

WATER

CURRENT

NEBRASKA WATER CENTER
PART OF THE ROBERT B.
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GLOBAL INSTITUTE AT THE
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Fall Harvest: Research, News and More from the Nebraska Water Center



**Nebraska
Water Center**

Daugherty WaterforFood Global Institute

Nebraska plant biology student Kyle Linders measures sorghum stem diameters in test plots at 84th & Havelock in Lincoln.

Inside

From the Director	p. 2
NWC Mini-Conference	p. 2
Water and Public Safety	p. 3
Hubbard Foundation Gift	p. 4
Research Updates	p. 6
Seeds of Change	p. 8
Antibiotics in Watersheds	p.11

And More!



From the Director

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

Dear Reader,

The return of the fall semester has brought a semblance of normalcy to our lives. Though things look different, students are back on campus, buses are running, research is being conducted and football is back. At the NWC, we are convening groups virtually for seminars, research conversations, and to brainstorm funding. On occasion we have met in person, but work continues apace remotely, and we are doing our best to adapt.

Before providing my updates, I would like to recognize Dr. Kyle Hoagland who passed away on August 12 after a lengthy battle with Parkinson's Disease. Kyle taught at UNL for over 25 years and served as NWC's director from 2000 to 2009. My thoughts go out to Kyle's family as they mourn.

We're excited to welcome Dr. Sahila Beegum to our team. Sahila joined in September as a postdoctoral research associate and will be working conjunctively with the USDA's Agricultural Research Service (ARS) on crop and groundwater modeling. She received her Ph.D. in hydraulics and water resources engineering last year from Indian Institute of Technology Madras, one of the country's top STEM institutions.

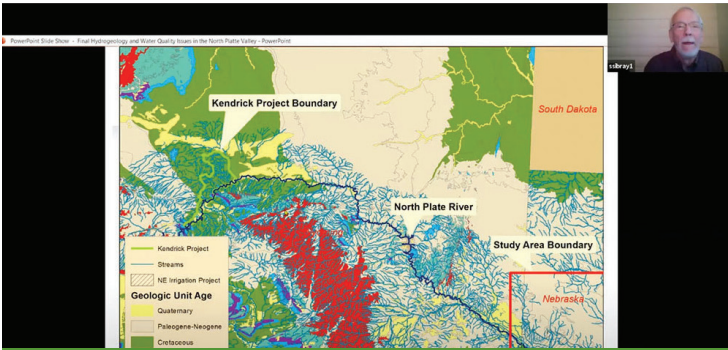
NWC's communications and engagement team has been plugging away. Research and extension communications specialist Crystal

Powers has provided updates to NRD managers, participated in Extension events and recently convened meetings to focus on nitrate strategies and smart farms. Concurrently, Jesse Starita, our PR and engagement coordinator, has worked on a special Water Sciences Lab edition of this newsletter and coordinated several virtual seminars for our faculty and stakeholders. We've also started planning our 2021 Spring Seminar Series and will provide updates on that in the next edition.

Finally, we are still engaged on the ground. In northeast Nebraska's Bazile Groundwater Management Area (BGMA), soil samples were collected from the soil health demo farm for analyses. In early September, UNL helped organize a Demo Farm Field Day with university speakers, industry experts and producers focused on cover crops, no-till farming and Variable Rate Irrigation, or VRI. This summer, we learned that the Nebraska Environmental Trust (NET) funded year two of the project, whose ultimate goal is to research nitrate reduction strategies. Relatedly, a new citizen science project, also funded by NET, is working with Bazile area high schools to train students on measuring water quality.

In conclusion, it won't be long before the holidays are upon us. Though they will undoubtedly look and feel different this year, I hope you and your families will find ways to come together and celebrate. Let's look forward to a better year in 2021!

NWC Convenes August 3 Mini-Conference



Nebraska Geoscientist Steve Sibray discusses the hydrogeology of western Nebraska during the virtual mini-conference.

The Nebraska Water Center (NWC) hosted a virtual mini-conference on August 3 for and featuring stakeholders around the state. The event was held on the same day that its annual in-person water conference would have taken place in Scottsbluff. That conference is tentatively scheduled to return next August in partnership with UNL's Panhandle Research and Extension Center and the North Platte Natural Resources District.

