

2018 Water Tour Heads West to Wyoming

Steve Ress



Pathfinder Dam, completed in 1909, is one of five main storage dams in the U.S. Bureau of Reclamation's North Platte Project.

The University of Nebraska's water and natural resources tour will travel west through the Platte River basin in Nebraska and Wyoming this coming summer.

The tour will feature a visit to the U.S. Bureau of Reclamation's (USBR) North Platte irrigation project in Wyoming – including Pathfinder and Seminole reservoirs -- as well as points of interest in Colorado and Nebraska.

Organizers have set tour dates for June 26-29 and the event will likely begin and end in Holdrege. It is being planned and supported by the University of Nebraska Water Center, Central Nebraska Public Power and Irrigation District, Nebraska Public Power District, NU's Robert B. Daugherty Water for Food Global Institute and UNL's Institute of Agriculture and Natural Resources.

"The Bureau of Reclamation's North Platte Project is one of the granddaddies

of surface irrigation projects in the west," said tour co-organizer Steve Ress of the Nebraska Water Center.

The project extends more than 110 miles from Guernsey, Wyo. to Bridgeport, Neb., where it irrigates nearly one-quarter of a million acres. It features about 2,000 miles of canals, laterals and drains and has five main storage dams, the first of which was completed in 1909 under then President Theodore Roosevelt.

"Water stored in the project's reservoirs ultimately winds-up in Lake McConaughy, so touring the project is a natural follow-on to last year's tour of irrigation facilities in western Nebraska," Ress said. "Everyone who works in water and irrigated agriculture in Nebraska needs to see the upper reaches of the Platte, but it is remote, which is part of the reason the tour periodically visits there."

Continued on page 19

Spring water seminar lectures will Key on "Advances in Irrigation Management"

A series of seven, free public lectures at the University of Nebraska-Lincoln's Hardin Hall, beginning in January, will revolve around the broad topic of "Advances in Irrigation" Management."

"As we work towards making irrigation both more efficient and more effective, we sometimes lose track of how far we have come in this critical area," said Nebraska Water Center director Chittaranjan Ray.

The NWC, in cooperation with UNL's School of Natural Resources, plan the annual spring lecture series, which is free to the public and offered for course credit through several UNL colleges.

The hour-long lectures are offered roughly every-other-Wednesday, beginning January 17 and ending April 18.

This year's speakers will cover a broad range of interests and perspectives on irrigation technology and use in production agriculture, including perspectives from industry, research and Nebraska Extension.

The annual lecture series dates to the 1970s and is planned and presented by NWC, part of the Daugherty Water for Food Global Institute, and UNL's School of Natural Resources and Institute of Agriculture and Natural Resources.

Lectures are 3:30 to 4:30 p.m. in the first floor auditorium of Hardin Hall on

Continued on page 4

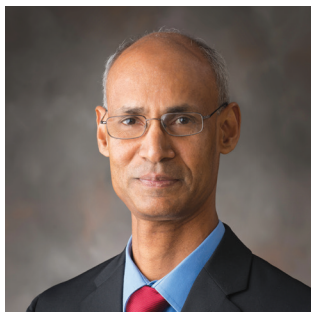
Inside

DIRECTOR'S NOTES:	2
EBB AND FLOW	4
ADVISORY BOARD	7
WRAP	8
HUSKER HARVEST DAYS	14



Nebraska
Water Center

Daugherty Water for Food Global Institute



Enjoying the busiest time of the year

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

Going from the end of the summer to the beginning of fall semester is a bit like cruising down the highway at 65 mph in an open-top sports car, then suddenly downshifting the transmission from fifth gear to fourth gear and mashing the accelerator.

It goes very quickly, yet at the same time is the most productive and rewarding time of the year in many respects.

I want to thank all of our planning committee, speakers, panelists and my staff for perhaps one of the best fall symposiums the Nebraska Water Center has ever hosted. I was extremely gratified to hear all the comments during and after the October event telling me that we had done a very good job with the overall theme for the symposium, as well as with the individual speakers and panels we had invited to present. Early on in the planning, we thought the topic of nitrates in production agriculture would allow for some much needed discussions that we hope will carry on in a meaningful way.

We also had a grandly successful fall research faculty retreat in September here at Nebraska Innovation Campus in Lincoln. There were many stakeholders making significant suggestions on research and collaboration with faculty and I was impressed by the professional diversity of those attending. Not simply research faculty looking to present on their latest research or hook-up with colleagues on grant proposals, but a full house of representatives from federal and state agencies, industry and from the state legislature. This sort of diversity helps keep the discussions broader and more meaningful. My personal thanks to those who attended and contributed to these important meetings.

In late August, our faculty advisory board met and I took the opportunity to chat with them on how we are addressing a few challenges that were identified during our five-year national review a year ago. While all three of the reviewers were unanimous in noting that NWC's affiliation with the Daugherty Water for Food Institute is mutually beneficial and should be strengthened, they noted that NWC's branding should clearly identify how it works for Nebraska, a point the advisory board is in agreement with. We are currently working through some of these branding issues and will likely be rewriting NWC mission statements in the near future.

There were a good number of other meetings and events in August and September, including:

- A stop at Nebraska Extension and NU research exhibits at the Husker Harvest Days farm show near Grand Island with various partners and stakeholders in September.
- Hosting a partner meeting of the researchers from Nebraska and Objective Team 1 who are leading the U.S. Department of Agriculture Ogallala aquifer project to discuss progress and tasks that need to be completed in the current funding period.
- Visiting the TAPS project field day at UNL's West Central Research and Extension Center in North Platte, in combination with a visit to the Roric Paulman farm near Sutherland for NEWBA's hosting of visitors from Argentina. I continue to be extremely impressed with the innovative success of the TAPS program, which seems to be the near-universal opinion of this fine program.
- I attended the Natural Resources Districts managers in meeting in Norfolk in late August to give an update of activities occurring within NWC and our Water Sciences Laboratory.
- Visited with City of Hastings officials on their new project to control groundwater nitrates in late August.

• In September, I was invited by IRZ, Inc., a subsidiary of Lindsay Corp., to understand irrigation water delivery as well as to see a diversity of cropping systems and associated industries in eastern Oregon and Washington. This was an eye-opener for many of us attending, as these areas have a mix of agricultural production and processing operations, plus extensive dairy operations. The area economy is very vibrant there.

Since the last issue of this newsletter, I have also submitted a \$5 million research proposal to USDA's National Institute of Food and Agriculture addressing the sustainability of food production systems in the Missouri River basin. NWC led this proposal with UNL as the consortium lead. North Dakota State University, South Dakota State University, South Dakota School of Mines and Technology, University of Wyoming, and USDA ARS at Sidney, Montana are partners along with the

Alberta Irrigation Projects Association in Canada as an international partner. We anxiously await the results of this competition, which should be known early next year.

