

WATER CURRENT

NEBRASKA WATER CENTER
PART OF THE ROBERT B.
DAUGHERTY WATER FOR FOOD
GLOBAL INSTITUTE AT THE
UNIVERSITY OF NEBRASKA
WINTER 2022 VOL. 54, NO. 1

Core Research, Events and News from the Nebraska Water Center



**Nebraska
Water Center**
Daugherty Water for Food Global Institute

A research team from the University of Nebraska–Lincoln digs into a cornfield near Mead, NE in November to collect soil samples. The team is part of a larger research collaboration to understand the breadth and depth of contamination from the AltEn ethanol facility (see story on p.4)

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And More!



From the Director

Chittaranjan Ray, Ph.D., P.E.
Director, Nebraska Water Center (NWC)

Dear Reader,

First and foremost, I hope you and your loved ones had a spirited and rejuvenating holiday season. 2021 was yet another long year with unforeseeable ups and downs. As I write this, a new COVID variant is spreading in the United States like never before. Yet the important work on water research, education and outreach to safeguard our most precious natural resource can and must continue.

For one reason, public and ecosystem health depends upon a safe, reliable water supply. A case in point is the environmental monitoring and cleanup from the AltEn ethanol plant's contamination just up the road in Mead, Nebraska. The Nebraska Water Center, and more precisely our Water Sciences Lab, is playing a decisive role in collecting and analyzing soil and water samples from areas downstream and downwind of the pesticide contamination. Our student intern, Callie Svoboda, wrote a descriptive account of this research on p. 4.

Switching gears to events, we're pleased to kick off another installment in our long-running spring water seminar series. The theme is "Hydrotourism and Economic Development in Nebraska" and features a breadth of water specialists representing everything from city engineers to Indigenous educational consultants to river outfitters. Page 6 includes a news release and flyer. The series begins February 2 and runs until April 20 — so save the dates!

Alongside the Daugherty Water for Food Global Institute, we made waves at the recent Nebraska Association of Natural Resources Districts (NARD) Legislative Conference January 25-26 in Lincoln. We co-sponsored the senators' reception on the evening of Jan. 25 and both luncheons. Additionally, our Research and Extension Communications Specialist Crystal Powers presented "Level Up: Toolbox for Farm Nitrogen Efficiency," to a packed room on day two. Her presentation was one of several on nitrogen and nitrate, helping raise critical awareness about excess fertilizer application and water quality.

As many of you know, we host an annual water conference that regularly draws 100-200 participants. We are planning to hold this year's conference October 24-27 at the Younes Conference Center in Kearney. The location reflects the conference's theme of the Platte River basin and ecosystem and will be co-hosted by partners in Colorado and Wyoming. Please stay tuned for more details on our website and in future correspondence.

Circling back to the beginning of this missive, I wish everyone a healthy and prosperous 2022. Hopefully we will connect (and reconnect) with you this year and together advance our work to promote and preserve water for its many beneficial uses.

Chittaranjan Ray

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Daugherty Water for Food Global Institute Releases Annual Report



The Daugherty Water for Food Global Institute (DWFI) at the University of Nebraska has released its 2021 annual report online, showcasing the institute's work over the past year — both local and global — related to water and food security.

Highlights include:

- With \$5 million gift, UNMC College of Public Health and DWFI launch program on water, climate and health
- New agricultural water management tools use DWFI's GloDET and SETMI products to create synergistic systems supporting producers and helping achieve critical global food production goals
- New agricultural water economics team advances water policy
- Nebraska nitrate working groups tackle persistent drinking water contamination
- DWFI leads smallholder sustainable irrigation entrepreneurship project in sub-Saharan Africa
- Solving the mystery of Nebraska's intricate aquifer system

Every day, nearly a billion people in the world are food-insecure, without enough safe and nutritious food to lead healthy and active lives. Many of them are also water-insecure, without reliable access to

an adequate amount of clean water to meet their needs. This situation has been exacerbated by the COVID-19 pandemic. "The mission of DWFI — to secure more nutritious food with less stress on our scarce water resources — is more relevant and urgent than ever," said Peter G. McCornick, DWFI executive director.

With now a decade of experience, and together with its Faculty Fellows, supported students and partners, the institute has become a global leader in enhancing knowledge, fostering future leaders and developing effective techniques to sustainably manage water and increase food security.

DWFI was founded to leverage the expertise of Nebraska and the University of Nebraska and extend it with strong state, national and international partnerships. The 2021 Annual Report highlights research impacts from the institute and its partners to expand and accelerate efforts to produce more nutritious food with less water; catalyze the development and deployment of solutions to the next generation of producers, water managers and entrepreneurs; strengthen water and food systems to adapt to water-related shocks; and reverse the wide-spread trend of water quality degradation.

