Nebraska Water Center

Daugherty Water *for* Food Global Institute

Nebraska Water Conference

Managing water resources in urban Nebraska:
learning from the past to prepare for the future

October 3rd and 4th
Omaha, NE

Nebraska Water Center

Managing water resources in urban Nebraska:
learning from the past to prepare for the future

The Nebraska Water Center would like to welcome you to the annual Nebraska Water Conference. This interdisciplinary conference will feature experts in urban water and natural resources planning, the hydrology of eastern Nebraska, wastewater management, current natural resource challenges faced by Lincoln and Omaha, and the future of water management in eastern Nebraska.

To learn more about upcoming events and Nebraska Water Center news, please visit **watercenter.unl.edu**.

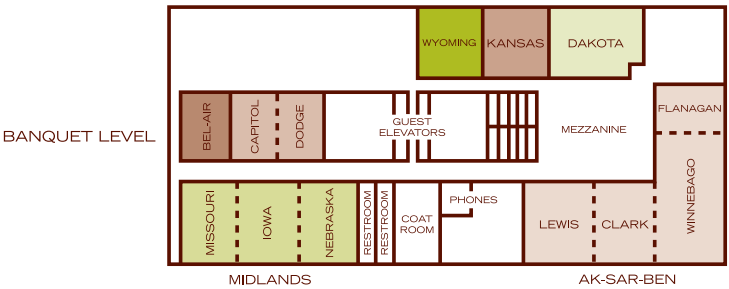
Please join us next summer for the 50th annual Water Tour hosted by the Water Center. More information will be shared in the spring and on our website.

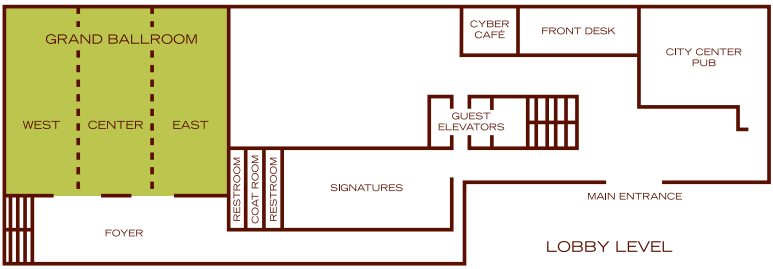
Announcements

Wi-Fi: Hilton Honors Meeting
Password: Hilton2023

Parking: Parking passes for the attached garage will be provided at the water conference registration desk on the day of the conference.

Conference Details: All conference materials will be found on our website at **go.unl.edu/waterconference**





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Tuesday, October 3
Quick Agenda

7:30 - 8:30 a.m.
Registration and Poster Competition set up ..... Foyer outside of Ballroom

8:30 - 10:00 a.m. **Morning Welcome**
Opening Keynote: Managing water resources in urban NE* ..... Ballroom

10:00 - 10:30 a.m. **Break**
Poster Competition ..... Foyer outside of Ballroom

10:30 a.m. - 12:00 p.m. **Morning Breakout Sessions**
Civity Workshop: Creating Connection in Your Work ..... Ballroom
Urban Environment* ..... Ballroom West
Flood Planning and Mitigation* ..... Midlands Room

12:00 - 1:00 p.m. **Lunch** ..... Aksarben Room
Poster Winners Announced ..... Aksarben Room
EPSCoR Brainstorming Meeting ..... Lewis Room

1:30 - 2:30 p.m. **Afternoon Breakout Session I**
Missouri River Management* ..... Ballroom
Tools for Water Management I* ..... Ballroom West
Wastewater and Sewer Systems ..... Midlands Room

2:30 - 3:00 p.m. **Break** ..... Foyer outside of Ballroom

3:00 - 4:30 p.m. **Afternoon Breakout Session II**
Urban Agriculture and Landscape Design ..... Ballroom
Tools for Water Management II* ..... Ballroom West
NDMC Drought Workshop* ..... Aksarben Room

