2025 Daugherty Water for Food Global Institute Research Forum Presentation Abstracts

First Name	Last Name	Email Address	Title	Abstract
PowerPoint Presentations:				
Augustine Kena	Adjei	aadjei2@huskers.unl.edu	From County-level Groundwater to Individual Household Drinking Water Exposure: The Impact of Agrichemicals in Drinking Water on Birth Outcomes.	Nebraska relies heavily on groundwater for agriculture and human consumption, making water quality a critical public health concern. Nitrate contamination remains a persistent issue and there is growing evidence of other agrichemicals co-occurring with nitrate. Nebraska's birth defect rate (BDR) is almost double the U.S. national average of 3% percent of live births; 65 counties reporting rates higher than the national average. We hypothesize that maternal exposure to agrichemical mixtures through drinking water increases birth defect risk compared to exposure to single compounds or no exposure. To test this, two studies were conducted. First, associations between county-level BDRs and water quality data were analyzed using Spearman correlation and the Mann-Whitney U-test. Counties with high BDRs had a higher percentage of wells containing atrazine and nitrate, atrazine alone, or nitrate with nitrosatable agrichemicals. Second, a pilot case-control study assessed maternal exposure to agrichemicals through personal drinking water and association with specific birth defects. Odds ratios and 95% confidence intervals were estimated, and Weighted Quantile Sum (WQS) regression was used to identify relative effects of individual chemicals within mixtures. Exposure to nitrite-containing mixtures was associated with increased risk for neural tube, abdominal wall, and cardiac defects. While WQS identified alachlor OA, alachlor ESA, and acetochlor OA as the predominant contaminants in the mixture associated with birth defects, nitrate exposure alone showed no significant association with birth defects in either study. The consistent findings of these studies highlight the need for expanded epidemiological studies, including exploration of maternal genetic susceptibility to agrichemical-induced teratogenesis.
Shara	Akat	sakat2@huskers.unl.edu	Climate Variability and Drought: Quantifying Impacts on Cattle Stocking Rates and Climate Adaptation Strategies	Livestock producers rely on rangelands and pastures to maintain adequate forage availability, with stocking rate serving as a key measure of grazing efficiency. Stocking rates are influenced by a complex interplay of climatic variability, land-use changes, and economic factors. This study evaluates the impact of drought and extreme weather events on cattle stocking rates across U.S. counties using an econometric framework that integrates county-level beef cattle inventory, pastureland data, and climate indicators, including Potential Evapotranspiration (PET), Growing Degree Days (GDD), and Extreme Degree Days (EDD). Understanding how climate stress affects stocking rates is critical for developing sustainable livestock management strategies and informing adaptive policy interventions. To analyze these dynamics, we compiled beef cattle inventory and pastureland acreage data from the USDA Census of Agriculture spanning 1982 to 2017. Climate variables were derived from the PRISM dataset to assess long-term temperature and precipitation trends. Our econometric model accounts for both immediate and lagged effects of drought, capturing delayed producer responses to forage scarcity and shifting precipitation patterns. Additionally, we incorporated hay stock data to evaluate the role of supplemental feeding in mitigating drought-related impacts on stocking rates. Our findings reveal that severe drought conditions reduce stocking rates by up to 18%, with prolonged effects persisting across multiple years. The relationship between hay stocks and stocking rates is nonlinear: while moderate hay availability supports stable stocking levels, excessive reliance on hay during prolonged droughts results in significant reductions. Regional trends exhibit considerable variation, with the Northern Plains experiencing a decline in stocking rates, while the Lake States and Corn Belt regions show an upward trajectory. Furthermore, climate model projections indicate that under a moderate climate change scenario (RCP 4.5), stocking rates decline gradually over time. In contrast, under a high-emissions scenario (RCP 8.5), stocking rates decline more sharply and exhibit greater volatility. These findings underscore the necessity of adaptive grazing management strategies, including flexible stocking decisions, rotational grazing, and improved forage conservation practices. Policymakers can leverage these insights to design climate-resilient agricultural policies that enhance the sustainability and resilience of livestock production systems in the face of increasing climate variability.