The report is now available at go.unl.edu/annualreport.

Return Flow: Scott Snell Comes Home to Water



Scott Snell shares his many hats during a presentation at the 2018 World Water Forum in Brasilia, Brazil.

You might say Scott Snell has meandered. The 55-year-old Hastings resident has been many things in life: Hollywood television staffer, real estate agent and philanthropic fundraiser. As the son of a naval chaplain, he hopped around military bases on Midway Island, Guam, Hawaii, California and Washington.

But water has been a constant. Oceanography fascinated him as a child. Later on, Scott worked for nearly two decades as public relations manager with the Upper Big Blue Natural Resources

District in York. Seeking a more flexible schedule, Scott waded into residential real estate in the spring of 2019.

"I had some success right out of the gate. I was very fortunate," he said.

That said, it does help to have a measure of guile in sales, something a forthright person like Scott lacks. So when Nebraska water legend Lee Orton, whom Scott knew from his NRD days, offered a full-time gig to work on special water projects, he couldn't say yes fast enough. Today,

he's the project and programs coordinator with Orton Management, which oversees the Nebraska Well Drillers Association, Nebraska State Irrigation Association and Nebraska On-site Wastewater Association.

One of his larger projects is the Nebraska Water Leaders Academy. Since 2009, this year-long program has delivered lessons on transformational leadership and water's vital role in our state to scores of Nebraskans, including Scott, who graduated in its second class. He credits the academy with fundamentally changing his conception of water — from segregating surface water and groundwater toward a more holistic view.

"We've got to get our minds and our hearts and our passions together and work as one for the commonality of water — and no labels."

So, what is it about water that continually attracts?

"Water," he reflected "is a destination we like to go to — to recreate and just to rejuvenate."

Welcome back to the water, Scott!

To support the Water Leaders Academy and other educational initiatives through a donation or estate planning, contact Scott at 402-705-6263.

University of Nebraska Researchers Aim to Monitor Long-term Impacts of AltEn Pesticide Contamination

By Callie Svoboda, Business and Marketing Intern, Water Sciences Laboratory, University of Nebraska–Lincoln

It's a frosty early November morning in a cornfield near Mead, Nebraska.

Here, Patrick Niyitugize is pounding a soil probe into land on the University of Nebraska–Lincoln's Eastern Nebraska Research, Extension and Education Center (ENREEC). As it happens, a two-lane highway is all that separates ENREEC's property line from the now defunct AltEn ethanol plant, making it an ideal location to understand contaminant transport downstream. Niyitugize, a senior from Rwanda studying integrated science, is one of roughly a dozen students and postdocs working alongside 13 faculty researchers at Nebraska, the University of Nebraska Medical Center and Creighton University to assess the scope of contamination stemming from AltEn. Joining him are Shahab Karimifard, a postdoctoral associate in UNL's Department of Civil and Environmental Engineering and Arindam Malakar, a research assistant professor with the Nebraska Water Center.

"Initially, it was mostly the surface water sampling," Malakar explained of the research. In early 2021, the team started sampling creek water running from AltEn into ENREEC's property and found high amounts of contamination.

"We started to realize this is a bigger problem than just surface water contamination. That led to the thinking of how badly the soil might be affected. This is what we are trying to answer today," Malakar said.

When it started operating in 2015, the plant represented an innovative way to generate ethanol from feedstocks consisting almost entirely of leftover seed corn treated with pesticides and fungicides. Treated seed is not unusual; but using it in large volumes to produce ethanol is. Over time, area residents became concerned as fish, bees, and house pets fell ill and died. Residents themselves endured a stench in the air, burning eyes and breathing difficulties.

The discarded seeds were treated with neonicotinoid insecticides — a popular protection against a broad spectrum of pests. While neonics, as they're known, target insects with a lethal efficiency, there is a growing body of research pointing to toxic impacts on non-pest species, including bees and deer. Furthermore, a large percentage of these chemicals find their way to other parts of the environment, such as surface water and untreated plants. In places like Mead, the human health impacts of neonics are surfacing. Understanding the extent of their toxicity to humans takes dedicated research and cutting-edge laboratory analysis.

Enter the Nebraska Water Center's Water Sciences Laboratory. The lab is the primary destination for all water and soil samples collected through this research. A committed group of students and full-time technicians, including Niyitugize, operate its high-powered equipment using sophisticated methods. He says the lab has been "a good opportunity to learn the whole process of sampling, analyzing, and then evaluating the data."

The overall goal of the project is to figure out the extent of contamination within the surrounding land, air, water, and animals. According to Karimifard, "The team will continue to monitor all aspects of the environment affected and have more decisive results in the near future."

