

# Fall 2021 Newsletter

Department of Plant and Environmental Sciences | <https://aces.nmsu.edu/academics/pes/>



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## Introduction

About 21 months ago, the pandemic disrupted our routines in multiple ways. While some of these disruptions are still with us, I am pleased that this semester we had the option to offer our classes in person. Our students value the face-to-face interactions with our faculty, instructors, and fellow students. They also enjoy flexibility in their schedules, and online classes may help engender more curriculum choices for them. After all, something positive may have emerged from the disruptions.

In this newsletter, you will notice that our current students and faculty continue to perform at a very high level. Three of our faculty received awards at the ACES 2021 Awards Day Ceremony and Recognition of Service. Our undergraduate and graduate students have been recognized at the national level and our faculty continue to attract significant external funding.

Our former students also continue to do well. I am always pleased to learn of the amazing accomplishments of our alumni. We have included a biographical sketch of the department's 2021 Outstanding Alumni, Tana Eckols. Tana now directs British Petroleum's waste management program for the Gulf of Mexico. Our students were delighted to learn how Tana's Environmental Science degree prepared her for a career at one of the world's largest companies.

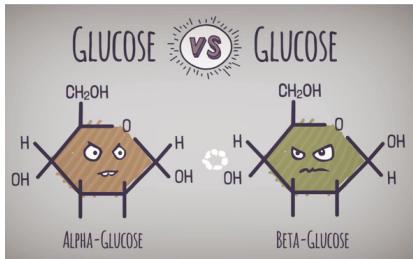
Speaking of alumni, one of former students, Dr. Brian Baldwin along with his spouse, established the Baldwin and Reichert Agronomy Scholar Award. I am pleased to announce that the department awarded the first Baldwin-Reichert Award this year. Please see the details about this year's Baldwin-Reichert awardee on page five.

## Department Head



*Rolston St. Hilaire*

## In This Issue:



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# 1977 M.S. Graduate of the NMSU Agronomy Department Recognized at University of Maryland

Patricia (Trish) M. Steinhilber, a 1977 Master of Science graduate of the New Mexico State University Agronomy department, was recognized this past March in honor of Women's History Month. After completing her M.S., she went on to get a Ph.D. from the University of Georgia in soil fertility. She was on the faculty of Louisiana Tech University prior to relocating to Maryland. Today, Trish is a Soil Fertility and Nutrient Management Specialist, and a retired affiliate faculty member of the department of Plant and Environmental Sciences. "Recently retired as coordinator of UMD

Extension's (UME) Agricultural Nutrient Management Program (ANMP), a somewhat under-the-radar but tremendously influential operation that arguably experienced one of the most dynamic transitions in AGNR history. Beginning her tenure in 1993 and strapping in for a whirlwind 25 years before retirement in 2018, Steinhilber looks back on her professional journey as one occasionally wrought with conflict and periods of intense change, but also with immense pride in her accomplishments and hope for the future... Steinhilber believes that we are in... [a]

period of rapid evolution in the workplace, and that ANMP will continue to evolve. She is confident that she has left the program in a strong place to continue this evolution, and foresees a bright future for AGNR and ANMP both in professional pursuit and equal representation" (Binder, Graham, "AGNR Celebrates Women's History Month: Trish Steinhilber."). For more information, go to: <https://agnr.umd.edu/news/agnr-celebrates-womens-history-month-trish-steinhilber>



Dr. Trish Steinhilber

## Award Winning Soil, Water, and Environmental Physics Project

Soil, Water, and Environmental Physics Project (W4188) won the 2021 Excellence in Multistate Research National Award given by USDA-NIFA. Dr. Manoj Shukla, Professor, Plant and Environmental Sciences, is the NMSU representative on the project, and is also the past Chair of the W3188. Dr. KC Carroll, Associate Professor, Plant and Environmental Sciences, is a member on the project as well. There are more than 24 state Agricultural Experiment Stations including NMSU AES, who worked together to better understand how water, energy, and

nutrients move through and interact with soil. Since its inception, the Soil Physics team has made significant scientific advances and helped state and federal agencies to develop best management practices and policies. For more information on this prestigious award, please visit: <https://www.mrfimpacts.org/single-post/soil-water-and-environmental-physics>

