; conducting an energy audit to evaluate how to minimize utility costs; looking at current investments; starting a long-term emergency fund and adding to short-term emergency fund; and paying extra toward debt to lower cost of interest.

Understanding their financial options, and taking control of the resources available to them, led to increased confidence, decreased stress, and increased understanding of how to navigate these difficult financial times. Participants found the material to be very useful, and many shared it with others.

Bryce Jorgensen, *Family Resource Management Extension Specialist, Extension Family and Consumer Sciences*

Dianne Christensen, *Extension Home Economist, Bernalillo County, Northern District*

Estate Planning for Families

Helping individuals and families in New Mexico get control over their finances is a critical need in New Mexico. Financial literacy is important to individuals, families and communities at all income levels, and it is especially critical for those living on restricted income or below the poverty level. Families with limited resources struggle when unexpected circumstances, such as financial errors, emergencies, job loss, medical emergencies, or even death, occur. The Curry County FCS Advisory Committee identified estate planning skills as a need in Curry County.

The FCS and Ag Agents partnered with the Family Resource Specialist and local attorneys to provide a workshop on basic estate planning addressing trusts as a follow up to the 2021 workshop on wills. Additional topics have been identified for future workshops to create a series on estate planning for Extension clientele, including agricultural producers, seniors and young families.

Almost all participants reported an intent to review or establish a will to fit their current situation and review options for setting up trusts with an attorney. Participants also indicated they plan to attend future trainings to gain knowledge related to leaving advance directives and living wills.

Mindy Turner, *County Program Director, Family and Consumer Sciences Extension Agent, Curry County, Eastern District*

Youth Development

Educating Youth in Animal Agriculture in New Mexico

The average age of the New Mexico livestock producer is 60.5 years old (USDA NASS, 2017). Given this reality, youth education and involvement in agriculture is needed to sustain and grow this very important industry.

NMSU Extension provides a variety of programming targeting the next generation of farmers and ranchers. The New Mexico Youth Ranch Management Camp (NMYRMC), an annual five-day camp, introduces young people to all aspects of ranching. The New Mexico Youth Quality Assurance program is educational training developed for young people who exhibit livestock in New Mexico; this training educates young people in health management, nutrition, and showmanship. And lastly, the New Mexico Youth Beef Project (NMYFB) is a state-wide program for young people interested in beef production to raise a steer from weaning to finishing. Participants also learn how the supply chain works in the beef industry.

Over 500 students have been trained in animal agriculture management since 2010. Evaluations provided each year of the NMYRMC have indicated over a 20% increase in knowledge after

attending the camp. At least 60% of participants have decided to attend NMSU and major in an agriculture-related degree program. Of those who graduated, 90% have remained in the agriculture industry. Program evaluations indicate a 20% gain in overall knowledge overall. Three NMRMC participants are now veterinarians or studying to be a large animal veterinarian. They also gained skills in utilizing excel spreadsheets to manage record books, and calculating benchmarks related to profitability in the beef industry. Participants developed speeches, videos, and posters to communicate what they learned from the program. Evaluations indicate a 40% improvement in overall knowledge base by the participants. Parents even commented on what they had learned by working with their kids.

It is today's youth that will become tomorrow's agriculture producers. Sparking interest through educational activities in their formative years is vital to help an industry that feeds the world continue to grow and thrive.

Marcy Ward, *Extension Livestock Specialist, Extension Animal Sciences and Natural Resources*



4-H Fridays

The 4-H Fridays program in Bernalillo County was developed to help youth overcome the academic divide while learning everyday life skills. The principal of Collet Park Elementary observed that her students could learn a skill for a short period of time but could not retain it or generalize the skills to be used in other situations. Students scored 16% in language arts proficiency, absenteeism hovered at 23%, and student behavioral issues and suspensions were not uncommon. The school felt that the lack of experiences outside of school contributed to the achievement divide between low socio-economic status students and their higher socio-economic peers. As she was looking for a solution to help her students, the principal contacted Bernalillo County 4-H to devise a plan.

The program was built on the idea that if students participated weekly in 4-H clubs, it would increase their engagement in learning, encourage them to persist through difficult tasks and ultimately, build their capacity to learn traditional academic content. Becoming 4-H leaders would also encourage teachers to change the ways they presented academic content and trust students' abilities to handle increased levels of difficulty. To implement the program, teachers added an experiential learning process to their curriculum. Since then, the program has shifted and evolved and is part of the structure of the school, resulting in a decrease of chronic absenteeism at the school, which has dropped from 23% to 7%.

The principal also found that the number of students who regularly left early Friday afternoons dropped nearly 100%. The principal attributed this impressive decline directly to the 4-H club meetings. Behavior referrals to the office also dropped drastically. The 4-H program was so successful in helping to reduce behavior-based issues that the teachers were able to handle most of them, without having to refer the youth to the office.

Additionally, the state-wide test scores for the entire school went up by more than six points in the first year, bringing the school's rating to less than a point away from the next tier. Before implementing 4-H Fridays, the students had a 16% proficiency in language arts. After completing one year with the 4-H Fridays, the students were 47% proficient.



The Bernalillo County Extension Office is entering their 7th year of the 4-H school partnership. Since the implementation of this program, it has spread to ten schools in the county as well as numerous other schools in counties across the state. In 2020, NBC filmed a video for National 4-H on the success of the program. Finally, the agents and the principal have developed curriculum addendums focused on school-based implementation to use alongside 4-H curriculum in the classrooms.

***Brittany Sonntag, 4-H Extension Agent,
Bernalillo County, Northern District***

Southern Regional Livestock School

As a society, it is important for our youth and future generations to have skills such as self-confidence, work ethic, responsibility, and motivation. For the past two years, the Southern Regional Livestock School has worked with close to 250 youth in five Southwest Regional Counties to promote education for youth and families requesting knowledge-based skills to enhance livestock production projects.

The school is divided into four species-specific instructional units, including sheep, goat, swine, and cattle. Instructors in each category teach individuals basic and advanced skills in the areas of Showmanship, Nutrition, Grooming and Clipping, Animal Health and Animal Selection.

About 95% of participants indicated they had a deeper understanding of their livestock project after participating in the school, and 91% believed the course material covered by instructors was extremely to moderately useful in improving their understanding of overall animal care and preparation.

Additionally, 95% of participants agreed that the material learned has been utilized to complete their livestock project. One individual indicated their favorite component of livestock school was, “The feedback and the way I could see results from hands-on-learning.” A parent said, “both of my boys gained so much confidence from the workshop. This was their first year in cattle breeding. There was so much to learn, and still more to learn, but the confidence they gained is unexplainable.”

Sara Marta, County Program Director, Agricultural Extension Agent, Sierra County, Southwest District



Environmental Stewardship

Extension Serves NM Through Historic Wildfire Season

In response to New Mexico’s devastating and historic fire season through the spring and summer 2022, the Cooperative Extension Service is working in numerous ways to help residents recover, prepare and mitigate damage from future blazes.

The 2022 fire season started earlier than predicted and included the largest wildfire in New Mexico history - the Calf Canyon Hermits Peak Fire near Santa Fe, which burned more than 530 square miles and took four months and \$300 million to contain. Throughout that fire and all the others, Extension connected with multiple local, state and federal agencies, and directly helped community members. Extension personnel participated in daily Emergency Support Function calls to ensure efficient use of resources and no duplication of efforts by the agencies, giving everyone involved some knowledge about the critical needs and which group will handle them.

In counties with active fires, Extension agents provided evacuation education, and in counties hit hardest by the Calf Canyon Hermits Peak Fire, agents collected items for evacuees. Extension provided leadership and deployment of pet shelter trailers that provided needed pet supplies at evacuation sites. Coordinating with hay producers, Extension agents acquired livestock feed (through donations) and delivered the feed to designated sites.



Going forward, Extension continues to support the people of New Mexico by implementing post wildfire programs to address issues involving livestock producers, soil and watershed management, water quality, mental health or social economics.

Cooperative Extension Service

Navigating Persistent Drought

Pasture yield is limited, and producers are selling livestock. Irrigated crops: stunted. Dryland crops: brown. Wildfires may increase. These are some of the ways the National Integrated Drought Information System describes about 60% of New Mexico, placing most of the state within its “severe drought” category.

With limited relief on the horizon, NMSU’s Extension Animal Science and Natural Resource Specialists conducted a webinar series discussing production strategies to help New Mexico producers navigate extended drought conditions. Through the webinars, along with an in-depth set of downloadable assets, Extension provided research-based information on several range monitoring-relevant topics, including calf management, wildfire preparedness and how to interpret range-monitoring data.

NMSU Extension Beef Specialist Craig Gifford discussed the impacts of weaning calves earlier than normal — done correctly, this can be an effective tool to mitigate the impacts of drought. Separately, he also talked about calf vaccination protocols. Marcy Ward, an Extension livestock specialist, developed a presentation detailing how to select cows and bulls for maximal feeding efficiency, which also can be vital during drought. More specific to bulls, John Wenzel, NMSU’s Extension veterinarian, talked about managing them throughout the year.



Extension specialists also created plenty of materials on range monitoring. Casey Spackman, an NMSU Extension range specialist, delivered a basic synopsis of monitoring and why it’s even more important under drought conditions. Later, Spackman gave information on how to

compile and interpret rangeland monitoring data. Doug Cram, NMSU Extension forestry and fire specialist, went over home and range wildfire preparedness tactics, giving simple tips that everyone in the family can use to keep safe.

