

Water and natural resources tour examines Platte River basin June 27-29, 2017

The next Water and Natural Resources Tour will examine surface and groundwater issues in the central Platte River basin June 27-29, 2017.

“This is a critical stretch of the (Platte) river that has many faceted and far-reaching impacts on all Nebraskans. It is tremendously important for agriculture, Nebraska’s economy, recreation, hydropower production, fish and wildlife and many others issues,” said Steve Ress, communicator for the University of Nebraska’s Nebraska Water Center (NWC),

part of the Robert B. Daugherty Water for Food Global Institute (WFI).

NWC and WFI co-host and help plan the annual tour with The Central Nebraska Public Power and Irrigation District UNL’s Institute of Agriculture and Natural Resources, among others.

They began as summer irrigation field tours that were initiated by then UNL Chancellor D.B. “Woody” Varner more than 40 years ago.

“The scope and emphasis of the tours

has evolved and broadened since then to encompass many other water and environmental-related topics impacting Nebraska,” Ress said.

Early planning and discussions for the three-day tour have stressed touching on all of the sometimes competing uses for the basin’s waters as they flow slowly east to the Missouri River.

Surface and groundwater irrigation, water rights, production of hydropower and water for fish and life and for recreation will be high among the list of topics.

It is likely the tour will begin and end in Holdrege.

Points of interest on the tour could include organic farming near Bertrand, irrigation and hydropower production by CNPPID and Nebraska Public Power District, Nebraska Game and Parks Commission facilities, area Natural Resources District projects, origins of surface irrigation and the beginnings of large-scale irrigation projects in the 1940’s and 1950’s.

Also being considered are stops at Frito-Lay’s Gothenburg Corn Handling Facility and Monsanto’s Water Utilization Learning Center.

Cropping and irrigation technology experts at UNL’s West Central Research and Extension Center in North Platte will be on the tour’s agenda, along with a stop at the North Platte Fish Hatchery and at newly completed water transfer and pipeline facilities built by the Nebraska Cooperative Republican Platte Enhancement Project (NCORPE).

As the tour moves west, focus will shift to Lake McConaughy and the Ogallala

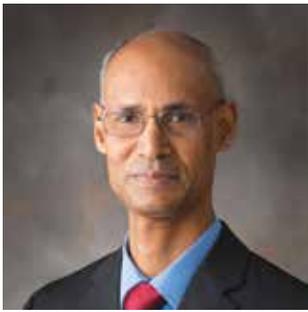
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Kingsley Hydro Plant and Lake Ogallala just east of Lake McConaughy.

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Research workshops are local to global; efforts on grants, collaborations continue

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

Over the past three to four months, there has been a great deal of national and international travel on my part, along with plenty of activity closer to home, all in pursuit of strengthening old connections and forging new ones that will ultimately help the Nebraska Water Center, the Daugherty Water for Food Global Institute (WFI) and the University of Nebraska as we strive to grow and enhance our reputations as leaders in water research and education.

In July I was very gratified to return to Prague, Czech Republic for final evaluations and closure of last summer's International Research Experience for Students (IRES) collaboration with Czech Technical University. In that program were four University of Nebraska-Lincoln students who spent two months conducting research on the vadose zone water flow and chemical transport. We are now accepting applications for this coming summer's program. Science and engineering students who want to be considered for an IRES internship can find information and applications online at ires.unl.edu.

Following quickly on the heels of that trip was another to Ethiopia in mid-August with a group of universities organized by Texas Tech University to examine potential areas for collaboration, student/faculty exchanges, etc. I presented the capabilities and interests of the Daugherty Water for Food Global Institute and then spent two more days visiting the International Water Management Institute and the University of Addis Ababa.