Upcoming, the annual spring semester water seminar lectures will begin January 17, 2018. The seven free public lectures at UNL's Hardin Hall will all key on advances in irrigation management. Colleagues Pat Shea and Martha Rhoades are leading the course part of the lectures for students. As always, the public is encouraged to attend as many or as few of the lectures as their time and interests allow for.

Our water and natural resources tour organizing committee has decided that the annual tour will visit the U.S. Bureau of Reclamation's historic North Platte and Kendrick irrigation projects in Wyoming this summer. Tour dates are June 26-29, 2018. The projects are critical to surface irrigation in western Nebraska where they help irrigate about a quarter million acres. They are also quite remote, so we expect the tour to fill very quickly as everyone involved in water in Nebraska wants to see the system

of reservoirs and they aren't located where you simply stumble across them on a casual drive west. As the planning progresses, updates will be posted online at watercenter.unl.edu.

Elsewhere in this edition of the Water Current, you will see the debut addition of what we hope will be a regular column by our director of laboratory services, Dan Snow. We are always keen to get information out on what the lab is doing, and we thought that one way to help do that was a recurring piece in this newsletter by the lab's director.

Finally, we wish all of you the very best during the coming holidays.

USGS: Pesticides prevalent in Midwest streams

More than 180 pesticides and their byproducts were detected in small streams throughout 11 midwestern states, some at concentrations likely to harm aquatic insects, according to a new study by the U.S. Geological Survey.

On average, 52 pesticide compounds were detected in each stream.

At least one pesticide in at least half of the 100 streams sampled exceeded a threshold predicted to cause harm to aquatic insects and other stream organisms. Pesticides were not measured at levels predicted to be toxic to fish in most streams.

While numerous pesticides were detected at low levels, only a few—atrazine, acetochlor, metolachlor, imidacloprid, fipronil, and organophosphate insecticides—were predicted to be major contributors to toxicity. The first three are widely used agricultural herbicides, and the latter three are insecticides used in both residential and agricultural settings.

This is one of the most extensive assessments of pesticides in streams to date: 1,200 samples were collected at 100 Midwest streams over a 12-week period during the 2013 growing season and analyzed for 228 pesticide compounds. This study is one component in the first in a series of five USGS regional stream quality assessments.

This newsletter is published with partial financial support from the Department of the Interior; U.S. Geological Survey. The content does not necessarily reflect the views and policies of the Department of the Interior, nor does mention of trade names or commercial products constitute endorsement by the U.S. Government.

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

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

Editor
Steven W. Ress
Editorial Assistant: Patricia Liedle

Designer
Clint Chapman

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: sress@nebraska.edu



NebrWaterCenter



NebraskaWaterCenter



The Ebb and Flow

Ben Beckman

As we enter the heart of the fall season, take five minutes, stand still, you'll notice the rest of the world buzzing around you. Farmers are bringing in the harvest, water managers are getting final readings in before the weather turns south, and if that isn't enough to keep busy it seems like there is another conference to attend every week.

Each year, the Nebraska Water Center hosts a fall symposium that gathers researchers, water managers, and users to discuss and share information about a water topic important to the state. This year's conference focused on water quality concerns in production agriculture.

This isn't by any means a new concern, but it seems that the need to address these concerns as they impact communities statewide becomes more and more urgent. If you attended the opening talk of the symposium, you saw a slide where Bruce Lindsey noted that nitrogen exceeded its MCL more than any other contaminant in groundwater systems. The highest number of nitrate violations in public water systems occur in the Midwest, with Nebraska among the top five. In particular, a quarter of domestic wells in agricultural areas exceed the 10 parts per million limit nationally.

Looking at these systems, it's not hard to reach agreement that nitrates are an issue needing to be addressed. The debate often arises when we begin the task of implementing strategies for mitigation. What can actually be done, are our actions actually making an impact, and where fault for the issue lies can easily become stumbling blocks to moving forward with plans for remediation.

So what do we do about it? For those of you who know me, you know I enjoy fall for two reasons, getting to help out on the family farm with harvest and pheasant hunting season. Growing up, many a weekend morning was spent with friends walking a field edge or CRP field. Sadly, I can count on one hand the number of times we walked away with our limit in birds. You might be tempted to chalk it up to us being terrible shots, except for the fact that the number of birds we would see on those outings could usually be counted on your other hand.

This low number of bird sightings was not for lack of trying! We knew every grass remnant and weed patch in a 10 mile area and had permission to hunt all of them. The birds just weren't there. And if I'd ask, I got all sorts of answers for why that was: lack of habitat, a hard winter, no small grains for food, too much predation. And try as we might to fix the issues we could, by putting field corners and poor crop ground into habitat programs, the birds never came.

You might be asking why this is at all relevant to the issues of groundwater quality, but I think the lessons learned with my

pheasant hunting experience are particularly relevant. In both cases, the causes of problems were not clear and probably were a complex mixture of many factors. Pointing fingers and trying to fix things we had no control over, like the weather, didn't help us solve anything. Even when we were able to address a possible problem, we really needed a concerted effort by the entire neighborhood to enact change.

Groundwater quality issues are not going away in Nebraska, but it's up to us to decide how to address them. We can argue over what's to blame and issues we have no control over, working piecemeal to try and implement lasting change and hoping its good enough. For my pheasant hunting experiences growing up, that didn't work out too well. However, if we can sit down, listen to one another, and commit to cooperative planning and programs that will make meaningful change across broad landscapes, maybe the end of this tale can be different.

Continued from page 1

Spring water seminar lectures will Key on "Advances in Irrigation Management"

- UNL's East Campus at N. 33rd and Holdrege Sts. in Lincoln.
- All speakers in the seminar had not yet submitted titles to their talks when the Water Current went to print.
- Series lectures include:**
- Jan. 17 Cody Bailey, Reinke Mfg.
 - Jan. 31 Williams Memorial Lecture: Ken Quandt, Micrometer
 - Feb. 14 Trenton Franz, UNL School of Natural Resources
 - Feb. 28 Daran Rudnick, UNL Department of Biological Systems Engineering, UNL West Central Research and Extension Center, North Platte
 - March 14 Kremer Memorial Lecture: Kurtis Charling, Lindsey Corporation, "Using Proven Science, Research, and Big Data to Simplify and Optimize Irrigation Management"
 - March 21 No Seminar (UNL Spring Break)
 - April 4 Derek Heeren, UNL Department of Biological Systems Engineering
 - April 18 Xin Qiao, UNL Department of Biological Systems Engineering, UNL Panhandle Research and Extension Center, Scottsbluff, "Irrigation Management in Western Nebraska and Future Opportunities"

Managing impacts to water quality in production agriculture

Steve Ress



Left; Nebraska Water Center director Chittaranjan Ray opens the Fall Nebraska Water Symposium. Below; Bruce Lindsey of the U.S. Geological Survey.