2025 Daugherty Water for Food Global Institute Research Forum Presentation Abstracts

Rafael	Bley Cottica	rbleycotticca2@unl.edu	Evaluation of Chilling-Tolerant Grain Sorghum in the High Plains of Nebraska	Western Nebraska is a unique crop production region characterized by high altitude, low precipitation, and a shorter growing season. Grain sorghum (Sorghum bicolor L. Moench) has drought and heat tolerance, excellent water efficiency, and low input. Thus, it is an attractive crop for the region. There are, though, constraints to sorghum production in the area. These include overcoming photoperiod response, intolerance of seeds and seedlings to cool soils and reduced growing degree day accumulation. This work aims to identify lines that can tolerate cold conditions, allowing farmers to plant earlier in the growing season and capture a longer growing season. Emergence and cold tolerance testing will be conducted at the High Plains Agricultural Laboratory, located in Sidney-NE, in 2023 and 2024 in a split-plot design with 38 entries, containing experimental chilling tolerant lines and hybrids, known lines with and without complex tolerance traits, and commercial hybrids as checks, with two planting dates and four replications. The emergency date and stand count after each planting date are used to monitor growth as well as attrition of plants due to cold intolerance. Average plant height was collected weekly to keep track of the growing speed and plant development. Volumetric water content was collected biweekly for water use comparison. Early results show the possibility of establishing an earlier planting date using these experimental genotypes. Important sorghum line characteristics for the region were identified, and lines will be selected for future hybrid development, increasing the region's options and potentially the grain yield average.
Moriah	Brown	mbrown136@huskers.unl.edu	Watershed Monitoring of Shell Creek for Antibiotics and Antibiotic-Resistant Bacteria	Runoff from agricultural fields poses a significant threat to water bodies by transporting sediments, nutrients, and chemicals, including antibiotics and antibiotic-resistant bacteria (ARBs), which degrade water quality. Despite their crucial role in disease prevention and growth promotion in agriculture, antibiotics' presence in watersheds raises environmental and health concerns, particularly regarding the spread of antibiotic resistance. This study focuses on the Shell Creek watershed in east-central Nebraska, an agriculturally dominated area, where antibiotics are extensively used in farming practices. Over a two-year period, bi-weekly grab samples were collected from four locations along Shell Creek and analyzed for bacteria and antibiotics. In 2023, antibiotic detections were infrequent and mostly below quantification limits, though ionophores, particularly monensin, were more frequently detected. In 2024, antibiotics were more frequently detected, particularly Erythromycin while monensin also remained frequently detected. The presence of antibiotic-resistant bacteria highlights the potential risks associated with agricultural practices and antibiotic use in the watershed, highlighting the need for sustainable management strategies to mitigate water contamination and safeguard public health and ecosystems.
Ethan	Freese	efreese2@unl.edu	Platte Basin Timelapse Student Internship Program	Platte Basin Timelapse (PBT) is a conservation storytelling project that explores watersheds, builds community, and inspires care for our natural world. PBT is a team of multi-talented professionals who tell stories, create films, give presentations, host events, teach classes, and conduct research. The project also has a network of more than 70+ timelapse cameras spread throughout the Platte River Basin that have been taking pictures daily since 2011. The Daugherty Water for Food Global Institute has funded 46 student internships through PBT since 2013. The materials produced by our interns, which include everything from timelapses to short films, have been valuable tools for our science communication and storytelling efforts. Several past interns have gone on to complete graduate degrees through PBT at the University of Nebraska and are now working as full-time employees with the project. Currently, PBT has six undergraduate interns who assist with timelapse production, social media, research and storytelling. Our DWFI-supported interns are critical to the continued success of PBT.
Tika	Gurung	tgurung3@unl.edu	High-resolution climate simulations over High-Mountain Asia: Focus on the Central Himalaya and Karakoram	High Mountain Asia (HMA) region, also known as the Third Pole, is crucial for the global water cycle, holding the largest freshwater reserves outside polar regions and supporting millions of people downstream. Limited observational data above 3000 m elevations and complex topography make accurate hydroclimatic modeling essential to capture the pronounced temperature and precipitation variations. This study presents high-resolution simulations of hydroclimatic conditions using the Weather Research and Forecasting (WRF) model, with a grid spacing of 12 km and 4 km, for two hydrological years (October 2016-September 2018). The simulations are evaluated against observations from weather stations above 3000 m and gridded datasets (CHIRPS, CMORPH, ERA5, ERA5-Land). The study examines variations in temperature and precipitation across HMA and focus on the Central Himalaya and Karakoram regions, known for contrasting glacial environments. The Central Himalaya is influenced primarily by monsoon patterns, while the Karakoram region is more affected by winter conditions. The WRF model captures the spatial and temporal variability of temperature and precipitation. Overall, WRF outputs outperform ERA5-Land, offering a more realistic representation of hydroclimatic variability in these regions. Comparison with precipitation products reveal discrepancies with over- and underestimation, depending on the reference dataset. Performance metrics (coefficient of determination and Root Mean Square Error), indicate station-specific variations between WRF and ERA5-Land. Probability density and quantile comparisons show that WRF outputs align better with in-situ data than ERA5-Land. These findings suggest that integrating multiple data sources with advanced statistical methods can improve model evaluation and capture regional complexities more effectively.

