

WATER

CURRENT

NEBRASKA WATER CENTER
PART OF THE ROBERT B.
DAUGHERTY WATER FOR FOOD
GLOBAL INSTITUTE AT THE
UNIVERSITY OF NEBRASKA

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Fall Harvest: Research, News and More from the Nebraska Water Center



**Nebraska
Water Center**

Daugherty Water_{for}Food Global Institute

Corn and soybean fields in southeast Lancaster County in the final stages before harvest create a patchwork of colors at sunset.

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And More!



From the Director

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

Dear Reader,

Autumn is in the air. This is typically a busy time of the year—and this one is starting off no different.

We hosted our annual water conference toward the end of August in Scottsbluff. Venturing west was a great reminder of the diversity and dynamism of cropping systems and surface and groundwater interaction in the Nebraska Panhandle. Following the one-day in-person conference, we joined the Scottsbluff/Gering United Chamber of Commerce for a two-day tour of the North Platte River basin. I enjoyed reconnecting with old partners and meeting new ones along the way.

In terms of proposal development, we have been deeply engaged with our Institute of Agriculture and Natural Resources (IANR) leadership on USDA’s Farm of the Future grant. The \$4 million award, if funded, envisions an agricultural test bed for precision agriculture, smart automation, data connectivity and transfer and climate-smart agriculture, among other things. Additionally, we recently submitted several proposals to expand the Know Your Well program, including one to the Nebraska Environmental Trust that the Papio-Missouri Natural Resources District would lead. Speaking of grants, I’m pleased to share that our Research Assistant Professor, Dr. Arindam Malakar, recently received a \$750,000 USDA National Institute of Food and Agriculture (NIFA) award to study nitrogen dynamics in the vadose zone to protect groundwater quality.

This summer, Dr. Saptashati “Tania” Biswas accepted a research chemist position at the University of North Dakota’s Energy and Environmental Research Center. Tania managed the day-to-day operations of the Water Sciences Lab for four years with verve and I wish her well in her new post. We recently hired Victoria Dey as her replacement. Victoria brings several years of laboratory experience to bear and I encourage you to reach out to her if you have analytical needs.

As I hope you discover in this edition, much research is underway to understand and promote Nebraska’s water quality. UNMC’s newly-formed Water, Climate and Health Program is playing an important part in this (p.8). So too is innovative research like Dr. Dan Snow’s in the Bazile Groundwater Management Area, profiled on the next page.

As the last eighteen months have demonstrated, protecting our health and the health of others is paramount. I wish you a healthy and productive fall!

Chittaranjan Ray

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Director
Chittaranjan Ray, Ph.D., P.E.

Director of Laboratory Services
Water Sciences Laboratory
Daniel D. Snow, Ph.D.

Cover Photo Credit
Craig Chandler, UCOMM

Editor
Jesse Starita
Editorial Assistants: Patricia Liedle and
Crystal Powers

Designer
Stephanie Severin

Nebraska Water Center
Robert B. Daugherty
Water for Food Global Institute
University of Nebraska
2021 Transformation Drive, Suite 3220
P.O. Box 886204
Lincoln, NE 68588-6204
Phone: (402) 472-3305
e-mail: jstarita@nebraska.edu



Innovative Research Looks to Control Nitrate Leaching, Protect Nebraska Groundwater

By Jesse Starita, Public Relations and Engagement Coordinator, NWC

Around the world and across Nebraska, nitrogen fertilizer is regularly used to grow crops.

Some of this nitrogen is converted to nitrate that can be easily lost from the root zone, eventually contaminating ground and surface water. In addition to being harmful to human health, excess nitrate in drinking water is costly for small communities to treat. Sandy, irrigated soils in Nebraska are highly vulnerable to nitrate leaching and few options exist for controlling nitrogen losses from these fields.

These concerns motivated Nebraska researchers to try something new on this old problem.

In 2018, the Nebraska Water Center received a grant from the Nebraska Environmental Trust to research how injecting carbon into the subsoil—by way of mulch and sawdust—could absorb and remove extra nitrate from the soil. The project is led by Dr. Dan Snow, research professor and director of the University of Nebraska’s Water Sciences Laboratory.