Returning home, my UNL Department of Civil Engineering Ph.D. student Pongpun (Num) Juntakut and I spent some time at Colorado State University in Fort Collins, Colo. to attend a training course on integrated surface-groundwater modeling (SWAT-MODFLOW) as well as DSSAT (a crop modeling tool). What we learned in these training courses will be put to use in the work we are doing as part of the recently awarded U.S. Department of Agriculture/NIFA grant project on sustainability of the High Plains/Ogallala Aquifer. This is a very exciting, far-reaching project that involves faculty, staff and students from an array of universities across the High Plains region of the U.S.

Also in September, Ben Beckman and I attended the Nebraska Association of Resources Districts annual conference in Kearney, an event NWC helps sponsor. This was a great opportunity for the two of us to interact with statewide NRD staff and general managers to help identify areas where the 23 individual NRDs can utilize NU research and Nebraska Extension expertise to help them manage the state's groundwater assets. Ben, by the way, joined NWC

staff in early August after spending the last two years of his professional career in Nebraska Extension's Pesticide Education Office. He was hired by and works jointly with the NWC, WFI and Nebraska Extension and spends the majority of his time working to improve collaborations between those three entities and the NRDs, state and federal agencies, irrigation districts and other organizations and groups working on Nebraska water quantity and quality issues. He is already proving himself to be a quick study. If you have not yet met Ben, I'm sure you will in the coming months as he travels across the state.

We held our fall faculty research brainstorming meetings on August 30 at Lincoln's Wilderness Ridge with about 40 faculty members, agency representatives and others attending this one-day meeting to discuss what grant proposals might be undertaken. Now we are working on a NSF-NRT (Graduate Traineeship) proposal for which I was selected to submit one of the two proposals from UNL. I am very pleased with the increasing level of participation in these semi-annual retreats, which are bearing real fruit in terms of increased cooperation among NU water faculty in developing and writing research grant proposals. The meetings have been a huge catalyst toward more and better grant writing.

In mid-September we hosted an international-level Organization for Economic Cooperation and Development (OECD) workshop that I felt was an unqualified. OECD organizers called it one of the best organized and most collegial they have had to date. The workshop was for water researchers from around the world on "Virtual water in agricultural products: Quantification, limitations and trade policy." Part of the workshop was held at Lincoln's LICOR Biosciences and part at Farm Progress Co.'s Husker Harvest Days commercial farm show near Wood River where Nebraska Extension and UNL's Institute of Agriculture and Natural Resources have a significant presence in research-based exhibits. Two days of the three-day workshop were dedicated to formal research presentations. This was a great opportunity for our NU research faculty to collaborate in the emerging area of "virtual water" which is attempting to quantify the amount of water used and exported in food production.

Our annual symposium on "Managing an Essential Resource: Basin-by-Basin" (largely panel discussions on the overall state of Nebraska's major river basins) was Oct. 20 with about 170 attending, followed by the Nebraska Water Law Conference Oct. 21, with about 130 attending. Both events were at Nebraska Innovation Campus for the first time. Lee Orton and W. Don Nelson were both stellar in working with me to organize the symposium and invite speakers, as was Anthony Schutz from NU's College of Law for the water

law conference. These events are broadly co-sponsored and supported by the NU College of Law, WFI, Nebraska State Bar Association, and USGS Nebraska Water Sciences Center. We had a very well attended Water Resources Advisory Panel (or WRAP) breakfast meeting the morning of the law conference and I want to take this opportunity to say once again that we appreciate all the guidance this group provides. I want to especially recognize our program assistant, Tricia Liedle, who did an absolutely phenomenal job in organizing the myriad details necessary to make both events the huge success they were.

WFI proposal development coordinator Karen Hansen helped finish a proposal to the National Science Foundation for conducting a workshop at the Indian Institute of Science at Bangalore, India with a focus on food, energy and water nexus. Results of this proposal are not yet known.