The mini-conference featured two sessions on western Nebraska's water resources. The first included Nebraska researchers Steve Sibray and Troy Gilmore who presented western Nebraska's unique hydrogeology. The second one featured the Water for Agriculture Project, a USDA-NIFA-funded effort focused on stakeholder engagement for addressing critical issues at the nexus of water and agriculture. Presenters included: Mark Burbach and Jessica Groskopf, University of Nebraska-Lincoln, and collaborators Wes Eaton, Penn State University; Jason Farnsworth, Platte River Recovery and Implementation Program; and Janeene Brown, Dines Irrigation.

Both sessions are now available on the NWC's YouTube channel.

Water and Public Safety

By Alan Kolok, Director, Idaho Water Resources Research Institute (IWRRRI)



Dr. Alan Kolok

Author's Note: Before taking his current position as IWRRRI Director, Dr. Alan Kolok spent 17 years at the University of Nebraska at Omaha and was a frequent guest contributor to the Water Current newsletter.

The novel coronavirus, SARS-CoV-2, was first identified in Wuhan, China, in late 2019. The illness caused by this virus, or COVID-19, has spread exponentially since then, infecting tens of millions world-wide while destabilizing

economies, as well as social and political stability. Closer to home, in Idaho and the United States, stay-in-place strategies were implemented in mid-March, with the hope that by Fall semester there might be some relief. That has not come to pass. While there is no silver lining to the COVID-19 pandemic, there are a few things I try to remember that steel my resolve, give me hope and keep me focused.

First, it helps to remember that, in many public health crises, water management has played a pivotal role. In 1854, for example, Dr. John Snow curtailed a vicious Cholera outbreak in the Soho region of London by disabling the Broad Street pump, thereby preventing the community from drinking contaminated water. Likewise, at the turn of the 20th century, Dengue fever was eliminated from the island of Cuba via stringent control of the Aedes aegypti mosquito. Water management was critical to mosquito control, and Dengue was wiped off the island by

draining stagnant waters where the insect bred. Water and public health are inexorably linked, as has always been so.

Second, it may be valuable to keep in mind that there is no evidence that water, either wastewater or untreated surface or ground water, is likely to be a vector for the transmission of COVID-19. The virus spreads from person-to-person in respiratory droplets released when an infected individual coughs, sneezes or otherwise exhales. While the virus is detectable in human wastes, there is no evidence that wastewater represents a significant source of infection.

Third, while viral particles in wastewater are not likely to be sources of infection, they can be used in public health reconnaissance. In fact, the national Water Resource Foundation is joining with other partners to evaluate current analytic methods to test for the genetic signal of COVID-19 in wastewater. They argue that surveillance of wastewater may have the potential to serve as an early detection tool relative to community health, which may save lives.

Finally, while water may not play a pivotal role in the fate, transport and spread of the virus, water is definitely part of the solution. Prior to the development of a vaccine, the best that we can do to aide health professionals is to maintain social distance, wear a mask and repeatedly wash our hands. Potable water saved lives back in Dr. John Snow's days in London, and it continues to do so today. Without minimizing the significant impact that COVID-19 is having on all of us, I take comfort in the scientifically supported facts, including the heretofore mentioned interplay between the virus and water resources. In the meantime, heed the safeguards that we have all been practicing. Maintain safe distancing, wear a mask and repeatedly wash your hands.

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University Receives \$5 million Gift to Create Program on Water, Climate and Health

By Lisa Spellman, Publications/Media Specialist, UNMC

Author's Note: This article originally appeared in IANR News on August 27, 2020.

The University of Nebraska will receive a \$5 million gift to create a new program to address some of Nebraska's most pressing public health issues associated with water and climate.

The Water, Climate and Health program will be based in the University of Nebraska Medical Center's College of Public Health and brings together experts from the Institute of Agriculture and Natural Resources and the Robert B. Daugherty Water for Food Global Institute (DWFI) at the University of Nebraska to conduct research and disseminate information on environmental issues related to water, climate and health.

Anne Hubbard, a retired physician, alumna of UNMC and member of the University of Nebraska Foundation Board of Directors, has made a \$5 million gift commitment to the University of Nebraska Foundation through her family's foundation, the Claire M. Hubbard Foundation, to create the program.

"Until the pandemic, public health did not get much publicity, and it is significantly underfunded," Hubbard said. "The idea

of public health is to prevent disease instead of just treat it. I decided to focus on water quality after learning more about diseases in Nebraska that may be related to water. The University of Nebraska is doing important work in water quality and climate change. Human health is significantly affected by our environment. As we make the disease-environment connection, are there things we can do about it?"

Dr. Hubbard said she was particularly interested in the university's ability to draw experts together from UNMC's College of Public Health, Daugherty Water for Food Global Institute and the Institute of Agriculture and Natural Resources, to address these issues.