“This project is innovative because it provides a new, economical approach for improving groundwater quality,” said Snow.

The project’s goal is to offer a cost-effective method for producers and Nebraska’s Natural Resources Districts to reduce nitrate leaching beneath cropland in areas that are most vulnerable to

groundwater contamination. In the spring of 2021, Snow and collaborators injected fine-ground wood mulch below the root zone using a modified subsoil plow on two demonstration sites in northeast Nebraska’s Bazile Groundwater Management Area. They will monitor differences in nitrate leaching between treated and untreated fields for several growing seasons to measure the method’s effectiveness. The team will return this fall to collect water, soil and plant biomass samples for analysis.

Ultimately, the project seeks to demonstrate the efficacy and cost effectiveness of using an abundant carbon source to intercept and remove dissolved nitrate after it has left the root zone.

In addition to Snow, the team includes Arindam Malakar, research assistant professor, Nebraska Water Center; Amy Schmidt, assistant professor, department of biological systems engineering, UNL; Daniel Miller, research microbiologist, USDA Agricultural Research Service; and Xiaochen Dong, graduate student, School of Natural Resources, UNL.

Additional project support is provided by the Daugherty Water for Food Global Institute and Bazile Groundwater Management Area.

For more information, visit <https://watercenter.unl.edu/>.

Accompanying video: <https://www.youtube.com/watch?v=i7zwRfG36yl>



Know Your Well Project: Educating a New Generation on the Importance of Safe Drinking Water for Nebraska

By Callie Svoboda, Business and Marketing Intern, UNL Water Sciences Laboratory

As kids we often dream of what we want to be when we grow up. Maybe that’s inspired by a childhood hero or what our parents do. However, some don’t figure that out until we have experiences that mark us for life.

Bryce Christensen is a prime example. A few years ago, as a Waverly High School student, Bryce had an encounter with water that rippled into a career. Back in 2017, his science teacher introduced a new hands-on project that empowered Bryce and his peers to test drinking well water in his community. Four years later, these experiences led him down the commencement aisle to pick up bachelor’s degrees in water sciences and fisheries and wildlife from the University of Nebraska–Lincoln. So, what was this project? Why has it influenced Bryce and many others to take action in their communities and future?

Funded by the Nebraska Environmental Trust, the Know Your Well Project began in 2017. It was coordinated by the Nebraska Water Center which focuses on helping the University of Nebraska–Lincoln become an international leader in water research, teaching, extension, and outreach. The project put power into the hands of over 160 students at 19 high schools to test the very water their communities were drinking—from Crawford in the Sandhills to Auburn in the southeastern corner. This is important because nearly 85% of the state’s residents rely on groundwater for their drinking water. Urban residents’ water is tested by municipal utilities, but one in five Nebraskans gets their drinking water from private domestic wells around the state—which are rarely tested for contaminants that can have harmful health effects on communities.

“Overall, I would say that it has impacted me by influencing what I studied in college, and what I want to do for a career,” Bryce explained, “It (KYW project) is important to communities and schools around Nebraska because many people are not aware of some of the problems that their wells may have and how to fix them if possible.”

As the project’s manager, Christopher Olson drove nearly twenty thousand miles to train students and teachers and share his expertise and passion for the science of groundwater and drinking water. Before doing so, he had to find a way to adequately capture the attention of students and get them interested in their water. He didn’t do so by putting chemistry equations up on the whiteboard but rather by initiating discussion and conversation amongst youth to instill a curiosity about the topic. Olson asked these young citizen scientists to ask themselves: “What is in our water?”

“The first step in the process,” Olson explained, “was getting students to understand why they should care about water quality and instill in their minds and hearts a sense of ownership into what they are drinking.”

After taking STEM education courses at the University of Nebraska–Lincoln, Olson found a way to grasp students’ interest and fascination with the project through introduction exercises. His go-to activity involved three test tubes that were secretly filled with chamomile tea, grape soda, and tap water. The students, under the impression that

the grape soda and tea were contaminated, all responded that they would prefer to drink the clear tap water. Afterward, he told them that two of the test tubes contained drinkable substances like soda and tea and that the tap water they chose to drink contained nitrate-contaminated water. When Olson asked if they would still go with their first choice, the students reversed course.