To the naked eye, these fields look the same as they always do. But on this chilly November morning, these three University of Nebraska researchers are digging deeper. What emerges from their investigation will help answer critical questions — for both the people of Mead and future communities exposed to contamination. What's in our water? What does this mean for our health?

For more information about Nebraska's AltEn research, visit go.unl.edu/mead.

Watch a video of the research team in action at go.unl.edu/mead-video.



Patrick Niyitugize, a UNL senior and WSL student intern, pounds a soil probe into a cornfield.



Beautiful frosted grass forms a buffer between the highway and cornfield near Mead.



WSL Business and Marketing Intern Callie Svoboda reports from the field.

Nebraska Water Center Seminars Focus on Hydro-tourism and Economic Development in Nebraska

WATERCENTER.UNL.EDU

The Nebraska Water Center (NWC), in partnership with the University of Nebraska–Lincoln’s School of Natural Resources, will begin its annual Spring Water Seminar Series this February. The 2022 Series will highlight the significance that water holds in and around Nebraska and its ability to bring people from all walks of life together. The Series is open to the public and will be held at Hardin Hall on the University of Nebraska–Lincoln East Campus at 3:30 p.m. every other Wednesday.

In addition, the series — with writing assignments and in-class, student-led discussions on alternate weeks — doubles as a one-credit hour undergraduate/graduate course listed under NRES/AGRO/GEOG/GEOL 484/884 and WATS 484. Students interested in registering should be junior level or above.

The 2022 seminars feature an extraordinary slate of specialists representing everything from city engineers to indigenous educational consultants to river outfitters. This diversity in fields and experience will highlight how water means something different to every individual but is also something that unites us.

Established in 1968, the series provides a forum to increase awareness and allow for meaningful conversation regarding these issues. The series is a cornerstone of NWC’s mission to help the University of Nebraska become an international leader in water research, teaching, extension and outreach.

This year’s lectures include:

February 2 - Wynn Hjermsstad, Community Development Manager, City of Lincoln; Glenn Johnson, Former General Manager of Lower Platte South NRD

February 16 - Kevin Kruse, Engineer, JEO Consulting Firm; Steve Rames, City Engineer, City of Norfolk

March 2 - Chris Chizinski, Associate Professor, UNL School of Natural Resources; Dean Rosenthal, Administrator, Fisheries Division, Nebraska Game and Parks Commission

March 23 - Ken Schilz, Former State Senator; Mary Wilson, Co-Director, Keith County Area Development; Jim Swenson, Assistant Director, Nebraska Game and Parks Commission