2025 Daugherty Water for Food Global Institute Research Forum Presentation Abstracts

Shabani	Muller	shabanikmuller@gmail.com	Tracking Agrochemical Contaminants in Aquatic and Terrestrial Environments Using Tadpoles and Songbirds as Sentinels	Agrochemical contamination can adversely impact human, animal, and ecosystem health. The AltEn Ethanol plant in Mead, NE processed waste seed products treated with neonicotinoid and fungicide pesticides through 2020, with liquid and solid byproducts entering streams and applied to fields. We sampled tadpoles and songbirds to detect agrochemicals in surrounding aquatic and terrestrial environments. In 2021, we collected American Bullfrog (Lithobates catesbeianus) tadpoles from surface-water sites and Red-Winged Blackbird (Agelaius phoeniceus) and Brown-headed Cowbird (Molothrus ater) eggs from farmland/wetland sites. Tadpole tissues and songbird eggs were analyzed for pesticides and degradation products using advanced gas and liquid chromatography-tandem mass spectrometry. Neonicotinoid residues were detected at an average rate of 21.21%, with clothianidin, clothianidin-desmethyl, and thiamethoxam identified. The minimum concentration detected for neonicotinoids was 3.2 ng/g, while the maximum concentration reached 315.4 ng/r. Fungicide residues, including atrazine, atrazine-desethyl, and atrazine-desisopropyl, were detected at an average rate of 32%, highlighting significant contamination. For Bullfrog tadpoles, the average neonicotinoid detection rate was 12.4%, with clothianidin detected in a concentration range of 16.2-17.9 ng/g and thiamethoxam detected in a range of 18.6-8908.8 ng/g. The fungicide detection rate in Bullfrog tadpoles was 36.5%, with concentrations ranging from 6.7-116.2 ng/g. The highest concentrations of these pesticides were found bordering the AltEn facility (songbird eggs) and at sites downstream (tadpoles). Our results show that tadpoles and songbird eggs are effective wildlife sentinels in this environment. We expanded sampling in 2022 - 2024 to investigate spatial and temporal trends in contamination.
Kaitlin	Steinauer	ksteinauer2@unl.edu	What Goes up Must Come Down: Tracking Groundwater Levels in Nebraska with Repeated Gravity Surveys	Spatial resolution is one of the main limitations of using satellite gravity data to determine groundwater storage change in aquifers and basins. By following a similar method, a relative gravimeter can be used to collect regular gravity surveys at designated locations to determine the groundwater level changes. Two study areas were selected to track groundwater level variations throughout the 2024 irrigation and recharge seasons. Both areas are equipped with observation wells, which allows for comparison with the gravity data. The first study area is located near Plymouth, NE, and exhibited 12.16 ft in groundwater level changes in the unconfined aquifer in 2024. The gravity response was up to 41 micro-Gals, and readings followed a similar trend with the well data. The second study area is near Oakland, NE, and involved four different well sites over multiple confined aquifers. After downloading 2024 well data, only two wells were successful in collecting groundwater levels. This data is the process of being analyzed, but gravity data shows consistent trends between the sites.
Bincy	Sunny	bsunny@unomaha.edu	Microbial Ecology and Water Quality in Protected Niobrara vs. Unprotected Elkhorn Watersheds	Freshwater quality is essential for both ecosystem function and public health, particularly in watersheds that serve as sources of drinking water. This study characterizes and compares microbial community composition using 16S rRNA gene sequencing in the protected Niobrara River and the unprotected Elkhorn River, the latter providing water for human consumption in Nebraska. Over the summers of 2023 and 2024, samples were collected from water, sediment, and biofilm compartments, and key water quality parameters including pH, temperature, specific conductivity (SPC), chlorophyll a, and dissolved oxygen (DO) were measured. We found that SPC, chlorophyll a, DO, and pH differed significantly between the two rivers. Likewise, significant differences in microbial diversity and community composition were observed. Variations in SPC, chlorophyll a, and DO were particularly influential in shaping these communities, highlighting the impact of anthropogenic activities in the unprotected Elkhorn watershed. Functional profiling revealed significant variation in the abundance of chemoheterotrophs (produce CO), methanotrophs (consume CH), and denitrifiers across river compartments and years. Although functional differences were evident, greenhouse gas flux rates did not differ significantly between rivers or years, suggesting that microbial functional shifts may not directly translate into measurable differences in emissions. Nonetheless, the distinct microbial profiles indicate that land management practices influence water quality, potentially impacting long-term ecosystem resilience and water safety. These findings underscore the importance of integrating microbial ecological insights with traditional water quality assessments to inform and improve watershed management strategies.