"We are also fortunate in Nebraska to have a very rich tradition of cooperation along broad public and private lines in looking for workable solutions to reducing nitrate use and potential for contamination of our precise water supplies," Ray said.

Bruce Lindsey of the U.S. Geological Survey in Harrisburg, Penn. opened the symposium with a national perspective on the risk of nitrate in U.S. groundwaters, followed by Steven Wolf of



Managing impacts to water quality in production agriculture was the theme for the Nebraska Water Center's annual water symposium at Nebraska Innovation Campus on Oct. 26 and 27.

"This is one of our state's most important ongoing challenges and one that effects all Nebraskans. It is an area where our university shines in the depth and breadth of research and Extension faculty addressing the many aspects of this challenge," said Chittaranjan Ray, director of the Nebraska Water Center, part of the Daugherty Water for Food Global Institute at the University of Nebraska.

Speakers for the day-and-a-half symposium came from within and outside of the university. Many were noted state, federal and local agency experts, as well as from the private sector.

Lincoln's JEO Consulting Group on overcoming communication challenges for nitrate abatement.

First morning topics delved into nitrate in groundwater and municipal systems, managing nitrogen at the Natural Resources District level, Nebraska water quality public water supplies.

Afternoon topics shifted to nitrogen transformation and other

Continued on next page.

Continued from page 5

complications from nitrate use, such as balancing nitrogen inputs and outputs, storing nitrogen in the critical vadose zone, co-contaminants, and age dating sources.

A seven-member panel concluded the first day's discussions by looking at the science, regulation and culture of water quality in Nebraska.

On the second day, the symposium moved into best management practices (BMPs) for reducing nitrogen loss and use through budgets for landscapes, cover crops, and BMPs for animal operations.

Closing topics made recommendations for moving forward, such as crop yield versus crop inputs; economy, environment and society for nitrogen management, nutrient stewardship and the role education, outreach and extension can play in comprehensive nitrogen management into the future.



Above: UNL Institute of Agriculture and Natural Resources associate vice chancellor Ron Yoder speaks at the Fall symposium.



Wrap panel

Teaming to sponsor the symposium were the Nebraska Water Center, the USGS Nebraska Water Sciences Center, NU's Daugherty Water for Food Global Institute and UNL's Institute of Agriculture and Natural Resources.



Ferguson



Stone

USGS 104b request for pre-proposals

Proposals that address water resources priority issues in Nebraska are now being solicited. The Nebraska Water Center, part of the Daugherty Water for Food Global Institute anticipates research funds being available in 2018 through its Section 104(b) Water Institutes Program, U.S. Geological Survey (USGS). Faculty members at all Nebraska universities are eligible and encouraged to apply for these research funds. The start date for projects is March 1, 2018 for a one-year period ending February 28, 2019.

Proposed research that addresses one of the priority water research challenges identified on Attachment 1 will be

ranked higher if there is collaboration with USGS. Proposals will be evaluated by: an advisory board comprised of state and federal agency representatives, faculty members, external reviewers, and the director. Proposals are due electronically (as a pdf file) to the Nebraska Water Center on or before Monday, November 12 by 1 p.m. CST. At this stage, a four-page pre-proposal is needed for review.

After review of pre-proposals by an advisory board and suggested reviewers using Attachment 5 which is provided as a sample to you, the PI to receive funding will be contacted by December 1 to move forward with the USGS full proposal process and will receive further

instructions from the Nebraska Water Center. Final full electronic proposals are due Wednesday, December 20 via the NIWR website by 1 p.m. CST.

If you the PI or co-PI's have not registered for proposal submission, please do so at <http://niwr.net> and go to "tools" on the left and select "register" to complete the process before making your submission. If you have any questions concerning application procedures, or potential research topics, please contact Tricia Liedle at the Nebraska Water Center @ 472-3305 or Chittaranjan Ray at cray@nebraska.edu or 472-3305.

Advisory board meets in August

The Nebraska Water Center's advisory board met for research presentations and discussions on Aug. 29 at Nebraska Innovation Campus.

NWC director Chittaranjan Ray gave the board brief updates on a number of U.S. Geological Survey-funded research projects that he is involved with, along with updates on



- Impact of variable rate irrigation consumptive use of water resources, Derek M. Heeren, UNL Department of Biological Systems Engineering.
- Spatial variability of streambed Hydraulic conductivity across multiple stream orders, Aaron Mittelstet, UNL Department of Biological Systems Engineering.
- A spatial index for leachability of chemicals in Nebraska, Mohana Sundaram Shanmugam, Nebraska Water Center.
- Nitrate mediated mobilization of naturally occurring uranium in groundwater, Karrie A. Weber, UNL School of Biological Sciences.

The advisory board advises and strengthens the water center by helping to guide it in its mission of supporting water-related research, education and outreach, and through helping to share information with constituent groups.

The board combines many existing advisory functions into one body. Examples of issues on which advice may be sought include research needs, events and programming to facilitate interdisciplinary research, shaping of academic programs, seed grant awards and outreach event topics.

Current members of the board are:

- Shannon Bartelt-Hunt, UNL Department of Civil Engineering
- John Bender, Nebraska Department of Environmental Quality
- John Berge, North Platte NRD
- Dana Divine, UNL School of Natural Resources/Conservation and Survey Division
- Tom Franti, UNL School of Natural Resources and Department of Biological Systems Engineering
- Rick Holland, Nebraska Game and Parks Commission
- Suat Irmak, UNL Department of Biological Systems Engineering
- Peter McCornick, Daugherty Water for Food Global Institute and UNL Department of Agronomy and Horticulture
- Dan Miller, UNL Department of Agronomy and Horticulture
- Jennifer Schellpeper, Nebraska Department of Natural Resources
- Tim Shaver, UNL Department of Agronomy and Horticulture, West Central Research and Extension Center.
- Bob Swanson, USGS Nebraska Water Science Center
- Steve Thomas, UNL School of Natural Resources
- Karrie Weber, UNL Earth and Atmospheric Sciences and School of Biological Sciences



Top: Troy Gilmore presents at August's Nebraska Water Center Advisory Board meeting. Above: Ashraf Aly Hassan presenting on his research.

the upcoming water symposium and water faculty retreat, management involvement in Nebraska Extension's Husker Harvest Days exhibits and some of his recent travels to work on research collaborations, as well as outreach associate Ben Beckman's travels around the state to meet with Natural Resources District staffs, agency representatives and Nebraska Extension educators.

He gave each of them a copy of the NWC's recent five-year external review that was conducted by Kaye Brubaker of the Maryland Water Resources Research Center; Doug Parker of the California Institute for Water Resources; and Reagan Waskom of the Colorado Water Institute.

Though the review was extremely positive on the whole, Ray told board members that NWC is working to better define its mission statement and relationships with the Daugherty Water for Food Global Institute and to enhance its linkages with other Nebraska universities and colleges, among other things, as a result of review team recommendations.

