

Fall 2018



Growing

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Resistance

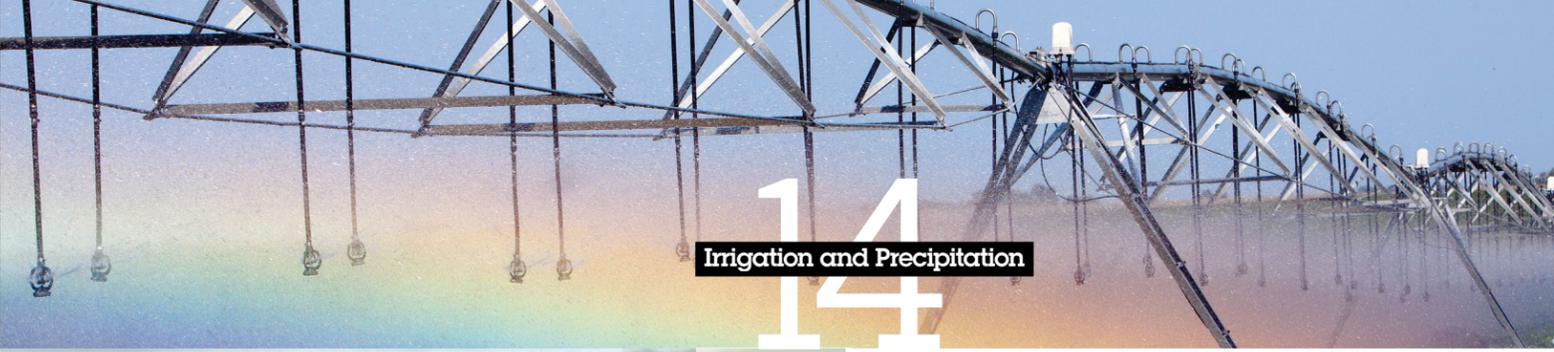
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FOOD • FUEL • WATER • LANDSCAPES • PEOPLE

INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES | UNIVERSITY OF NEBRASKA-LINCOLN





GROWING NEBRASKA

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Irrigation and Precipitation



Michael J. Boehm

Over the past several months I've thought a lot about grit. What is it? How do you find it? How can it affect others?

Perhaps the best way to gain an understanding of grit is to spark up a conversation with passionate Nebraskans, which I've made a habit of doing as I continue to explore this

great state. Earlier this year I spent a significant amount of time listening to people in northeast Nebraska. Community members gathered in coffee shops, community centers, pole barns and at county fairs to join candid discussions about real issues such as education, workforce development, water quality, and science and agricultural literacy.

As we engaged in discussions concerning Nebraska's future, it didn't take me long to sense their determination, dedication and work ethic. Their passion for their communities and for being good stewards of our natural resources is palpable. This is a prime example of grit, in my opinion.

The good news is that those of us connected with IANR are in an ideal position to amplify the grit of Nebraskans to address these areas of need. For instance, there are countless ongoing projects within the Institute focused on pressing water topics such as nitrate contamination and irrigation technology, which you will read more about in this issue of Growing.

IANR is not only focused on combatting issues facing our state's citizens, but also seizing opportunities to propel Nebraska forward. We believe that now is Nebraska's time to be a global leader in resilient food animal production, health and well-being. Several advancements in recent months have given us considerable momentum in this endeavor.

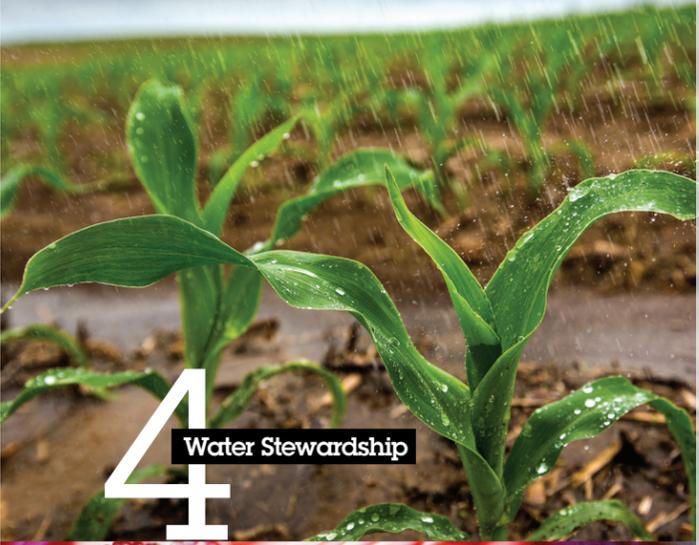
One example of this momentum is the Institute for Antimicrobial Resistance Research and Education. Nebraska will help lead this new national institute addressing antimicrobial resistance, which is a tremendous threat to human, animal and environmental well-being. The need to find proactive solutions to slow down the rise of drug resistance is urgent, and the university is ready to take on this mighty task. You can read more about this effort on page 18.

Our vision for a prosperous land will not be achieved overnight, but with the energy from the national center for antimicrobial resistance, the largest enrollment in CASNR history and our extension professionals delivering education in more ways than ever before, it is an ideal time to combine this momentum with the grit of Nebraskans and begin reaching for the glory we deserve.

I ask you to join us as IANR continues to strategize around growing Nebraska. Our upward trajectory depends on Nebraskans' continued partnership, and we need your help - whether that means sending us your ideas, sharing a story you read in this magazine with a friend or colleague, or lifting up your voice in support of an affordable and excellent University of Nebraska. I hope you'll share feedback with me directly at mboehm3@unl.edu, or visit www.nebraska.edu/advocates to learn about how and when you can get engaged as an NU Advocate.