I was pleased to see former Ph.D. student Tony Carr's thesis research (co-authors Haishun Yang and myself) was recently published by the journal PLOS ONE. "Temporal Variations of Water Productivity in Irrigated Corn: An Analysis of Factors Influencing Yield and Water Use across Central Nebraska" can be found online at <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0161944>

Planning has begun in earnest for next year's Water and Natural Resources Tour that will be in the central Platte River basin June 27-29, 2017. Since our longtime tour organizer Mike Jess has retired, WFI education and outreach associate Jesse Starita and Ben Beckman have joined our communicator, Steve Ress and Jeff Buettner of The Central Nebraska Public Power and Irrigation District on the tour's core planning committee. The tour will theme around critical surface and groundwater use and integrated management planning in what is arguably the most critical stretch of Nebraska's most important river basin.

For the ninth straight year, Steve Ress was responsible for IANR facilities and oversaw Nebraska Extension and research exhibits at the annual Husker Harvest Days farm show. This event is recognized by IANR and the UNL Chancellor's office as critical to bringing the campus to the people in showcasing the latest in applied research and Extension programming and for student recruitment for IANR colleges. Ress began exhibiting at the show in 1997, so has a very long association there. For the second year, NU exhibits were themed to helping farmers and ranchers adapt and prosper during times of weather extremes and climate change.



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Water Tour

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area with a possible tour not only of Lake McConaughy facilities, but also of NPPD's coal-powered Gerald Gentleman Station near Sutherland.

A canoe or kayaking trip in the Plum Creek Reservoir/ Gallagher Canyon area is being considered on the tour's third and final day.

"We want to include as many entities and organizations with a stake in using the basin's waters as we possibly can and to presenting as broad an overview of why this stretch of the river is so important to all of us as we can in three days," Ress said.

The latest tour information will be online at watercenter.unl.edu. Organizers anticipate limiting registrations to about 55 people and to opening registration in early May 2017.



Rail cars at Frito-Lay's Gothenburg corn handling facility.



Gothenburg's Frito-Lay corn handling facility is one of the largest such facilities in the U.S.



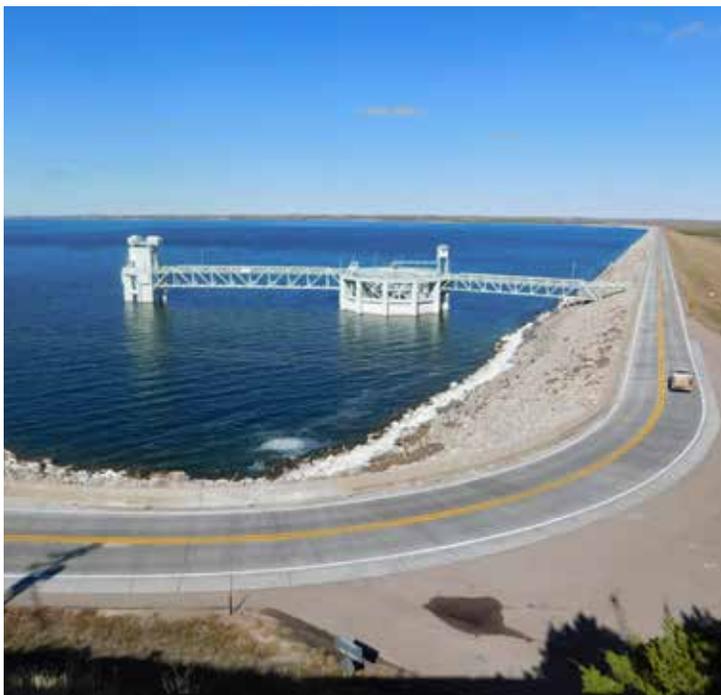
Nebraska Public Power District's Gerald Gentleman Station and Sutherland Reservoir.



The Central Nebraska Public Power and Irrigation District's historic Jeffrey Lodge near Brady.



Ben Beckman and Jeff Buettner look over the control panel for a hydro-power station at Johnson Lake.



Lake McConaughy and Kingsley Dam near Ogallala.