The following research presentations were made at the meeting:

- Groundwater system response to water resources management in the North Platte NRD, Troy Gilmore, UNL School of Natural Resources.
- Utilizing biotrickling filters to reduce water consumption at fermentation and dryer stacks in ethanol plants, Ashraf Aly Hassan, UNL Department of Civil Engineering.

WRAP meets following fall symposium

Steve Ress

Water Resources Advisory Panel (WRAP) members met with faculty and staff from the Nebraska Water Center and Daugherty Water for Food Global Institute (DWFI) following the Oct. 26 and 27 fall water symposium at Nebraska Innovation Campus in Lincoln.

WRAP facilitator and DWFI assistant director Rachael Herpel broke from the group's normal meeting routine to ask all those attending to take a marker in hand and write on the NIC conference white board walls their ideas for what "The most impressive thing the university can do in the next one, three and five years."

That idea coupled with many of the members having just come from a day and a half of symposium talks centered on managing impacts to water quality in production agriculture, spurred a number of general themes on what university researchers and water experts should be taking hard looks at in the coming years. Representative of the ideas that were shared and discussed were:

- Engaging crop consultants and agronomists in driving adoption of sustainability practices
- Studying the economic losses attributable to use of nitrate fertilizers, especially bringing attention to the cost of losing a public water system well to nitrate contamination
- More education of urban state senators on rural and agricultural issues in Nebraska
- Alternative cropping, especially increasing diversity in corn-corn rotations
- More study/emphasis on risks to human health from continuing use of nitrate fertilizers
- Spread the recently implemented Nebraska Extension TAPS program statewide
- Export Nebraska's Natural Resources District system
- More emphasis on scientific research and long-term data collection (not just three year projects)
- Enhance data integration
- More emphasis on and use of crop diversity and niche market farming
- University of Nebraska help in creating an educational "conservation center" that recognizes the importance of soil health

New program offers free water and energy meters

Kate Gibson



Media interviews Kate Gibson at Husker Harvest Days

A new program sponsored by the Robert B. Daugherty Water for Food Global Institute at the University of Nebraska aims to provide agricultural producers with information about real-time energy use and cost of pumping groundwater for irrigation.

DWFI researchers have partnered with Smart Water Metering, a startup company that develops smart meters, to produce water and energy meters that provide real-time information via email, on a desktop computer, or by phone.

The meters are not traditional water meters but instead measure energy usage and calculate water use without direct contact with water, providing highly accurate and non-invasive measurements. The meters will work with most 480 volt electric-driven irrigation pumps.

As part of the program DWFI can provide a number of meters and associated data and analysis free to interested producers in Nebraska. The goal is to help producers understand in detail how their pumping costs vary across their own fields, to try to identify potential problems with irrigation pumps, and to provide anonymized benchmarks that show how costs vary relative to others with similar groundwater conditions.

This new metering program was on display as part of University of Nebraska Extension and research exhibits at the annual Husker Harvest Days agricultural show near Grand Island in September.

Meter installations will begin this November in preparation for the 2018 irrigation season. For more information on the program or to sign up, contact Kate Gibson at (402) 472-5728 or kgibson@nebraska.edu.

Nebraska Water Law CLE

The annual Nebraska Water Law CLE conference was Oct. 6 at the University of Nebraska's College of Law in Lincoln.

Conference topics spanned the length and breadth of Nebraska water law, from "Nebraska and the Trump Administration" and "Water Law 101" to the Keystone XL pipeline and ethics and water law.

"This years conference gave attendees updates on the numerous Nebraska Supreme Court cases involving water over the past year, including litigation concerning property rights in water and Natural Resource Districts' regulatory efforts," said University of Nebraska-Lincoln Associate Professor of Law Anthony Schutz.

The conference updated attendees on new legal developments, as well as specific topics of interest in water law.

Continuing Legal Education, or CLE, credits were available for Nebraska, Colorado and Iowa

Morning topics at the conference included "Water Law 101," a refresher and introduction to the days topics; Nebraska Supreme Court decisions dealing with compensation for water users; evolving litigation involving Memphis, Tenn. in its fight with Mississippi over groundwater; a keynote address discussing Colorado's experiences over the past decade on water planning and equity issues by Dick Wolfe, Colorado State Engineer and Director of the Colorado Division of Water Resources; and a panel discussion of the future of water management under the Trump Administration.

Afternoon topics included "Water and Taxes," Natural Resources District Practice and Procedure, the Keystone XL pipeline, and a presentation concerning legal ethics.



Top; The Nebraska Water Law CLE conference was at NU's College of Law in Lincoln in early October. Above, left; Anthony Schutz opens the annual Nebraska Water Law CLE conference. Above, right; Daugherty Water for Food executive director Peter McCornick (center) talks with Dick Wolfe.

USDA Funds to Protect and Restore Nebraska Agricultural Land, Grasslands and Wetlands

The U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) is accepting applications for the Agricultural Conservation Easement Program (ACEP). The program provides funding for the purchase of conservation easements to help productive farm and ranch lands remain in agriculture and to restore and protect critical wetlands and grasslands.

Acting State Conservationist Myron Taylor said, "Conservation easements are a good tool to ensure natural resources are conserved and protected for all Nebraskans. We encourage Indian tribes, state and local governments, non-governmental organizations and private landowners to contact their local NRCS office to find out how to apply."

ACEP's goal is to prevent productive agriculture land from being converted to non-agricultural uses and to restore and protect wetlands and wildlife habitat. Applications to be considered for 2018 funding opportunities in Nebraska must be received by December 1. Applications are currently being accepted for both agricultural land and wetland reserve easements.

Eligible landowners can choose to enroll in a permanent or 30-

year easement. Tribal landowners also have the option of enrolling in 30-year contracts.

A key option under the agricultural land easement component is the "grasslands of special environmental significance" that will protect high-quality grasslands that are under threat of conversion to cropping, urban development and other non-grazing uses.

All applications will be rated according to the easement's potential for protecting and enhancing habitat for migratory birds, fish and other wildlife. Eligible applicants will be compensated with a payment rate comparable to the local land use value.

Applicants will need to provide accurate records of ownership and ensure they have established current year ownership eligibility with USDA's Farm Service Agency. Application information is available at your local USDA Service Centers and at www.nrcs.usda.gov/GetStarted.

For more information about NRCS and the services it provides go to www.ne.nrcs.usda.gov.

NWC holds faculty and stakeholder retreat at NIC

Steve Ress

The Nebraska Water Center held a retreat for university research faculty and stakeholders to discuss leveraging joint capabilities on Sept. 19 at Nebraska Innovation Campus in Lincoln.

The NWC retreats are typically held a couple of times per year, most often in Lincoln, but not always.

The September retreat drew nearly 50 attendees that included faculty and staff from within the University of Nebraska system, from cooperating state, federal and local agencies, a state senator and others.