The Water, Climate and Health program will work in three main capacities:

- 1) Bring diverse university experts together to solve complex issues
- 2) Find technical and policy solutions to improve the environment for better human health
- 3) Provide experiences for students studying these issues

“

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ANNE HUBBARD, M.D.

Alumna of UNMC and member of the University of Nebraska Foundation Board of Directors



Research topics the program could address include:

- Links between the state's water quality and pediatric cancer and birth defects
- Health outcomes related to Nebraska's flooding
- The impact of technology, such as precision application of nitrogen fertilizer on soil and water quality
- Mapping of at-risk populations and environmental exposures in the state

"These are all issues that affect people around the globe," Dr. Hubbard said.

"Dr. Hubbard's gift to the College of Public Health, the Institute of Agriculture and Natural Resources, and the Daugherty Water for Food Global Institute is transformational in nature and will directly impact the health of people in the state, region and nationally," said Ali S. Khan, M.D., MPH, Dean, UNMC College of Public Health. "Her gift will allow us to look at the spectrum of environmental issues at the nexus of water and health—all the way from what is happening in the environment that are the sources of our water, to its health impacts on humans. We also will ensure we are sustainably looking at how water use occurs in our state and beyond."

Dr. Hubbard's gift not only provides program start-up funds but also will make possible a named professorship and support graduate and professional students who are conducting research in water, climate and health. The student support funds are being matched by a gift from the Robert B. Daugherty Foundation, which will allow more students to receive research stipends. The gift also is meant to fund outreach to Nebraska middle and high school students and educators, to engage them in issues of public health and the environment and inspire them to pursue a career in public health.

Mike Boehm, Ph.D., NU vice-president for agriculture and natural resources and IANR Harlan vice-chancellor at UNL, said the gift would help students build valuable, interdisciplinary relationships early in their careers.

"This gift makes it possible for students interested in public health to work alongside students studying water quality and climate and a host of other interrelated issues," Boehm said. "These students will be tomorrow's practitioners and leaders, and will begin their careers with a broad understanding of the interconnectedness of water, climate and health, along with deep connections to their peers across these fields. That's the true power of this gift."

“ Dr. Hubbard's gift to the College of Public Health, the Institute of Agriculture and Natural Resources, and the Daugherty Water for Food Global Institute is transformational in nature and will directly impact the health of people in the state, region and nationally. ”

— Ali S. Khan, M.D., MPH, Dean, UNMC College of Public Health



The gift allows UNMC's Dr. Jesse Bell to be an endowed professor and appointed as the new program's director. (Credit: UNMC)

Jesse Bell, Ph.D., an expert in public environmental health and environmental science, has been named as the director for the new program and will hold the Claire M. Hubbard Professorship of Water, Climate and Health. Dr. Bell is currently an associate professor of health environment in the UNMC College of Public Health. With his appointment as the program director, Dr. Bell also will assume a leadership position within the Daugherty Water for Food Global Institute.

"Water quality and its effect on public health is one of DWFI's top five areas of focus," said DWFI's

Executive Director Peter G. McCornick. "We are very pleased to welcome Jesse Bell to our leadership team, as his expertise in connecting the effects of water quality and climate change on public health is a tremendous addition to our capabilities. Dr. Hubbard's generous gift will foster collaboration and accelerate progress in ensuring health and quality of life under changing conditions here in Nebraska and beyond, and achieving our mission of a water and food-secure world."

Dr. Hubbard encouraged other donors to take advantage of the matching gift offer from the Robert B. Daugherty Foundation, as she did, to provide more financial support for students interested in studying Nebraska's water, climate and health. Matching funds are available through 2020.

Brian Hastings, president and CEO of the University of Nebraska Foundation, said, "Anne Hubbard cares deeply not only about Nebraska, its people and natural resources, but about our planet. Her gift will support scientific research that will lead to a healthier state for all of us to live, work and play."

About Anne Hubbard

Anne M. Hubbard, M.D., of Omaha is a graduate of the University of Nebraska Medical Center and a retired pediatric radiologist. She leads the Claire M. Hubbard Foundation, which was established by the estates of her late mother and father, Claire Watson Hubbard and Theodore Hubbard. Over the years, the family has made gifts to UNMC, UNO and UNL, including generous support to Ashfall Fossil Beds State Historical Park and the University of Nebraska State Museum.



Researchers Study Wastewater to Search for Data on Spread of Coronavirus

Courtesy of UNL College of Engineering

Author's Note: This article first appeared in the College of Engineering's July 7th newsletter and reflects events that may have already occurred.