Doug Cram, *Extension Forest and Fire Specialist*

Craig Gifford, *Extension Beef Specialist*

Marcy Ward, *Extension Livestock Specialist*

Casey Spackman, *Extension Range Specialist*

Extension Animal Sciences and Natural Resources

NIFA Grant for Postfire Response to Establish Virtual Fencing

Rebuilding after extreme weather events such as wildfires and flooding can be a tedious task. A new grant will help the Cooperative Extension Service aid agricultural producers with these efforts. NMSU is one of two universities in the country that was awarded a grant from the United States Department of Agriculture's National Institute of Food and Agriculture. NMSU's project, "Implementation of virtual fencing technology to build resiliency of agriculture systems impacted by wildfire and subsequent flooding," will receive \$222,192 from the Agriculture and Food Research Initiative – Rapid Response to Extreme Weather Events Across Food and Agriculture Systems program.

Craig Gifford, Extension beef cattle specialist, and Santiago Utsumi, Animal and Range Sciences associate professor, are leading the one-year project, and team members include Sara Marta, Sierra County program director; Doug Cram, Extension forest and fire specialist; Marcy Ward, Extension livestock specialist; Tom Dean and Marshal Wilson, co-directors of the Southwest Border Protection and Emergency Preparedness Center; and Casey Spackman, Extension range specialist.

NMSU's project will address a need for ranching infrastructure after hundreds of miles of fences were destroyed in the Black Fire in 2022. More than 325,000 acres of forest and rangelands in the southern portion of the Gila National Forest were burned and affected the forage base that area ranchers rely on to maintain their operations.

While the rangelands are now recovering, maintaining boundaries between grazing management allotments is a challenge. NMSU's project will utilize innovative virtual fencing technology to aid ranchers in grazing management until fencing systems can be rebuilt. The project will be conducted on three ranches and grazing allotments covering thousands of acres of rugged rangeland and open savannas with 300 crossbred cattle that will be collared for one year. It will use a virtual fence collar and dashboard monitoring system manufactured by Vence.

Key objectives of the project consist of training producers on the use of virtual fencing to contain livestock, implementing ways to manage livestock grazing distribution, and facilitating the recovery of rangelands impacted by wildfire in the state. NMSU ACES also has plans to determine best use practices for virtual fences in extensive livestock production systems and evaluate rangeland indicators in response to grazing management through virtual fence use and to establish framework for the use of virtual fencing during and after natural disasters.

Craig Gifford, *Extension Beef Specialist, Extension Animal Sciences and Natural Resources*

Anna, Age Eight Institute

Executive Summary

In 2022, the Anna, Age Eight Institute created three research briefs focused on the mission of transforming the adverse social determinants of health into positive ones across New Mexico. This work was undertaken in partnership with Chapin Hall at the University of Chicago with data collected through a framework of quarterly reporting for each county. In the area of training, the institute created three web-based courses: one, a public-facing course to educate community partners and stakeholders about the 100% New Mexico initiative's work ensuring ten vital services, plus two courses aimed at established initiative participants to promote professional development. In addition, the institute developed a course for building statewide capacity that will launch in 2023. In 2022, the number of counties with an active 100% New Mexico initiative rose to eighteen. The institute began rolling out both the 100% Family Center project and the 100% Community Schools project to each of the participating counties. In the area of outreach, the institute launched the "Road to 100%" mini-documentary series, established regional and county-level 100% Summits to highlight local progress, expanded the popular 100% Mural project to new counties, and regularly published through the institute's 100% Blog and in local media outlets. In addition, the institute continues to work in collaboration with NMSU partners across the state to create home, school, campus, and workplace environments where all New Mexicans can reach their full potential and thrive.

We're Ensuring Every Family Can Thrive

The Anna, Age Eight Institute was funded by the New Mexico state legislature in 2019 to reach the goal of ensuring that our children, students, and families are trauma-free and empowered to succeed in family life, school, and the workplace. We employ a data-driven and collaborative process focused on building the capacity of each county to strengthen local governmental and nongovernmental services and systems of health, safety, education, job readiness, and resilience. We are guided by decades of research focused on the social determinants of health and the social-ecological model that guides public health endeavors.

We Are County Based

We bring to each county's leaders and stakeholders a process of problem-solving, brainstorming, learning, mobilizing, capacity-building, and innovating, all with the support of state-of-the-art technology. Our goal is to create within each county a public and private sector partnership that includes city and county government, schools, higher education, and health councils, to ensure the accessibility of vital services for surviving and thriving for 100% of residents.

Short-Term Goals

Build the organizational structure to implement the 100% New Mexico framework, educating county residents about the costs of adverse childhood experiences, family trauma, and social adversity. Build ten action teams with a shared vision, goals, interconnected activities, and a protocol for using data, technology, and communication.

Intermediate Goals

Support ten action teams in identifying barriers to vital services and guiding initiative project leaders through assessment, planning, acting, and evaluation. Identify funding and resources to support our three main strategies:

1. Building the 100% Family Center, a one-stop service hub offering access to all ten vital services;
2. Transforming public schools into fully resourced 100% Community Schools offering access to all ten services to students and parents;
3. Ending the digital divide so that 100% of residents can access ten vital services online.

Long-Term Goals

With service barriers removed, we can measure increases in family self-sufficiency, school achievement, job readiness, work performance, and community engagement, focused on growing a culture of caring where every child is the top priority.

More information about the institute and the 100% New Mexico initiative can be found on our websites: <https://annaageeight.nmsu.edu> (institute) <https://www.100nm.org> (initiative)

Expansion

By the end of 2022, the Anna, Age Eight Institute expanded the 100% New Mexico initiative to eighteen counties:

- San Juan
- Rio Arriba
- Taos
- McKinley
- Santa Fe
- Mora
- San Miguel
- Bernalillo
- Valencia
- Guadalupe
- Catron
- Socorro
- Lincoln
- Chaves
- Curry
- Roosevelt
- Doña Ana
- Otero

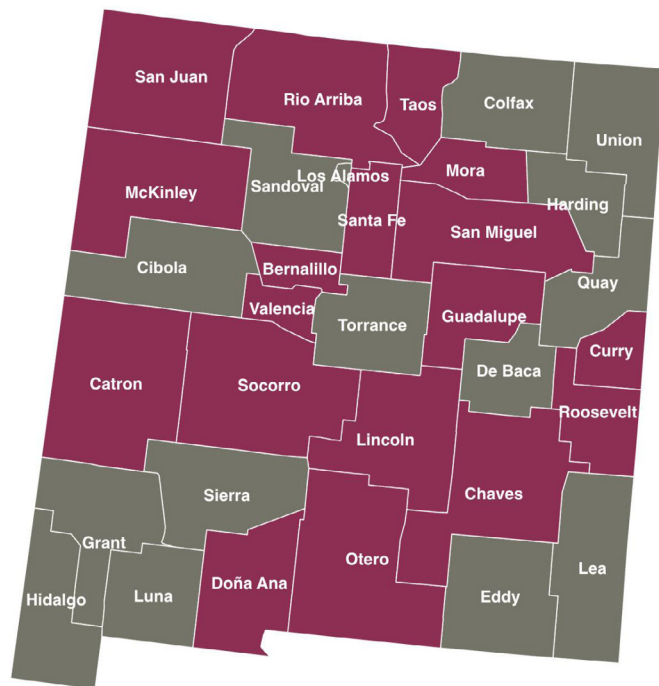


Figure 1: All New Mexico Counties with an active 100% New Mexico initiative

Empowerment and Support

The Anna, Age Eight Institute continued to expand its support of each county in both establishing a 100% New Mexico initiative and maintaining momentum of established initiatives. Our support in 2022 included coordinating funding, outreach support, and technology solution support.

Websites

In coordination with local initiative teams, the institute expanded the number of county websites in 2022 to thirteen. These websites are used for public outreach and as repositories for data used when meeting with potential local stakeholders in government and the community at large. All county websites can be accessed through our county map at <https://www.100nm.org>.