The day opened with a series of short research presentations by university faculty and staff and agency collaborators, which included:

- Climate and large lake-aquifer systems in the Nebraska Sand Hills, Vitaly Zlotnik
- Impact of variable rate irrigation on consumptive use of water resources, Derek Heeren
- Current projects in collaboration with the Nebraska Water Center, Yusong Li
- Nitrate-mediated uranium mobilization in groundwater, Kerrie Weber
- Nebraska water funding, Carla McCullough and Ryan Chapman, Nebraska Department of Environmental Quality
- Evaluating water quality as a risk factor for adverse health outcomes: The continuing saga of nitrate and atrazine, Martha Rhoades
- Groundwater response to management and environmental factors, Troy Gilmore
- Using watershed boundaries in a geospatial analysis of pediatric cancers in Nebraska, Shannon Bartelt-Hunt
- Update on the USGS Nebraska Water Science Center, Steve Peterson, USGS Nebraska Water Science Center
- Tracking drought impacts, Kelly Helm Smith

Nebraska Water Center director Chittaranjan Ray updated the gathering on research collaborations involving the NWC and on results of NWC's recent external five-year review and expected outcomes from that process.

The remainder of the retreat was primarily spent in small group discussions focused on facilitating connections among faculty and stakeholders, leveraging capabilities and improving professional development opportunities.

Recommendations from those groups and strategies for moving forward concluded the day's activities.



Top; Steve Peterson of the USGS Nebraska Water Science Center presents at the Fall water faculty retreat at Nebraska Innovation Campus. Middle; State Senator Tom Brewer of Gordon (left). Bottom; Kelly Helm-Smith of the National Drought Mitigation Center at UNL makes a presentation at the retreat.



Unmanned Aircraft Research Team: (left to right) Joe Luck, Christopher Neale, Wayne Woldt, George Meyer, Derek Heeren, Yufeng Ge, (inset) Eric Frew.

Drones are buzzing toward increased crop production

Wayne Woldt

A new research project funded by the United States Department of Agriculture and the Daugherty Water for Food Global Institute at the University of Nebraska seeks to deploy unmanned aircraft (drones) in search of improved crop irrigation efficiency. The funding provided by the half million-dollar grant will be used to explore using new aerial robotic technologies to help farmers make informed decisions about managing their complex center pivot irrigation systems.

“This funding recognizes the ability of the University of Nebraska and the Daugherty Water for Food Global Institute, to lead this potentially game changing research,” said Christopher Neale, DWFII director of research and the lead project director. “We have a looming challenge of feeding a growing world population expected to reach nearly 10 billion by the year 2050, effectively doubling the demand for food, and we will need to use every tool and opportunity available to rise to this challenge” he said.

The innovative project will allow a team of engineers to fly drones over crops at the Eastern Nebraska Research and Extension Center near Mead, Nebraska, and collect large volumes of data using advanced remote sensing systems and in-field sensors. The project also involves research collaboration with the University of Colorado-Boulder, Research and Engineering Center for Unmanned Vehicles (RECUV) residing in the The Ann and H.J. Smead Aerospace Engineering Sciences Department.

Eric Frew, Associate Professor and Director of RECUV, said, “This collaboration will be a win-win for both institutions, providing an opportunity for UNL to draw upon our depth of aerospace engineering expertise, while we learn more about agriculture and the challenges of increasing food production efficiency.”

The project will conduct regular flights of unmanned aircraft equipped with multispectral and thermal infrared imaging sensors, from planting to harvest, and also explore a new concept in which an unmanned aircraft is used to communicate with in-field soil water content and canopy temperature sensors.

“Essentially, we will be able to economically collect near real-time crop and soil water content data, that are not currently available, and use these data to create water management prescriptions for newer variable rate center pivot irrigation systems,” according to Wayne Woldt, one of the investigators, director of the NU-AIRE laboratory, and an associate professor in the School of Natural Resources and Department of Biological Systems Engineering. With this sophisticated level of detail, farmers can respond quickly and more accurately to their soil conditions, increasing crop production while maximizing their water use efficiency.

Boosting climate literacy

Haley Apel

The University of Nebraska-Lincoln is working with Nebraska high schools to develop an online tool focused on climate modeling.

Cory Forbes, associate professor of science education in the university's School of Natural Resources, will lead the four-year project funded by a \$1.7 million grant from the National Science Foundation. To develop the curriculum, the team will use global climate models, which are used to produce daily weather reports and climate-related news. While the general public rarely comes into contact with these models, NASA scientists commonly use them.

"A lot of science in today's world is based around these computer-based models, something historically K-12 students don't really have a lot of exposure to," Forbes said. "Students need an understanding of how these models are used in science."



Cory Forbes

Forbes said the team will use climate as a launch pad for high school students to explore other issues related to food, energy and water. For instance, students will use the tool to look at historical data and climate trend predictions in the Great Plains to see how they might impact the agricultural economy and other industries.

Forbes will work with Mark Chandler, a climate scientist at Columbia University who also works at NASA's Goddard Institute for Space Studies; Devarati Bhattacharya, a K-16 STEM education postdoctoral fellow at Nebraska; and partner school districts throughout the state to develop, implement and assess the new curriculum. Funding also supports a doctoral student and undergraduate student researchers.

"We're taking the largest computational models on the planet and getting them into the hands of high school students in

Nebraska," Chandler said.

Martha Shulski, director of the Nebraska State Climate Office, will advise the team on curriculum development.

"Educating youth on climate and climate change will help lead to an informed public that is able to navigate this complex issue that impacts us all," Shulski said.

Climate change is an interdisciplinary core idea included in Nebraska's new science standards. The project also contributes to the missions of the Institute of Agriculture and Natural Resources' (IANR) Science Literacy Initiative and Nebraska Collaborative for Food, Energy and Water Education. They are core parts of IANR's efforts to foster a scientifically literate society capable of making effective decisions grounded in science-informed analysis of complex, real-world challenges associated with food, fuel, water, landscape and people.

Buffett, Johanns join board of directors for Daugherty Water for Food Global Institute

Philanthropist and university lecturer Howard W. Buffett and former U.S. Secretary of Agriculture Mike Johanns have joined the board of directors for the Robert B. Daugherty Water for Food Global Institute (DWFI).

"The University of Nebraska has an opportunity to lead the way in sustainably feeding the world. It's an ambitious vision and we need the right people around the table to achieve it," said NU President and DWFI Board Chair Hank Bounds.

Johanns and Buffett join a prestigious team of advisors on the board, including Bounds, Robert B. Daugherty Foundation Chair Mogens Bay and Chancellor of The City University of New York James B. Milliken.

Together with more than 120 NU faculty and global fellows, DWFI works globally, nationally and in Nebraska to find solutions that contribute to water and food security, leveraging the university's expertise in agricultural research and water management and expanding it through strong local and international partnerships.