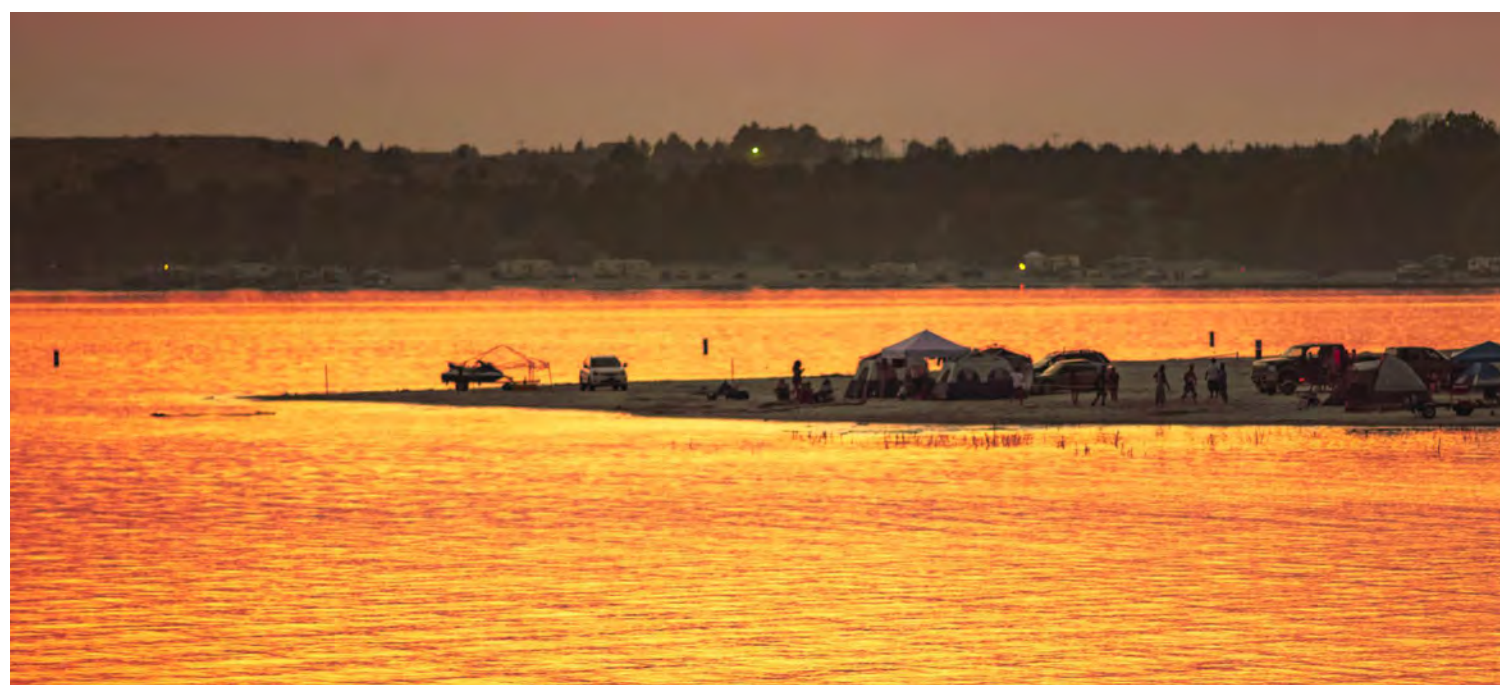
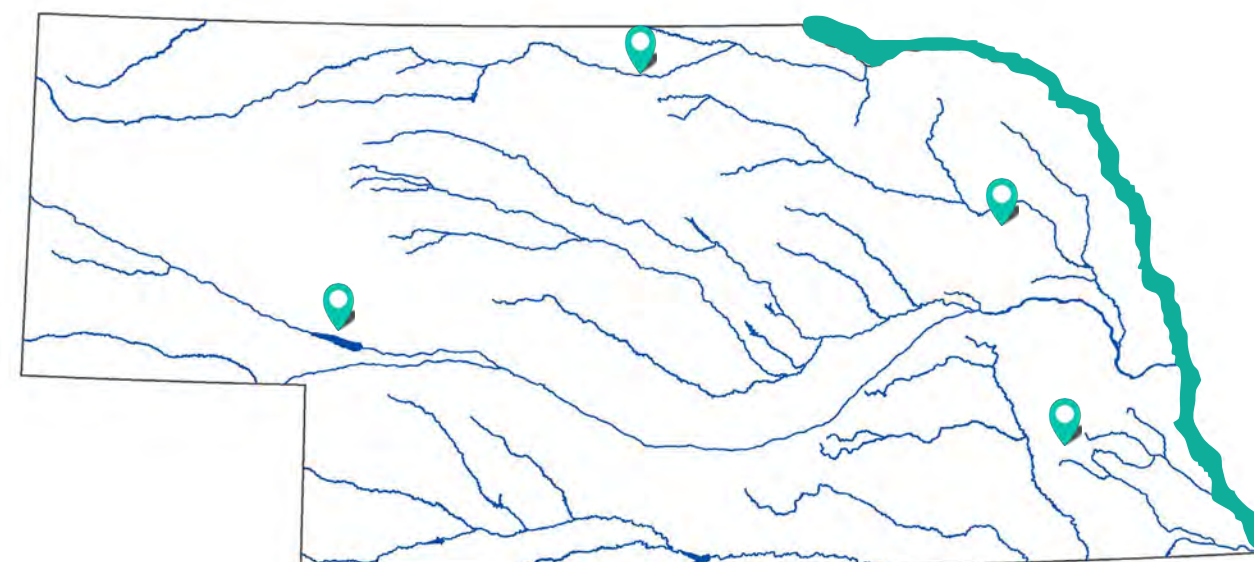
April 6 - Shane Doyle, Educational Consultant, Crow Tribe of Montana

April 20 - Mike Murphy, General Manager, Middle Niobrara NRD; Matt Sprenger, Project Manager, U.S. Fish and Wildlife Service; Susan Cook, Acting Superintendent, Niobrara National Scenic River

More information is available at watercenter.unl.edu/.

S P R I N G 2 0 2 2 WATER SEMINAR SERIES

‘HYDROTOURISM AND ECONOMIC DEVELOPMENT IN NEBRASKA’



Fishing as the sun sets over Lake McConaughy (Credit: Nebraska Game and Parks Commission)

**FEB.
2**

ANTELOPE VALLEY PROJECT

GLENN JOHNSON, Former General Manager, LPSNRD
WYNN HJERMSTAD, Community Development Manager, City of Lincoln

**FEB.
16**

NORTH FORK DEVELOPMENT PROJECT

STEVE RAMES, City Engineer, Norfolk
KEVIN KRUSE, Water Resources Engineer, JEO

**MAR.
2**

HYDROTOURISM AND THE NEBRASKA OUTDOOR ENTHUSIAST

CHRIS CHIZINSKI, Associate Professor, UNL School of Natural Resources
DEAN ROSENTHAL, Administrator, Fisheries, Nebraska Game and Parks Commission