NCORPE general manager Kyle Sheperd with Jeff Buettner and Ben Beckman during water tour planning discussions.



Chittaranjan Ray and W. Don Nelson open the symposium.



Symposium co-organizer Lee Orton

Water symposium and law conference at Nebraska Innovation Campus

Steve Ress

Basin-specific panels took a long and detailed look at water management in Nebraska at the University of Nebraska's annual water symposium and water law conference that were held Oct. 20 and 21.

The back-to-back events were at Lincoln's Nebraska Innovation Campus for the first time.

"At the first day's symposium, the panels discussed what basin groups have concluded about state water policy and goals, objectives and problem areas in each basin," said Lincoln attorney Lee Orton, who helped plan the symposium agenda with Prairie Fire publisher W. Don Nelson and Nebraska Water Center director Chittaranjan Ray.

Among the problems experienced in water management and planning for each of the state's major river basins are supply, political structures, past management and development characteristics and other topics.

"The current state of water planning and management in each basin was front-and-center in the discussions, along with unique and shared problem areas," Ray said.

Panels covered the Upper Platte, Lower Platte, Republican, Blue and Niobrara basins. Panel members came from a wide array of local, state, federal and private water interests.

Bob Swanson, director of the U.S. Geological Survey's Nebraska Water Sciences Center also gave an update on USGS research work in Nebraska.

Afternoon talks keyed on work being done by the Nebraska Department of Natural Resources and views from some of the state's largest utilities, including Omaha's Metropolitan Utilities District, Lincoln Water and the Omaha Public Power District.

Christine Reed of the University of Nebraska, Omaha led an integrated management plan panel discussion prior to a wrap-up by Orton and Ray.

The following day NWC and the University of Nebraska College of Law presented the Nebraska water law conference.

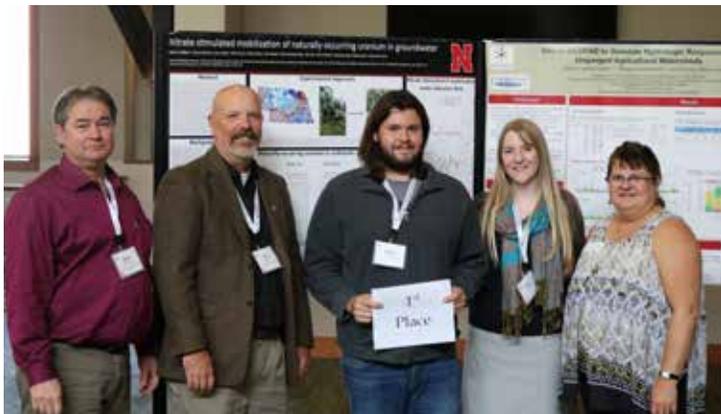
Organizer Anthony Schutz of the Law College opens with sessions on Water Law 101 and updates in current water law followed by attorneys Mike Klein and Justin Lavene on "Takings claims."

Attorney Don Blankenau kicked-off a conjunctive management session on western Nebraska's NCORPE project, followed by Upper Niobrara-White NRD manager Pat O'Brien on Niobrara transfers and Central Platte NRD manager Lyndon Vogt on short-term auctions in the Central Platte NRD.

Pre-lunch keynote speaker Roger Patterson addressed what California has learned from Nebraska as the Golden Gate state manages one of the worst ongoing droughts in its history.

In the afternoon, Lincoln attorney Stephen Mossman discussed landowner drainage liability and Drake University's Jerry Anderson talked about the recent Des Moines, Iowa water litigation followed by water quality discussions on Nebraska nitrates by Michael Linder and lessons from Flint, Michigan by Rick Kubat of Omaha's Metropolitan Utilities District. Attorney Lash Chaffin looked at the ethical dimensions of that event.