2025 Daugherty Water for Food Global Institute Research Forum Presentation Abstracts

Amy	Yanagida	ayanagida2@unl.edu	Release, Adsorption, and Biotransformation of Biosolid-Borne PFAS at the Water-Sediment Interface in Agricultural Watersheds	We have collected biosolids and tested them for release of PFAS. Sediment samples were also collected to assess the readsorption of released PFAS onto sediment at the water sediment interface. It was found that one of the PFAS most abundant in biosolids also adsorbed most to sediment surfaces, while other PFAS did not adsorb much. Next steps are to test biotransformation of the released PFAS.
Poster Presentations:				
Atiqullah	Atif	aatif2@huskers.unl.edu	Farm water management and nitrate concentration in the Bazile Groundwater Management Area in Northeastern Nebraska	Nitrate contamination is a critical environmental and public health concern in Nebraska, particularly in the agriculturally intensive Bazile Groundwater Management Area (BGMA). High nitrate levels, primarily from synthetic fertilizers and livestock manure, pose severe risks to drinking water safety, affecting rural communities and small towns dependent on groundwater. This research aims to enhance understanding of nitrate transport and temporal dynamics in both surface and subsurface water systems within the BGMA. Utilizing a unique farm management dataset collected by the Lower Elkhorn Natural Resources District (LENRD) from 2016 to 2024, the study employs HYDRUS-1D to simulate nitrate movement through the root zone and integrates it with MODFLOW to model groundwater flow and nitrate flux. The research addresses three core objectives: estimating nitrate transport based on agricultural practices, linking surface and groundwater models to assess nitrate dynamics, and implementing scenario-based analysis to evaluate the effectiveness of nitrogen management strategies. By digitizing and analyzing detailed data on fertilizer application, irrigation, and crop types, the study provides a robust framework for sensitivity and uncertainty analysis. The findings will inform more effective nitrate mitigation strategies and support sustainable water resource management in northeastern Nebraska. Additionally, the outcomes will assist NRDs and policymakers in implementing data-driven, site-specific best management practices (BMPs) for groundwater protection. Ultimately, this research contributes to the broader goal of improving water quality, protecting public health, and fostering sustainable agriculture in nitrate-affected regions.
Sophia	Becker	sbecker14@huskers.unl.edu	Investigating Cosmic-ray Neutron Sensors in a Mountainous Pilot Network for Soil Moisture and Vegetation Water Monitoring	Nationally coordinated soil moisture data are lacking in the United States. A network of cosmic-ray neutron sensors (CRNS) offers a promising approach for high-resolution soil moisture monitoring. While soil moisture estimation from moderated CRNS signals is well-established, the response of bare neutron detectors to forest vegetation remains uncertain. This study aims to (1) evaluate both the uncertainty in soil moisture estimates using a universal calibration parameter and the need for vegetation water content corrections, and (2) assess the relationship between bare CRNS data and remote sensing imagery across different land covers. We analyzed a mountainous pilot network of 15 CRNS stations in the Roaring Fork watershed, Colorado, integrating data from moderated and bare CRNS, time-domain reflectometry, gravimetric soil moisture samples, Landsat 9 imagery, and vegetation water content samples. The calibration equation utilizing a universal network parameter yielded an R of 0.71 and an RMSE of 0.07 g cm compared against gravimetric samples. Among vegetation indices, the normalized difference water index (NDWI) from Landsat 9's near-infrared and shortwave-infrared bands correlated best with field-measured vegetation water content. Correlations between bare CRNS signals and NDWI were 0.32 in forests, 0.12 in mixed forest-meadow areas, and 0.45 in non-forested (sagebrush) sites. Site-specific calibration or additional vegetation corrections are needed to achieve an RMSE below 0.04 g cm. Further research is required to better characterize the influence of forest vegetation water on bare CRNS measurements.