4:30 - 5:00 p.m. **Afternoon Keynote**
Basin Wide Planning - Lower Platte River Consortium ..... Ballroom

5:00 - 6:00 p.m. **Break and Travel to Gene Leahy Mall**
Walk or take the hotel shuttle, map on p.9 ..... Foyer outside of Ballroom

5:00 - 7:00 p.m. **Evening Reception**
Food trucks and networking ..... Canopies, Gene Leahy Mall

Wednesday, October 4
Quick Agenda

8:30 - 9:00 a.m. **Morning Welcome** ..... Ballroom
Load buses to tour sites

9 a.m. - 12:00 p.m. **Tours**
Urban Water Projects Site Tour ..... JEO Consulting Group
Platte West Water Treatment Plant Site Tour ..... Metropolitan Utilities District
Flood Management Site Tour ..... Papio Missouri River NRD
Research Site Tour ..... University of Nebraska-Omaha

12:00 - 1:00 p.m. **Lunch** ..... Aksarben Room

1:00 - 2:00 p.m. **Afternoon Speaker I**
Lincoln's Water 2.0 Project - Developing a Second Water Source* ..... Ballroom

2:00 - 3:00 p.m. **Afternoon Speaker II**
Urban Water and Wastewater Infrastructure: Prospects and Challenges .... Ballroom

3:00 - 3:30 p.m. **Break** ..... Foyer outside of Ballroom

3:30 - 5:00 p.m. **Closing Keynote Panel**
Future of Water Management in Urban Nebraska ..... Ballroom

5:00 p.m. **Adjourn**

*Continuing Education Credits
All sessions marked with (*) are eligible for Water Well Standards Continuing Education Credit. There will be a sign-in sheet located in each eligible session at the front of the room for each attendee wanting to earn credit.

QR Codes
The QR codes on each page direct to **watercenter.unl.edu** where attendees can read the speaker bios and full abstracts for each session. The QR code on p.9 shows the menus of the food trucks for the Tuesday night reception at the Riverfront.

Tuesday, October 3
Agenda with Abstracts

8:30-10:00 a.m.
Morning Welcome (Ballroom)
Opening Keynote: Managing water resources in Urban NE*
Renee Sans Souci, Omaha Tribe; Steve Owen, City of Lincoln; Jim Theiler, City of Omaha; Doug Whitfield, MUD
This panel will introduce the overall theme of the conference by providing a look at the history of water management in Eastern Nebraska and a look to the future as the Lincoln and Omaha metro areas continue to grow. Speakers will cover the historical and indigenous uses of the Missouri River, the current state of the City of Lincoln, and the current state of the City of Omaha.

10:00-10:30 a.m.
Break and Poster Competition (Foyer outside of Ballroom)
Snacks will be provided

10:30 a.m.-12:00 p.m.
Morning Breakout Session
Civity Workshop: Creating Connection in Your Work (Ballroom)
Lucy Hancock, Civity
For leaders working in water quality and resource management, communication skills and tools to engage effectively with individuals from diverse backgrounds are crucial. In this 1.5 hour skillbuilding workshop, which includes opportunities for real-time practice, participants will learn how to deepen conversations and connection through storytelling and active listening. Participants will take away actionable strategies that are grounded in cross-cutting social science research.

Urban Environment* (Ballroom West)
Erin Haacker & Sarah Michaels, UNL; Kristina Kintziger, UNMC; Judy Joyce, Impact 7G
This breakout session will provide information on urban environments related to water. Speakers will discuss the differences between urban and rural water sources, heat islands and the Water, Climate, and Health program, an urban flood risk case study, and connecting underserved communities to water.

Flood Planning and Mitigation* (Midlands Room)
Lori Laster, Papio NRD; Tom Smith, Dodge County Emergency Management; Steve Shultz, UNO; Tirthankar Roy, UNO
This breakout session will provide information on flood planning and mitigation. Speakers will discuss Omaha's flood planning, the Papillion Creek Watershed, Fredmont and Dodge County area flood mitigation efforts, and A Typology of Properties Generating Flood Damage Exposure in Omaha.