From there, students were trained on test kits which contained portable meters and colorimeters to measure levels of atrazine, coliform bacteria, pH, conductivity, hardness, nitrate, ammonia, chloride, copper, and manganese. Some contaminants occur naturally; others are the byproduct of agricultural practices, including runoff from farm fields and livestock pens. They would independently collect and test samples from about 20 wells within 50 miles of their schools. Students collected and uploaded their data via smartphones and sent duplicate samples for validation to the Water Sciences Laboratory (WSL) on UNL’s East Campus.

In its first four years, the Know Your Well Project empowered young citizens to become active participants in researching a topic that directly impacts them. As well as opening further interest in learning how water and soil quality could impact their futures.

Discussions that otherwise wouldn’t have happened did due to the investment of students and educators talking about how water quality impacts their community and surrounding areas. This gave students the opportunity to initiate conversations with stakeholders, school board members, and administrators on the topic of water quality in Nebraska.

So where is Know Your Well today? In 2020, a coalition of Natural Resource Districts, state agencies, and University of Nebraska campuses joined the Nebraska Water Center in submitting a grant application to Nebraska Environmental Trust to expand the project. The proposal envisioned bringing Know Your Well into the curriculum of 500 more high school students, who would sample more than 1,000 wells. Partnerships with NRDs would boost the program’s long-term sustainability and expand public understanding around the importance of guarding Nebraska’s drinking water.

While the proposal ultimately wasn’t selected for funding in 2020, the coalition is again seeking funding through the Nebraska Environmental Trust in 2021.

Donors to the University of Nebraska also have the opportunity to play a role in expanding Know Your Well into more schools in Nebraska and beyond.

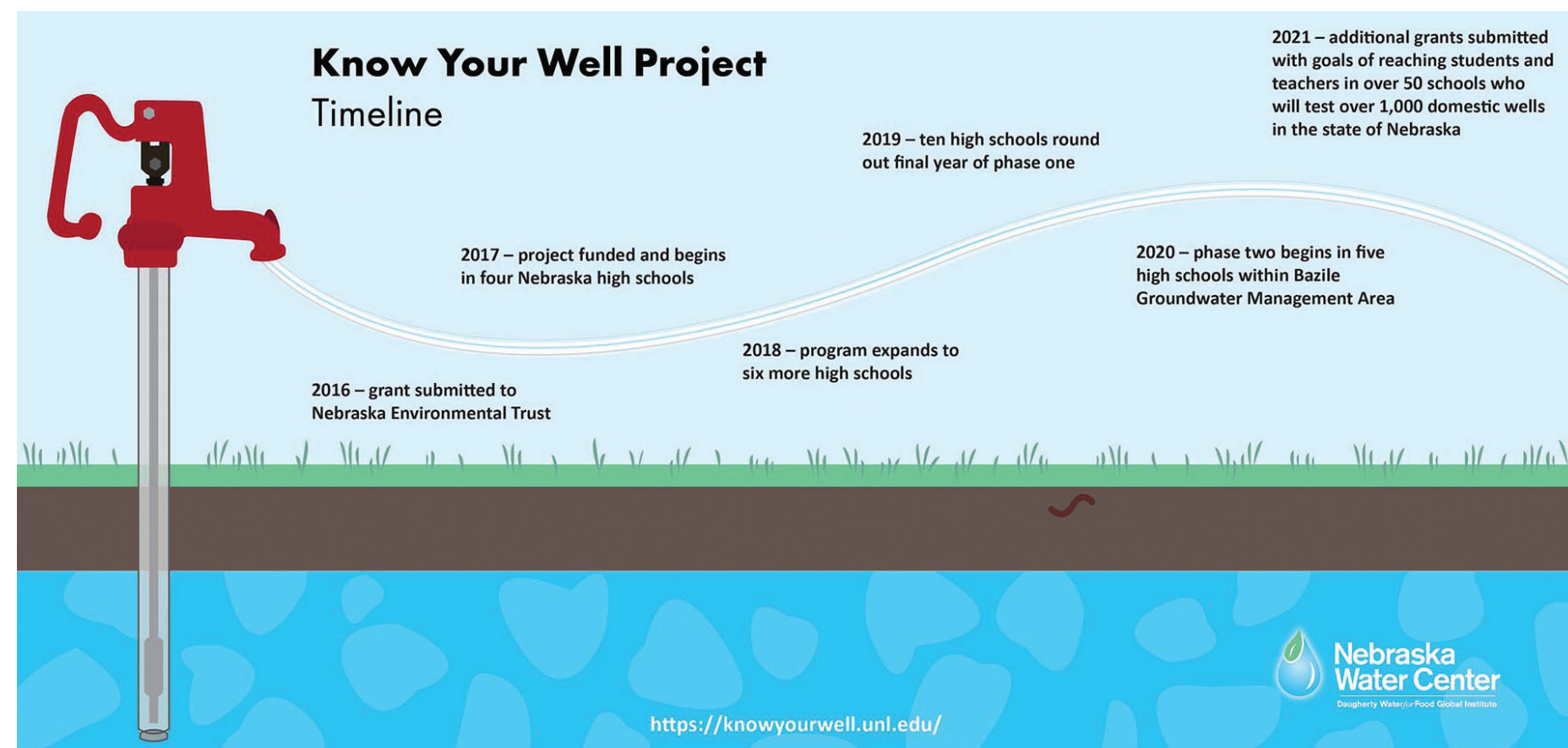
Laura Goracke, a science educator at Seward High School, introduced the project to her students and found that it was a great way to inspire students around water while raising their awareness of a topic that affects people on a global scale.