With assistance from the Lincoln Wastewater System, researchers from the University of Nebraska–Lincoln (UNL) have launched projects to use wastewater samples for early detection of the SARS-CoV-2 Coronavirus.

Scientists from UNL and the University of Nebraska Medical Center (UNMC) will join Mayor Leirion Gaylor Baird and officials from Lincoln Transportation and Utilities (LTU) during the mayor's briefing at 3:30 p.m., Tuesday, July 7, to provide information about the research, which they hope could provide health officials as much as a week of lead time before a COVID-19 outbreak.

The work is among a number of coronavirus-related research projects underway at UNL. Donna Garden, assistant director of Lincoln's Transportation and Utilities Department, describes the city's participation as part of multiple efforts to keep the community safe.

Previous studies have shown that many people who are COVID-19 positive can shed the novel coronavirus via their stool

even when they have only mild symptoms, said Xu Li, associate professor of civil and environmental engineering, who is co-leading one of the projects.

"Studies have shown that levels of coronavirus in municipal wastewater can correspond with the spread of COVID-19 in a community," he said. "We hope to quantify the coronavirus levels in the wastewater from six regions within Lincoln to see if we can detect such a correlation."

Megan Kelley, a UNL assistant professor of nutrition and health sciences, will co-lead the Lincoln-based project with Li. She will assess how community-level contextual factors and local policy measures relate to levels of coronavirus in the wastewater samples over time. Both researchers are working with Lincoln officials so that samples can be taken with geographic precision.

Shannon Bartelt-Hunt, chair of the civil and environmental engineering department, collected wastewater samples weekly from Lincoln, Grand Island and Omaha in early April and has worked with UNMC scientists on testing methods and the possibilities of sequencing and culturing the virus to learn more about its origins, as well as precautions needed for

utilities workers. Jesse Bell, professor of health and environment at UNMC, will participate in Tuesday's briefing.

Bartelt-Hunt said her team will be able to compare the samples taken during those past three months to the progression of the disease in Lincoln, Omaha and Grand Island. In a study conducted at Yale University, researchers were able to predict the number of cases seven days ahead using the amounts of coronavirus found in the samples.

"It's a predictive tool, it can give you a sense of the number of cases that will occur so you can target testing resources and directed health measures," she said. "It gives you more information about what's happening in the community."

The Lincoln Transportation and Utilities Department is proud to partner with UNL and UNMC, Garden said.

"Access to clean water, proper handling of wastewater and many more everyday services is key to maintaining Lincoln's quality of life," she said. "To provide opportunities for these researchers to collect wastewater samples during the pandemic and see the importance of how this data can assist all of us with making data-driven decisions is just one way LTU keeps our community safe."



UNL Civil and Environmental Engineering Professor Shannon Bartelt-Hunt collects a wastewater sample at the Elkhorn Wastewater Treatment Plant in June.



Bartelt-Hunt and City of Omaha Engineering Technician Jeremiah Birdsall at the Elkhorn Treatment Plant. (Photos Courtesy of Anna Reed, Omaha World-Herald)

Research Corner

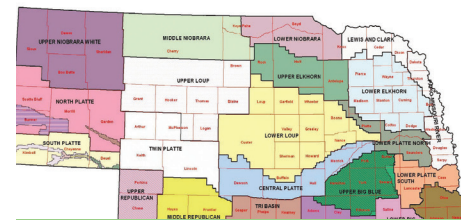
Stimulating Soil Health within Nebraska's Natural Resources Districts

By Andrea Basche, Ph.D., Dept. of Agronomy, UNL; Morgan Wirth-Murray, Regulatory Specialist, U.S. Army Corps of Engineers



Dr. Andrea Basche (pictured) and her undergraduate student recently published a paper on soil health in Nebraska. (Credit: UNL)

Improving soil health is increasingly recognized by farmers, researchers, policymakers, and agribusiness as a solution to a number of challenges facing agriculture, including rising soil degradation, growing climate change risks, and declining water quality (FAO 2011; Webb et al. 2017; Zimmnicki et al. 2020). As a result of this additional focus on soil health, a number of new policy initiatives are being developed to support increased funding and capacity for soil health-related practices. This includes federal policies, through mechanisms such as the farm bill, which designate funding for national conservation programs to address natural resource concerns, of which soil health is one of many (Harrigan and Charney 2019). At present, these programs represent greater than U.S. \$6 billion spent annually and are organized into various initiatives such as working lands programs, land retirement, easements, partnerships, and grants (CRS 2019). These dollars are distributed at the state level based on local resource needs and other technical considerations, through the USDA Natural Resources Conservation Service (NRCS)