I wish you all health and prosperity and I look forward to seeing you down the road.

Michael J. Boehm, Ph.D.
Vice President, Agriculture and Natural Resources
University of Nebraska
IANR Harlan Vice Chancellor,
University of Nebraska-Lincoln



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GROWING A HEALTHY FUTURE

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There is no charge for this magazine. Each issue describes IANR programs that benefit Nebraska and beyond. If you happen to receive more than one copy, please share with a friend.

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A July sunset on the
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Water sustainability starts with water stewardship

From cattle and hogs to corn and dry beans, the agricultural diversity of Nebraska is one of its unique characteristics. With a vast number of commodities produced within the state, it's no wonder that the agricultural industry pumps \$25 billion into the state's economy on an annual basis. The success of Nebraska depends on the success of agriculture, which is why the Institute of Agriculture and Natural Resources (IANR) remains steadfast in its efforts to support and strengthen the industry.

Strengthening agriculture in Nebraska means examining the factors contributing to its success. With an elevation drop of 4,584 feet from west to east, the state's unique geography supports everything from grazing cattle to growing grapes for wine production. Coupled with the variety of landscapes is Nebraska's abundant natural resources, namely water.

By: Haley Apel

Located on a steep east-west precipitation gradient, Nebraska agriculture benefits enormously from a vast, though finite and vulnerable supply of high-quality groundwater. The source of Nebraska's plentiful groundwater supply is the High Plains Aquifer, which includes the Ogallala Aquifer. The aquifer spans eight states and nearly 175,000 square miles. While nearly 70 percent of the volume of the aquifer is beneath



Nebraska, one should not assume that water is not a concern for the state. Understanding the increasing incidence of water contamination and how to implement better water management practices are just two of the major issues facing the state when it comes to water. Limiting water woes while ensuring a sustainable supply for future uses is critical for Nebraska, which is why IANR is actively involved in a number of efforts to protect and conserve the state's most important natural resource.

Water quality

High nitrate levels are a common water quality issue. While nitrate does occur naturally at low concentrations in groundwater (~2 mg/L nitrate-N), increasing concentrations in excess of 5 mg/L are linked to areas where nitrogen is over applied to lawns, gardens and crops. Additionally, nitrogen is also carried in waste found in feedlots and animal yards, and overapplication of this nitrogen source can also contribute to elevated nitrate-N concentrations in a few areas.

Dan Snow is the director of the university's Water Sciences Laboratory. Snow leads the lab in its efforts to identify new methods to evaluate water quality issues such as nitrate contamination, along with challenges concerning water quantity. He said in the majority of cases he's studied, the source of contamination is from commercial fertilizer, or more specifically, overapplication of nitrogen and irrigation water exceeding plant needs. Nebraska leads the nation in the amount of irrigated cropland. When too much water is added to a fertilized soil, much of the nitrate will wash down below the root zone and eventually percolate the water table.

"In my opinion, nitrate contamination is the biggest issue affecting groundwater in Nebraska," Snow said. "Nitrates have been increasing across the state since the 1970s."

Testing public water supplies for nitrate is required by the Environmental Protection Agency. The maximum contaminant level for public water supply is 10 milligrams per liter. In order to maintain a healthy water supply, communities across the state, such as McCook, Hastings, Grand Island and Creighton, have had to

install costly treatment solutions. The costs for treating public water supplies to levels required under the Safe Drinking Water Act are increasing statewide and most of these costs are passed on to consumers.

To help communities manage the quality of their water, scientists across the university are researching areas with high nitrate contamination, as well as emerging contaminants, which have not been studied as extensively as nitrates. Tiffany Messer, an assistant professor in the Department of Biological Systems Engineering and School of

Natural Resources, studies nitrate contamination and its impact on emerging contaminants in rivers and streams, two common sources of drinking water. Her research focuses on the way contaminants move through surface water and interact with groundwater. Armed with this information, Messer is working with her colleagues and other partners to take steps to improve Nebraska's water quality through best management treatment practices.

Water quantity

Sitting on top of the deepest and widest part of the High Plains Aquifer means that Nebraska has more groundwater than any other state overlying the aquifer, but that doesn't mean that it is immune to challenges when it comes to the amount of water available.

Water compacts with neighboring states, contamination issues and drought coupled with the amount of water being pumped from the aquifer by irrigation wells have put into question Nebraska's water quantity levels. The depletion of the High Plains Aquifer has been well publicized in recent years; however, the most severe water quantity concerns are found in neighboring states.

"Nebraska has maintained its groundwater levels. The volume of groundwater stored in Nebraska is pretty close to what it was predevelopment," said Troy Gilmore, groundwater hydrologist in the Department of Biological Systems Engineering and School of Natural Resources. "In some places we've had rising water tables due to leaking out of canals, for instance, which has offset declining groundwater levels in other areas."

Surface water systems such as streams, rivers and lakes can both gain and replenish water from groundwater sources. This is why a few areas of the state, such as



Troy Gilmore sets up to take groundwater samples from the Loup River in the Sandhills of Nebraska in September 2018.

A system-wide approach to water stewardship

Nebraska has one of the most progressive and prosperous agricultural industries in the world thanks to the benefits of our natural resources, the ingenuity and hard work of our farmers and the research leadership of the University of Nebraska.