2025 Daugherty Water for Food Global Institute Research Forum Presentation Abstracts

AFRUJA	BEGUM	abegum2@huskers.unl.edu	MODELLING THE EFFECTS OF BIOPOLYMER MULCH ON WATER ROUTING USING HYDRUS	The application of biopolymer mulch in agriculture presents a sustainable approach to enhancing water use efficiency and mitigating environmental impacts associated with traditional mulching materials. This study investigates the effects of biopolymer mulch on soil water dynamics, specifically runoff, evaporation, root zone water retention, and deep percolation. Using the HYDRUS-2D model with the Dual Porosity package, we simulate water movement and solute transport in the vadose zone under varying mulch conditions. Model calibration and validation will be conducted using a combination of literature-sourced hydraulic parameters and built-in HYDRUS functions. Our simulations aim to demonstrate that biopolymer mulch improves soil moisture retention by reducing evaporation and modifying infiltration patterns compared to bare soil and conventional polyethylene mulch. The findings will contribute to sustainable water management strategies in agriculture, offering insights into the practical applications of biopolymer mulch under different environmental conditions. Future research should examine its long-term effects on soil structure, hydrological scaling across field conditions, and economic viability for widespread adoption. This study underscores the role of biopolymer mulch in advancing climate-resilient agricultural practices.
Alex	Egbuchiem	aegbuchiem@unmc.edu	Evaluating Atrazine Exposure on Parkinson's Disease Prevalence in Rural Nebraska Counties	Objective: This research aims to investigate the association between atrazine exposure and Parkinson's Disease (PD) incidence in rural Nebraska. The study explores the prevalence of PD, atrazine levels in groundwater and surface water, and their potential correlation with PD cases, particularly focusing on the rural population's drinking water sources. Methods: Data on Parkinson's Disease cases spanning 21 years were obtained from the Nebraska State Parkinson's Disease Registry. Atrazine levels in groundwater and surface water were gathered from multiple databases covering a 30-year period. Statistical analysis, including Generalized Linear Model regression, was conducted to assess the association between atrazine exposure and Parkinson's Disease incidence. Results: The research reveals a median annual PD incidence rate in Nebraska 58.87 per 100 k is higher than the national average 57.2 per 100k , with a notable concentration of affected individuals aged 50 and above. Atrazine levels in both groundwater and surface water show regional disparities, with certain counties exhibiting elevated concentrations. Analysis suggests a potential positive association between surface water atrazine levels and PD incidence in individuals aged 50 and above. Application to the field: This study contributes to understanding the potential role of atrazine exposure in PD development, particularly in rural settings heavily reliant on private well water. Findings underscore the importance of monitoring pesticide levels in drinking water sources and implementing preventive measures to mitigate health risks. The research highlights the need for further investigation into the impact of pesticide exposure on neurodegenerative diseases and emphasizes the importance of sustainable agricultural practices to safeguard public health.
Rimsha	Hasan	rhasan4@unl.edu	A Data-Driven Framework for Assessing Surface Water-Groundwater Resilience in Nebraska	In the context of extreme climate and increasing irrigation water demand, large-scale hydrological and data-driven models are helpful for understanding and predicting future water resources across the globe. Groundwater constitutes one-third of global water withdrawals and supports 40% of irrigation worldwide making it an important resource for agriculture and human consumption. The hydrogeochemical cycle is affected by the interaction of surface water and groundwater which leads to a change in pollutant sources, its fate and transformation within an aquifer. This research aims to create a framework for the predictability of surface-to-groundwater resilience to interdependent chronic and interannual water deficits and pollutants. Our Proposed methodology will combine advanced data-driven approaches to simulate groundwater quality changes, with a focus on nitrates and evaluate the impacts of hydroclimate forcings. Understanding groundwater is also crucial for ecosystems and aids in evapotranspiration, leading to climatic feedback. By leveraging OpenET, we quantify the role of ET in the groundwater system. The study employs large-scale groundwater flow modeling using MODFLOW-Vistas coupled with OpenET to analyze groundwater fluctuations, enabling simulations of the impacts of various hydrological events on water table dynamics. The coupled data-driven model will predict the spatiotemporal distribution of nitrate loads, while the integration of MODFLOW and OpenET will simulate groundwater fluctuations and assess the effects of ET on groundwater levels in the study region. The model demonstrates significant applicability in regions characterized by intensive agricultural activities and heterogeneous climatic conditions, offering essential tools for sustainable groundwater management and supporting evidence-based policy decisions in water-scarce environments. This research contributes to a deeper understanding of groundwater resilience and its role in mitigating water stress under changing climatic and anthropogenic pressures.