“They weren’t just learning about something in science class. Students were able to see that this was an issue not only in Nebraska but worldwide,” Goracke explained.

Meanwhile the project continues to evolve into phase III of its life, which emphasizes improved communication, increased participation, and collection of adequate data to deliver high-quality domestic well data to residents. Because Nebraskans are so reliant on groundwater and agriculture, the choices we make above ground impact our water and, sooner or later, our collective health. When done right, Know Your Well is a crucial vehicle to connect the health of groundwater to the Nebraskans who rely on it every day.



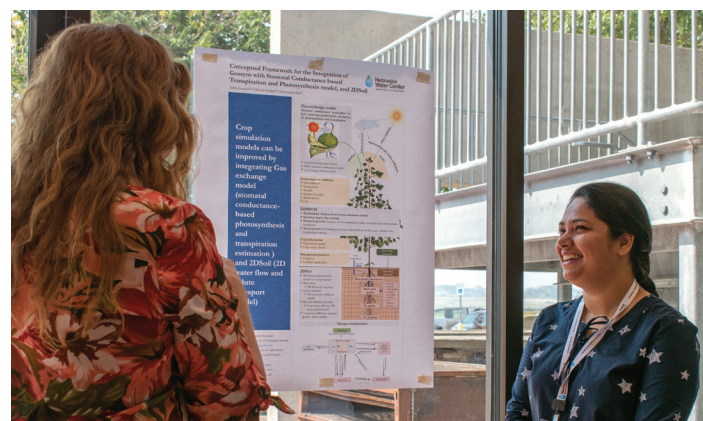
Madison High School students uncover a drinking water well.



2021 Nebraska Water Conference: The Shape of Water in Western Nebraska

The Nebraska Water Center’s 2021 conference is now in the books. Entitled “The Shape of Water in Western Nebraska,” the conference was held August 16th at the Panhandle Research and Extension Center in Scottsbluff. An esteemed lineup of Nebraska water leaders discussed water infrastructure in the panhandle, western Nebraska’s unique hydrogeology, and innovations in water and agricultural management. Attendees also enjoyed live jazz at an evening banquet at the Legacy of the Plains Museum.

On August 17th and 18th, a post-conference water tour—sponsored by the Scottsbluff/Gering United Chamber of Commerce—traversed the North Platte River basin making stops at dams, ranches, fish farms, potato processors, and vital waterbodies like Lake McConaughy.



NWC Research Extension Communications Specialist Crystal Powers (L) and NWC Postdoctoral Associate Sahila Beegum visit during a break.



A morning break at the conference.



Group photo time at the Wildcat Hills State Recreation Area.



Jessica Groskopf, assistant extension educator for ag economics.



John Berge, North Platte Natural Resources District general manager.