The **Robert B. Daugherty Water for Food Global Institute (DWFI)** was founded in 2010 to leverage the University of Nebraska's expertise and extend it with strong state, national and international partnerships. As a system-wide institute, DWFI taps the specialized resources available at all four NU campuses, and also includes the valuable assets of the Nebraska Water Center and the Water Sciences Laboratory.

The **Nebraska Water Center** was established by Congress in 1964 as one of 54 water resources research institutes nationwide. Today, as part of the Robert B. Daugherty Water for Food Institute and IANR, the Nebraska Water Center supports research addressing water problems or water understanding, helps new water researchers and engineers, and publishes research results to water professionals and the public through publications, colloquiums and events.

Part of the Robert B. Daugherty Water for Food Global Institute and the Nebraska Water Center, the **Water Sciences Laboratory** provides technical expertise and sophisticated analytical instrumentation for environmental and water-related research. Since the center was established in 1990, faculty, staff and students have analyzed thousands of water samples.

Know Your Well

IANR researchers are not only focused on improving water quality, but ensuring the next generation understands such issues. The “Know Your Well” program is a Nebraska Environmental Trust-funded project that launched in 2017 training high school students to sample and test well water quality.

The tests will look for levels of nitrate, metals, pesticides and bacteria and will then be compared with results from the Nebraska Water Sciences Laboratory.

In addition to Dan Snow of the Water Sciences Laboratory, others coordinating the project include Nebraska Water Center Director Chittaranjan Ray, Ashook Samal and Shine Bedi from the Department of Computer Science and Engineering, Christopher Olson from the School of Natural Resources and Matt Kreifels from the Department of Agricultural Leadership, Education and Communication.

Through this program, future well owners and the next generation of water scientists are together learning more about the state’s groundwater. To learn more, visit knowyourwell.unl.edu.

southwestern Nebraska, have seen streamflows decline due to decreasing groundwater levels. Along with Gilmore, others within IANR are constantly working to develop conservation technologies, such as sensors that can detect a crop’s exact need for water, and the amount of water available in the soil. The sensors allow farmers to apply only the amount of water necessary, protecting both water quality and quantity.

“To truly sustain this vital resource well into the future, we must preserve both the quality and quantity of water,” Gilmore said.

Water management

Nebraska has made it a priority to manage its vital resources now, to prevent major problems in the future. Since many of these issues are customized to the state, Nebraska has developed its own customized system of management. In most states, natural resource districts are divided by county, whereas in Nebraska the districts are based on river basin boundaries.

Programming delivered by each of Nebraska’s 23 Natural Resources Districts (NRD) will vary based off the needs of the local area. The university plays a major role in providing each district with the education and information it needs to manage its district and disseminate information to the public. For instance, IANR’s Conservation and Survey Division (CSD) has been instrumental in helping the state’s natural resources districts prepare water management plans required by law. Monitoring groundwater levels, providing computer simulation to assist water management and integrating geochemistry with studies of groundwater geology are just a few of the resources the CSD provides.

The NRD system and its support network has worked well enough to garner international interest. In 2017, Nicholas Brozović, director of policy at the Daugherty Water for Food Global Institute at the University of Nebraska, hosted a group from the World Bank wanting to learn about Nebraska’s approach to groundwater management. The group was interested in the NRD structure, funding and decision-making processes to identify ways to replicate similar approaches in their own countries.

Team effort

The abundance of water in Nebraska means it’s going to take a team effort to sustain the resource into the future. Researchers at IANR have developed dynamic relationships with groups like the Natural Resources Districts, numerous state agencies and the state’s citizens to find solutions to pressing water issues, educate the public and policymakers about such issues, and advance Nebraska’s water stewardship efforts.

“It’s important that we work with producers, the NRDs and other groups to solve our water problems. This has to be a collaborative effort,” said Chittaranjan Ray, director of the Nebraska Water Center.

One result of this collaboration is the ability to place experts in the field in the greatest areas of need. IANR is partnering with the NRDs to hire a water quality expert who will be based in northeast Nebraska, where nitrate contamination is a serious concern. While the focus will be on improving water quality, the position is also expected to raise awareness of the importance of water stewardship in the area.



Peter Miller, renter at Murray farm, Lexington, Neb., stands next to an irrigation canal while holding a shovel circa 1936.

By: Linda Ulrich

NEBRASKA'S IRRIGATION HISTORY – IT'S COMPLICATED

When the well is dry, we know the worth of water.”
— Benjamin Franklin

Irrigation is part of the early history of Nebraska — and the university. Water research began in the late 1800s with the first Agricultural Experiment Station Bulletin, “Irrigation in Nebraska,” published in 1887.

Nebraska now has more irrigated area than any other state but determining who gets how much water is an age-old concern for irrigators, said Derrel Martin, University of Nebraska-Lincoln professor and extension specialist in irrigation and water resources engineering.

Nebraska’s irrigated area has grown continuously since statehood but expanded most substantially during the 1970s. This was due to a widespread drought, favorable economic conditions, growth-oriented water policies and technological advances with commercialization of center pivots. In that decade, three times as many irrigation wells were drilled compared with any other decade.

Expansion of irrigation generated economic growth through enhanced yields, equipment investment, increased production inputs and escalating land values. However, increases in pumping prompted some disputes within the state and intensified interstate water use tensions. In several cases, disputes about water rights led to legislation and/or litigation. Some interstate conflicts involved the United States Congress and U.S. Supreme Court.