2025 Daugherty Water for Food Global Institute Research Forum Presentation Abstracts

Kristina	Kintziger	kkintziger@unmc.edu	Patterns of Select Per and Polyfluoroalkyl Substances (PFAS) in Nebraska Drinking Water	Per and polyfluoroalkyl substances (PFAS) are a group of synthetic chemicals that have entered water systems globally. Since the 1950s these chemicals have grown from industrial use to cosmetic, medical, textile, and other applications. Pattern and concentrations of PFAS are influenced by water source, location, environment, and many other factors. While many public water systems in the United States (US) have been monitored for PFAS, private well monitoring remains limited. The primary objectives of this research were to determine PFAS profile across drinking water in rural Nebraska and to characterize the risk of PFAS exposure through drinking water. Water samples were collected around seven different sites in Nebraska. Samples were extracted and analyzed by liquid chromatography tandem mass spectrometry following US Environmental Protection Agency (USEPA) Method 1633. Participants were surveyed at the time of sample collection to help evaluate factors which may contribute to exposure. Five PFAS compounds were considered for statistical analysis based on detection frequencies. Results revealed that at least one PFAS compound was detected in 98% of water samples (N=192). For the sum of five PFAS the median concentration was 2.23 ng/L. Wilcoxon Z/Kruskall chi squared test showed significant differences for all five individual PFAS analytes by town. There were significant differences in some of the individual PFAS concentrations by point source, water source, and distance from point source. Quantified PFAS in household water samples across Nebraska expand water quality data and will guide mitigation action priorities.
Mahyar	Mahdavi Hezaveh	mmahdavihezaveh2@huskers.unl.edu	FTIR-Based Analysis of Corn Ethanol Fermentation Emissions: Air Treatment Optimization and Machine Learning Modeling of Hazardous Air Pollutants	This study aims to improve understanding of the dynamics and mechanisms underlying hazardous air pollutants (HAPs) emitted during ethanol fermentation. Over the past year, extensive data collection efforts have led to the development of a novel methodology utilizing portable Fourier Transform Infrared Spectroscopy (FTIR) to capture emissions directly from ethanol plant fermenters as well as combined emissions from multiple fermenters operating simultaneously. Alongside emission data, comprehensive operational parameters, such as fermentation stage, were also collected. Following collection, the datasets underwent thorough preprocessing and visualization, offering preliminary insights into the complexity and variability inherent in fermentation emissions. Future work involves leveraging the preprocessed FTIR and operational data to train predictive machine learning models. One such model aims to predict fermenter emissions based on operational conditions and fermentation stages, facilitating optimi
Joseph	Oboamah	joboamah2@huskers.unl.edu	Energy from Flow: Self-Powered Wireless Irrigation Valves for Efficient Farming	Efficient water management in precision agriculture requires adaptive irrigation strategies that respond to spatial variability within a field. This study presents the development and implementation of an intelligent valve system that enables variable-rate irrigation (VRI) based on location-specific needs. The system consists of sprinklers equipped with wirelessly controlled valves that regulate water distribution dynamically. Each valve communicates with a central commanding device via LoRa (Long Range) wireless communication, ensuring low-power and long-range connectivity in agricultural environments. The valve additionally generates power hydraulically, thereby substantially reducing the cost of cabling compared to a conventional VRI system. A user-friendly web application serves as the interface for farmers to define irrigation zones and set application rates within designated field boundaries. Through the app, users can customize percentages of the full irrigation amount that will be applied in those boundaries, optimizing irrigation efficiency and reducing water waste. Prototypes have been successfully tested using the web-based interface, demonstrating remote control of individual nozzles. The system's ability to adapt irrigation rates based on spatial requirements enhances water conservation while maintaining optimal crop health. This project is in collaboration with KZValve LLC in Greenwood, Nebraska. The project is funded by the Nebraska Department of Economic Development and DWFI.