**MAR.
23**

LAKE MCCONAUGHY DEEP DIVE

KEN SCHILZ, Former State Senator

GROUP PANEL

**APR.
6**

INDIGENOUS PERSPECTIVES ON MISSOURI RIVER

SHAYNE DOYLE, Member of the Crow Tribe and Educational Consultant

**APR.
20**

ECOTOURISM AND ECOLOGY ALONG NIOBRARA RIVER

GROUP PANEL

An Interview with Former Nebraska Water Center Intern Kelsey Jameson



Author’s Note: The goal of this periodic series is to learn what former Nebraska Water Center staff and interns are doing today and how their experiences here prepared them for the present. Kelsey Jameson interned with NWC from February to November of 2020.

Where are you from and where are you now?

I am from Kearney, NE and after graduating from the University of Nebraska–Lincoln in December of 2020 I ended up in Holdrege, NE.

What have you been doing since graduation?

I have been with the Holdrege Area Chamber of Commerce since June of 2021. I get to spend my days engaging in conversations with community members and business owners to help move Holdrege forward in workforce development, as well as other issues in the community. We are currently planning events for the winter months to complement this.

Groundwater Measurements of Herbicide May Underestimate Human Exposure

Author’s Note: This version of Pocket Science originally appeared in the January 14, 2022 edition of Nebraska Today.

Welcome to Pocket Science: a glimpse at recent research from Husker scientists and engineers. For those who want to quickly learn the “What,” “So what” and “Now what” of Husker research.

What? Atrazine ranks as a common herbicide in the United States, where it’s frequently used to boost corn and sorghum yields by curbing weed growth.

Conversely, the European Union has banned atrazine, which some research suggests can disrupt hormone production in wildlife and potentially humans. A 2021 study from the University of Nebraska Medical Center indicated that Nebraska counties applying the most atrazine also exhibited higher incidences of estrogen-related cancers, including breast and prostate cancer.

Human exposure to herbicides often comes via drinking water, much of which is drawn from groundwater — with many studies consequently using groundwater concentrations as a proxy for local exposure risks. Given that, the UNMC researchers expected to find elevated concentrations of atrazine in the groundwater of high-usage counties. They didn’t.

So what? Seeking answers to the seeming paradox, the UNMC team recently partnered with the University of Nebraska–Lincoln’s Olufemi Abimbola and Shannon Bartelt-Hunt. Together, the researchers analyzed data from 33 eastern Nebraska counties that used the most atrazine between 1995 and 2014. As expected, the study showed that groundwater concentrations of atrazine were generally higher in shallower wells than deeper ones.

What did you do and learn as a Nebraska Water Center and Water for Food Institute intern?

As an intern for the Nebraska Water Center and Water for Food Institute, I worked on events and marketing and led development of a brochure for the Water Sciences Laboratory. Through this, I learned that any experience you have can follow you and open doors in the future. I had a conversation with an employee of the Central Nebraska Public Power and Irrigation District just recently and we will be working on scheduling a water tour for our board of directors.

How did the internship and your undergraduate education in general prepare you for your current occupation?

The internship prepared me for the formal communication that I engage in daily with top donors, CEOs, and key players in our community.

What’s one thing that people don’t know about Holdrege that you are proud of?

One thing that people don’t know about Holdrege is that we have life-sized bronze art sculptures scattered about the town. Some have been made by world-renowned artists, George Lundeen and Brad Pearson, as well as other artists.

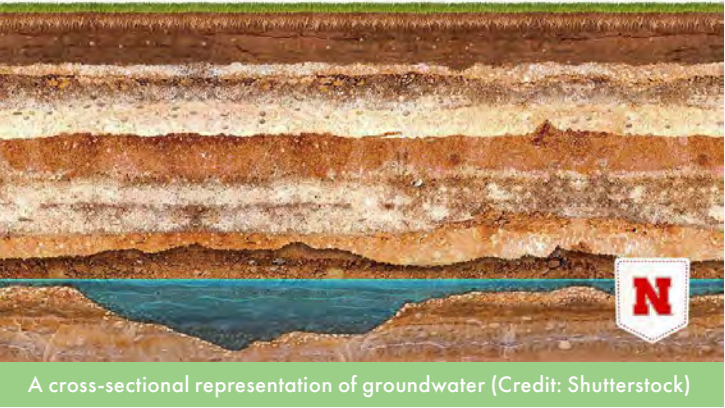
What activities do you recommend for Holdrege visitors?

I would recommend a visitor to review the visit37.com website as we have several activities to fill a weekend with!