The Republican River Compact, the North Platte River Decree and Settlement, and the South Platte River Compact have created the most conflict related to irrigated agriculture, Martin said. Kansas, Colorado and Nebraska entered into the Republican River Compact in 1943 “to provide for the equitable division of the basin’s waters, remove causes of potential controversy, and promote interstate cooperation and joint action by the states and the United States in the efficient use of water and the control of destructive floods.”

“Equitable division of the basin’s waters” caused decades of disagreements and litigation as Kansas sought to secure what it considered its share.

An interstate compact between Nebraska and Wyoming, the Upper Niobrara River Compact,

apportions the water common to the two states.

Water compacts, decrees and other agreements often are re-evaluated and revised because no one can predict future water uses due to changing production practices and technological advancements — negotiators in 1943 had no idea center pivots would be invented in 1948, soon after the Compact was approved.

Nebraska established the Natural Resources District system in 1972 to focus local efforts in managing groundwater resources.

Water for irrigation comes from groundwater storage and/or water that would have been

streamflow if not used for irrigation. Some Nebraskans have concerns about depletion of the Ogallala Aquifer, part of the High Plains Aquifer System. The aquifer spans six states with approximately 2/3 of the water stored in Nebraska. Water in the aquifer in Nebraska is equivalent to approximately half the water in Lake Michigan, Martin said. Studies show that statewide water storage has remained relatively stable over the last 60 years. Some areas have experienced groundwater declines while levels have risen in other areas because water diverted from rivers seeped into the groundwater.

The Platte River Recovery Implementation Program is a basin-wide effort by the U.S. Department of the Interior and Nebraska, Wyoming and Colorado. The purpose is to protect and sustain wildlife habitat for the endangered least tern, whooping crane and pallid sturgeon, and the threatened piping plover. It could potentially affect crop irrigation because each state must return to a July 1, 1997, “level of development of water use and associated river depletions.” New or expanded uses that result in streamflow depletions must be offset.

“The overall driving issue across much of the Western U.S. is sustainability of

irrigated agriculture and the interaction between groundwater and surface water,” he said. “Holistic water management is a big issue in the Republican and Platte River basins.”

Other uses affect water basin management, including industrial use, generation of electricity, recreation and ecosystem needs. However, irrigation consumes the majority of the water, Martin said.

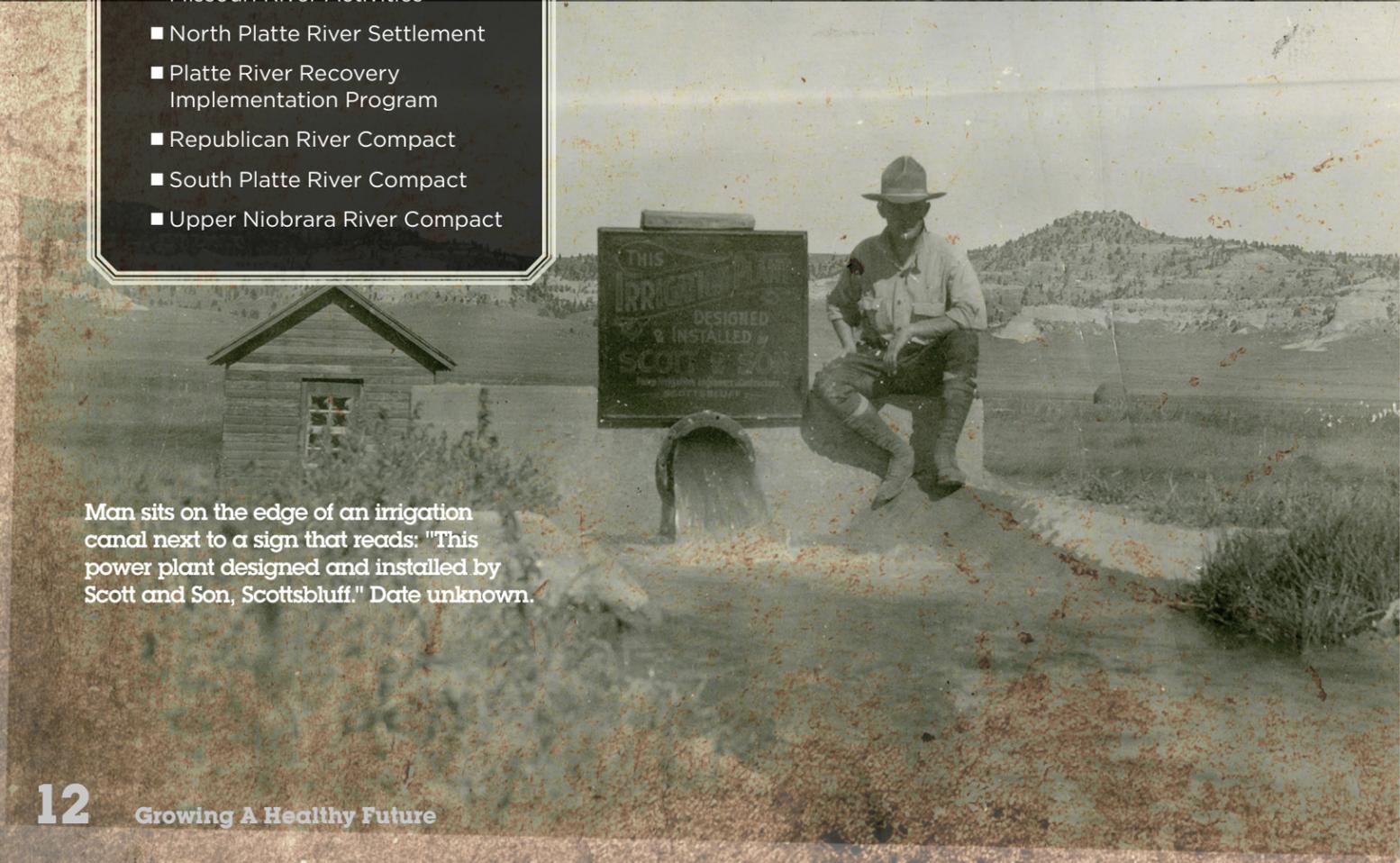
Precipitation, drought and flooding also play a prominent role in irrigation. The droughts in the early-2000s and during 2012-2013 had a significant impact on Nebraska agriculture and other water users. The economic impact to agriculture was less severe than would have occurred without irrigation compared with widespread impacts during the Dust Bowl era when little irrigation occurred, Martin said.