2025 Daugherty Water for Food Global Institute Research Forum Presentation Abstracts

Andrew Stiven	Ortiz Balsero	aortizbalsero2@unl.edu	Evaluating the Reuse of Greywater for Irrigating Ground-Level Fresh Produce: A Microbiological Risk Assessment of Generic E. coli Contamination on Lettuce	Chile's water crisis, driven by drought and rising agricultural demand, calls for innovative solutions like greywater reuse. This study applied a Quantitative Microbial Risk Assessment (QMRA) model to assess Escherichia coli contamination risks on raw-consumed lettuce. The QMRA incorporated modules for microbial dynamics at each stage, from production to retail. Baseline scenarios simulated contamination risks from three irrigation sources: untreated greywater, surface water, and groundwater. Treatment scenarios evaluated the efficacy of wetland-based and microfiltration primary systems combined with secondary disinfection methods (ClO2, ozone, and UV). Additionally, sensitivity analyses identified other key risk factors, from soil contamination to post-harvest practices. Findings revealed that untreated greywater posed significant risks, with 85.06% and 82.10% of cases exceeding E. coli safety threshold of 3-LogCFU/g in fresh produce in Spring/Summer and Fall/Winter, respectively. However, integrated primary and secondary treatments reduced microbial loads by over 5-log, meeting international safety standards. In addition to irrigation water, soil contamination presents another major risk factor, particularly with insufficient manure application intervals. Additionally, inadequate cold chain control accelerated post-harvest contamination, with lettuce exceeding safe E. coli levels within 30 hours post-harvest at ambient temperatures. This study highlights the feasibility of greywater reuse when supported by effective treatment while emphasizing contamination risks from irrigation, soil, and post-harvest practices. The findings will be used as the scientific basis for the development of new legislation in Chile on the safe reuse of greywater in agricultural settings and offering a framework for policies promoting sustainable water management and public health protection.
Rachel	Williss	rwilliss2@huskers.unl.edu	Water Management and Agricultural Community Resilience: Communication Approaches	Jackson County, Oklahoma is among the many rural areas facing a major decline in water security due to drought, water management practices, and conflicts with other communities that share the same water sources. This issue can also exacerbate many existing challenges such as population decline, poverty, and limited resources that can further decrease the resilience of these communities. Rural Confluence is an interdisciplinary, multi-university partnership that aims to co-create knowledge with rural communities to help them increase their resilience to climate impacts. This poster will detail the future research direction of one component of the project which focuses on collecting drought stories from Jackson County residents and incorporating them into the communication of localized climate data and other resources the project team will use in conversations with these communities. Through interviews and narrative analysis, data on personal experiences and impacts from drought will be collected.