The team also analyzed two clusters of wells featuring similar depths but high vs. low levels of atrazine. Lower-concentration wells not only served roughly three times as many people but were also generally used to draw water rather than just monitor its quality, suggesting that excessive extraction of groundwater may lower its atrazine concentrations. Those wells were likewise located in areas of so-called discharge, where groundwater naturally flows to the surface.

Now what? The findings indicate that groundwater concentrations of atrazine may underestimate the likelihood that people are exposed to it, said the researchers, who recommended measuring atrazine in already-extracted groundwater when studying its potential health implications.

Read the study at go.unl.edu/nebraskaatrazine.



A cross-sectional representation of groundwater (Credit: Shutterstock)

Research Corner

New Article Traces Aspects of Irrigation History and Water Productivity in the Great Plains



University of Nebraska–Lincoln Associate Professor and Irrigation Engineer Derek Heeren recently co-authored this summary of irrigation and water productivity in the Great Plains. Other contributors include Steve Melvin, irrigated cropping systems extension educator; Sandeep Bhatti, Ph.D. student, biological systems engineering; Eric Wilkening, undergraduate research assistant, biological systems engineering; and Christopher Neale, director of research, Daugherty Water for Food Global Institute. An excerpt is below.

Irrigation has been part of agriculture in the Great Plains, which Nebraska is right in the middle of, as far back as we have records and probably much longer than that. The region has productive soils and a good climate to grow crops but does not receive enough rain to produce top yields. In addition, the rain that is received is inconsistent, thus irrigation can supplement the water the crops need between rains allowing farmers to produce a good crop every year. The increased yields and year-to-year yield stability has led to a better economic environment in the region as well.

A recent article by Dr. Steve Evett and others traces the history of irrigation in the Great Plains region from a geographical, technical, and political perspective as well as how it has impacted the water resources.

Read a summary of this article at go.unl.edu/irrigatehistory.

New Research Provides Insights into Ecology and Soil Health



Daugherty Water for Food Global Institute (DWFI) Student Support Grantee Fernanda Souza Krupek is the lead author on a new paper investigating soil health practices in central and eastern Nebraska. Krupek, a Ph.D. student in UNL’s Department of Agronomy and Horticulture, is being supervised by Andrea Basche, a DWFI faculty fellow and assistant professor. The paper discusses several soil health practices implemented on the fields of 17 farmer collaborators. An excerpt from the paper follows.

Improving soil health is critical to reversing trends of soil degradation and is of increasing interest to a range of stakeholders including policymakers, agricultural industry leaders, food companies, and farmers. Crop and soil management practices focused on ecological functions can be effective in restoring fundamental biological, chemical and physical soil properties. The call for ecological intensification of agricultural systems has the potential to improve soil health and input-use efficiency. In this study, we developed a framework to classify spatial and temporal ecological intensification with soil health practices: tillage, crop rotation, cover crop, organic amendment, and crop-livestock integration. We applied this framework in a statewide soil health project featuring collaboratively designed on-farm research. We found that ecological intensification affected all properties commonly used in soil health assessments, but the sensitivity of different practices to impact changes varied among the soil physical, chemical and biological properties. The use of cover crops had the greatest impact on driving changes in soil properties, in particular those closely related to organic matter and carbon (C) and nitrogen (N) dynamics. Soil-test biological activity and its association with soil-test predicted N release in cropping systems intensified with cover crop use was found to reduce predicted nutrient fertility needs substantially compared to less intensified systems.

Read the full article at go.unl.edu/soilshealth.

Salt Creek Tiger Beetle the Focus of New Conservation Project



University of Nebraska–Lincoln Community and Regional Planning Professor and Daugherty Water for Food Global Institute (DWFI) Faculty Fellow Zhenghong Tang is spearheading a new project to monitor and preserve saline wetland habitat for the endangered Salt Creek tiger beetle. The project is being supported by the United States Environmental Protection Agency and DWFI. The following is an excerpt from a September 13, 2021 Nebraska Today article.

Search the entire Earth and nowhere else in the world will one find a small, tiny insect called the Salt Creek tiger beetle but in the few remnant saline marshes near Lincoln.

The Salt Creek tiger beetle, considered to be an extremely rare and endangered insect — numbering only a few hundred — has adapted to the highly specific habitat conditions of the Nebraska saline wetlands. However, its habitat

is shrinking. In fact, according the Nebraska Game and Parks Commission, since the state’s settlement, more than 90 percent of the Nebraska’s saline wetlands have been destroyed or highly degraded through drainage or filling for agricultural, commercial and residential development.

A regional collaboration, involving University of Nebraska–Lincoln researchers, is working to not only prevent the extinction of this rare beetle, but also preserve its habitat and that of other species with the installation of an environmental monitoring system.

Read the full article at go.unl.edu/saltcreek.