Irrigation test at Dreesen Farm, Alda, Neb. A man and a child stand across an irrigation canal while another man performs an irrigation test with a truck and large pulley. Water flows out of the canal from a pipe. July 1937.

The Nebraska Department of Natural Resources lists seven compacts, decrees and interstate agreements related to the state's water flow and use:

- Big Blue River Compact
- Hat Creek Court Decisions
- Missouri River Activities
- North Platte River Settlement
- Platte River Recovery Implementation Program
- Republican River Compact
- South Platte River Compact
- Upper Niobrara River Compact



Man sits on the edge of an irrigation canal next to a sign that reads: "This power plant designed and installed by Scott and Son, Scottsbluff." Date unknown.

Water research in the Institute of Agriculture and Natural Resources focuses on "the value we derive from water we use," he said, and Nebraska Extension disseminates those findings to producers and consumers.

"The overall driving issue is the development of sustainability and the interaction between groundwater and surface water. Holistic water management is a big issue in the Republican and Platte River basins."

- Derrel Martin

New irrigation technologies abound. Creation and evaluation of technology is part of IANR's research. The UNL Water App, for example, helps farmers use soil sensors to schedule irrigation and predict the last irrigation of the year.

"Farmers invest in technology that pays," Martin said, and the university helps develop and evaluate that technology. Ag producers benefit from new knowledge resulting from the university's research, but IANR also benefits from the knowledge of Nebraska producers, Martin said. "Farmers and water managers know a lot. It needs to be a team effort as we go forward."



Seven men install 18-inch intake pipe in an irrigation canal at the Union Fruit Farm Pumping Plant. Date unknown.

NSF GRANT TO EXAMINE IRRIGATION'S ROLE IN PRECIPITATION

By: Shawna Richter-Ryerson

A national team led by the University of Nebraska-Lincoln is studying potential links between irrigation, cloud formation and rainfall.

Funded by the National Science Foundation, the Great Plains Irrigation Experiment — or GRAINEX — gathered weather observations in June and July from a 3,600-square-mile region in southeastern Nebraska. The timing allowed the team to better understand how irrigation may affect climate conditions at the start of irrigation season in June through late-July when it peaks.



Maiana Hanshaw, right, with the Center for Severe Weather Research, and Shelby Finks, senior fisheries and wildlife major in the School of Natural Resources, show Rezaul Mahmood, lead researcher on GRAINEX, the Doppler radar output as it collects climate and weather data for miles around the research space near a farm field outside of Dwight, Nebraska.

“The study area includes transition from extensively irrigated areas to dryland or nonirrigated areas,” said Rezaul Mahmood, lead researcher and director of Nebraska’s High Plains Regional Climate Center at the School of Natural Resources. “In other words, the experimental setting provides a unique opportunity to investigate the influence of these two noticeably

different land surface and land cover side by side.”

Ultimately, results of the study will be used to better inform agricultural planning and weather forecasting in the United States and around the world.

What science already has proven is that widespread global irrigation is adding significant amounts of water to the land surface and is altering regional land use and land cover. Researchers know these changes can affect local and regional weather development, including cloud formation and therefore rainfall. But the link hasn’t been fully fleshed out.

“Prior studies have found that the Great Plains is a hotspot where soil moisture plays an important role in cloud formation and precipitation,” said Nick Anderson, a program director in the National Science Foundation’s Division of Atmospheric and Geospace Sciences, which funded the research. “Land use change and irrigation due to agricultural activities could be important factors affecting land-atmosphere interactions in this region.”

In May, the researchers from six partnering institutions — Nebraska, the Western Kentucky University, the University of Alabama at Huntsville, the University of Colorado Boulder, the National Center for Atmospheric Research, and the Center for Severe Weather Research — started collecting weather observations at five locations in the state.

They deployed 80 temporary research-grade meteorological stations; measured the fluxes of water and energy from six irrigated and six nonirrigated locations; gathered radar observations of the lower atmosphere, or Planetary Boundary Layer, from three locations; and added two surface-based locations capable of observing and collecting data on the daily evolution of the PBL. They also sent up 360 weather balloons to collect data on the atmospheric pressure, temperature, humidity and wind speed every two daytime hours for 15 days starting July 16.

If it seems like overkill, it isn’t.

“Several times, I asked myself if I was asking for too much or trying to do too much,” Mahmood said, especially once he discovered the trucks hauling helium to the testing sites were too heavy to cross the rural route bridges. “But we want to do good science.”