## PES Graduate Student Funded With Western SARE Research Grant

Pramod Acharya, a Ph.D. student from the Plant and Environmental Sciences department, has been awarded a Graduate Student Research Grant from Western Sustainable Agriculture Research and Education (W-SARE). The W-SARE research grants are very competitive, and Pramod is one of the first two graduate students from New Mexico to receive this award. He has been working under the supervision of Dr. Rajan Ghimire since summer 2019, with research on soil carbon and nitrogen dynamics, greenhouse gas emissions, and soil health in forage production systems. This new project will complement his

ongoing research and help Pramod better understand the nitrogen use efficiency of cover crop integrated forage production system in semiarid irrigated conditions. The research will be conducted at the Agricultural Science Center, Clovis, NM. As an outreach activity, the project results will be disseminated to the local growers and the general audience (researchers, educators, students, and policymakers). A local farmer from Clovis, NM, Vance Dewbre, is also part of the project team as a farmer-advisor. The project started recently in August 2021, with a projected completion date of April 2023.



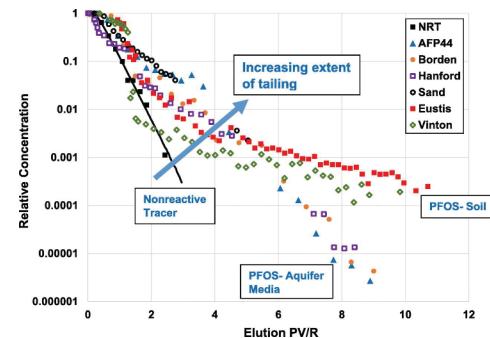
Left: Pramod Acharya, a graduate student from PES. Right: Pramod applying vacuum suctions to extract soil water samples for nitrogen analysis. (NMSU ASC, Clovis, NM).

# Journal Article on the Transport of Aquifer Contaminant Published

Dr. Kenneth Carroll, et al., released a journal article titled: Transport of PFOS in aquifer sediment: Transport behavior and a distributed-sorption model. In abstract, the journal involves an examination of the transport of perfluorooctane sulfonic acid (PFOS) in aquifer sediment comprising different geochemical properties, and compares the behavior to that observed for PFOS transport in soil and sand. The results of model simulations indicated that rate-limited sorption/desorption was the primary cause of the nonideal PFOS transport. Comparison of PFOS transport in aquifer media to data reported for

PFOS transport in two soils and a quartz sand showed that PFOS exhibited more extensive elution tailing for the soils, likely reflecting differences in the relative contributions of various media constituents to sorption. A three-component distributed-sorption model was developed that accounted for contributions from soil organic carbon, metal oxides, and silt + clay fraction. The model produced very good predictions of K<sub>d</sub> for the five media with lower soil organic-carbon contents ( $\leq 0.1\%$ ). Soil organic carbon was estimated to contribute 19–42% of the total sorption for all media except the sand, to which it contributed

~100%. The contribution of silt + clay ranged from 51 to 80% for all media except the sand. The only medium for which the contribution of metal-oxides was significant is Hanford, with an estimated contribution of 15%. Overall, the results of the study indicate that sorption of PFOS by these aquifer media comprised contributions from multiple soil constituents. For more information, go to: <https://www.sciencedirect.com/science/article/abs/pii/S0048969721015126>



Geographical Abstract

Image examples from the Science of Agriculture interactive website.

## Impact of Multimedia Learning Tools in Science Classes

Each year, the Agronomy, Crops, and Soil Science Societies of America recognize an outstanding group of authors, editors, and peer reviewers at their Annual Meeting. Articles published during the preceding two years are considered for the current year's award (e.g., articles from 2018 and 2019 are considered for the 2020 award). In general, the selection is based on how the article has advanced knowledge in the profession, the effectiveness of communication, originality, and impact. The Outstanding Paper for 2021 in the **Natural Sciences Education** journal was "Impact of Multimedia Learning Tools in Agricultural Science Classes" authored by April Ulery, Amy Smith Muise, Kenneth C. Carroll, Barbara Chamberlin, Laura White, Pamela Martinez, LaJoy Spears, et. al. Read up on the 2021 *Natural Sciences Education* Award Winner here: <https://acsess.onlinelibrary.wiley.com/doi/10.1002/nse.2.20011>

All of the authors are from NMSU; Dr. Ulery and Dr. Carroll are in the PES department with most of the others in the Media Productions Research & Innovation department. This team has worked together for several years on federally supported projects to design and develop interactive online learning tools to improve STEM education and understanding. To see some of the products of our work, go to: <https://www.scienceofagriculture.org/>