Tuesday, October 3
Agenda with Abstracts

12:00-1:00 p.m.
Lunch and Poster Winners announced (Aksarben Room)
EPSCoR Brainstorming Meeting (Lewis Room)

1:00-2:30 p.m.
Afternoon Breakout Session I

Missouri River Management* (Ballroom)

Nicolás Velásquez, Iowa Flood Center; Andrea Gebhart and Dan Fricke, JEO
This breakout session will provide information on Missouri River management. Speakers will discuss flood information systems, levee set back initiatives, and levee improvement efforts.

Tools for Water Management I* (Ballroom West)

Dave Meisbach, NDEE; Mikaela Cherry, USGS; Junke Guo, UNL
This breakout session will provide information on tools for water management. Speakers will discuss the Nebraska Clearinghouse, using the R app for groundwater quality, and Design Hydrographs in Small Watersheds from General Unit Hydrograph Model and NRCS-NOAA Rainfall Distributions.

Wastewater and Sewer Systems (Midlands Room)

Jim Theiler, City of Omaha; Jeff Thompson, SCCWA; Matt Moser, USGS
This breakout session will provide information on sewer systems in the Omaha area. Speakers will discuss Omaha's combined sewer separation efforts, the Southern Sarpy Wastewater project and its relation to development, and Monitoring for changes in the Missouri River downstream from combined sewers near Omaha, Nebraska 2012 - 2022.

2:30-3:00 p.m.
Break (Foyer outside of Ballroom)
Snacks will be provided

Tuesday, October 3
Agenda with Abstracts

3:00-4:30 p.m.
Afternoon Breakout Session II
Urban Agriculture and Landscape Design (Ballroom)
Gus Von Roenn, Omaha Premaculture; Tim Rinne, Lincoln; John Porter, UNL Extension; Kelly Feehan, UNL Extension
This breakout session will discuss how urban agriculture is becoming part of landscape design, and its contributions to water management, food security, and community building.

Tools for Water Management II* (Ballroom West)
Jesse Korus, UNL; Katie Cameron, ENWRA; Matt Bergmeyer and Rusty Bartlett, SmallData Tech; Brooke Mott, DNR
This breakout session will provide information on tools for water management. Speakers will discuss the GeoCloud project, the Eastern Nebraska Water Resources Assessment project, using the Internet of Things for observation well monitoring, and transformational leadership.

NDMC Drought Workshop* (Aksarben Room)
Grace Campbell, Tonya Bernadt, and Lindsay Johnson from NDMC
The *Ready for Drought?* game is an in-person role-playing game based on the Extreme Event game developed by the National Academy of Sciences. Players work together to solve problems that can arise in their communities during a drought - building community resilience. They learn to prioritize resources, build coalitions, respond to, and assess the impacts of a drought, while practicing critical thinking and improving civic literacy related to drought resilience.

4:30-5:00 p.m.
Afternoon Keynote
Basin Wide Planning - Lower Platte River Consortium (Ballroom)
Rick Kubat, MUD; Steve Owens, City of Lincoln; Jennifer Schellpeper, DNR
This session will provide general information and background on the Lower Platte River Consortium, a collaborative approach of drought management with the mutual goal to assure adequate streamflow in the Lower Platte River Basin.

5:00-6:00 p.m.
Break (Foyer outside of Ballroom)
Travel to Gene Leahy Mall
Attendees can walk or take the hotel shuttle. A map is provided on the next page.

6:00-8:30 p.m.
Evening Reception (Canopies, Gene Leahy Mall)
Spend time networking and enjoying food from local food trucks.

Tuesday, October 3
Riverfront Social
6:00 - 8:30 p.m.