Johanns is recognized worldwide as a leader in agriculture and development, serving at virtually every level of government and

successfully leading large and complex organizations over the past three decades. He was elected to the U.S. Senate in 2008, was U.S. Secretary of Agriculture from 2005 to 2007 and served as Governor of Nebraska from 1999 to 2005. His public service began on the Lancaster County Board from 1983 to 1987, followed by the Lincoln City Council from 1989 to 1991 and was elected Mayor of Lincoln in 1991 and reelected in 1995.

Buffett lectures on international food security, foreign aid, and agricultural policy in the College of Agricultural Sciences and Natural Resources at the University of Nebraska-Lincoln. He is also a lecturer in international and public affairs at Columbia University.

He was previously the executive director of the Howard G. Buffett Foundation, which distributes more than \$100 million annually to initiatives that improve the lives of impoverished and marginalized populations across the world.

Buffett also led agriculture-based economic stabilization and redevelopment programs in Iraq and Afghanistan for the U.S. Department of Defense and served as a policy advisor in the White House, where he co-authored the President's cross-sector partnerships strategy, and launched the White House Energy Innovation Conference Series.

The Nebraska Water Center is a part of DWFI.

Minimizing impacts of agriculture on water resources

Pongpun Juntakut

The Chicago Council on Global Affairs is pleased to present the 2017 Next Generation Delegates blog series. This year's Delegation was comprised of 20 outstanding students from universities across the United States and around the world studying agriculture, food, and related disciplines. We were thrilled to feature these emerging leaders at the Global Food Security Symposium 2017, and look forward to sharing the exciting work of this extraordinary group.

Due to increasing population growth and food demand around the world, global food crises are increasingly likely to happen. Thus, food security can be a powerful tool to mitigate violence and conflict, and to promote national security. The Chicago Council on Global Affairs' Global Food Security Symposium presented these ideas in a new perspective to me, and prompted me to rethink the role of the military in achieving national security by increasing food security.

While the Symposium focused primarily on global food security, it's important to remember that agriculture—and therefore food security—is inexorably linked to water security. To ensure sustainable development of food systems, we must also conserve natural resources and minimize the impact of intensive agriculture on fresh water. Groundwater is a major resource for agriculture and human consumption worldwide, especially in the United States, but has been impacted due to application of nitrogen fertilizers in agricultural areas. The US Geological Survey (USGS) reported in 2016 that more than one million private domestic wells during 2012-2013 are located in risk areas where the nitrogen concentration is above the standard limit of 10 mg of nitrogen per liter of water, as regulated by the US Environmental Protection Agency (EPA). Drinking nitrate-contaminated water can cause various health problems, including a temporary blood disorder in infants called blue baby syndrome, as well as cancers and other chronic conditions. Most nitrogen compounds in commercial fertilizers and manure can be converted to nitrate. Nitrate is highly soluble in water and can easily be transported through soil to groundwater. Thus, controlling and monitoring nitrogen leaching from agricultural areas is important for planning and controlling nitrate occurrence in groundwater.

Nebraska, for example, has a large number of wells dug where the nitrate concentrations in groundwater are above the drinking water standard set by the EPA. A major cause of nitrate concentration in wells is due to extensive fertilizer application. Currently, more application of nutrients, pesticides, and irrigation water has increased crop yield. The high nitrogen contamination in groundwater is also causing uranium in the aquifer to oxidize and become more soluble. As a result, Nebraska's Natural Resources Districts (NRDs) started a groundwater quality management program (GWQMP) in 1988 to monitor the nitrate occurrence with four different phases. Phase I, II, III and IV have been

classified based on nitrate concentrations of ≤ 7.5 , 7.6-15, ≥ 15 mg nitrogen per liter of water, and not declining at acceptable rate of nitrate-to-nitrogen levels, respectively. Within the areas of Phase II and III, the timing and application rates of nitrogen fertilizer on irrigated agriculture are regulated. In Nebraska, nitrogen application is not allowed before the first of March. Additionally, the state is trying to control over-application by taking credits for organic matter conversion to nitrogen, manure, and other organic manure additions and by irrigation with nitrogen-contaminated groundwater. Furthermore, it's recommended that farmers apply their fertilizer in multiple applications, with no more than half their allotted nitrogen applied prior to planting.

And this isn't only an issue in the United States. In the developing world—in countries like Thailand, where I'm from—treating contaminated groundwater is expensive, sometimes prohibitively so. In such situations, the need to prevent nitrogen from leaching into the groundwater in the first place is more important than ever. Best practices, like preventing farmers from over-applying nitrogen to their fields, and encouraging farmers to use appropriate fertilizer management and irrigation practices, are some of the best ways to prevent groundwater from becoming contaminated. These are important steps to take to preserve quality drinking water, and by extension, water and food security. As described, in order to produce sustainable food systems, we must consider the impact of intensive agriculture on water resources. I strongly believe that experience and knowledge gained from my time at the University of Nebraska, and at the 2017 Global Food Security Symposium, will enable me to tackle these lessons learned at home in Thailand, and apply them to any developing country in need.



(Pongpun Juntakut is a Ph.D. candidate in UNL's Department of Civil Engineering and 2017 Next Generation Delegate. At UNL, Juntakut's studies are under the direction of Chittaranjan Ray, director of the Nebraska Water Center, part of NU's Daugherty Water for Food Global Institute).

Husker Harvest Days exhibits key to strengthening Nebraska's ag economy

Steve Ress

University of Nebraska exhibits at this year's Husker Harvest Days show near Grand Island focused on showing farm and ranch families how small changes can bring big payback.

“Small Changes, Big Payback: Strengthening Nebraska's Agricultural Economy” themed exhibits at the Sept. 12-14 fully irrigated farm show.

Exhibits inside the IANR building looked at:

- Specific strategies for managing family budgets during challenging economic times; making informed choices in terms of food, entertainment, utilities and other monthly expenses.
- The relationship between cost, nutritional value and impact of various feed sources for cow/calf operations in order to make better management decisions
- Understanding county-by-county differences in risk factors that affect crop insurance rates and how they affect profitability and management decisions for farmers
- How farmers can better utilize the Farm Bill safety net during a time of transition into new realities in the agricultural marketplace
- Benchmarking the true costs of pumping irrigation water in order to better control input costs and make decisions related to pump efficiency and energy usage, which was presented by the Daugherty Water for Food Global Institute
- Crop production strategies that can have a positive bottom-line impact on cost-per-acre and profit margins
- Using crop budgets to analyze operating costs for a farm
- An update on UNL's annual survey of agricultural land value and rental rates in Nebraska.

Additional exhibits featured demonstrations related to irrigation efficiency and reducing irrigation pumping costs including variable rate irrigation, variable frequency drives, running sprinklers down in the canopy, and using the IrrigatePump app, and a solar-powered cell phone charging station.

“This year marks Husker Harvest Days 40th anniversary and IANR has been a proud part of it ever since the very first show in 1978,” Boehm said.