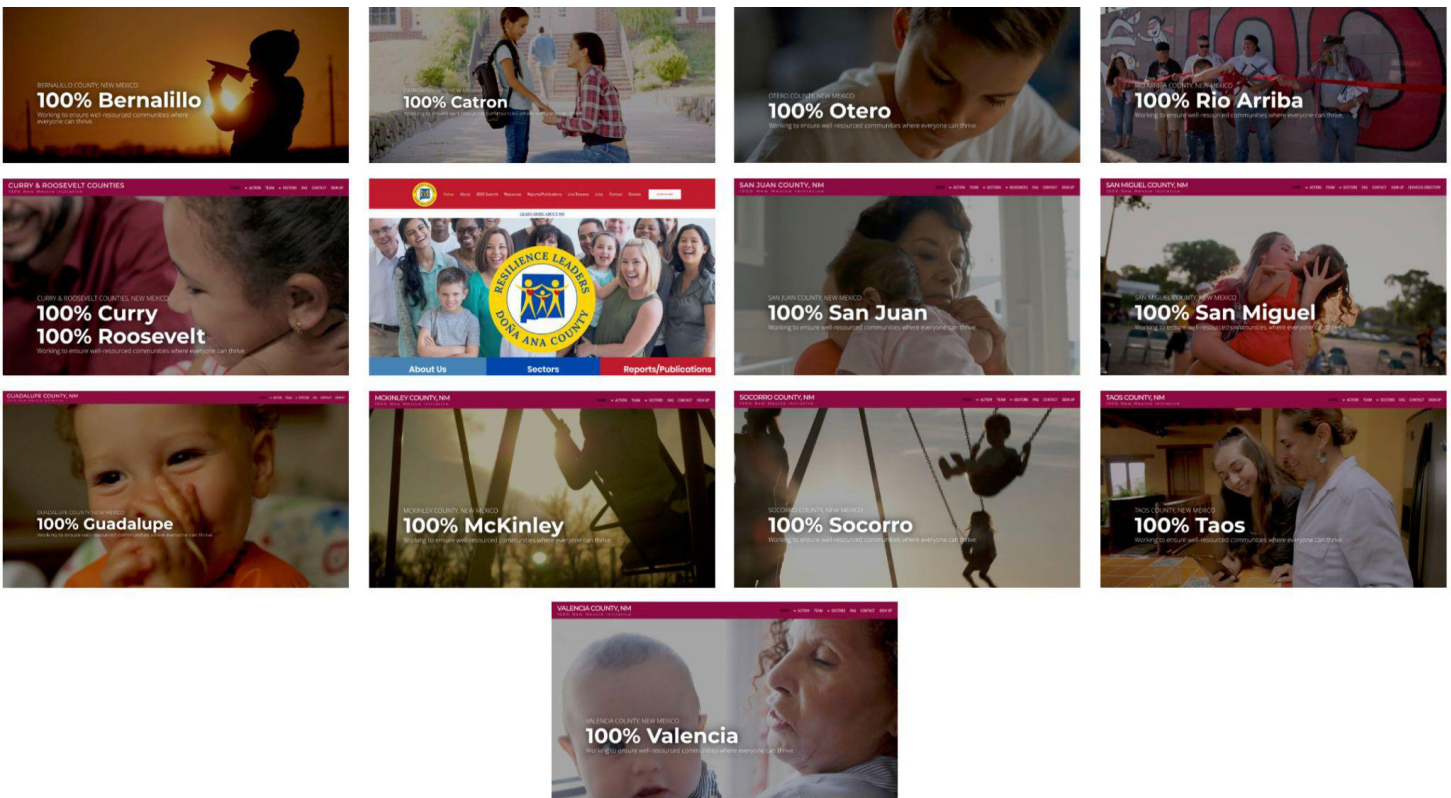
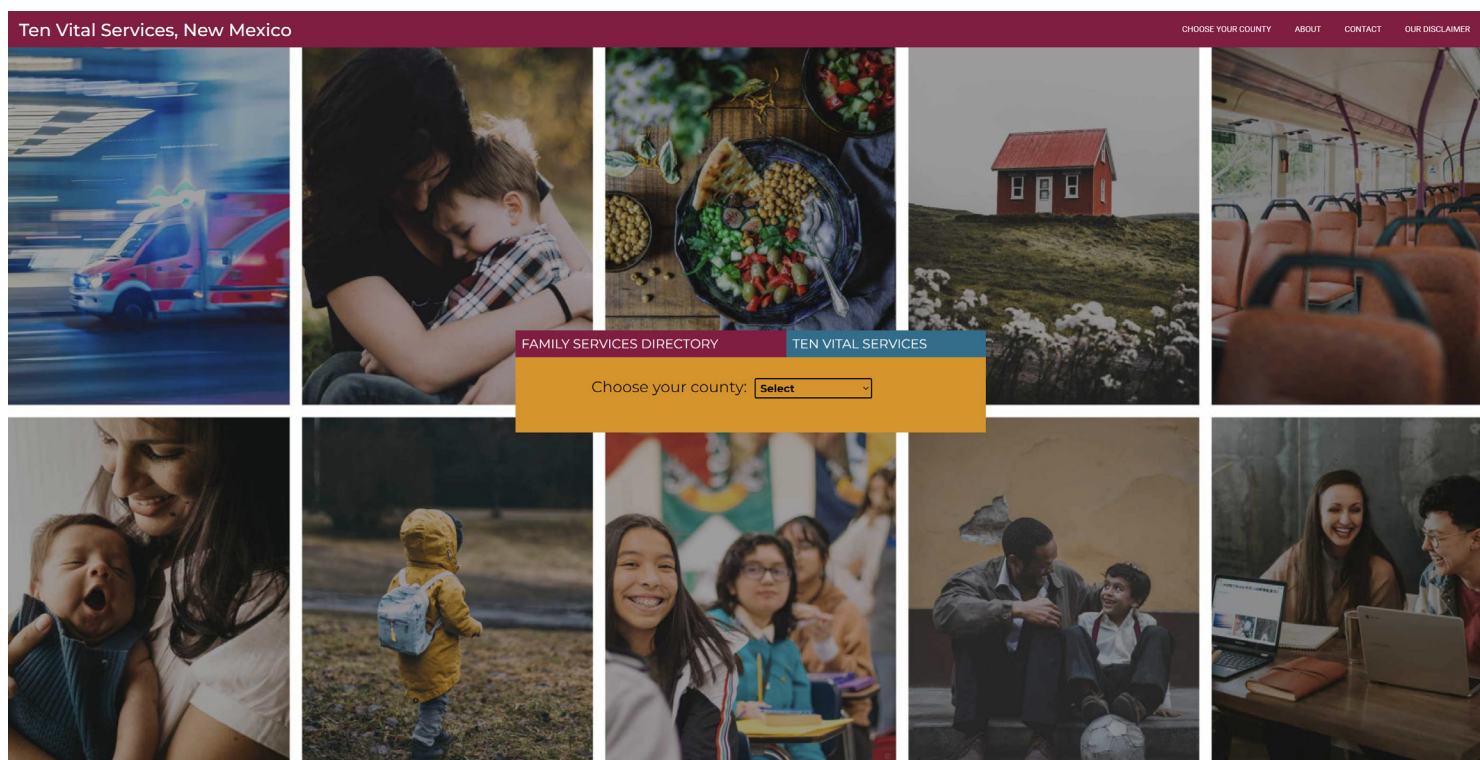


Figure 2: Each county with an active 100% New Mexico initiative will receive a community website

Services Directory

As part of the data collection process, the initiative in each county creates a human-vetted services directory listing all currently available services in the ten sectors. This project exposes gaps in services at the local level and creates important metrics that help drive positive change. In 2022, three new counties were able to complete this stage of the process with support of the institute. The Family Services directory can be found at <https://www.tenvitalservicesnm.org>.



Regional Summits

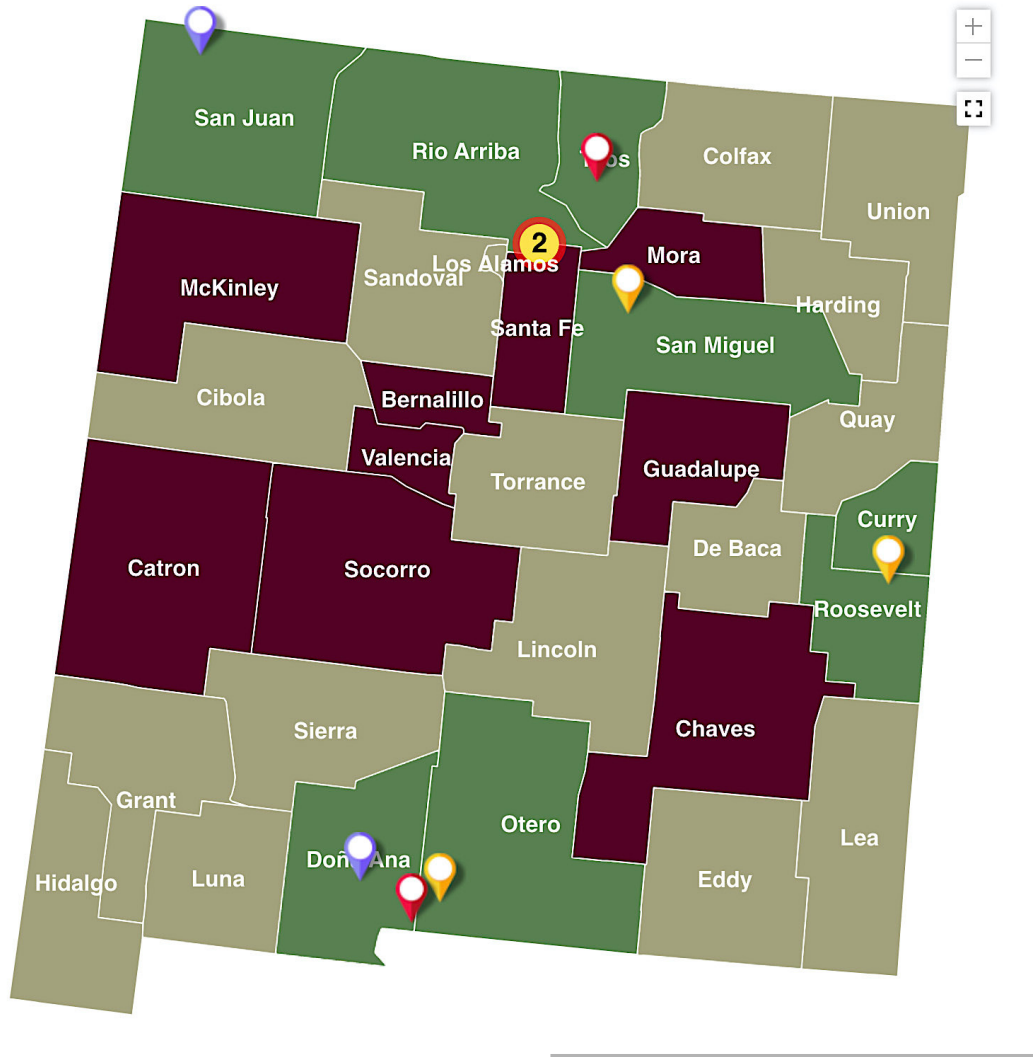
2022 saw the expansion of regional summits to support the initiatives in each county. The thirty-three New Mexico counties are grouped into five regions, following the groupings set by the NM Department of Health: Northeast, Northwest, Metro, Southeast, and Southwest. Most summits offered both in-person and virtual attendance options and each one reached full attendance capacity. More information about our regions can be found at <https://www.100nm.org/regions>

Power Hours

The institute ran a series of “lunch and learn” virtual presentations called “Power Hours” in each quarter in 2022. These events, presented through Zoom, helped to educate and expand the initiative in each county and will be carried forward into 2023.