# PES Participates in AG Day!



AG Day is a tailgate event held before one of the New Mexico State University Aggies football game in the fall. The 2021 AG Day was Saturday, September 25 from 2:00 p.m. to 6:00 p.m. Since September 25 was also NMSU Homecoming, there were many visitors on campus. Faculty and Students in Plant and Environmental Sciences participated in AG Day. AG Day is a celebration

of the agriculture industry in New Mexico and is held to boost understanding of the industry and help educate the public about what agriculture looks like in the Land of Enchantment. The popular festival has turned into a trademark event within the community in the last several years, and many associate it with the communal, energetic atmosphere that NMSU

homecoming events spark. Attendees can expect to interact with dozens of educational and informational booths at the event, all representing various organizations, groups and other agricultural entities from across New Mexico. AG Day also includes live music, games, prizes, farm animals, and samples of New Mexico made and grown food products.



## Is There a Role for Drylands in a Carbon Neutral World?

In preparation for the UN Climate Change Conference (COP26), Dr. Niall Hanan and collaborators reviewed the current literature on dryland systems and their role in future climate management. Drylands cover around 40% of the Earth's land surface, but that percentage is expected to grow as the bioclimatic conditions that support drylands have become more prevalent. In fact, drylands already have expanded. From 1950-2000, long-term climate records indicate that dryland climates increased in size on all continents, except for Europe and South America.

With the increasing dominance of drylands on our global landscape, accurately assessing their carbon reserves is important. Historically, carbon was vastly underestimated in drylands due to the wrong assumption that tree and grass biomass and soil carbon in drylands is

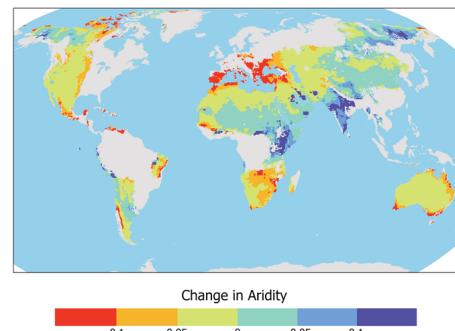
negligible. However, new estimates of carbon in vegetation and soils suggest that drylands contain ~30% of global terrestrial carbon stocks. Although not exact, this carbon approximation demonstrates the significance of dryland carbon reserves, and the necessity for them to be considered in global carbon management plans.

Short-term fluctuations in dryland carbon emissions are most affected by variability in rainfall, primary production, and wildfires. But ultimately, long-term sequestration will depend on the capacity for carbon storage in vegetation and soil. In most tropical and temperate drylands, increased carbon storage capacity will be correlated with increased water availability. Predicting changes in aridity in the years to come will be difficult, however, while temperatures will increase, future rainfall patterns will vary in drylands

around the world. Hanan and several PES faculty and students contribute to the Jornada Basin long-term ecological research (LTER) project that includes long-term measurements of carbon dynamics. Jornada long-term datasets support our understanding of carbon dynamics in dryland vegetation and soils and the changes associated with shrub encroachment and soil degradation. Future

management of carbon in the drylands will need to consider local ecological contexts that can enhance carbon in vegetation and in soil organic and inorganic carbon, while ensuring ecological integrity of dryland systems and provision of critical services to dryland populations. To read the full article, go to:

<https://www.frontiersin.org/articles/10.3389/fenvs.2021.786087/full>



Change in aridity (P/PET) projected for 2076-2100 relative to 2006-2025 averaged across 22 GCM participating in the climate model inter-comparison project (CMIP5) for continued greenhouse gas emissions and a cumulative 8.5W additional radiative forcing (RCP 8.5).

# PES Student and Faculty Journal Article is Released

Plant and Environmental Sciences' Ruba Mohammed, Tanzila Ahmed, and Dr. K.C. Carroll released a journal article titled, *Comparison of fiber-optic distributed temperature sensing and high-sensitivity sensor spatial surveying of stream temperature*. This journal article involved measuring surface water temperature spatial variability is needed to estimate the interaction between surface water and groundwater, evaluate fish habitat and thermal inertia,

and to estimate streamflow frequency and duration. Fiber optic distributed temperature sensing (FO-DTS) has been used in rivers and lakes, providing high-resolution and sensitive temperature monitoring over large temporal and spatial scales. However, in streams with cobble or bedrock-lined streambeds and variable bathymetry, use of FO-DTS to measure temperature close to the surface water and groundwater interface can