A map of Nebraska's 23 Natural Resources Districts

and/or their partner organizations (USDA ERS 2019; USDA NRCS 2020). In addition to federal support for soil health, there are a growing number of statewide initiatives; for example, the Nebraska legislature recently passed a bill to support the creation of a "Healthy Soils Task Force," a group of agricultural leaders in the state who are developing a road map for future soil health-related work in the state (NDA 2019). It is important to more closely consider the implementation of soil health-related programs, particularly at a local level, given increasing interest and investments. Read more at <https://go.unl.edu/nrdsoilhealth>.

Past, Present, and Future of Irrigation on the U.S. Great Plains

By Steven R. Evett, Paul D. Colaizzi, Freddie R. Lamm, Susan A. O'Shaughnessy, Derek M. Heeren, Thomas J. Trout, William L. Kranz, Xiaomao Lin



A groundwater well for irrigation in Scott County, Kansas, 1910. (Courtesy: G. Bowlin)

Motivated by the need for sustainable water management and technology for next-generation crop production, the future of irrigation on the U.S. Great Plains was examined through the lenses of past changes in water supply, historical changes in irrigated area, and innovations in irrigation technology, management, and agronomy. We analyzed the history of irrigated agriculture through the 1900s to the present day. We focused particularly on the efficiency and water productivity of irrigation systems (application efficiency, crop water productivity, and irrigation water use productivity) as a connection between water resource management and agricultural production. Technology innovations have greatly increased the efficiency of water application, the productivity of water use, and the agricultural productivity of the Great Plains. We also examined the changes in water stored in the High Plains aquifer, which is the region's principle supply for irrigation water. Relative to other states, the aquifer has been less impacted in Nebraska, despite large increases in irrigated area.

Greatly increased irrigation efficiency has played a role in this, but so have regulations and the recharge to the aquifer from the Nebraska Sand Hills and from rivers crossing the state. The outlook for irrigation is less positive in western Kansas, eastern Colorado, and the Oklahoma and Texas Panhandles. The aquifer in these regions is recharged at rates much less than current pumping, and the aquifer is declining as a result. Improvements in irrigation technology and management, plus changes in crops grown, have made irrigation ever more efficient and allowed irrigation to continue. There is good reason to expect that future research and development efforts by federal and state researchers, extension specialists, and industry, often in concert, will continue to improve the efficiency and productivity of irrigated agriculture. Public policy changes will also play a role in regulating consumption and motivating on-farm efficiency improvements. Water supplies, while finite, will be stretched much further than projected by some who look only at past rates of consumption. Read more at <https://go.unl.edu/irrigationppf>.

Connecting the Acre: Building the AgTech Innovation Pipeline

By Crystal Powers



Roric Paulman (R) and son Zach at their farm outside of Sutherland, NE. (Credit: Paulman Farms)

Located outside of Sutherland, NE, Paulman Farms held a Virtual Field Day this fall focused on methods to synergize across research, development, and education to provide value back to the farmer through AgTech. Farmer and Daugherty Water for Food Global Institute (DWFI) International Advisory Panel member Roric Paulman worked with DWFI, NWC, and Nebraska Extension in partnership with the Irrigation Innovation Consortium and Paige Wireless to host an action-packed session with the latest in Ag Tech innovations being deployed on his farm. Watch a recording of the field day at <https://www.youtube.com/waterforfood>.

Seeds of Change: Interseeder Research Collaboration Makes Cover Crops Accessible for Local Producers

Author’s Note: This article, written by Upper Big Blue Natural Resources District (UBBNRD) Public Relations Manager Chrystal Houston, originally ran on Thursday, June 18, 2020, on the UBBNRD’s website.

On a hot, dry, and extremely windy day in early June, Neal Hentzen surveys the dry-land field on the edge of Seward where his corn is ankle high. The leaves on the plants whip in the wind like green streamers running in long, straight rows from the road to a faraway fencepost. Hentzen is semi-retired, but he still farms this field and one other, 160 acres in all. In the distance, a tractor slowly rolls down the rows pulling a blue piece of equipment. The device is gently breaking the soil between the rows of corn and depositing a multi-variety cover crop mixture.

“I’ve been farming around here for 50 years,” Hentzen says. “When I heard about this research project with cover crops, I thought, ‘why not give it a try?’”