On stage at UNL’s Panhandle Research and Extension Center.



The Austin Sailors Quintet serenades the evening banquet at the Legacy of the Plains Museum.



A center pivot sprinkles test plots at the Panhandle Research and Extension Center.

Events

SEP 23

DWFI Fall Welcome
4-6PM
The Mill, Nebraska Innovation campus

SEP 27 - SEP 28

Natural Resources District Annual Meeting
Kearney, Nebraska

OCT 3 - OCT 9

Water for Food Global Forum:
Food Systems and Nutrition

OCT 10 - OCT 16

Innovation and Entrepreneurship in Agricultural and
Water Management

OCT 17 - OCT 23

Water and Nutrient Management

OCT 24 - OCT 30

Climate Change and Extreme Events

Register now
go.unl.edu/waterforfood

OCT 13,
NOV 10

Mass Spectrometry Summit
Register now
<https://waters.com/environmentalmsfall2021>

Now - Dec 23

Art exhibit
"The Nature of Waste: Material Pathways and Discarded Worlds"
Sheldon Museum, Lincoln

FEB 2,FEB 16,
MAR 2, MAR 23,
APR 6, APR 20
2022

Nebraska Water Center Spring Seminars
3:30pm
Hardin Hall Auditorium, East Campus

JAN
2022

NRD Legislative Conference
Embassy Suites, Lincoln





Victoria Dey

This article originally ran in IANR News on October 4

About Victoria

I was born in Lincoln but grew up in California. My family and I moved back about 15 years ago to be close to family. We have relatives in both states, so when I was younger, Lincoln was my summer vacation destination! I honestly love it here. I have been married to my high school sweetheart, Devin, for 2 years in November. I received my bachelor’s degree in water sciences at UNL and have been with the Water Sciences

Laboratory for almost five years now. I started there as a student worker, became a research technician, and recently was appointed as lab manager. I am so thrilled to be able to continue my efforts supporting environmental research and monitoring.

What is your position at the University of Nebraska–Lincoln?

I am the research laboratory manager at the Water Sciences Laboratory on East Campus. My main responsibility is making sure that the lab is running smoothly and that all interns, students, clients and full-time technicians are properly trained. Another key facet of my job is monitoring our quality control samples and ensuring that the instruments are being maintained properly. I also interface directly with clients and researchers, answering any questions they may have and assisting with sample collection and submittal. Finally, I assist in a supporting role with the business side of the laboratory.

Water and Health Summit Brings Together Leaders to Clarify Issues in Nebraska, Define Solutions

The Water and Health Summit was held June 29-30 in Lincoln with the goal of improving the health of Nebraska. The in-person event brought together leaders in health and water to clarify issues in Nebraska, define obstacles to key solutions and operationalize solutions. One outcome of the Summit was to build a community of practice linking health professionals and knowledge to those doing work in water resources and agriculture. Organizers also plan to produce a white paper and policy brief on the challenges and solutions identified, with next steps listed for each partner and a final presentation to policymakers.

What drew you to the University of Nebraska–Lincoln?

Living in Lincoln, coming to the University of Nebraska–Lincoln was an obvious choice. It also helped that Devin had started attending the university a year prior. I really felt drawn to East Campus and have always loved the atmosphere here. I’ve stayed because I really feel as though the work I’m doing is able to make a difference.

What aspect of working in an educational setting do you enjoy most?

I think my favorite part is working with students. Their passion really rubs off on me. It’s so fulfilling being able to help them with their research or teach them skills that will benefit them in the rest of their professional career.

What do you consider your greatest achievement?

I consider becoming the manager at the Water Sciences Laboratory and being able to continue to support environmental research at the university to be my greatest achievement thus far. I’m very excited to see where this opportunity will lead me, and what kind of difference I can make.

What is something that most people don’t know about you?

Before I started at the Water Sciences Laboratory I worked as a sterile processing technician at Bryan Hospital. We were responsible for cleaning and re-sterilizing all the instruments used during surgery. That means a lot to me because multiple members of my family have worked at Bryan Hospital for generations. For example, my grandfather learned how to use the very first heart-lung machine that Bryan had. I’m proud that I was able to help continue that tradition.