The Nebraska Water Center was a charter university exhibitor at the show and has helped organize and facilitate Nebraska Extension and research exhibits there for the past 10 years.



“Small Changes, Big Payback: Strengthening Nebraska Agricultural Economy” Was theme for annual Husker Harvest Days



Top; Ron Seymour greets showgoers visiting University of Nebraska exhibits. Middle; John Hay talks about the economics of solar electrics at a his cellular phone charging station.



Top; Lieutenant Governor Mike Foley (right) tours Nebraska Etension and research exhibits. Right; Jenny Rees engages show attendees.



Denny Bauer talks to a showgoer about cutting the cost of feeding cattle.



FFA students get signed-up for the CASNR scavenger hunt at HHD.



“Small changes, big payback” was the theme for Nebraska Extension and research exhibits at this year's Husker Harvest Days show near Grand Island.

Four States Irrigation Council visits central Nebraska

Nearly 60 people toured irrigation and public power districts and other water, industry and agriculture sites in central Nebraska as part of the Four States Irrigation Council's summer tour.

Based in Grand Island, the two-day tour visited a number of irrigation districts in the Loup and Platte River basins, including Loup Public Power District, Middle Loup PPID, North Loup PPID and Twin Loups ID.

Attendees were also treated to tours of Diamond Plastics Co. in Grand Island, one of the world's largest producers of piping for irrigation and utilities use, Preferred Sands and the iconic, Depression-era Columbus hydro plant as well as Sherman and Calamus Reservoirs.

Also part of the event were tours of the Nebraska State Fairgrounds in Grand Island and Fort Hartsuff State Historical Park near Burwell.

Ben Beckman and Steve Ress of the Nebraska Water Center attended the tour, with most attendees coming from Nebraska, Kansas, Wyoming and Colorado, the four states comprising the council.

Four States Irrigation Council holds their summer tour every other year, rotating it among the four member states, making this summer's Nebraska tour the first in the state since 2009.

Nebraska Water Center's Ben Beckman (center) on tour with the Four States Irrigation Council in June. The 4-Statyes tour visits Nebraska every eight years.



The Loup Public Power District diversion dam above Columbus. Water levels in the Loup Rivers were high during a Four States Irrigation Council tour of the basin in June.



Water flows fast from a diversion dam at Ord during the Four States Irrigation Council tour in June.



Floodwater and stormwater can contaminate water wells

Meghan Sittler

Over the past month, images of the flooding associated with Hurricanes Harvey and Irma have shown the power water can have on people, property and the landscape. The historic and catastrophic storms have left more than a billion dollars in damage in its wake and will have forever reshaped the natural and built environment in southeast Texas and Florida.

The extreme flooding also resulted in thousands of people losing access to safe drinking water and exposure to floodwaters containing untreated wastewater. Impacts to water systems and water quality are often not as visible as the damage to property or the landscape. Additionally, rainfall does not have to be on the level of those from a storm like Hurricane Harvey or Irma to result in flooding or stormwater runoff that can pose serious risks to water systems and human health.

Nebraska is fortunately not subject to the devastating impacts of hurricanes. However, heavy rains are common to Nebraska and can produce high volumes of stormwater runoff, flash flooding or floods from swollen creeks, rivers and reservoirs that can persist over days, weeks or even months.

The likelihood of flooding or frequent occurrence of significant stormwater runoff is generally higher in eastern Nebraska because of higher average rainfalls, heavier clay soils that are not able to absorb rainfall very quickly, as well as, larger river systems and a corresponding higher number of smaller contributing watersheds. Those natural characteristics combined with the higher population of people residing in Eastern Nebraska, means there are more people with a higher potential to experience impacts from floods and stormwater runoff.

Floodwater and Stormwater Hazards to Drinking Water

Floods are high volumes of water flow over areas that are normally dry land. They affect houses, infrastructure, businesses, farmland and other areas where chemicals, fuel, bacteria and other potential pollutants harmful to human health and the environment may be located. Those contaminants travel with the floodwater, often in very high volume, as it courses over and accumulates across the landscape. The result is a significant and serious risk to essentially anyone or anything the floodwater has contacted, including individual drinking water wells or community water systems.

Floodwaters can fully inundate water wells for days or weeks. The force of floodwaters can also disrupt or damage well or water supply infrastructure and directly introduce the contaminated water into the well.

Stormwater runoff is water from rain or melting snow and ice that does not soak into the ground. Stormwater can be thought of simply as rainwater or snow melt that leaves a downspout on a house, runs down the driveway or across the yard and is far more common than floods.

In urban areas where paved surfaces are more common, stormwater can accumulate in larger volumes and travel more quickly than in suburban or rural areas such as acreages or farmsteads.

Regardless of where stormwater runoff occurs, like floods, it can carry with it harmful contaminants such as soil, animal waste, salt, pesticides, and oil which can potentially impact drinking water wells and water quality. Contaminant-laden runoff can enter drinking water wells through well casings or caps that may not be completely water tight or through infiltration into more shallow groundwater resources.

Runoff is less likely to introduce contaminants into deep wells that have been properly constructed, sealed and maintained. However, any potential introduction of contaminants into the well, can pose at least a short-term risk to water quality and human health.

Testing, Treatment, Mitigation

If an individual drinking water well is impacted by a flood, it is critical to stay away from the well while floodwaters are present to prevent potential electrical shock from the pump. It is also critical that the water is not used for drinking, washing dishes or clothes or bathing to avoid the potential to become sick or have a topical reaction. Bottled water should be used or the water should be boiled prior to use.

A certified water well professional should assist with cleaning the pump, flushing and disinfecting the well. They should also perform any other maintenance needed to ensure the well is operating properly. The water should be tested for potential contaminants prior to resuming using the water.

Stormwater runoff, unlike floods, can be more easily and consistently managed to protect drinking water wells. A good practice is to take a moment to watch how stormwater runoff flows away from a home or across a driveway or yard during and immediately after rains. If it is running into the vicinity of a well or is accumulating near the well it needs to be redirected to prevent it from entering the area.

Some easy and largely cost-effective methods to better manage or redirect runoff include:

- changing the length or direction of your downspouts.
- installing a rain barrel to collect rainwater for reuse.
- use gravel, pavers or rock for walkways instead of concrete.
- adding mulch or different types of grasses or landscaping can help slow, retain or redirect stormwater runoff.
- Pollutants available for runoff to “grab” and carry with can be reduced by:
 - applying pesticides or fertilizers according to label directions and not within 24-hours of forecasted rain.

- preventing oils or other automotive fluids from being dumped on the ground.
- sweeping grass clippings and other yard wastes off paved surfaces and away from runoff routes
- removing pet waste from the yard.

Preventing potential impact from stormwater runoff also includes inspecting the well regularly to identify any cracks in the cap or casing. If runoff has pooled near the well over time or if any cracks are noticed, a water quality test should be performed to ensure the water is free of potentially harmful contaminants.