All the data is now in the process of being analyzed. It then will be used beside modeled applications to determine if and how irrigation is affecting precipitation in the Great Plains. For modeling, the team will use NCAR’s supercomputing facility as well as the Holland Computing Center at Nebraska and computational facilities of WKU and UAH.

Researchers on the project include Udaysankar Nair of UAH, Eric Rappin of WKU, and Roger Pielke Sr. of CU Boulder, and the team is working closely with Nebraska State Climate Office, Nebraska Extension, and the State of Nebraska’s Natural Resources Districts in the study areas.

The grant, earned earlier this year while Mahmood served as the associate director of the Kentucky Mesonet and Kentucky Climate Center at WKU, is being transferred to Nebraska.



One of three Doppler on Wheels radar trucks used for the GRAINEX research project.



A national team led by the University of Nebraska-Lincoln collects climate data from a farm field near Dwight, Nebraska.

Left, top: the research crew checks the data collection instruments, which need to stay cool, in the DOW truck.



Left, bottom: Shelby Finks, senior fisheries and wildlife major in the School of Natural Resources, far right, fills a weather balloon with helium to release into the lower atmosphere.

WATER ADVISORY PANEL CONNECTS UNIVERSITY WITH WATER DECISION-MAKERS

By: Linda Ulrich

The University of Nebraska Water Resources Advisory Panel (WRAP) was formed in 2006 during a severe statewide drought. WRAP comprised representatives of state agencies, NGOs (nongovernmental organizations)

research have played a big role in addressing the concerns that led to the original formation of the group. Currently, water quality, particularly high nitrate levels in groundwater, has emerged as a focus, said Rachael Herpel, assistant director for the university's Robert B. Daugherty Water for Food Global Institute and the Nebraska Water Center; Herpel coordinates WRAP activities.

WRAP is made up of 15 individuals representing a cross section of Nebraska's water decision-makers, including agricultural producers, representatives of many of the state's water-related agencies and others who serve as the "voices of Nebraska" for water issues, Herpel said. The goal is to better connect the university with the wisdom of outside experts and those who often rely on the university's water-related research, education and outreach to make decisions that affect Nebraska's water resources.

Panel members agree that the university should support technologies and efforts that make water conservation easier and water safer, but producers need to know what technologies are worth their investment, particularly in the current economy. Stakeholders also want the university to model the sustainable behavior it believes in. Those are just a couple of the many water issues the panel has identified, Herpel said.

WRAP helps the university learn about stakeholder concerns, work on those issues and be responsive to their needs, she said. "The panel takes this responsibility very seriously."

and constituency groups with interest in addressing the best management of water resources in Nebraska because the state was facing increased pressure to address water issues resulting from interstate compacts, the ongoing drought and other factors.

Collaboration among the groups represented in WRAP, adoption of technology and university

Statistics Department identifying more collaborative strengths

By: Linda Ulrich

The Department of Statistics is about more than just analyzing a bunch of numbers.

In addition to developing new analytical methodologies, the University of Nebraska-Lincoln Statistics Department uses existing methodologies in new ways for addressing new problems and for analyzing new data types. Statistical analyses range from helping identify genes in both humans and corn to guiding economics and drug discovery to precisely managing agricultural production and natural resources.

The university created the Department of Statistics in July 2003 by merging the Department of Biometry in the Institute of Agriculture and Natural Resources (IANR) and the statistics division of the Department of Mathematics and Statistics in the College of Arts and Sciences. Until July 2018, IANR and the College of Arts and Sciences (CAS) jointly administered the Statistics Department.

Because of the importance of the Statistics Department to the cutting-edge research and education in IANR, the Institute agreed to assume the portion of financial support formerly provided by the College of Arts and Sciences — allowing CAS to reduce its budget by that amount. IANR reduced its budget in other areas to make this high-priority, strategic investment, said Ron Yoder, IANR senior associate vice chancellor.

The number of faculty members in the Department of Statistics had decreased in recent years. "The department is currently beginning searches to hire five faculty members to rebuild the strength in data management and analysis that is critical to complement the excellent faculty hires we have made in other areas in the past six years," he said.



The new faculty members will enable IANR to augment existing strengths of the Department of Statistics by adding expertise in emerging areas of statistics to build collaborative relationships with faculty members from other disciplines. The department will continue to offer a variety of statistical methods courses to students throughout the university, Yoder added.

“Through its teaching and research, we offer master’s and Ph.D. programs in statistics. In addition to a purely statistical Ph.D. program, we also offer several Ph.D. programs jointly with other departments,” said Bertrand Clarke, professor and Statistics Department chair. “We also offer graduate and undergraduate minors in statistics.”

Nebraska partners to fight antimicrobial resistance

By: Leslie Reed

The University of Nebraska-Lincoln will help lead a new national institute addressing antimicrobial resistance, an increasingly urgent global public health concern, the Association of Public and Land-grant Universities and the Association of American Veterinary Medical Colleges announced in July.

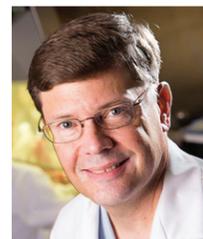
The university is partnering with Iowa State University, the University of Nebraska Medical Center and the University of Iowa. The proposal was selected from among nine submitted by major universities throughout the nation.



Each year in the U.S., at least 2 million people are sickened from bacteria resistant to antibiotics, and 23,000 people die from those infections. Many more die from other conditions complicated by an antibiotic-resistant infection, according to the Centers for Disease Control and Prevention. Infections from drug-resistant “superbugs” result in an estimated \$20 billion a year in direct health care costs and up to \$35 billion in lost productivity from hospitalizations and sick days.