New Study Reveals Depths of Irrigation Industry Value



What does the irrigation industry contribute to the U.S. economy? That is the question Dr. Renata Rimsaite, a postdoctoral research associate with the Daugherty Water for Food

Global Institute and National Drought Mitigation Center, set about to tabulate in a recently published study.

The study, “Economic Impact of the Irrigation Equipment and Services Industry,” was commissioned by the Irrigation Association and Irrigation Innovation Consortium. Rimsaite worked with Nebraska-based Headwaters Corporation to contribute to the 38-page report.

“I was pleased to support this effort,” she said, noting the report has thus far received positive feedback.

Released last December, this study shows a vibrant and healthy industry estimated at an almost \$9 billion direct economic impact and a \$23.3 billion impact when including indirect induced impacts. This translates to over 70,000 industry-wide jobs, which is increased to over 167,000 jobs when secondary impacts are included. This study shows the sizable impact the irrigation industry has on the economy and, when compared to a similar 2010 study, demonstrates the industry’s ability to overcome challenges and innovate to continue growing.

For more information on the study, visit go.unl.edu/irrigationimpact.

Nebraska Water Center Director Co-authors New Book on Food, Energy and Water Nexus



Nebraska Water Center Director Dr. Chittaranjan Ray

Five years ago, Nebraska Water Center Director Dr. Chittaranjan Ray organized a workshop in India to introduce Indian scientists to their American counterparts. His goal was two-fold: Unite these researchers behind the shared challenge of feeding a growing world and discover how the nexus of food, energy and water could be exploited to meet this challenge. The April 2017 workshop at the Indian Institute of Science in Bangalore assembled 30 agronomists, biologists,

economists, engineers, atmospheric scientists, sociologists and hydrologists. The fruit of that assembly has ripened into a newly-published book, “Food, Energy and Water Nexus: A Consideration for the 21st Century.”

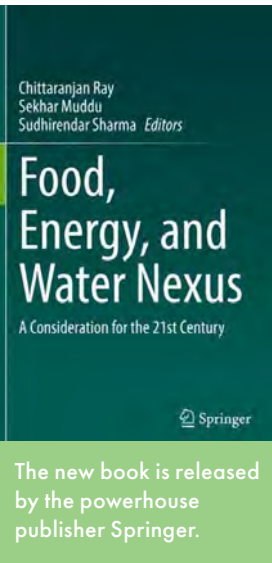
“This book stems from years of international collaborations. Furthermore, it encapsulates case studies from Nebraska and India that demonstrate key distinctions and connections and what those mean for water, food and energy security,” Ray said.

In addition to Ray, the book’s co-editors are Sekhar Muddu, professor, civil engineering, Indian Institute of Science Bangalore and Sudhirendar Sharma, senior consultant with the World

Bank. The new book mirrors the impressive range of topics presented at the workshop. These include new technologies and methods to measure crop water productivity, water use efficiency and water footprints; precision farming practices; remote sensing tools for crop water productivity; implications of biofuel production on land and water; and agricultural groundwater contamination and remediation.

In addition to Ray, other University of Nebraska-Lincoln faculty and book chapter authors include Adam Liska, Biological Systems Engineering Department; Craig Allen, School of Natural Resources; Bijesh Maharjan, Department of Agronomy and Horticulture; Daran Rudnick, Biological Systems Engineering Department; Karrie Weber, School of Biological Sciences; Arindam Malakar, Nebraska Water Center; Mesfin Mekonnen, Civil, Construction and Environmental Engineering, University of Alabama (formerly of UNL); and Vivek Sharma, Department of Agricultural and Biological Engineering, University of Florida (formerly of UNL).

For more information, visit go.unl.edu/nexusbook.



Pocket Science

Author’s Note: This version of Pocket Science originally appeared in the November 24, 2021 edition of Nebraska Today.

What? Arsenic, uranium and other trace elements naturally occur in topsoil across the U.S. Corn Belt, including the Cornhusker State. Crops grown in soils containing elevated levels of those trace elements can absorb them through roots, potentially curbing growth and threatening the health of those who regularly consume them.

So what? Nebraska’s Arindam Malakar, Chittaranjan Ray and colleagues were curious about whether ferrihydrite — a nanoscopic mineral sometimes found in soils but also used to treat groundwater and drinking water — might help address the issue.

As part of a greenhouse experiment using soil from the university’s Panhandle Research and Extension Center, the Husker team planted corn in three soils: one with no ferrihydrite, another with 0.05% ferrihydrite, and a third with 0.10% of the mineral. After irrigating the soils with arsenic- and uranium-fortified water, the researchers tracked the growth of the corn plants and monitored concentrations of the trace elements in water surrounding the plant roots.