What is your life like outside of work?

I love spending time with my family. Devin and I both agree that it’s more fun to do things with others than by ourselves, so we spend as much time as we can together. We are lucky enough to share a lot of the same interests, so that keeps us busy.

Invited participants included experts from DWFI, the University of Nebraska Medical Center (UNMC) and the University of Nebraska’s Institute of Agriculture and Natural Resources (IANR), as well as Natural Resources Districts managers, physicians, donors, government entities, growers and others.

The Summit was organized by the Water, Climate and Health Program, a joint initiative of the UNMC College of Public Health, DWFI, and IANR as the result of a gift to the University of Nebraska Foundation from the Claire M. Hubbard Foundation.

For more information, visit <https://www.unmc.edu/publichealth/wch/index.html>.

Agricultural Discharges Under the Clean Water Act: Old Questions and New Insights



Anthony Schutz

University of Nebraska–Lincoln Associate Professor of Law Anthony Schutz recently published a paper on agriculture, water and environmental regulation. An excerpt from that paper is below.

Agriculture loves the environment; it depends on natural resources to thrive. But agriculture resists environmental law; it is best to keep environmental costs off the balance sheet. As a result, the greatest stewards often ask lawmakers for exemptions to environmental regulation, seek regulatory favoritism from agencies, and sue regulators for expansive interpretations of statutory or regulatory language or narrow interpretations of favorable statutory or regulatory exemptions.

The most famous article on agriculture and environmental law is J.B. Ruhl’s *Farms, Their Environmental Harms, and Environmental Law*, written in 2000. After more than twenty years, very little has changed. Production has intensified and environmental policy’s blind spot for agriculture remains. A push for ethanol production increased farm profitability during the most recent ethanol boom for crop producers, and profitability remains relatively high. This boom did not spark interest in implementing previously unaffordable conservation practices. Rather, it drove the push for less conservation, bringing land into production from the Conservation Reserve Program and from lands that had never been broken. And as crop prices have risen, livestock production has been squeezed between high feed costs and a powerful and small class of livestock buyers. As a result, livestock operations have gotten bigger, with larger environmental impacts.

Read the full article in *University of the Pacific Law Review* at <https://law.unl.edu/node/3574/>.

Identifying Reactive Nitrogen Dynamics in the Deep Vadose Zone to Protect Groundwater Quality



Arindam Malakar

NWC Research Associate Professor Arindam Malakar recently received a \$750,000 USDA Agriculture and Food Initiative (AFRI) grant to study nitrogen’s impact on groundwater quality. More details about the grant follow below.

Specifically, the project will measure the occurrence of multiple nitrogen species beneath gravity, pivot irrigated and dryland corn using deep coring, elucidate transformation pathways between nitrogen species by comprehensive chemical analysis and column experiments with isotope-labeled fertilizers and simulate reactive transport of nitrogen with appropriate modification of a well-developed USDA-ARS management model. The project period runs from April 1, 2022 to March 30, 2026. Malakar will serve as the lead investigator and is joined by co-investigators Erin Haacker, associate professor, Earth and Atmospheric Sciences, UNL; Dan Snow, director, Water Sciences Lab, UNL; and Chittaranjan Ray, director, Nebraska Water Center.

Climate Change and Water Management Challenges Facing the Great Plains



Dave Aiken

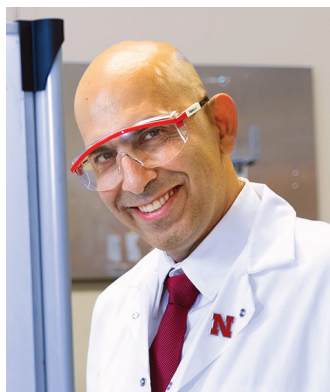
University of Nebraska–Lincoln Agricultural Economics Professor Dave Aiken contributed a summary in Great Plains Research of the water management challenges in the Great Plains under climate change. An excerpt from that paper is below.