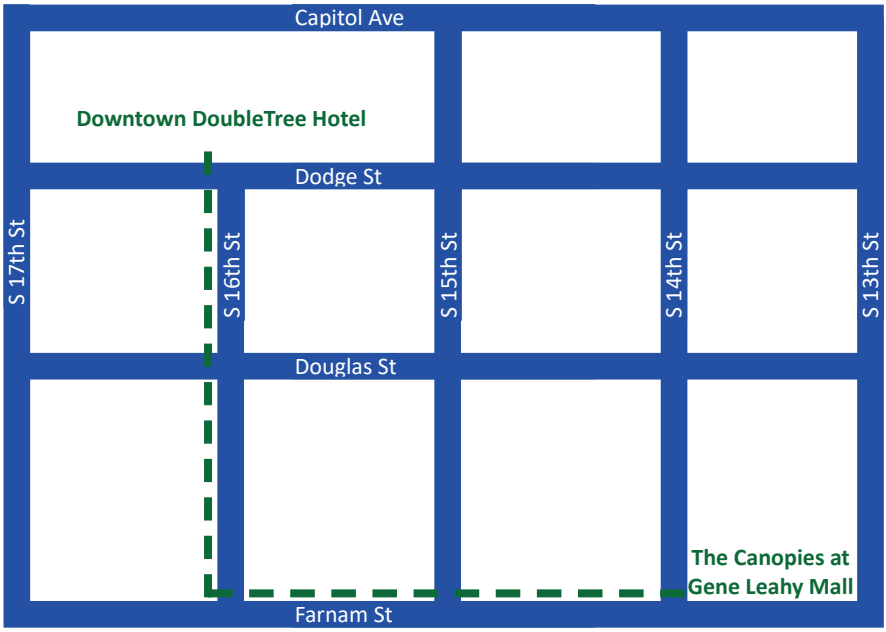
Join us for food trucks and networking at the Gene Leahy Mall, part of the newly finished RiverFront park. Just a short walk from the Downtown DoubleTree Hotel, the Gene Leahy Mall is the most urban of the RiverFront's three parks and includes a sculpture garden, performance pavilion, and outdoor activities for all seasons.

Four food trucks have been reserved for our reception. Meal tickets can be found in your name badge and can be redeemed for entrees or desserts at the food trucks. You will be provided with two entrée tickets and three dessert tickets, to be used as you wish.

We invite you to try all four trucks, network with conference attendees, and enjoy the newly updated Gene Leahy Mall. The Canopies, at the corner of 14th and Farnam Street, are reserved for our event, but you're welcome to explore the rest of the park.

The full menu for each food truck can be found on our website at **go.unl.edu/waterconference** or by scanning the QR code here:

Follow the walking map shown with the dashed green lines or take the hotel shuttle from the front of the hotel to arrive at Gene Leahy Mall.



Wednesday, October 4
Agenda with Abstracts and Tour Details

8:30-9:00 a.m.
Morning Welcome (Ballroom)

9:00 a.m.-12:00 p.m.
Site Tours

Flood Management Tour
Hosted by Papio-Missouri River NRD
This tour, hosted by the Papio-Missouri River Natural Resources District, will showcase flood management sites managed by the NRD in Omaha. Tour stops will include the Missouri River Levees at Haworth Park, Prairie Queen Recreation Area, and Wehrspann Lake/Chalco Recreation Area. Speakers will discuss levees, flood control reservoirs, and other Papio programs that help manage urban water.

Research Site Tour
Hosted by University of Nebraska-Omaha
This tour, hosted by the University of Nebraska – Omaha, will showcase water research and education sites in Omaha. Tour stops will include Glacier Creek Preserve and Elmwood Park. Speakers will discuss creek restoration, experiential classrooms, and water research being conducted by UNO faculty.

Water Treatment Tour
Hosted by Metropolitan Utilities District
This tour, hosted by the Metropolitan Utilities District (MUD), will examine water treatment methods in Omaha. The tour will stop at the Platte West water treatment plant and attendees will tour the facility and hear from MUD operators about water treatment methods used in Omaha.