Grassroots Community Engagement

Murals



The 100% Mural Project is designed to increase public awareness of the 100% New Mexico initiative and the need to address adverse childhood experiences, trauma, and social adversity. The mural project is far more than just painting a mural. It's a community engagement process that shares a powerful message about the importance of taking care of one another. In 2022, several counties petitioned and received approval to create 100% New Mexico initiative murals. These included Taos County, San Miguel County, Doña Ana County, Otero County, Rio Arriba County, and Roosevelt County. More information about our mural outreach program and a map of completed murals can be found at <https://www.100nm.org/mural/>.

Recognition

The Anna, Age Eight Institute was honored to receive official support from several local governments in 2022 in the form of resolutions being unanimously passed by the governing bodies. These included the following:

Taos County, NM Resolution No. 2022-16: “RESOLUTION IN SUPPORT OF 100% COMMUNITY ENSURING 10 VITAL SERVICES FOR SURVIVING AND THRIVING IN TAOS COUNTY, NEW MEXICO”

<https://www.100nm.org/blog/100-support-from-taos-county-commissioners/>

San Miguel County Resolution 12-20-22 Commission: “RESOLUTION IN SUPPORT OF 100% COMMUNITY: ENSURING 10 VITAL SERVICES FOR SURVIVING AND THRIVING IN SAN MIGUEL COUNTY, NEW MEXICO”

<https://www.100nm.org/blog/san-miguel-county-100-resolution-sends-an-important-message/>

Hagerman, NM (Chaves County) Resolution 121322-1: “RESOLUTION IN SUPPORT OF 100% CHAVES COUNTY INITIATIVE: ENSURING 10 VITAL SERVICES FOR SURVIVING AND THRIVING IN HAGERMAN, NEW MEXICO”

<https://www.100nm.org/blog/town-of-hagerman-nm-signs-resolution-for-100-chaves/>



CENTER OF EXCELLENCE IN SUSTAINABLE FOOD AND AGRICULTURAL SYSTEMS



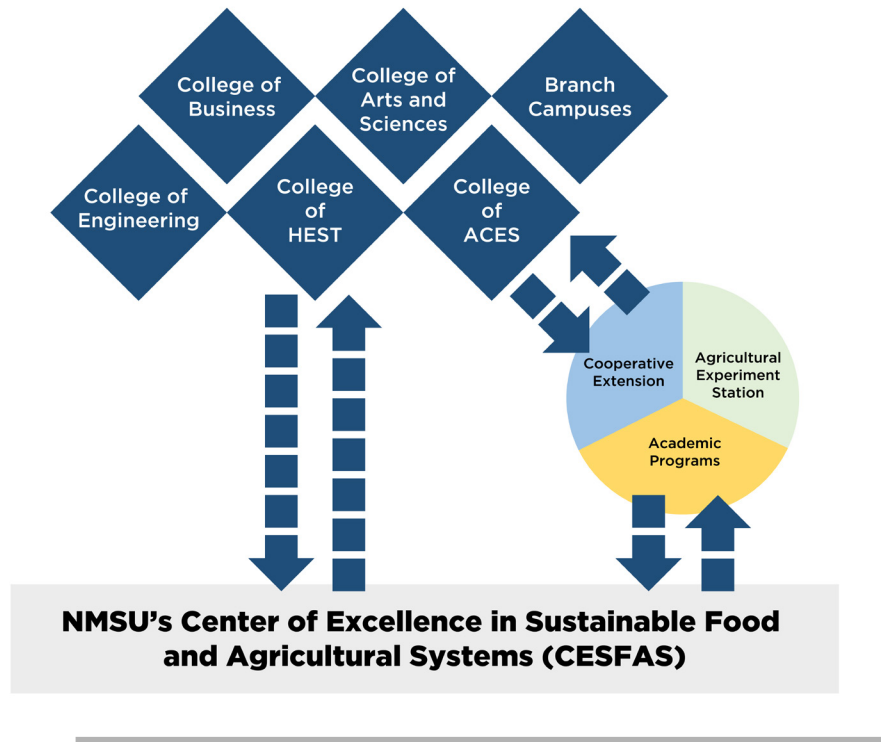
BE BOLD. Shape the Future.
College of Agricultural, Consumer
and Environmental Sciences

Executive Summary

The Center of Excellence in Sustainable Food and Agricultural Systems (CESFAS) was established in 2019 by Governor Lujan Grisham and the New Mexico Legislature. Within the Governor's initiative, four university-associated centers of excellence associated with emerging disciplines or needs were organized. The centers include:

- New Mexico State University's [Center of Excellence for Sustainable Food and Agricultural System](#)
- San Juan College's [Center of Excellence Renewable Energy & Sustainability](#)
- University of New Mexico's [Bioscience](#) Center
- New Mexico Institute of Mining and Technology's [Cybersecurity Center of Excellence](#)

The CESFAS is housed within the College of Agricultural, Consumer, and Environmental Sciences at New Mexico State University. A primary goal of CESFAS is to coordinate and encourage interdisciplinary teaching, research and outreach (Extension) activities that support sustainable food systems, develop and expand value-added agriculture, create jobs and prepare workforce-ready graduates. In 2022 the Center of Excellence focused its mission, goals and objectives towards post-harvest valued-added agriculture.



The College of Agricultural, Consumer, and Environmental Sciences

The College of Agricultural, Consumer, and Environmental Sciences (ACES) is broadly organized into three interrelated functional areas: Academic programs, the Agricultural Experiment Station, and the Cooperative Extension Service. Teaching, research, and Extension efforts within the College are centered on four primary pillars, with a foundation of education and training. The four pillars are (1) food and fiber production and marketing, (2) water use and conservation, (3) family development and health of New Mexicans, and (4) environmental stewardship. The Center of Excellence supports academic, research, and Extension/outreach activities within each of these pillars.

2022 Center Efforts

Research

Roadmaps

The Center of Excellence in Sustainable Food and Agricultural Systems is virtual in that it does not have a physical presence on campus. The Center's primary role is to coordinate the expertise and efforts of faculty and staff throughout the NMSU system and other stakeholders in developing solutions to problems facing New Mexico's food and agricultural systems, with a focus on post-harvest, value-added agriculture. Coordination efforts include developing and

supporting transdisciplinary “roadmap” teams, providing seed funding for innovative research projects, and collaborating with other New Mexico centers of excellence and other stakeholders. By encouraging and facilitating the development of roadmap teams, CESFAS is breaking down silos that commonly occur in higher education.

Center of Excellence directors work with other college administrators in organizing and supporting roadmap teams. Roadmap teams progressed along a continuum from initiation (initial team meeting) to sunset (roadmap/whitepaper identifying opportunities completed and funding opportunities explored).

What is a “Roadmap Team?”

The Center directors, in collaboration with College administration and affiliated faculty members, identify food and agricultural research areas (1) where University faculty have the expertise, (2) that are important to New Mexico, and (3) where there are opportunities for external funding. Once strategic research areas are identified, the Center directors work with affiliated faculty to build “roadmap” teams.

These transdisciplinary teams work together to better understand issues within the research area and develop a roadmap that outlines how NMSU faculty can contribute. Roadmaps team output may include a whitepaper that outlines the issue or issues addressed by the team, potential solutions, and resources needed to implement solutions. The teams are encouraged, with the support of Center directors, to seek for external funding that can be used to provide resources needed to address the issues identified by the team.

Examples of Roadmap Teams that Operated in 2022 Include:

- Controlled environment agriculture
- Carbon sequestration
- Regenerative agriculture
- Agricultural byproduct utilization
- Functional Foods
- Bioprocessing

Roadmap Team Examples

Controlled Environment Agriculture

Controlled environment agriculture includes a number of methodologies used to grow crops indoors. These include high tunnels, greenhouses, indoor vertical farms (in “brick & mortar” facilities), and container farms. A Center of Excellence supported roadmap team successfully obtained funding for a container farm placed on NMSU’s Grants campus.

The container farm is currently operating, producing kale during its first year of operations, as a part of a nationwide research project with the Electric Power Research Institute (EPRI). After producing kale, the researchers will explore growing other crops, exploring opportunities to increase the sustainability of the container farm.





Regenerative Agriculture

The Center of Excellence organized an initial roadmap team meeting focused on regenerative agriculture. Regenerative agriculture is a holistic approach that recognizes the interconnection of farming and ecological systems as a whole.

The initial team meeting, which was well-attended by faculty and staff, included a guest presentation from a regional farmer who has recently adopted regenerative agricultural practices. Roadmap team direction has been shared with the Agricultural Experiment Station, as much of the work of regenerative agriculture occurs prior to harvest.

Funding

To meet its full potential, the Center of Excellence must leverage funds provided by the State of New Mexico with external funds. In 2022, Center of Excellence faculty participated in numerous funding proposals to support the work of the Center. Some of these proposals included:

- NSF Innovation Engine (agriculture)
- NSF EPSCoR (Research Infrastructure Improvement)
- USDA (NextGen – Workforce development)
- USDA (Climate-smart agriculture)
- Cotton Incorporated (plant proteins)
- New Mexico Department of Agriculture (potato research)
- New Mexico Department of Agriculture (specialty crops)
- New Mexico Chile Association (disease management)

Outreach

Training

The Center is coordinating efforts to provide a certified meat processor training program focused on beef processing. The training program, which will launch in 2023, consists of a series of online training videos along with an opportunity to apply skills in a hands-on training. Additional programs designed for alternative meat processors will be developed in 2023.