be challenging if even feasible. FO-DTS can also be costly, involve difficult installations, and require an advanced understanding of the technology, calibration, and data processing. In this study, we compared FO-DTS stream temperature survey results to an alternative temperature survey method employing a towed transect of high-resolution temperature loggers spaced at 1-m and transported in the stream along the study reach, to measure the

spatial distribution of stream-water temperature in East Fork Poplar Creek near Oak Ridge, Tennessee, USA. To read on, go to: [www.sciencedirect.com/science/article/abs/pii/S0022169421010659](http://www.sciencedirect.com/science/article/abs/pii/S0022169421010659).

## Harpreet Kaur Announced as the 2021-2022 Recipient of the Baldwin and Reichert Agronomy Scholar Award

The Baldwin and Reichert Agronomy Scholar Award will be used to support Harpreet's travel to the Crop Science Society of America's annual meeting in Salt Lake city, Utah, on November 7-10, 2021.

She will present two posters here, and then travel to the Plant and Animal Genome conference in San Diego, California, on January 8-12, 2022, where she will be presenting as well.



## Three Students in Water Science and Management Graduate from Dr. Carroll's Lab:

This past summer three students from Dr. Carroll's lab graduated. Congratulations Cubed! Michael Hitzelberger has completed his M.S. degree, Autumn Pearson also completed her M.S. degree, and Peter (Chia-Hsing) Tsai completed his Ph.D. All three were in Water Science and Management. Michael's research was focused on the impact of hydraulic conductivity heterogeneity (spatial variability in the subsurface) on transport and fate of the emerging contaminants of concern called per and polyfluoroalkyl substances (PFAS). Autumn's research was focused on electrical resistivity mapping of Rio Grande River-groundwater interactions, and how she used electrical geophysical methods to map the reversibility of the

connection and disconnection of the River with the groundwater throughout an irrigation season. Peter's research compared in-stream tracer testing observations with mathematical modeling to characterize hyporheic zone exchange, which is surface water-groundwater exchange across the hyporheic boundary between them. In November, Dr. Carroll was convener for a Symposia for the SEQ Division of the Soil Science Society of America (at the annual Tri-Society Conference) focused on "Physical, Chemical, and Biological processes Controlling Solute Transport and Remediation of Contaminants in Soils," and is the organizer for an upcoming session on the same topic.



Autumn Pearson



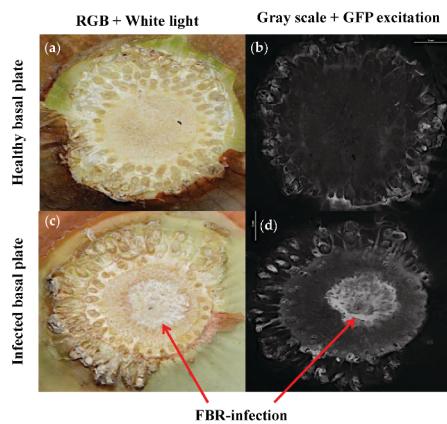
Peter (Chia-Hsing) Tsai

Michael Hitzelberger (not pictured)

# Three Papers from the Onion Breeding Program Featured in the Horticulturae Journal

Subhankar Mandal, a graduate student in the onion breeding program, published three peer-reviewed journal articles from his dissertation. Two of them were featured articles and one was highlighted as the cover article on the webpage of the journal, *Horticulturae*. One paper was selected as an editor's choice article. The citations to the papers follow.

Congratulations to Subhankar and Chris!



A comparison of digital images of healthy (a,b) and FOC-infected (c,d) onion basal plates captured with white light (a,c) and after GFP excitation (b,d). FBR symptom was indicated using the red arrows. White light images, captured by a Nikon©3200 DSLR camera, give the readers a perspective of visual scoring.

Mandal, S., and C.S. Cramer. Comparing visual and high-throughput image analysis techniques to quantify Fusarium Basal Rot severity in mature onion bulbs. *Horticulturae*, 7(6):156. <https://www.mdpi.com/2311-7524/7/6/156>. **Featured and Cover Page article (digital version)**. (Image Left).

Mandal, S., and C.S. Cramer. 2020. Screening of USDA onion germplasm for Fusarium basal rot resistance. *Horticulturae*, 7(7):174. <https://www.mdpi.com/2311-7524/7/7/174>.