Annual water symposium and water law conference are at Nebraska Innovation Campus



First place poster winner Jeffrey Westop with (from left) Mark Burbach, Dick Ehrman, Kate Gibson and Tricia Liedle.



Second place poster winner Jodi Delozier with (from left) Kate Gibson, Dick Ehrman, Mark Burbach and Tricia Liedle.



Third place poster contest winners Craig Adams and Jordan Shields with (from left) Kate Gibson, Mark Burbach, Tricia Liedle and Dick Ehrman.



Daryl Andersen, Little Blue NRD



Symposium attendees begin filling the NIC conference room.

Annual water symposium and water law conference are at Nebraska Innovation Campus



Lincoln attorney Don Blankenau and Lyndon Vogt of the Central Platte NRD



Brad Edgerton, Frenchman-Cambridge Irrigation District



Jeff Fassett, Nebraska Department of Natural Resources



Earl Green of the U.S. Geological Survey



Jerry Kenny, Platte River Recovery Implementation Program



Nebraska Extension educator Meghan Sittler



U.S. Bureau of Reclamation's Carlie Ronca



Nebraska Water Law Conference organizer Anthony Schutz

NWC, Daugherty Global Institute, OECD partner on “Virtual water” talks

Steve Ress

Water researchers from around the world gathered for a three-day workshop “Virtual Water in Agricultural Products: Quantification, Limitations and Trade Policy” at LI-COR Biosciences and Nebraska Innovation Campus on September 14-16.

Sessions were organized and sponsored by the Nebraska Water Center (NWC), part of the Robert B. Daugherty Water for Food Global Institute at University of Nebraska (WFI). Financial support came from the Organization for Economic Cooperation and Development (OECD), University of Nebraska-Lincoln Institute of Agriculture and Natural Resources (UNL IANR) and WFI.

Presentations and discussions themed on transfer of “virtual” surface and groundwater from river basins and regional aquifer systems among OECD member countries to determine how to better define and use this concept in structuring sustainable food production systems.

“Virtual water” is an attempt to quantify the amount of water used and exported in food production. There is wide spread

debate about the sustainability of “virtual groundwater” that is used and exported from regional aquifers and its transfer to other countries.

LI-COR Biosciences, which designs and manufactures specialized instruments supporting research, environmental and agriculture-based activities, hosted the first morning sessions, followed by a field trip for participants to view Nebraska Extension exhibits at the annual Husker Harvest Days irrigated farm show near Grand Island. This is the largest fully irrigated working farm show in the nation. It has had an extensive Nebraska Extension and research presence since opening in 1978. Workshop participants toured exhibits and met with NWC communicator Steve Ress, who coordinates UNL presence at the show for UNL’s IANR.

Vangimalla Reddy of the U.S. Department of Agriculture’s Agricultural Research Service opened the meeting at LI-COR with remarks on the work and goals of OECD’s cooperative research program on biological resource management for sustainable agricultural systems.

His remarks were followed by a workshop overview by NWC director Chittaranjan Ray and a presentation on virtual water definition and water footprint calculations by WFI’s Mesfin Mekonnen. LI-COR scientists and management then toured attendees through the facilities.

Morning sessions on the workshop’s second day were keyed to “Virtual water in trade and agriculture, global markets and trade” with introductory comments by Ron Yoder, IANR interim vice chancellor, and Peter McCornick, WFI executive director. Afternoon discussions centered on “Quantification of water footprint in agro-food, fishery and forestry sectors”.

On the third and final day of the workshop, sessions were devoted to the broad topics of “Sustainability concerns for large U.S. aquifers” and “Case studies from around the world.”

Ray said that top-level researchers from across the U.S. and around the globe were represented in the discussions. These included researchers from Japan, Chile, the United Kingdom, Canada and Spain, as well as from Kansas, Illinois, California, Texas and a large contingent of NU researchers.

“OECD is a productive and prestigious organization that helps facilitate collaborations among researchers globally and we are very pleased to be involved with and helping to plan on that level of potential research collaborations,” he said.