Testing Services

The Center of Excellence, along with the College's Food Science program, is working towards obtaining testing equipment necessary to test wine quality parameters for New Mexico's wine stakeholders. Testing services for the industry should be available in 2023, allowing wineries to better understand wine composition and improve their wines.

Coordination

Center directors facilitated interaction between Chile producers and processors. Industry participants could leverage interactions into collaborate efforts.

Community Engagement

The Center of Excellence welcomes opportunities to interact with community members regarding sustainable food and agricultural systems. In 2022 the Center participated in community outreach activities including the ACES Open House, Ag Days, and the New Mexico Water Symposium.

Center directors assisted colleagues from New Mexico Tech and Navajo Tech in organizing a New Mexico Water Symposium, directed towards high school students in the Four Corners region of New Mexico. High school students were able to listen to a keynote address given by Crystal Tulley-Cordova, Principal Hydrologist at the Navajo Nation Department of Water Resources, interact with a panel of industry and academic professionals, and participate in a case study competition.

Center directors presented the Center and its efforts at various conferences in New Mexico, including the New Mexico Chile Conference, Western Pecan Growers Association Conference, and the International Symposium of Food Science in the Chihuahua Desert Region of North America.

Academics

The Center of Excellence worked with academic stakeholders throughout the university to promote sustainable, value-added agriculture. Examples of the Center's support include:

- Financial support, in conjunction with the Dean of the College of Arts and Sciences, of a best paper competition associated with the Center for Latin American and Border Studies' International Symposium.
- Collaborative work with colleagues at Doña Ana Community College and NMSU to develop programming related to training students relative to agricultural technology. The funded project was titled "Training of Next Generation Workforce for Smart Food Science and Agricultural Technology in the Internet of Things Era" (WorkFoS-Ag).
- The Water Challenge case study designed for high school students participating in the Water Symposium.

Other

- The Center organized an advisory committee to assist directors and faculty in better understanding issues within the state and ways in which to communicate with stakeholders.
- Center directors met with leaders from other colleges to discuss opportunities to better integrate Center activities within the University.
- Center directors met with industry association leaders to discuss opportunities to better serve industry relative to post-harvest, value-added agriculture.

CESFAS Faculty Impacts

The Center supports two full-time faculty members, Luis Sabillon (Food Safety and Processing) and Sergio Martinez-Monteagudo (Food Engineering). Additionally, the Center has more than 120 affiliated faculty members who have indicated an interest in collaborating on agricultural-based research initiatives. Example impacts of the work conducted by center faculty are provided below.

Impact Statement - Sergio Martinez-Monteagudo

Title: Food and Bioproducts Processing

Relevance: Food systems are strained by extraordinary global challenges triggered by a growing population, climate change, and loss of natural resources. On a global scale, food systems are faced with seemingly contradictory challenges (e.g., food waste, food security, obesity, and undernourishment). Investigator Martinez-Monteagudo strives to integrate engineering, chemistry, and microbiology to create solutions and innovation paths enabling efficient and sustainable use of resources while maintaining the core elements of foods (e.g., nutrient content and sensory properties) and addressing societal issues (e.g., the livelihood of farmers and food processors).

Response: The generation of waste and byproducts is ubiquitous throughout the production of foods. Instead of landfilling, these materials can be turned into value-added products, such as fine chemicals, micronutrients, ingredients, and additives. Creating values from waste and byproducts is multidisciplinary in nature since it involves the application of a number of disciplines to create a desirable modification

Results: Significant progress has been made in this area, and it is reflected by the published work. A remarkable example of innovative research is the extraction of 99% phospholipids from byproducts streams using a method that does not require organic solvents. Interestingly, these phospholipids can potentially replace soy lecithin during the manufacture of instant powders. Since Fall 2020, I have been collaborating in the extraction and recovery of rare earth elements from coal ash. Future work in this area will build upon a recent equipment grant, where a phase equilibria apparatus was acquired to capture the predominant physical and chemical state of valuable compounds. This equipment is critical to generating the missing fundamental knowledge to improve existing and accelerate the discovery of new applications (e.g., extraction, fractionation, encapsulation, and solubility studies).

Impact Statement - Efren Delgado

Title: Engineering Technologies

Participants/Target Audience: We have cooperated with the chile, pecan and cotton industries on funded grants to utilize agro-industrial byproducts to extract alternative plant proteins and antioxidants that can be used as ingredients in the food and aquaculture industry.

Research and Teaching Responses: Research has been conducted to design and develop innovative technologies for utilizing agro-industrial waste as an alternative source of ingredients such as plant proteins and antioxidants for the food and aquaculture industry.

Our results show the effects of maltodextrins and gum arabic as microencapsulation agents on the stability of sugarcane bagasse extracts and the potential use of the extracts as antimicrobial agents. The bioactive compounds in sugarcane bagasse (SCB) were extracted using 90% methanol and an orbital shaker at a fixed temperature of 50 °C, thereby obtaining a yield of the total phenolic content of 5.91 mg GAE/g. The bioactive compounds identified in the byproduct were flavonoids, alkaloids, and lignan (-) Podophyllotoxin. The total phenolic content (TPC), antioxidant activity, and shelf-life stability of fresh and microencapsulated TPC were analyzed. This experiment's optimal microencapsulation can be obtained with a ratio of 0.6% maltodextrin (M.D.)/9.423% gum arabic (G.A.). Sugarcane bagasse showed high antioxidant activities, which remained stable after 30 days of storage and antimicrobial properties against *E. coli*, *B. cereus*, *S. aureus*, and the modified yeast SGS1. The TPC of the microencapsulated SCB extracts was not affected ($p > 0.05$) by time or storage temperature due to the combination of M.D. and G.A. as encapsulating agents.

Other accomplishments include a PhD and a master student graduated in Food Science and Technology, one book published in 2021, four peer-reviewed publications, one oral presentation or poster presented by students, and four invited oral presentations, as well as serving on an invited peer-review panel for USDA-NIFA and four journal article reviewers .

The Food Science and Technology Group in the Department of Family and Consumer Sciences managed to study the antioxidant and antimicrobial capacities of sugarcane bagasse extracts, showing their potential use as a source of bioactive compounds for further use as a food additive or nutraceutical. The results are a first step in encapsulating phenolic compounds from SCB as a promising source of antioxidant agents and ultimately a novel resource for functional foods.

With an interdisciplinary group of more than 18 food science and food engineering programs from different universities in the country, we organized the first of its kind "Multi-Institutional Food Engineering Seminar Series" as part of the USDA Multistate Committee NC1023. The participating higher education institutions were: New Mexico State University, Cornell University, Illinois Institute of Technology, Iowa State University, Michigan State University, Oregon State University, Rutgers University, South Dakota State University, The Ohio State University, The Pennsylvania State University, UC Davis, University of Arkansas, University

of Illinois, Urbana-Champaign, University of Kentucky, University of Maryland, University of Minnesota, University of Nebraska-Lincoln and Washington State University. We had an average of 139 participants each week from January to March 2021. The seminar was also posted for virtual participation. We had an average of 2,634 minutes viewed. Areas covered included: Food By-Product Utilization, Engineering for Health, and Engineering and Processing for Sustainable Systems. We had 12 presentations from faculty from 12 different food science or food engineering programs around the country.

Summary of Program Impacts and Results

- Sugarcane bagasse (SCB) extracts contain the high antioxidant activity of bioactive compounds.
- The antioxidant activity of SCB is stable for 30 days of storage at 4 °C, showing stability with no degradation, allowing further processing as a potential food additive or nutraceutical.
- The bioactive compounds found in sugarcane bagasse have been reported as therapeutic and anticarcinogenic agents.
- The outcome of this research showed promising effects against well-known pathogenic bacteria and as a possible anticancer agent.
- A microencapsulation process of freeze-drying bioactive compounds was optimized, ensuring the protection of the extracted bioactive compounds, positively supporting its potential use as a food additive.
- Co-organized the first "Multi-Institutional Food Engineering Seminar Series" as part of USDA Multistate Committee NC1023.

Partners: Chile, pecan, USDA, Industrial Engineering, Mechanical Engineering, and the cotton industry in N.M.

Impact Statement - Luis Sabillon

Title: Photodynamic Inactivation of Foodborne Pathogens

Relevance: Low-moisture foods and fresh produce that are handled and packed in dry environments are often implicated in foodborne outbreaks due to Salmonella contamination. This enteric pathogen can survive under harsh, dry conditions and colonize food-contact surfaces for lengthy periods of time, thus increasing the risk of cross-contamination during processing. Therefore, there is a real and urgent need for the development of alternative technologies to enhance the antimicrobial efficacy of existing sanitation protocols. In recent years, antimicrobial photodynamic treatment (aPDT) has emerged as an innovative method for microbial inactivation. This water-less, chemical free, light-based treatment is based on a combination of visible light, a photosensitizer and molecular oxygen, which further react with multiple targets within microbial cells and eventually cause cell death.

Response: The antimicrobial efficacy of aPDT has yet to be studied on a wide variety of food matrices and processing related surfaces. The overall goal of my research program is to design, develop and optimize effective aPDT treatments for food and surface disinfection in industrial settings. The antimicrobial efficacy of aPDT is being tested against several foodborne pathogens and agricultural commodities of great economic importance to New Mexico.

Impact: My research program is generating novel experimental data to better understand the impact of visible light and photosensitizer on the inactivation of enteric pathogens. aPDT technology may play an important role in eliminating persistent pathogen reservoirs, thereby reducing the risk of food safety incidents. My research program will not only complement and expand on existing research, but also will serve as a foundation for the design and validation of suitable aPDT that could be coupled with conventional sanitizing strategies to enhance microbial inactivation across the entire landscape of agri-food products and food-contact surfaces. This cutting-edge technology has gained much attention during the last decade from funding agencies as a promising technology for its potential to improve the safety and sustainability of food production. A diverse funding portfolio that includes federal competitive grants and private entities is being targeted to secure external funds to develop this cutting-edge research program.