“Antimicrobials are critically important tools for maintaining

human, animal and crop health,” said Mike Boehm, University of Nebraska vice president and Harlan Vice Chancellor for the University of Nebraska-Lincoln Institute of Agriculture and Natural Resources.



Rodney Moxley

“This new institute will accelerate discoveries and engage producers in new and impactful ways that will enhance the stewardship and prolong the shelf life of these disease-prevention tools. The establishment of this institute is a

big deal, and we are excited about this next chapter of our partnership with our colleagues from Iowa, the industry and beyond.”

The institute will be jointly funded by the University of Nebraska-Lincoln and Iowa State at a combined \$525,000 per year for three years (\$1.575 million total). Rodney Moxley, Charles Bessey Professor of Veterinary Medicine and Biomedical Sciences at Nebraska, will play a leadership role.

The Institute for Antimicrobial Resistance Research and Education stems from recommendations by a joint AAVMC/APLU task force, which authored a 2015 report outlining an array of research and education initiatives to address antimicrobial resistance. The report recommended that veterinarians, physicians and other scientific experts work closely together to attain optimal health for people, animals and the environment. The institute will help coordinate and implement those recommendations at universities and veterinary medical colleges across the country.

The new institute will build upon an existing partnership. The universities involved began to address some of these same problems three years ago through the Antimicrobial Resistance Consortium, a research initiative that has involved Nebraska, UNMC, Iowa

State, Iowa, the USDA Agricultural Research Service, the Mayo Clinic and a team of more than 100 researchers, educators, clinicians and extension personnel.

“Antimicrobial resistance touches each of us in our daily lives. This new institute provides a great resource for the entire country as we work to build strong, collaborative research and educational programs to mitigate this risk,” said Paul Plummer, associate professor of veterinary diagnostic and production animal medicine at Iowa State. Plummer directed the AMR Consortium and will serve as executive director of the institute, which will be housed at Iowa State.

Along with Plummer and Moxley, institute leadership will include:

- Kenneth Bayles, vice chancellor of basic research and professor of pathology and microbiology at UNMC.
- Christine Petersen, associate professor and director of the Center for Emerging Infectious Diseases at the University of Iowa. Petersen will coordinate involvement of participants from the University of Iowa College of Public Health and College of Medicine.
- Robin Patel, chair of the Division of Clinical Microbiology, director of the Bacteriology Laboratory, and director of the Infectious Diseases Research Laboratory, Mayo Clinic.



“Antimicrobials are critically important tools for maintaining human, animal and crop health.”

— Mike Boehm

TOGETHER, WE CREATE THE FUTURE: 2018 RURAL FUTURES INSTITUTE STUDENT SERVICESHIP

By: Katelyn Ideus, Rural Futures Institute

“They were surprised,” she said.

“They didn’t think I would consider living here — that I would call their community home.”

Mirissa Scholting, a senior agricultural leadership major in the University of Nebraska–Lincoln College of Agricultural Sciences and Natural Resources, along with 22 of her peers from the University of Nebraska spent 10 weeks in rural communities across the state this summer.

Scholting, originally from Louisville, Neb., and her partner Haley Ehrke, a senior agribusiness major, worked, served and lived in Box Butte County, providing additional perspective, energy, capacity and — to her surprise — confidence.

“For some reason they needed to be reminded that their community is attractive to soon-to-be young professionals like us,” Scholting said.

“And I learned that, while we hear, ‘Oh, these communities need help,’ they are actually thriving. We need to show people that, tell people what these rural communities, these people, have to offer. That was a lot of what our projects focused on, but I’m also taking it personally and telling people that Hemingford and Alliance are real options.”

Created through the Rural Futures Institute at the University of Nebraska in 2014 by UNL professors and partners, RFI Student Serviceship brings students from the University of Nebraska at Kearney, UNL and the University of Nebraska at Omaha together with communities of place and practice to work on future-focused, strategic projects that embrace opportunity.

It has resulted in 60 NU students experiencing, not only what it means to live and work in a rural community, but what it means to lead in a rural community.

As for the 25 Nebraska communities that have participated so far, the serviceship experience provides a “great bridge” from the university to rural communities, said Chelsie Herian, executive director of the Box Butte Development Corporation and Scholting and Ehrke’s lead mentor. Distance is tough, but this program overcomes that, she added.

“We have so much to learn about their age demographic,” Herian said. “We just don’t get that perspective very often, especially in such a focused way. So while they were accomplishing some of our ideas, I was also digging into what they look for in a community, a place of work, how they want to be engaged, where our community and businesses should reach them. All of this is essential to how we plan for our community to recruit and retain residents in the future.”

Herian is currently leading Box Butte County through Marketing Hometown America, a community education program focused on recruiting and retaining new residents. It was created through RFI funding in 2013 by Cheryl Burkhart-Kriesel, associate professor and Nebraska Extension Community Vitality Specialist at the Panhandle Research and Extension Center in Scottsbluff, Neb.

The program engages communities through small groups to have more people involved and more voices heard. Designed as a tool to create dialogue

that moves toward action, Marketing Hometown America can be the spark to help a rural community look at itself and the recruitment and retention of new residents in a new way.

Not only did Scholting and Ehrke help facilitate the process and participate with their perspectives, they also executed several of the outcomes, creating four short films, producing a community commercial, taking thousands of photos and auditing the community’s websites for improvements.