The team found that ferrihydrite-enriched soils lowered the concentrations of arsenic and uranium by about 20%. They also appeared to reduce the loss of nitrate, which is essential to plant growth but can cause health issues when leaching into groundwater, by roughly 30-50%. Water retention, meanwhile, rose from about 13% with no ferrihydrite to roughly 17% with it.

Crucially, the corn likewise seemed to benefit: Plants in the ferrihydrite-enriched soils grew taller, produced 12-15% more living tissue, synthesized more chlorophyll and yielded kernels containing nearly twice as much iron.

Now what? Conducting similar experiments in actual field conditions, rather than a greenhouse, will be necessary to validate the study’s results, the researchers said.

But the initial findings suggest that adding even small doses of ferrihydrite to irrigation could limit concentrations of toxic elements while boosting crop growth and nutrient uptake.

Read the study at go.unl.edu/ferrihydrite.

NEBRASKA WATER SCIENCES LABORATORY



Nebraska Water Center
Daugherty Water for Food Global Institute

AT A GLANCE

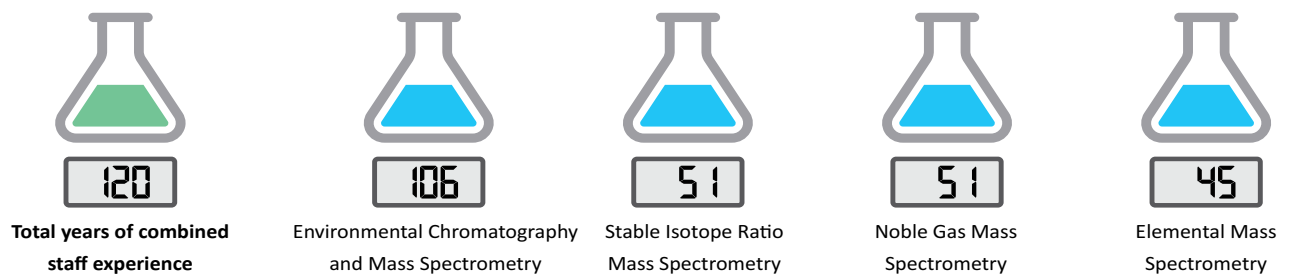
- ▶ State of the art water research facility serving local, national, and international entities.
- ▶ Additional services are available for soils, bio-solids, plant, and animal tissues.
- ▶ Connecting environmental scientists with advanced technologies, the newest methods, and the highest quality results.

GLOBAL REACH



Water Sciences Laboratory (WSL) location: Lincoln, Nebraska, USA

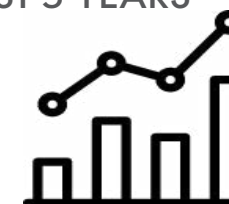
Countries of staff, students, clients, or collaborators of the WSL (20 total)



OUR OUTCOMES IN THE LAST 5 YEARS



Over **50,000** samples analyzed



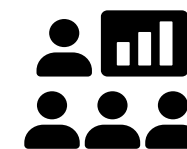
140 analytical methods offered



87 faculty users



100+ peer reviewed publications



150 students, interns, postdocs, international scholars, faculty, and technicians trained.

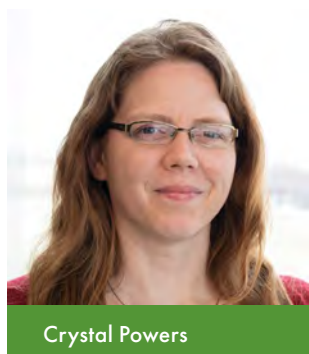


\$1.5 million in client service revenue

ADDRESS SERVICE REQUESTED

The Ebb and Flow

By Crystal Powers, Research and Extension Communications Specialist, DWFI/NWC/Extension



How do we foster actionable engagement with Nebraska's water resources? By connecting with the issues Nebraskans care about! A national survey on How Americans Relate to Water found 9 in 10 people connect water to their health and food, and nearly 8 in 10 have a personal connection to a specific body of water. (The Water Main, www.thewatermain.org)

From this they crafted three groups to frame water discussions:

		Interests	Connections to water
Outdoor	The Outdoor Recreation Enthusiast	Fishing Boating Swimming	<ul style="list-style-type: none"> • Their favorite body of water • Science-related information • Their heritage
Personal	The Day-to-Day User	Health Food Education	<ul style="list-style-type: none"> • Food • Drinking water and hygiene • Job/career • Cost of living
Societal	The Social Impact Citizen	Arts Science Culture	<ul style="list-style-type: none"> • Environmental issues • Societal well-being (economy, human rights, foreign policy) • Spirituality

These are valuable ways to help people understand how the topics you work with every day connect to their real life, so use them to frame the water science you would like to share. And next time you're out with friends or family, ask about their favorite water spot, you might just find you share a common connection!