Nelson Winkel, soil health specialist with The Nature Conservancy, watches the cover crop mix running through the interseeder to make sure everything goes smoothly during planting. (Credit: Chrystal Houston, UBBNRD).

Hentzen is one of 11 area producers participating in an on-farm research study that looks at the many effects of inter-seeding cover crops into standing corn at an early stage of development. The study is a collaboration between the Upper Big Blue Natural Resources District, Nebraska Extension, and The Nature Conservancy.

Hentzen has used cover crops for many years in his seed corn, planting once the male rows were destroyed. He experimented with using different planting methods and seed varieties to find the best outcomes for winter grazing cattle and reducing soil compaction in his fields. This year, he is growing commercial corn and is eager to see how inter-seeding the cover crops (a method he has not used before) will change the operation. “It will be an experiment. Since they were providing the equipment and were going to plant it for me, I thought I would see if it would work. If it does, I will probably do it again,” he said.

Cover cropping has numerous benefits, from preserving soil moisture and decreasing flooding, to adding carbon and other nutrients to the soil ecosystem, to preventing nitrogen leaching to the groundwater supply. Many previous studies have established the value of cover crops. This new study will look specifically at timing. How does planting the cover crop into an immature growing crop, as opposed to a newly harvested field, impact the system?

It’s an important question, as farmers who are interested in introducing cover cropping may struggle to do so in the fall. There is a small window of time between harvest and when the soil is too cold for plants to get established. Inter-seeding the cover crop in late spring or early summer extends the window of opportunity.

Even in spring, the timing is tricky. Plant the cover crop too early and it will crowd out the cash crop. Too late and it will not have sufficient time to get established before the canopy of the corn leaves block out the sunlight. The best time to do it is between corn growth stages V4 and V6, when the plant is about four inches high, the study organizers predict.

NRD Water Conservationist Dan Leininger is behind the wheel of the tractor in Hentzen’s field. A farmer himself, Leininger is at home in the cab as he slowly steers the machine between the rows of green, planting the cover crop in eight row strips. Leininger is the resident cover crop evangelist at the NRD; for the past four years he has maintained the Project GROW demonstration fields in York, where cover crops are an essential component of restoring soil health.

“What I wish more farmers understood about cover crops is that they’re not going to rob your cash crop of water and nutrients. The cover crops lock up leftover nitrogen [during its fall and spring growth] in the above ground biomass, which is going to be available for next year’s crop,” Leininger explains over the rumble of the tractor’s engine. “This system keeps any residual nitrogen from leaching into the underground aquifer,”—an important consideration, as many rural Nebraskans are exposed to the health risks associated with increased nitrate in their drinking water as a result of incomplete plant uptake of nitrogen fertilizer.

The cover crops Leininger is planting today will emerge in the next two weeks, then will lie dormant for a time when the canopy of the corn closes over them. When the corn reaches senescence in the fall and the leaves dry out, the cover crop will spring back to life and continue to grow, protecting the soil when the cash crop has been harvested.

For this research project, cooperating producers were given the choice between two cover crop mixes: a legume mix to add nitrogen to the soil and a diversity mix better for grazing, increasing biodiversity, and building organic matter and activity.

Hentzen’s is the second field Leininger has planted so far for the research project. “That field we planted near Beaver Crossing yesterday had some cover crops on it over the winter, so that

planting was really different. The ground was a lot softer,” he says, noting how the roots of the cover crops keep the soil loose and porous. At the end of the row, Leininger swings wide, skipping eight rows before starting down another stretch of the field. This is intentional, as the alternating sections of cover crops provide a control group in the experiment, giving side-by-side verification of the practice’s effectiveness. The process will be repeated in this field for the next three years.

According to Steve Melvin, UNL Extension educator based in Hamilton and Merrick Counties, the three-year period will even out weather variations from one growing season to the next and will provide more reliable data than a one-year snapshot approach. Data on soil health and yield will be analyzed and reported annually through UNL’s On-Farm Research Network publications and events as well as through the NRD, but the overall effectiveness of the project won’t be known until after harvest in 2022. In future years of the project, they may expand to inter-seed cover crops into soybeans as well.

Nelson Winkel, soil health specialist with The Nature Conservancy, describes how the project came to be. “When we start a new project, we’re always looking for ways to amplify the good work of others already underway. When we learned from the Upper Big Blue NRD and UNL that farmers in the area were starting to experiment with inter-seeding, we knew there was a great project waiting to be funded.” In collaboration with Kellogg Company and a pending grant from the Nebraska Environmental Trust, The Nature Conservancy purchased the project’s inter-seeder drill and will cover the costs of soil and plant tissue analysis.