Public Value Statement: The near-term benefit of my research program is the development of cost-effective, water-less sanitizing tools that can be used at dry food processing environments to further address microbiological risks.

2023 Goals for CESFSAS

1. Facilitate interaction and collaboration between post-harvest, value-added agricultural industry participants and University faculty and staff
2. Assist University faculty and staff in visualizing innovative future opportunities associated with post-harvest, value-added agriculture in New Mexico
3. Develop a sustainable process to support faculty, staff, and students working in the areas of post-harvest, value-added sustainable agriculture



EQUITY, INCLUSION AND DIVERSITY INITIATIVE



BE BOLD. Shape the Future.
College of Agricultural, Consumer
and Environmental Sciences

Executive Summary

The College of Agricultural, Consumer and Environmental Sciences (ACES) is committed to embracing equity, inclusion and diversity (EID) in our community that enables all students, faculty, and staff to fully engage in the educational, outreach and scholarly pursuits of our college. As part of this commitment, Dr. Laura Bittner, Interim State 4-H Department Head, and Dr. Karim Martinez, Extension Family Life and Child Development Specialist, were selected in August 2021 to serve as co-directors of a College of ACES EID Initiative. Their duties include coordinating and managing strategic activities related to EID on behalf of ACES while serving as a liaison to related campus-wide initiatives. They collaborate with the NMSU Vice President of EID, Dr. Teresa Maria Linda Scholz, and are also in conversation with ACES administrators to develop a strategic plan aligned with NMSU LEADS 2025 EID Goals throughout the college's academic departments, Cooperative Extension Service and Agricultural Experiment Station.

Examples of initiative objectives include (1) reviewing, evaluating, and recommending policies and programs promoting diversity and inclusivity for ACES faculty, staff, and students and (2) collaborating with ACES administrators to identify and implement strategies to foster equitable and inclusive environments within the college as well as externally with community stakeholders.

The College of ACES is leading the university by establishing a position specifically dedicated to EID efforts. The College of Engineering has recently established a similar position and VP Scholz is encouraging additional colleges at NMSU to establish similarly dedicated positions.

Highlights from 2022

- Dr. Martinez and Dr. Bittner are part of a team of New Mexico Cooperative Extension Service (CES) faculty who are trained as facilitators of a national CES program called Coming Together for Racial Understanding. Additional team members include Newt McCarty, State 4-H and Youth Development Agent, and Dr. Marisa Thompson, Extension Urban Horticulture Specialist. The Coming Together program is a dialogue-to-change process for working together across racial/ethnic lines that seeks to foster understanding and build trust in order to take informed collective action for meaningful change. This team provided five professional development workshops to ACES faculty, staff and administrators In January 2022 with 14 people attending these virtual sessions. Workshops included the following sessions:
 - Overview of the Coming Together Program and the Dialogue Process
 - Considering Differences and the Role of Culture
 - Levels of Change and Tools for Navigating Change
 - The “Dialogue to Change” Model
 - Dialogue Across Racial/Ethnic Differences and Realities
- The Coming Together Team also provided three professional development sessions for faculty and staff from the Agricultural Experiment Stations with an average of 15 people attending each session.
- Dr. Bittner and Dr. Martinez provided EID workshops for faculty and staff at department meetings and as part of ACES convocation. They also provided similar workshops to students at ACES Ambassador meetings. Forty people attended these workshops.
- In addition to directly delivering professional development workshops, the co-directors also invited guest presenters to provide learning opportunities for ACES faculty, staff and administrators. In October, 2022, Dr. Monica Torres, DACC President, provided a four-session series titled Your Brain is Good at Inclusion...Except When It's Not. This engaging series included viewing a film of the same name and provided opportunities for discussion and reflective thinking through short stories from “What IF?...Short Stories to Spark Inclusion & Diversity Dialogues,” by Dr. Steve L. Robbins. Thirty-six participants registered for the 8-hour series, with an average of 22 people attending each session.
- The co-directors also invited NMSU VP for EID, Dr. Teresa Maria Linda Scholz, to provide three workshops. The 6-hour educational series addressed building a shared EID language, implicit bias and microaggressions, and inclusive communication. Interest in the topics grew each week, as evidenced by attendance. Fourteen people attended the first session, 18 participants attended the second session, and 29 participants attended the final session.
- Feedback was collected from workshop participants, is currently being analyzed and will be used to inform future professional development workshops and the development of an EID strategic plan for the College of ACES.



Executive Summary

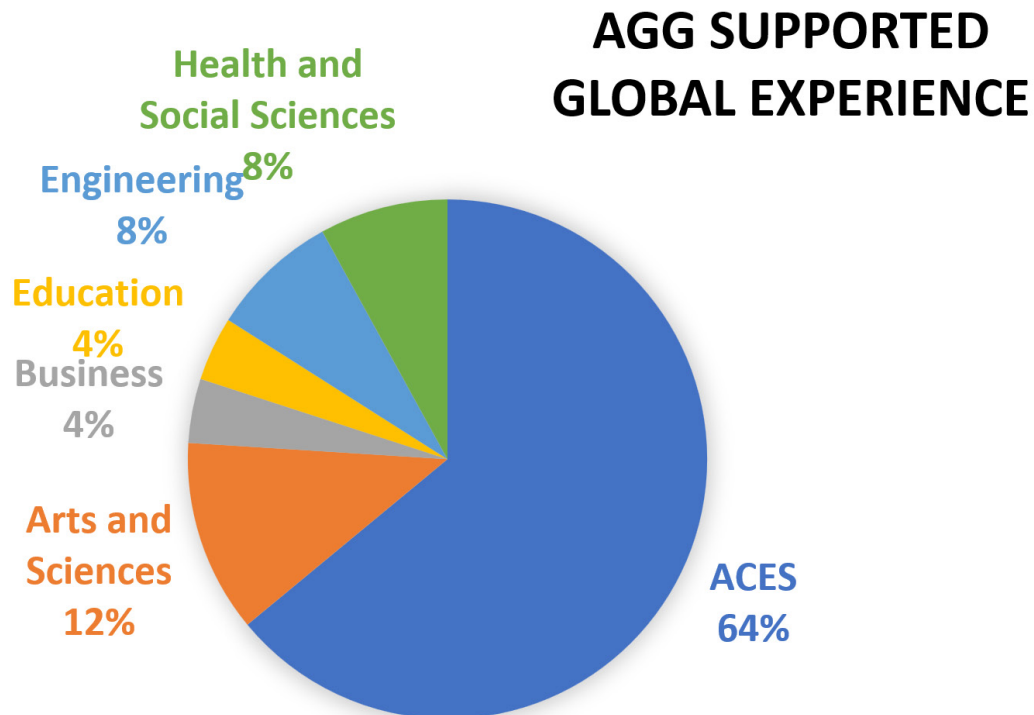
The mission of the College of ACES Global Program (GP) is to provide every student in the College of Agricultural, Consumer and Environmental Sciences an opportunity to have an inspiring international experience prior to graduation. The ACES GP supports LEADS 2025 goals of social mobility (Goal 1) and amplifying impact of research findings by addressing local needs that align with global challenges (Goal 2.3; 2.4). The program supports ACES strategic Objective 4.1: recruiting students globally and Objective 4.5: continued targeted involvement in international programs. ACES GP has initiated several new MOUs with international universities and institutions, and has contributed to enhancing NMSU's global vision. The mission of ACES is to establish and streamline new opportunities for faculty global activities, especially teaching short courses abroad, organizing or participating in international workshops, and creating new opportunities for enhancing NMSU students' global experiences in collaboration with the Aggies Go Global program. The ACES GP also participates in large (USAID) and small (100,000 Strong; Cochran) grant proposals (LEADS objective 2.4) to amplify the impact of research on society and the economy and to promote international collaboration by accelerating technology and knowledge transfer. Global Programs also collaborates with international companies, including three Israeli companies, Ndrip, Tal Ya and Cropx,

on projects related to increasing water conservation and crop water use efficiency for the specialty crops of New Mexico. To encourage global activities, including recruitment of faculty and students, ACES GP has also initiated an annual Outstanding Global Work Award as well as travel awards. In order to further its mission and expand outreach to ACES alumni, ACES GP also gives an International Distinguished Alumni award.

LEADS 2025 Objective 1

ACES Global program supports the LEADS 2025 Objective 1, to enhance student success and social mobility.

1. More than 30 students participated in international travel through AGG financial support during 2022–2023. About five faculty members also travelled internationally.
2. 75 students from University of Sonora and CBT90a school in Mexico visited NMSU campus.
3. Five research scholars visited the College of ACES from partner international universities.
4. Five students from Las Cruces high school were trained on ACES Global Program activities.



LEADS 2025: GOAL 2. Elevate Research & Creativity NMSU

| | |
|--|----|
| Summer/winter short course opportunities developed with foreign universities | 5 |
| Joint international conferences/symposium organized with foreign institutions and universities | 8 |
| MOUs developed with partner international universities | 5 |
| Research/outreach projects developed at main campus | 1 |
| Number of joint publications developed with international partners | 15 |
| Helped developed new study abroad programs | 3 |

LEADS 2025 Objective 2.3

Amplify impact of research findings by addressing local needs that align with global challenges.

| | |
|--|----|
| Collaborations with international companies | 3 |
| Grant proposals written with international partners | 10 |
| Pecan and Nut Growers from Mexico visited Leyendecker farm | 4 |
| Founder and CTO of N-Drip visited Leyendecker farm | 1 |
| Growers and stakeholders visited Leyendecker experimental farm | 20 |

INDIAN RESOURCES DEVELOPMENT



BE BOLD. Shape the Future.
College of Agricultural, Consumer
and Environmental Sciences

Executive Summary

Indian Resources Development (IRD) is a statewide program, in the College of Agricultural and Environmental Sciences at New Mexico State University. IRD offers educational and professional development opportunities for Native American students in high school and college; and supports tribal nations in New Mexico in advancing their economic development goals in agriculture, natural resources, engineering, energy, business, workforce development, and education.