As a region, the Great Plains is famous for its water insecurity, as reflected by its earliest designation as the Great American Desert. Precipitation in the semiarid Great Plains has always been highly variable, sometimes alternating between flood and drought (Shafer et al. 2014, 441–42). The region suffered major floods in 2011 and 2019 and a searing drought in 2010–14 (Lall et al. 2018, 149–50; Umphlett et al. 2020). The most likely future suggests much, much more of the same (Oglesby et al. 2015). A regional future of higher temperatures, more drought, and more flooding poses significant regional water management challenges. In this article, I examine what is involved in addressing these challenges relative to increased stormwater runoff, irrigation and groundwater depletion, rainwater harvesting, municipal stormwater and wastewater reuse, and habitat protection.

Read the full article in *Great Plains Research* at <https://muse.jhu.edu/article/773463/pdf>.

Nejati's Molecular Research Earns CAREER Award

By Dan Moser, Research Communications Specialist, Office of Research and Economic Development



Siamak Nejati

This article originally ran in the July 16th Nebraska Today. One of Nejati's research interests is membrane-based technologies for wastewater purification—an important field given the increasing demands municipal wastewater treatment plants are under due to population growth and rising contaminants.

A University of Nebraska—Lincoln scientist is exploring new ways to build three-dimensional molecular structures that could have far-reaching impacts in electronics, medicine and more. Siamak Nejati, assistant professor

of chemical and biomolecular engineering, has received a five-year, \$593,240 Faculty Early Career Development Program grant from the National Science Foundation to build on his previous research.

The technological advances made to control the synthesis and growth of molecular materials have been the cornerstone of many scientific discoveries. The goal of Nejati's CAREER project is to realize a new green pathway that enables the high-precision deposition of ultra-thin porous and covalent organic frameworks. He will use a molecular layer deposition approach to construct films that feature a wide and tunable range of porosity in a solvent-free coating process.

Previously, scientists used a liquid-based process to synthesize these porous frameworks.

Nejati is honing a vapor-phase approach that can help form what are referred to as porous organic frameworks, or POFs, which are three-dimensional and much more versatile and easily assembled than their forerunners. The frameworks are composed of light elements such as carbon, nitrogen and oxygen. Scientists compare these materials and networks with LEGO bricks for their ability to be assembled in defined ways, forming a variety of topography and structures.

Nejati said the vapor-phase synthesis of POFs will enable integration of the films into energy-efficient, highly selective filters for gas and liquid separation schemes, along with electrodes for energy conversion and storage devices.

The proposed work will create a novel manufacturing process by allowing the synthesis of POFs that have not yet been processed as thin films. Moreover, the proposed research pathway allows for studying the physical and chemical properties of the frameworks, essential for developing fabrication processes with low environmental impact and energy footprints.

Nejati will leverage his materials-processing platform and separation science expertise to integrate organic frameworks as active layers in high-efficiency molecular separation technologies.

"In the past, we were mostly dealing with thin films of linear macromolecules," he said. "Moving forward, we are trying to explore materials that can grow in more than one dimension. Now we can give them structures so we can explore different ways of arranging networks of materials. It is an easier-said-than-done task, and we are just at the beginning of it."

"Given the versatility, and the need for having these materials as thin films, this development can have a huge impact."

"In the next five years, a major milestone is to tune the porosity of these networks in situ," Nejati said.

If scientists can achieve that, "it creates a lot of long-range possibilities" in electronics, opto-electronics, catalysis and more.

CAREER awards include an education and outreach component. Nejati plans to enhance participation of students from minority and underrepresented groups in STEM activities through a summer program to attract students to molecular engineering research. He plans to build on the existing infrastructure at Nebraska to conduct these outreach activities and enhance students' experiences.

With the support of the Nebraska Center for Materials and Nanoscience, Nejati said he plans to develop a new interdisciplinary course centered on thin-film processing for semiconductor manufacturing. The resulting educational content, outreach activities and summer programs will be available to the public via Nebraska's public digital library, Digital Commons.

“Given the versatility, and the need for having these materials as thin films, this development can have a huge impact.

In the next five years, a major milestone is to tune the porosity of these networks in situ.

— Siamak Nejati

WATER RESOURCES PLANNING AND MANAGEMENT GRADUATE SPECIALIZATION

Interested in diving further into the field of water resources planning and management?