Urban Water Projects Tour
Hosted by JEO
This tour, hosted by JEO Consulting Group, will highlight urban water management from an engineering perspective. The tour will visit two dams near Gretna Crossing Park. Each dam was built for a different purpose and is in a different stage of completion, allowing attendees to experience multiple stages of the building and planning process.

12:00-1:00 p.m.
Lunch (Aksarben Room)

Wednesday, October 4
Agenda with Abstracts

1:00-2:00 p.m.
Afternoon Speaker I
Lincoln's Water 2.0 Project – Developing a Second Water Source* **(Ballroom)**
Steve Owen, City of Lincoln
This presentation will share the process the City of Lincoln is undertaking to develop a second source of drinking water. Additional water supply is necessary to support Lincoln's growing population and to provide reliable water supply for the future.

2:00-3:00 p.m.
Afternoon Speaker II
Urban Water and Wastewater Infrastructure: Prospects and Challenges **(Ballroom)**
Sybil Derrible, University of Illinois-Chicago
This presentation will review the existing planning, design, and operating trends of infrastructure systems before focusing on the prospects and challenges of water and wastewater infrastructure. We will consider novel strategies to improve the existing flaws in infrastructure systems so we can then rethink how drinking water is collected and distributed in the future.

3:00-3:30 p.m.
Break (Foyer outside of Ballroom)
Snacks will be provided

3:30-5:00 p.m.
Closing Keynote Panel (Ballroom)
The Future of Water Management in Urban Nebraska
Amanda Grint, Papio NRD; Senator McDonnell; Mike Beringer, EPA Region 7
This panel will continue the discussion of some of the key issues in planning for the future of urban spaces: growth, recreation and safe drinking water supply.

5:00 p.m.
Adjourn

Poster Competition Abstracts

Awards provided by the Institute of Agriculture and Natural Resources and the Nebraska Water Center

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Xiaochen Dong

Controlling Nitrate Leaching with Subsoil Carbon Injection

Intensive irrigated crop production in Nebraska has led to elevated nitrate levels in groundwater. As a regulated drinking water contaminant, nitrate is easily solubilized and quickly leaches below the crop root zone to the deep vadose zone. Edge of field denitrification bioreactors practically remove nitrate from tile drainage water, but controlling nitrate leaching across an entire field is currently impractical. In earlier research, a series of bench tests contrasting wood chip thicknesses and source demonstrated the application of wood chips below the root zone decreased nitrate in leachate. A field-scale experiment was then conducted in Northeast Nebraska to evaluate the efficiency of the process under irrigated cropland. The preliminary field results showed that there is a significant ($p<0.05$) reduction in leached nitrate and ammonia in shallow soil (0-12 in). No difference in yield was found between control and treatment plots which suggested no production loss to this method. System design limited the carbon injection rate, and additional field experiments will be conducted to demonstrate the ability to increase carbon injection rates, improve long-term effectiveness, and reduce costs of this novel land treatment technology under irrigated cropland vulnerable to nitrate leaching.

Japhet Dushimeyesu

Developing the next-generation crop simulation model interface for efficient agroecosystem

Developing crop simulation models to increase yield and improve environmental resilience against changing climatic conditions. Cropping system models are a crucial tool for simulating, visualizing, and presenting quantitative information on crop growth related to boundary condition changes on a large scale. Within this framework, our project aimed to verify and validate the newly developed Crop, Land, and Soil Simulation (CLASSIM) model interface, which differs from other models by simulating both crop growth and mutual impacts between soil and crops during and after growing season. Using meteorological, soil, crop, and land

management input data; CLASSIM predicts soybean growth, yields, water use, and nutrient uptake at different stages of growth. To test and validate the model's accuracy, we generated destructive and non-destructive ground truth data from irrigated and rainfed soybean in Sutherland, NE, in 2022. The collected data will be used to train the model to improve its predictive accuracy in the long term. Our findings indicated a higher total harvest in irrigated soybean (14043.5 ± 970.0 lbs /acre) than rainfed soybean (1190.5 ± 125.4 lbs/acre), and the total biomass was higher in irrigated soybean (10582.2 ± 374.8 lbs/acre) than rainfed soybean (837.7 ± 100.7 lbs/acre). Our finding also emphasized the effect of water stress on soybean growth and harvest. Currently, CLASSIM is being trained for more crops like corn, cotton, and potatoes.