In the last year, IRD contributed to the advancement of its Strategic Goals and those of the ACES College and NMSU via the promotion of educational opportunities; establishment of paid internship and research opportunities; relationships and partnerships built; connections IRD helped made between tribes, higher education institutions and non-profits; leveraged funds and informational resources; provision of strategic planning and training related to workforce development.

IRD Enhances Student Success and Social Mobility via Outreach

Reached more than 600 high school students, parents, counselors, and entrepreneurs through presentations, college/career fairs, workshops, and other events that provided information and hands-on activities to guide career exploration, higher education opportunities in New Mexico, and business initiatives.

IRD gave presentations, workshops, and information to:

- A cohort of 36 NMSU undergraduate students participating in the NM Alliance for Minority Participation undergraduate research scholars program at NMSU Main campus in Las Cruces
- 12 high school students, 2 counselors, and 5 teachers at La Cueva high school in Albuquerque
- 22 junior high school students from the Native American Community Academy public charter school in Albuquerque attended small-group communication workshops lead by IRD
- 17 high school students via an information table at the N4WPP Water Symposium organized by of Navajo Technical University, New Mexico Institute of Mining and Technology, NM Bureau of Geology and Mineral Resources, Petroleum Recovery Research Center, IRD and CEFAS. The Symposium took place in Farmington.
- 15 families with an average of 2 people per family via a table at the Albuquerque Public Schools Native American College Fair.
- 20 high school students from Bernalillo High School who were interested in learning about resources related to college exploration and career paths
- 8 high school students from Dulce High School were invited by the Department of Agriculture of the Jicarilla Apache Nation to discuss career and college opportunities in agriculture and natural resources with IRD
- 10 college students from San Juan College who attended their Fall 2022 Transfer Fair, visited with IRD about 4-year college opportunities in New Mexico.
- 25 high school students visited with IRD at the Mescalero Apache Schools College and Career Day
- 8 high students, 2 counselors, and 3 tribal education representatives attended the Zuni High School college nights organized by the department of education of Pueblo of Zuni. IRD delivered a presentation regarding resources for Native American students at colleges and universities in New Mexico
- Over 180 people participated in the Extended Season Production Workshop Series offered by a collaborative made up of Flower Hill Institute, Indian Pueblo Cultural Center, NMSU CES-Pueblo Extension, Pueblo of Jemez Natural Resources Department, Santa Ana Pueblo, Dancing Butterfly Naturals, and IRD. The series included basics of greenhouses and hoop houses, planning and design, construction, management and maintenance, community panels, and hands-on demonstrations. The last session was in person at Jemez Pueblo and included a presentation about the challenges and consideration of building a green house, nature walk to identify medicinal plants, and community lunch and conversation about future topics to cover.

- 26 high school students from Mescalero High School and Santa Fe Indian School who attended the American Indian Science and Engineering Society region 3 conference and precollege presentations, including IRD
- 37 people stopped at the IRD table at the NMSU Agricultural, Consumer and Environmental Sciences Open House and 22 people at 2022 AgDay at NMSU main campus. IRD had examples of food sovereignty efforts from Pueblos in NM, Jicarilla Apache Nation, Mescalero Apache Tribe, and Navajo Nation; and other food sovereignty collaborative efforts.
- 43 high school, middle school, counselors, teachers, and parents stopped by the IRD table at the college fair hosted the NM Department of Higher Education-Indian Education and IRD at Pueblo of Pojoaque
- 50 attendees of the Native American Partnership meeting at Southwestern Indian Polytechnic Institute stopped at the IRD table to learn about the program, opportunities and resources offered

At the request of high school and college students, families, school representatives, and tribal education teams, IRD kept its 80-page IRD Sources of Financial Aid Booklet and website updated with resources and links to guide their exploration of higher education opportunities in New Mexico.

IRD Works Closely with Those Whom It Serves

IRD was in contact and collaborated with all 23 tribal nations in NM via tribal education, natural resources, or ag departments. Conducted asset and need assessments to identify specific projects, activities, programs, trainings on which each tribe was interested related to agriculture, natural resources, weather stations, education, and workforce development.

A few of examples of the work IRD did with the tribes are:

IRD helped promote the 2022 Summer Enrichment Internship grant opportunity for high school students or recent high school graduates sponsored by the College and Career Readiness Bureau at NM Public Education Department. The internship program provided high school students the opportunity to participate in high-quality tribal internship placements in government agencies, including county, tribal, and/or municipal placements. IRD served as resource to tribal nations interested in applying for the grant. With the support of IRD, 10 tribal nations secured the grant funds to offer 224 internships worth \$720,000.

In collaboration with University of New Mexico Transformation Network and UNM Southwestern Environmental Finance Center, IRD is working with members from Pueblo of Laguna Utilities Authority to discuss and put together a plan of collaboration related to workforce development from within the UA in the areas of water, broadband, waste, and recycling.

IRD was part of a collaborative with Santa Fe Indian School community-based education, Bureau of Indian Affairs, tribal natural resource and agricultural programs in NM, and NMSU Fish, Wildlife and Conservation Ecology faculty. The group met two times to share natural

resource, wildlife, and agricultural priorities and current projects on which tribes are engaged; and plan internship opportunities, at their own or neighboring tribes, for high school students attending high schools in NM.

IRD Serves as Connector and Promotor of Diversity

One of the most sought for and appreciated services of IRD is to serve as connector between higher education institutions in the state, tribes, non-profits, high school students, and college students. This valuable service is hard to quantify in terms of people served, funds raised, opportunities offered, and projects initiated. Following are a few examples of the work IRD did with higher education institutions in the state and other partners in NM:

In collaboration with San Juan College, University of New Mexico, NM Institute of Mining and Technology, Dine College, Navajo Technical University, and New Mexico State University, and the American Indian Chamber of Commerce, IRD established paid internships and research experiences in the fields of agriculture, natural resources, engineering, and business for 19 college students.

IRD organized a meeting with representatives from Santa Fe Community College, San Juan College, and ASC Farmington, to discuss how to collaborate to promote the training and degree offerings in controlled environment agriculture that SFCC offers and on which SJC is interested. January and February 2023 saw the launched of 2 courses offered by SFCC via SJC, one related to greenhouse design and operation, and another related to aquaponics and hydroponics.

In collaboration with Navajo Technical University, Diné College, and the Southwest Indian Polytechnic Institute, IRD secured \$138,472 to support internships and research opportunities for high school and college students.

Two projects are the result of the partnership between IRD and the American Indian Business Enterprise Center. The first project involved Navajo Technical University and Innoventure to secure \$40,000 funding to offer an agricultural and entrepreneurial camp for 35 high school students. The second project was partially funded by IRD so AIBE and another partner, New Mexico Community Capital, could offer two Native American Sprints and one Financial Business Essentials for NA entrepreneurs. NA Sprints are multi-week business accelerator programs for Native American entrepreneurs to successfully start and grow their businesses. The NA Sprints were attended by 22 entrepreneurs and business owners from 6 tribes in NM. The program is designed to build a solid foundation to form and grow business ideas with a personal financial plan for success. During the Financial Business Essentials, participants learn the tools to effectively conceptualize, plan and implement their financial goals and business ideas through hands-on learning experiences with a community of peers and mentors. The Financial Business Essentials was attended by 15 participants from 7 tribes.

In collaboration with ASC and the State Climatologist, IRD helped promote the opportunity and of the placement of weather stations in tribal lands in NM by putting in contact researchers

with tribal representatives. The purpose of the weather station network is to fill in the gaps where there are very weather observations. The weather stations collect temperature, relative humidity, wind speed, wind direction, pressure, precipitation, solar radiation, and soil temperature and moisture every 5-minutes. The stations are solar powered.

IRD Partnered with higher education institutions in the state, New Mexico Institute of Mining and Technology and UNM, to support a third one, Central New Mexico Community College, in their efforts of starting a new American Indian Science and Engineering Society (AISES) chapter on their college campus.

On a regular basis, IRD met with representatives, whether faculty from academic departments or staff from student services, Native American programs, career and workforce development programs, from 15 higher education institutions in New Mexico, to explore opportunities for collaboration. Meeting them facilitates the role IRD serves as connector between tribes and higher education institutions in NM. IRD partnered with 10 of those higher education institutions to apply for grants to evaluate economic feasibility of indoor farms, impediments, and mapping regions in NM apt to produce different types of produce; to support controlled environment ag via a container farm as a tool to support community wellness and conservation; and to support career awareness in agriculture and natural resources and workforce development for minority students in New Mexico. IRD also applied for five funding opportunities valued at several million dollars with broad collaboration with colleagues in NM, AZ, and TX.

The director of IRD is part of the Advisory Board of the NM Alliance for Minority Participation. A subgroup of the Board made up of IRD, UNM, NMSU, and NM Mathematics, Engineering, and Science Achievement, works with the NM AMP team to find ways to provide services to more students of color and to have more participation of faculty mentors with similar backgrounds to the minority students the program intends to serve.

In 2022, IRD worked at expanding connections with organizations and programs in the state that work in STEM to increase resources available to Native American high school and college students. Through that collaboration, IRD helped plan and host the first water symposium event for high school students in the four-corners area interested in careers related to water science, water resource management, and water economics and policy.