“We will be launching their videos soon, but we are already feeling the impact of Mirissa and Haley’s time here,” Herian said. “I’m pretty sure they hear from someone in the community every day, because we have built genuine friendships, but businesses and community organizations are also anxious to release what they have produced.”

Overall, a 2015 study of serviceship estimated a \$15,790 average economic impact per community. This year’s projects included strategic plans looking three to 20 years forward, event planning and execution, data collection and analysis, tourism initiatives and much more.

The effects of a serviceship experience are many, said Helen Fagan, RFI director of leadership engagement.

According to her initial research of the 2018 experience, 100 percent of lead mentors responded that RFI Serviceship is a positive reflection of the University of Nebraska’s commitment to rural communities, that they would like to participate in serviceship again and that being a lead mentor helped them grow as a leader.

In total, 100 percent of the 2018 student participants believed that they grew as a leader and a professional, that they had a positive impact on the community and the people they met and that the experience was so positive they would recommend it to their friends.

As a professor who teaches leadership and leader legacy, Fagan said watching these students make an impact by taking their education and putting it into practice is exactly what makes her work fulfilling.

“Every time I look at the outcomes from one community, I am in awe of the results, as I realize this is just one of 12 experiences we created this summer,”

Fagan said. “The efforts of these students, the mentors, the host teams and all of the community residents who made this meaningful — that’s the efforts of thousands of real Nebraskans with our students resonating to thousands more that are touched because of this work.

“But we’re not surprised by these outcomes because we understand the energy of these students, the grit of these mentors and the potential of these communities. Together, anything is possible in rural Nebraska.”

Program details, community outcomes, student video presentations and more available at ruralfutures.nebraska.edu/2018serviceship.



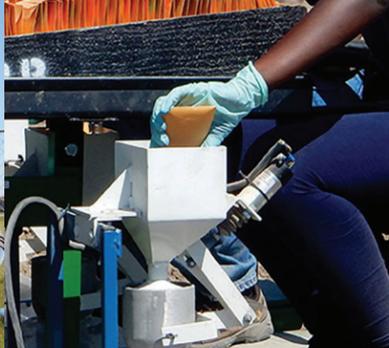
From left: Mirissa Scholting, Haley Ehrke, Chelsie Herian



Ty Schurr (center) enjoys talking with Dustin Olson during a harvest visit. Schurr is an agriculture and commercial loan officer at Gothenburg State Bank.



By: Linda Ulrich



Leadership skills valuable part of CASNR education

Leadership is important to Ty Schurr. Not for the sake of being called a leader but because it is a way to accomplish worthwhile goals and to give back to his alma mater and his community.



Ty Schurr explores the topic of finance with Gothenburg Public Schools students.

"I like the teamwork aspect of being a leader. I like working with people," he said.

Schurr grew up on a farm and ranch near Farnam. The development of his leadership skills began in high school through sports and FFA. They really blossomed during his undergraduate education in the College of Agricultural Sciences and Natural Resources. A 2013 graduate in agribusiness with an agricultural banking and finance option, he was a member of Alpha Gamma Rho Fraternity and Mortar Board. Schurr was president of the CASNR Advisory Board and the Agricultural Economics and Agribusiness Club. He also was an Ag Econ ambassador and the university's 2012 homecoming king.

An agriculture and commercial loan officer at Gothenburg State Bank, Schurr continues to use his leadership skills professionally and in a variety of organizations. He is president of the CASNR Alumni Board and a Teammates mentor. President of the Gothenburg Chamber of Commerce, Schurr is on the town's Planning and Zoning Committee. He also is part of the 2018 Dawson County Adult Leadership Team.

Schurr takes pride in working for a 100 percent family-owned bank in a rural area where he knows many of the bank's farm and ranch families and can help provide the financial assistance they need.

"I like getting out and about and talking with them and feeling that I'm part of their success," Schurr said.

Studies in the Department of Agricultural Economics created a strong foundation for his career. Equally valuable was the networking in the ag industry.

"Between the dedicated faculty and staff and the welcoming and rural culture of East Campus, my college experience in CASNR was second to none," Schurr said. "I won't ever regret the time I spent being part of numerous campus organizations. The lifelong connections that I built are priceless."

In his free time, Schurr enjoys attending Husker athletic events, hunting and spending time with his family and friends.

by the numbers

3 in 4 Nebraska farmers and ranchers work with Nebraska Extension each year to boost crop and animal productivity.

3.4 percent increase in CASNR's enrollment from the previous academic year. The total number of CASNR undergraduate, graduate and professional students is 3,199 – the largest enrollment in the history of the college.

55 Nebraska high schools that have added agricultural education programs in the last eight years with assistance from the university's Department of Agricultural Leadership, Education and Communication.

250 small and medium size manufacturing clients located in Nebraska that received support and assistance from the Nebraska Manufacturing Extension Partnership in 2017, resulting in \$2.2 million in new and retained sales, \$2.6 million in cost savings and \$628,701 in new client investments.

2,050 -plus tractor tests conducted at the Nebraska Tractor Test Laboratory. The lab is the officially designated testing station for the United States and gauges tractors according to the Organization for Economic Cooperation and Development codes.

14,115 hands raised for Nebraska 4-H as part of the National 4-H Raise Your Hand campaign. Nebraska 4-H claimed second place in the competition, earning \$10,000 to help provide hands-on learning experiences to more youth across the state.



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