“We are a science-based organization, and to make the science do its best work we put farmers at the center of our projects. When a farmer tells us that they’re experimenting with soil health, we ask them ‘what are you doing, what’s working, how can we get you the information you need to further assess the practice?’” Winkel adds. “Working with the NRD and UNL to deliver that science to farmers has been a great experience so far.”

Melvin is also pleased with the research collaboration between the three agencies. “I’ve heard from a lot of farmers in the last few years that they are interested in trying cover crops, but find it difficult to get them planted in a timely manner in the fall after harvest. This project is a good coming together of these three different groups, working together to test this idea,” he said. More than yield data or soil health breakdowns, Melvin says the first year of this project is about one question: will this work in Nebraska?

“There are a lot of questions about the practicality of inter-seeding and a lot of things we will measure, but we are looking at the big picture, a systems approach. How can we make cover crops work in the Nebraska corn/soybean cropping system? Is this the right time and method for cover crops?”

Time will tell.

Nitrates in the Drinking Water: How This Happened and What's Being Done

By Jessica Fargen Walsh, Assistant Professor, College of Journalism and Mass Communications, UNL



Jessica Fargen Walsh

Author's Note: This article is reproduced from a year-long graduate-level project by Jessica Fargen Walsh on nitrates in Nebraska's drinking water. Fargen Walsh is now an assistant professor at Nebraska. For more about the project, visit <https://www.nitratesinnebraska.com/>.

Nebraska's multibillion-dollar farm economy depends on groundwater and thankfully, the state has plenty of it for now. But that farming

success has come at a cost: the fertilizer used to make those crops grow over the years has contaminated Nebraska's groundwater, the drinking water source for most of the state.

It's a problem that is quietly costing the state and federal government millions of dollars, and changing the way rural residents get water and how much they pay. Health researchers believe nitrate contamination in drinking water could be one cause of Nebraska's higher-than-average pediatric cancer rate.

Nebraska has the seventh-highest pediatric cancer rate in the country and the highest in the Midwest.

This series of stories explores the history of this decades-old problem, how it is impacting Nebraskans and what's being done about it—from a corn and soybean field in McLean to a daycare in Edgar to a water treatment plant in Creighton.

"I think one way to describe this is, it's a very slow train wreck," said Dan Snow, a professor and director of laboratory services at the University of Nebraska–Lincoln Water Sciences Laboratory. "People are finally aware that there is a train coming, and now we need to figure out what to do about it."

For decades, Nebraska farmers over-applied nitrogen fertilizer, which seeped into the soil, drained into surface water and leached into the groundwater, the source of drinking water for about 85% of the state. Nebraska sits atop the plentiful Ogallala Aquifer, a fluid body of water with a water table that is hundreds of feet deep in some parts of the state and bubbling up into streams in another.

Much of the attention on Nebraska water has been the sustainability of the Ogallala Aquifer, but more and more Nebraskans are now worrying not only about quantity, but quality.

NWC Student Intern Digs Deep During Uncertain Summer



Gabrielle Boucher

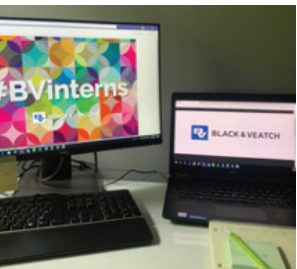
This past summer, NWC's undergraduate intern Gabrielle Boucher interned at Black & Veatch, an engineering consulting company headquartered in Kansas City. She worked in the Water Group alongside fellow Husker intern, Nate Mead. With the challenge of COVID-19, Black & Veatch transferred the entire internship program from in-person to remote—something never done before. The company worked extremely hard to give a great

experience to their interns by adding virtual Lunch and Learns, check-ins, and a virtual orientation the first week of the program. With the help of countless video and phone calls, Gabrielle was still able to learn more about engineering and contribute to the company while making meaningful connections with current employees.

She worked all summer on the Tomahawk Wastewater Treatment Facility Expansion project, located in Leawood, Kansas. This project, costing over \$200 million, has been in the works for many years and currently is in the construction phase. The new wastewater treatment plant will be able to treat 19 million gallons

per day (MGD) and no longer send wastewater to Kansas City for processing, as was done previously. The major construction work is slated to be finished by the end of 2021. Within this project, Gabrielle was able to complete many different tasks, giving her a great overview of how the plant works cohesively. These tasks included checking the math on Change Proposal Requests, completing markups on drawings, drafting change orders, coordinating submittals and more. While she was not able to physically visit the site of the project, she learned from drawings and Johnson County's interactive website about the project.