IRD has three office locations: one in Albuquerque, one in Las Cruces, and another one in Farmington; from there, IRD staff members work and outreach to partners in the state. Two Navajo Nation and two Pueblo representatives joined the IRD Tribal Advisory Committee. Together with the other TAC members, they advise the IRD director regarding community assets and needs, program priorities, contacts, collaboration, and funding opportunities.

One of the priorities of IRD is to secure funding for the IRD endowment fund to ensure the continuation and expansion of the work the program does throughout the state.

IRD

Highlights of 2022 by the Numbers



ird.nmsu.edu

IRD

Highlights of 2022 by the Numbers



ird.nmsu.edu



Executive Summary

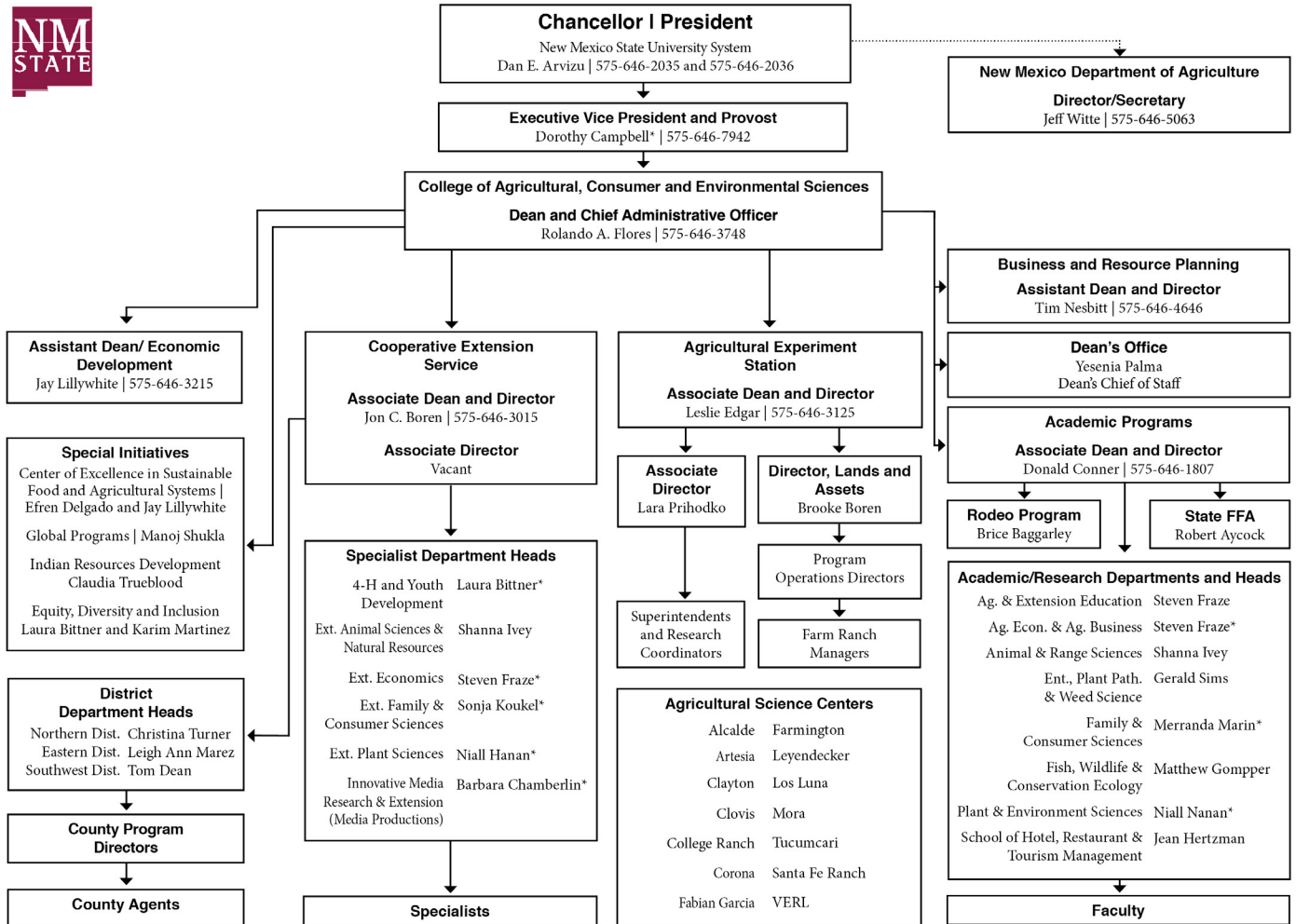
Approved by New Mexico voters through the GO Bond D in 2018, phase two has commenced to improve the modernization of New Mexico State University's educational facilities. Construction of the two-phase project started in August 2021 with a groundbreaking ceremony. Three new facilities – 1. Food Science, Security, and Safety; 2. Biomedical Research; and 3. Animal Nutrition and Feed Manufacturing – will provide central locations to teach and conduct cross-disciplinary biomedical research. With the right tools and facilities, NMSU research teams can continue their work to help the world understand, prevent, and manage disease outbreaks. Building and updating these facilities supports NMSU's mission to serve the people of New Mexico through teaching, research, and extension.





College of ACES Organizational Chart

NMSU College of Agricultural, Consumer and Environmental Sciences Organizational Chart

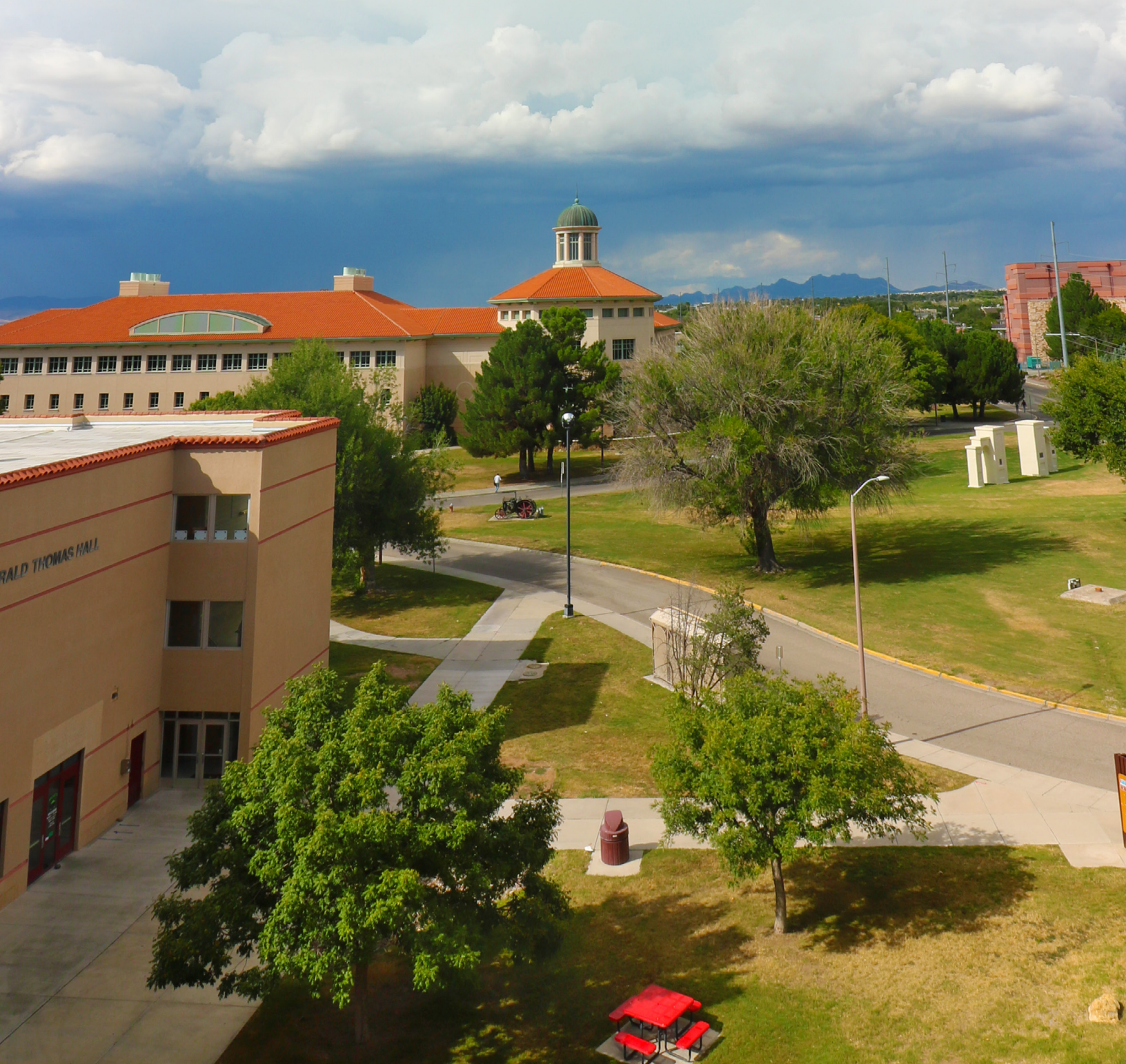


* = interim 12-01-2022



BE BOLD. Shape the Future.
**College of Agricultural, Consumer
and Environmental Sciences**

**NM
STATE**



[Facebook.com/nmsuaces](https://www.facebook.com/nmsuaces)



[Instagram.com/nmsu_aces](https://www.instagram.com/nmsu_aces)



[aces.nmsu.edu](https://www.aces.nmsu.edu)



[Twitter.com/nmsu_aces](https://twitter.com/nmsu_aces)



[Youtube.com/user/nmsuaces](https://www.youtube.com/user/nmsuaces)