Continued from page 1

2018 Water Tour Heads West to Wyoming

Tour planning is just beginning, but there is always much in the way of water topics to discuss and things to see along both the North and South branches of the Platte River.

“Nebraska, Wyoming and Colorado rely on the waters of the Platte Basin for irrigation, hydropower generation, recreation, wildlife habitat and groundwater recharge and the states are bound to share the water through interstate compacts and decrees,” said co-organizer Jeff Buettner of The Central Nebraska Public Power and Irrigation District in Holdrege. “Tour discussions will likely include topics such as water for wildlife habitat, effects on the rivers from invasive species, irrigation efficiency and generation of hydroelectric power.”

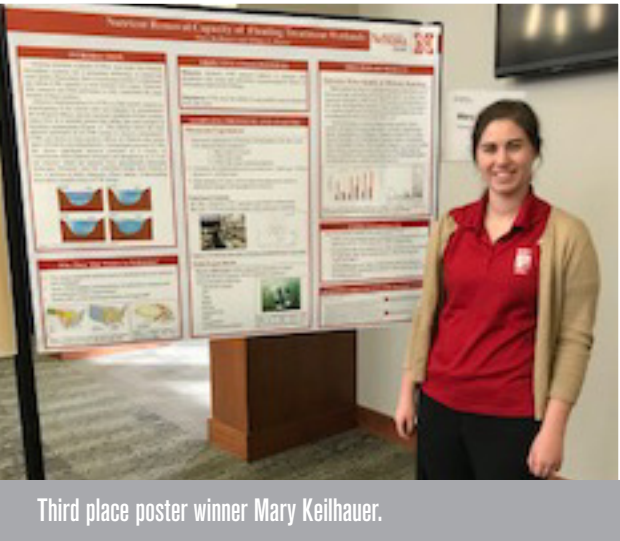
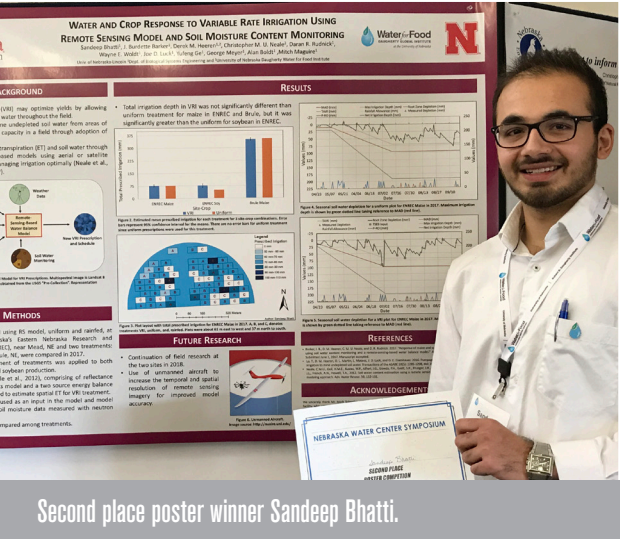
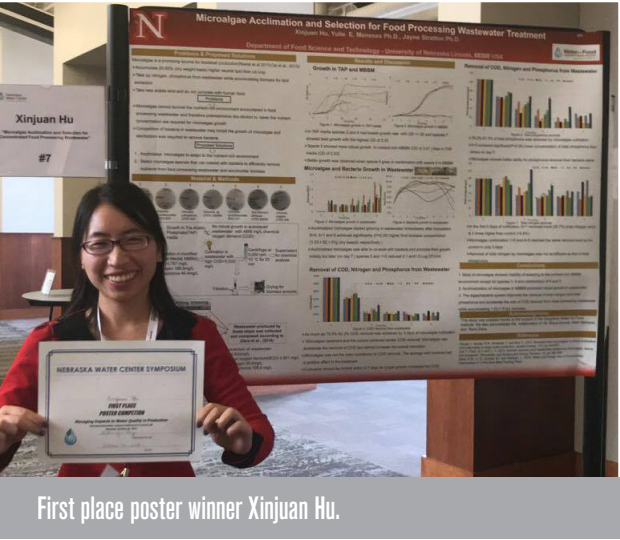
Those discussions could also include issues facing local irrigation districts, canal companies, and Natural Resources Districts and an overview of North Platte River operations, Buettner added.

The tour is expected to fill quickly. Registration will be in the spring of 2018 and will be announced well ahead of time.

Planning and registration updates will be posted at watercenter.unl.edu

The tour last visited the North Plate Project in 2014.

Water symposium poster winners



Nebraska leads soybean production yield gap project

A paper published in *Agricultural and Forest Meteorology* details University of Nebraska–Lincoln efforts to identify causes for yield gaps in soybean production systems in the north central region of the United States.

Average soybean yield in the north central region from 2010-2014 was 43 bushels per acre, yet some producers reached yields of over 80 bushels per acre.

The three-year study, led by Patricio Grassini, an assistant professor in the university's Department of Agronomy and Horticulture, and Shawn Conley, an associate professor in the Department of Agronomy at the University of Wisconsin, sought to identify causes of yield gaps over large agricultural areas and diverse in climate and soils. Faculty from 10 land grant universities looked at rain fed and irrigated soybeans in the north central U.S., which accounts for roughly one-third of worldwide soybean production.

Grassini and his colleagues explored the use of producer survey data as an alternative approach to traditional field research to identify management practices that explain highest soybean yields for different combinations of climates and soils. To obtain real-world producer data, they relied on Nebraska's Natural Resources Districts and 20 Nebraska Extension educators. In total, 3,568 soybean fields across 10 states were surveyed for this study, covering approximately 300,000 acres.

"Regional soybean yield was on average 22 percent and 13 percent below the yield potential estimated for rain fed and

irrigated soybean," said Grassini. "Sowing date, tillage and in-season foliar fungicide and/or insecticide were identified as explanatory causes for yield variation."

To reach these conclusions, researchers combined producer survey data with a spatial framework to measure yield gaps, identify management factors explaining the gaps and understand the biophysical drivers influencing yield responses to field management. According to Grassini, earlier sowing dates was the most consistent management factor leading to yield increases.

Juan Ignacio Rattalino, a research assistant professor at Nebraska who authored the paper, sees this study as a proof of concept about the power of using producer data to identify opportunities for improving farm management and profit.

"There are a lot of studies about yield response to planting date but this is the first one to explain why such response varies across years and regions. We found that the yield benefit derived from earlier planting depends on the degree of water limitation during the period of pod setting in soybean," Rattalino said.

\$1.4 million from the North Central Soybean Research Program, with complementary funding from the Nebraska Soybean Board and Wisconsin Soybean Marketing Board, supported the study. Other institutions involved include Iowa State University, Kansas State University, Michigan State University, North Dakota State University, Ohio State University, Purdue University, University of Illinois-Champaign, and University of Minnesota.