**Featured article.** (Image Middle).

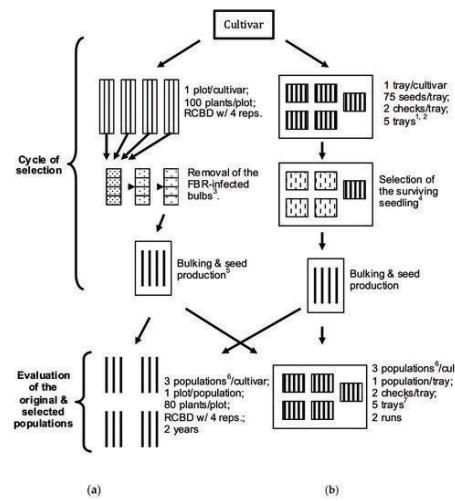
Mandal, S., A.S. Saxena, C.S. Cramer, R.L. Steiner. 2020. Comparing efficiencies of two selection approaches for improving Fusarium Basal Rot resistance in short-day onion after a single cycle of selection. *Horticulturae*, 6(2):26. <https://www.mdpi.com/2311-7524/6/2/26>. **Editor's Choice article.** (Image Right).

Table 1. Mean percent survival (in descending order) of USDA onion PI accessions evaluated in the seedling stage after inoculation with *Fusarium oxysporum* f. sp. *cepae* during 2018–2019.

Accessions/Check	Uninoculated Seedling Germ %	Adjusted Seedling Survival % ± SE
PI 035911	94.7	30.8 ± 7.4
PI 059595	94.0	37.4 ± 6.8
PI 208275	84	34.7 ± 5.3
PI 059596	86	34.3 ± 5.3
PI 059593	86	30.1 ± 5.9
PI 059591	72	26.4 ± 4.4
PI 208279	80.7	27.8 ± 6.2
PI 209328	84	26.8 ± 6.9
PI 049110	79	24.4 ± 4.0
PI 059597	81.9	19.4 ± 7.3
PI 049109	81.3	17.7 ± 6.8
PI 174510	58	16.9 ± 7.3
PI 059527	51.3	15.0 ± 2.5
PI 059565	52.0	15.0 ± 4.8
PI 059515	79	11.4 ± 5.1
PI 272356	61.3	11.4 ± 5.1
PI 059558	77.3	9.3 ± 4.4
PI 062458	87.3	8.9 ± 2.4
PI 059520	58	8.4 ± 2.0
PI 059529	87.8	7.0 ± 2.3
PI 059541	78	4.1 ± 1.8
PI 059542	81.3	2.4 ± 1.6
PI 059520	90.3	1.9 ± 1.1
PI 059547	74	1.7 ± 0.8
PI 059521	50.2	0.8 ± 0.4
Infected	76.3	0.7 ± 0.7
Infected	41	0.2 ± 0.2
Native Check	38.1	4.2 ± 1.8
Mean Percent		

\*The highlighted accessions had significantly higher (>Gmean-2 SE) seedling survival compared to Native Check (non-inoculated check, or 'Native' control). The three checks were also highlighted to indicate as reference to compare seedling survival of the accessions. X Seedling germination in the uninoculated stage, and the two rows are 1-year seedling survival adjusted by the number of seedlings alive in the inoculated tray divided by the total number of seedlings in the uninoculated tray. The data are the mean of two replicates per generation (>60%) of the uninoculated trays at least one tray were eliminated for the final survival percentage result. SE is standard error of the mean.

Mean percent survival (in descending order) of USDA onion PI accessions evaluated in the seedling stage after inoculation with *Fusarium oxysporum* f. sp. *cepae* during 2018–2019.



Flow chart of selection cycle and evaluation of a cultivar population via (a) Mature Bulb Selection (MBS) in a naturally FOC-infested field, and (b) Seedling Selection (SS) in a growth chamber for improving FBR resistance in onion.