The photo at right shows Gabrielle's work set up this past summer. It's crazy to think about all that can be done without ever leaving home. Thanks to the power of technology, she was able to get to know people at the company. One of her favorite ways to participate in getting to know other employees was "Stretch and Flex," a 10-minute break each afternoon to stretch and chat casually with peers over a video call. This summer sure was a unique one, but Black & Veatch and the interns were up to the challenge!



Gabrielle's summer 2020 work set up

Team Detects Antibiotics in Nebraska Watersheds

Author's Note: This article originally appeared in the September 3 edition of Nebraska Today.

A multi-campus collaboration among University of Nebraska system faculty, including four Husker researchers, has discovered antibiotics used in human treatment in two Nebraska agricultural water systems.

The finding of antibiotics in watersheds near Fremont and Lincoln is deeply concerning, said Wayne Matthews, associate professor and director of research with the University of Nebraska Medical Center's College of Allied Health Professionals.

"It likely could have an impact on our increasing resistance to antibiotics," Mathews said. "As clinicians, we hear frequent warnings not to over prescribe antibiotics, and I totally agree with that. But, for example, more than 30 percent of common (urinary tract) infections show resistance to antibiotic treatment."

According to recent research, that trend is likely tied to more than over prescribing. The same study also reports that high rates of antibiotic resistance are found in agricultural areas.

Members of the research team include, from the University of Nebraska–Lincoln, Xu Li, associate professor of civil engineering; Shannon Bartlett-Hunt, professor and chair of civil engineering; Dan Snow, research professor with the Nebraska Water Center; and Jodi Sangster, postdoctoral research associate; and, from UNMC, Matthews and Linsey Donner, assistant professor of microbiology.

The team's study features a two-year intensive analysis of the Elkhorn River and Shell Creek watersheds.

Their findings—which are awaiting publication—found that bacteria that carry an antibiotic-resistant gene is prevalent in drinking and agricultural water. Further, the study showed weak points in U.S. Food and Drug Administration safeguards and tracking related to human antibiotics in water.

The team presented its findings at the National Institute of Antimicrobial Resistance Research and Education's annual conference and has been accepted at IDWeek, an infectious disease conference, to be published in its Infectious Disease Abstracts.



The Elkhorn River, pictured here, is one of two watersheds where researchers found antibiotics in drinking and agricultural water. (Credit: Platte Basin Timelapse)

ADDRESS SERVICE REQUESTED

The Ebb and Flow

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



Crystal Powers

Ebb and flow is too gentle a term for 2020. Shall we call it “on the rocks” or “torrent?” We are all doing our best to ride out this convergence of crises. Even here in water, we have gone from flood to drought. I know I have felt strained both personally and professionally.

I want to thank each of you. Everyone we have worked with has been patient, engaged, and focused, despite 2020:

- Students – have done an amazing job of flexibility with course structures, lab work, and changes to their graduate research.
- Grants – Several large proposals went in over the last few months with many state stakeholders around soil health, Know Your Well, Testing Ag Performance Solutions (TAPS) and more. It took a lot more back-and-forth online, but I think some good ideas came forward.
- Updates – I’ve missed all our conversations at meetings, but have been keeping up with your newsletters, emails, websites, and social media. Are you hearing enough from us?
- Events – This has been the biggest change with several canceled and others moving virtual. I’ve seen that we have more individual attendees, but would love to hear how effective they have been for you. Are there some things better online?

With this carrying on into next year, I’d love to hear your thoughts on how we move forward most effectively. From our end, some additional upcoming focus areas:

- Inclusion – For our second year, we hosted sessions focused on Women for Water. We also will be adding a Tribal Water Summit next spring. We plan to build these into an integrated approach for more inclusive water professions—from students and professionals to leadership.
- Water and Health – With the launch of the new program at UNMC, we will be partnering to bring increased focus to the intersection of water quality, climate, and health.
- Budgets – All of us will be working in constrained budget environments.

How can we do better? How can we grow our collaborations? How shall we create balance between addressing immediate crisis and long-term strategies?

One thing I have learned: remember to CREATE peaceful moments. To breakup doom scrolling, I built out my gardens, and was rewarded with over a hundred Monarch butterflies stopping over on a single night last week—and hundreds through the season.

What unites us is greater than what divides us, and I look forward to when we can meet together again!