Kanak Kanti Kar

Influence of Climatic Patterns on Groundwater Levels in Nebraska

Most of the agricultural production and irrigation of Nebraska State relies on groundwater, while two-thirds of the High Plain aquifer water is in the State. Across the State, Climate, precipitation, and irrigation practices are distinct. Previous research studies showed that groundwater can be impacted due to its climate pattern. As such, understanding the climate impacts on groundwater levels (GWLs) can provide valuable insights into the dynamics of groundwater. This study considers three types of climate patterns (teleconnection, atmosphere, and ENSO) to find out the association with GWL. A Mann-Kendall trend analysis has been applied to analyze the long-term changes in GWLs. We collected more than three thousand wells data from different reliable sources and climate indices from the NOAA website. Results from this research will be helpful for groundwater resource management.

Nishant Kumar

Trend analysis of Rain on Snow Event across North America

Rain-on-snow (ROS) events are hydrometeorological phenomena under significant scrutiny in recent years. A ROS event is characterized by rain falling on pre-existing snowpack, posing a significant risk of flooding. In this study, we proposed a new approach to defining ROS events by putting thresholds on rainfall, snow water equivalent, air temperature, and dew point temperature simultaneously, which overcomes some of the limitations in the existing definitions.

Sudan Pokharel

Enhancing Peakflow Estimation in Nebraska with Machine Learning

Accurate estimation of peakflow is vital for infrastructure design and public safety. In Nebraska, regional regression equations, which have been developed by dividing the whole state into parts with similar characteristics, have long been employed to estimate peakflow for various return periods, often yielding results that vary

by orders of magnitude. In pursuit of a more effective approach, we developed a suite of Random Forest (RF) models. These RF models harness data from diverse locations across the state, outperforming traditional regional regression equations across all return periods. This study can improve decision-making regarding flood disaster mitigation and resilient infrastructure design, offering a more reliable system for safeguarding communities and critical assets.

Sinan Rasiya Koya

Causal Drivers of Rain-on-Snow Events in North America

Rain-on-snow (ROS) events, a phenomenon of liquid rainfall falling over accumulated snowpack, cause quick melting of snow, leading to rapid and catastrophic flooding. It is mostly unknown to scientists what causes the occurrence of ROS events. This study explores the causal drivers of ROS events across North America. We use the recorded measurements of hydroclimatic variables from the Global Historical Climatology Network Daily (GHCNd) dataset spanning over a period from 1951 to 2022. We implement Convergent Cross Mapping (CCM) to discover the causal links between measured variables and ROS frequency. Our results provide valuable insights into the potential mechanisms of ROS events in different regions in North America.

Shivendra Srivastava

Flood Vulnerability Assessment at the County Scale for the US

Flood vulnerability assessment at the county scale was conducted for the United States, leveraging only open-source datasets. The vulnerability framework consisted of interactions among four components, i.e., social, economic, ecological, and health. To quantify overall vulnerability on a county scale, we considered 18 variables under four components. The quantification of components of vulnerability was carried out by rescaling and averaging variables. A self-organizing map (SOM) machine learning algorithm was used to relate all four vulnerability categories to create county-scale vulnerability maps. SOM grouped the datasets according to vulnerability category in 2x3 clusters. The combination of county-scale data across the United States showed trends in high resolution that most prominently caused vulnerability in different regions of the country. A county-scale approach like this will make policymakers aware of the existing risks and vulnerabilities. This can help make tailored, effective, and locally relevant policies at the county level.