## NMSU Receives NIFA SAS Funding for 2022-2026

University of California Davis, New Mexico State University, University of Arizona, and California State University. Fresno researchers aim to alleviate groundwater over-use and sustain irrigated agriculture in the Southwest United States. The project will develop innovative education programs and novel extension programming to support sustainable groundwater and irrigated agricultural systems, create models (geophysical, hydrology, biophysical, and socioeconomics), develop climate change adaptation management strategies, and produce decision support tools. The project is of utmost importance as participating states are facing ever growing irrigation water shortfalls. This NIFA SAS (National Institute of Food and Agriculture / Sustainable Agriculture Systems) project is funded by U.S. Department of Agriculture (USDA). The total project funding is \$10 million and NMSU share is about \$1.25M. Dr. Manoj Shukla, PES, is the lead PI from NMSU and the overall Lead on objective 4 on Education Programs. Other CO-PIs from NMSU are Shannon Norris, AXED, on the education, John Idowu, EPS, on soil health, and Pei Xu, COE, on water treatment.

USDA United States Department of Agriculture National Institute of Food and Agriculture www.usda.gov/usda-nifa

NIFA

Sustainable Agricultural Systems (A9201)

The SAS program area priority solicits creative, visionary projects that

- are developed by transdisciplinary teams
- integrate research, education, and extension activities
- effectively use a systems approach
- promote convergence of science and technology
- solve present and future challenges in food and agricultural systems



# 2021 PES Department Outstanding Alumni Award

Tana Eckols was recently awarded with the PES Department's Outstanding Alumni Award. Eckols attended NMSU from August 1993 to May 1998 and graduated with a bachelor's degree in environmental science from the Plant and Environmental Sciences Department. While a student, Tana was an assistant lab technician with the City of Las Cruces. She also conducted research on chile peppers with Dr. Bill Lindemann, a professor in the Plant and Environmental Sciences Department. After completing her degree, Tana

moved to Midland, Texas to take a position as an Environmental Scientist with Eco – logical Environmental Services. She then joined the Texas Commission on Environmental Quality (TCEQ) as a Project Manager where she managed soil and groundwater remediation projects in the TCEQ group. She later served as an Air Investigator for TCEQ Region 7. From 2002 to 2007, Tana served as a project manager for Houston-based Environmental Resource Management. She also

served as the project manager for Compliance Management Programs and the Remediation and Litigation Group. Since 2007, Tana has worked for British Petroleum (BP) in Houston, Texas. At BP, she has served as a Compliance Management Coordinator, a Regulatory Advisor, and most recently, as an Environmental and Social Advisor. She currently serves as Gulf of Mexico Waste Management Advisor, and in this role, Tana directs the BP's waste management program for the Gulf of Mexico.



Tana Eckols

## PES Faculty Recognized at the ACES College 2021 Awards Day Ceremony and Recognition of Service



### Kenneth (KC) Carroll - Mobley Family Endowed Research Award

Faculty of the College of Agricultural, Consumer and Environmental Sciences with **3 to 10 years consecutive service in research** as part of their appointment, are eligible to receive the award in the category of Research Early/Mid-Career.



### Ivette Guzmán - Distinguished Teaching Award

The **Early/Mid-Career Award** is available to a faculty member of the College of Agricultural, Consumer and Environmental Sciences college with **3 to 10 years consecutive service in teaching** as part of their appointment.



### Nicole Pietrasiak - NACTA Teaching Award

Faculty who have displayed outstanding instructional performance in the area of teaching of an agricultural discipline are eligible to receive the award.



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## Student Awards:

### Maria Alvarez Zavala Receives Encompass Scholars Fellow Program Award from Crop Science Society of America:

The ASA-CSSA-SSSA Annual Meeting was held in Salt Lake City, Utah November 7-10, 2021. Maria Alvarez Zavala was awarded one of eight student slots in the Encompass Scholars Fellow Program sponsored by Bayer Crop Science. Fellows in the program are graduate students nearing the end of their graduation. The one-year program is designed to provide two immersive in-person experiences and additional virtual events. In 2022, Maria will visit congress in Washington, D.C. to advocate for food, agriculture, and natural resources. She will also connect with mentors in her field and participate in professional development workshops. Congratulations Maria!

**In addition to this award, Maria also received the following:**

The Dean's Award of Leadership Excellence for Graduates, NMSU Alumni Outstanding Senior (GR), and Dean's Award for Graduates.

**Congratulations Maria!**



## Additional Student Awards:



**Melissa Meyers** (Left) - Dean's Award for Excellence in Undergraduates

**Taylor Watson** (Right) - Outstanding Departmental Student



The College of Agricultural, Consumer and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research, and Extension programs. New Mexico State University is an equal opportunity/affirmative action employer and educator. NMSU and the U.S. Department of Agriculture cooperating.