This interdisciplinary graduate-level minor requires only 9 credit hours and offers the opportunity to network with other academic departments and experience their differing perspectives on managing water resources. This specialization is supervised by a committee representing 11 participating departments. Your degree must be in one of these departments, and your 9 credit hours need to be courses offered by the other departments. Also, 6 of the 9 credit hours must be from the committee-approved list below. The remaining 3 credit hours can be chosen from the more extensive list of water-related courses found in the graduate catalog.

AECN 857, Water Law
AGRO 807, Plant-Water Relations
AGRO 808, Microclimate: The Biological Environment
AGRO 875, Water Quality Strategy
BIOS 600; NRES 859, Limnology
AGEN 853, Irrigation and Drainage Systems Engineering
AGEN 954, Watershed Modeling
BSEN 957, Modeling Vadose Zone Hydrology
MSYM 852, Irrigation Systems Management
CIVE 830, Fundamentals of Water Quality Modeling

CIVE 852, Water Resources Development
CIVE 854, Hydraulic Engineering
CIVE 855, Nonpoint Source Pollution Control
CIVE 856, Surface Water Hydrology
CIVE 858, Groundwater Engineering
CRPL 870, Environmental Planning & Policy
GEOG 884, Water Resources Seminar
GEOL 888, Groundwater Geology
NRES 853, Hydrology
NRES 868, Wetlands

“One of the things I appreciated was that it was, by design, interdisciplinary. I met several people I ended up working with later while taking these classes, it really set me up for my career going forward.”

**RACHAEL HERPEL, ASSISTANT DIRECTOR,
NEBRASKA WATER CENTER**

For more information, contact the committee member in your department as listed below. You can also contact Dr. Chittaranjan Ray, director of the Nebraska Water Center within the Daugherty Water for Food Global Institute, who serves as chair of the interdepartmental committee, or Dr. Thomas Franti, associate professor of Biological Systems Engineering, who serves as committee co-chair.

- ◆ **Agricultural Economics:** Karina Schoengold
- ◆ **Agronomy and Horticulture:** Keenan Amundsen
- ◆ **Animal Science:** Sheila Purdum
- ◆ **Biological Sciences:** Brigitte Tenhumberg
- ◆ **Biological Systems Engineering:** Thomas Franti
- ◆ **Civil and Environmental Engineering:** David Admiraal
- ◆ **Community and Regional Planning:** Zhenghong Tang
- ◆ **Economics:** Sam Allgood
- ◆ **Political Science:** Dona-Gene Barton
- ◆ **School of Natural Resources:** Steven Thomas
- ◆ **Sociology:** Jeffrey Smith

“The most amazing moment was in the middle of the semester; I was taking biosystems engineering, civil engineering and geology – each dealing with the flow of water underground – and I had this ‘ah-ha’ moment, where the synergy of the three perspectives came together and I got it!”

**JENNIFER SCHELLPEPER, INTEGRATED WATER
MANAGEMENT DIVISION MANAGER, NEBRASKA
DEPARTMENT OF NATURAL RESOURCES**

ADDRESS SERVICE REQUESTED

The Ebb and Flow

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



Crystal Powers

How to tackle something as long-standing as water quality? We have long been fortunate to have among the best water and soils in the world, and it has been the foundation of some of the most productive agriculture in the world. Unfortunately, unintended consequences are impacting our most vulnerable citizens through negative birth outcomes, pediatric cancers, colorectal cancers and thyroid disease. But Nebraskans are resilient and can rise to this challenge.

We've seen change before in Nebraska, from prairie to crops, from horses to tractors, irrigation projects, smart phones, and GPS.

Change begins when ordinary people—not politicians or celebrities, but individual people like you and me—decide it must and it can. These people began to talk about change in their circles of influence. Conversations led to action. Individual drops form into trickles. More and more voices join; until it becomes a river. This is how we have changed before, and how we can change again.

There will be no magic answers, no silver bullets, simply enough of us deciding we will do what is needed to leave a legacy of clean water to future Nebraskans. Let us find points of connection around what we value as a state, our kids, the places we live and play. Then, discover solutions that work in our local homes, fields, and communities: from immediate needs for filtration to the long-term reduction of agrichemicals into our water.

So, will you join in the conversation? We are all in this together. Nebraska's water: it's all yours.