Sumaiya Tabassum

Student interpretation of evidence from online sources: Is climate change making floods more extreme?

Understanding complex issues like flooding requires critical evaluation of evidence and synthesis of scientific knowledge across disciplines. Students are the future

leader and decisionmaker and understanding, evaluating evidence correctly will deepen their perspective and impact their decision-making. We aimed to investigate how students find, analyze and interpret evidence about flooding issue from online sources. The study was conducted in a science literacy course that uses a structured decision-making (SDM) tool where students first learned about floods and their changing pattern, then were asked to express their understanding of whether flood events were becoming more extreme, evaluate evidence related to flooding, and provide reasoning in support of their ideas. Analysis indicates that 73% of students thought floods were becoming more extreme, and 47% included 'Climate Change' in their explanation of 'Why'. When asked to find a source of evidence online to support their reasoning, only 13% of students found peer-reviewed sources.

Yvon Ukwishaka

Redox-driven transformation of inorganic nitrogen species across the vadose zone: Insights from column experiment

Globally, nitrate deposition in the vadose zone has been gradually increasing. In Nebraska, heavy irrigation and nitrogen fertilizer reliance increased to boost agricultural production, leading to groundwater impairment. Understanding nitrogen redox transformation in the vadose zone can be critical to understanding nitrogen dynamics in the vadose zone and protecting groundwater. Our recently completed study aimed at identifying vadose-specific inorganic nitrogen redox reactions to predict and prevent nitrate groundwater contamination in heavily irrigated areas. Undisturbed segments of two 21-meter soil cores were packed to mix and match into 150-centimeter columns reflecting various substrate-specific biogeochemical reaction zones. Two sets of columns were treated to replicate infiltration beneath sprinkler-irrigated (n=3) and rainfed (n=3, control) row-cropped fields in central Nebraska, without adding external nitrogen. Water was supplied, allowed to infiltrate, and porewater was collected biweekly for nine months simulating the growing season from root zone (10 cm), capillary fringe (140 cm), and groundwater (140 cm). The results indicate that simulation of the vadose zone beneath irrigated fields produces significantly higher nitrate-N levels (5.8± 1.0 mg N/ L) than the rainfed soils (2.3± 0.3 mg N/ L) at the root zone. A similar pattern was found for the capillary fringe (irrigated: 1.1±0.5 mg N/ L, rainfed: 0.7± 0.2 mg N/L). In contrast, porewater ammonium-N concentrations were higher in the rainfed root zone (3.0±0.6 mg N/L) than in the irrigated root zone (2.0± 0.4 mg N/L) with similar levels in the capillary fringe (rainfed: 0.25±0.3 mg N/L, irrigation: 0.12±0.2 mg N/L). The same trend was observed in the groundwater system where rainfed system groundwater had higher ammonium-N (0.32±0.3 mg N/L) concentrations than the irrigated systems (0.26± 0.2 mg N/L), though nitrate-N concentrations were similar. Overall, the underlying mechanisms for the observed nitrogen dynamics are linked to water application differences.

Acknowledgements

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Matt Pillard, HDR
City Utilities:
Rick Kubat, Metro Utilities District
Steve Owens, Lincoln Water System
Tribal Members:
Renee Sans Souci, Omaha Tribe
Ted Hibbeler, Extension-Native American Coalition

2023 Nebraska Water Conference Survey

1. Please rate the Conference overall:
poor fair neutral good excellent
Comments:

2. What was your favorite presentation/breakout and why?

3. What was your least favorite presentation/breakout and why?

4. Please rate:

Timing (day of week/date):	poor	fair	neutral	good	excellent
Location:	poor	fair	neutral	good	excellent
Facilities:	poor	fair	neutral	good	excellent
Poster viewing:	poor	fair	neutral	good	excellent

Comments:

5. What topics would you suggest for next year's Conference?

Nebraska Water Center

Daugherty Water *for* Food Global Institute