Nebraska Water Center director Chittaranjan Ray (left) and OECD “Virtual Water” workshop attendees at the Husker Harvest Days farm show near Wood River.



Steve Ress (center) talks to “Virtual Water” participants about Nebraska Extension and research exhibits at September’s Husker Harvest Days show near Wood River.

WRAP meets ahead of October law conference

Steve Ress

The University of Nebraska's Water Resources Advisory Panel (WRAP) met for breakfast and discussions on October 21 at Nebraska Innovation Campus, just before that day's Nebraska Water Law Conference.

Jim Macy of the Nebraska Department of Environmental Quality commented that the department is anxious to strengthen its engagement with UNL through its "Grow Nebraska" initiative.

Nebraska Water Center (NWC) director Chittaranjan Ray updated the panel on research activities, including work funded by the U.S. Geological Survey and NU's role in the ongoing U.S. Department of Agriculture/NIFA Ogallala/High Plains Aquifer sustainability study being conducted in cooperation with colleagues from Colorado State University and other institutions. He also updated the group on progress on vadose zone nitrate and pesticide studies being conducted in the Hastings area in conjunction with the Water Sciences Laboratory, which is part of the NWC.

Jeff Fassett, director of the Nebraska Department of Natural Resources, said DNR is at or near the tipping point on many state water issues and that they would continue looking to UNL for more help wherever possible.

WRAP member Bob Bettger echoed those comments, noting there are many places UNL can get more involved in areas of agriculture and water economics, soil erosion and water quality issues, especially the economics of conservation measures.

Bettger said Iowa studies have indicated that state's economy is losing as much as \$1 billion per year due to soil losses from erosion.

Later, UNL irrigation engineer Derrel Martin said one of the challenges with UNL helping to solve these and other issues lies in how best to connect new faculty members and their areas of expertise with the needs of the state.

Lee Orton, of the Nebraska Well Drillers Association, mentioned the hiring of new

Nebraska Extension educator Meghan Sittler who is now working statewide from the Lancaster County office on domestic water and wastewater management. Sittler formerly coordinated the Lower Platte River Corridor Alliance.

Mark Brohman of the Nebraska Environmental Trust said the trust has received \$68 million in requests for funding assistance for a record \$19.5 million in available trust funds.

Jerry Kenny of the Platte River Recovery Implementation Program updated the group on a number of Platte River items, including that there will be an extension of the first increment's water goals, a possible inter-basin transfer of water project at Turkey Creek, and said there was currently a good deal of research and monitoring activity going on in the basin.

Interim NU vice president and vice chancellor of UNL's Institute of Agriculture and Natural Resources Ron Yoder reported that an announcement would likely soon be coming on who the next vice president and vice chancellor would be.

Steve Ress of the Nebraska Water Center reported that the next water and natural resources tour would be in the central Platte River basin June 27-29, 2017.



NU's Water Resources Advisory Panel, or WRAP, met at Nebraska Innovation Campus in October.



UNL's Derrell Martin, Daugherty Water for Food Global Institute's Peter McCormick and Mark Brohman of the Nebraska Environmental Trust share thoughts at October's WRAP meeting.

Extension and research exhibits at Husker Harvest Days “Weather Ready Farms: Successfully Weathering Extremes” Sept. 13-15, 2016



UNL Chancellor Ronnie Green (center) speaks with Kelly Smith and Mike Hayes of the National Drought Mitigation Center.



Crowds through the Husker Harvest Days farm show near Wood River.



Ivo Zution Goncalves and Mesfin Mekonnen of NU's Daugherty Water for Food Global Institute look over new irrigation equipment.



Jesse Starita and Num Juntakut look at irrigation equipment.



Peter McCornick, executive director of the Daugherty Water for Food Global Institute (second from left) talks with Nebraska Extension's Stonie Cooper, Randy Saner and Al Dutcher



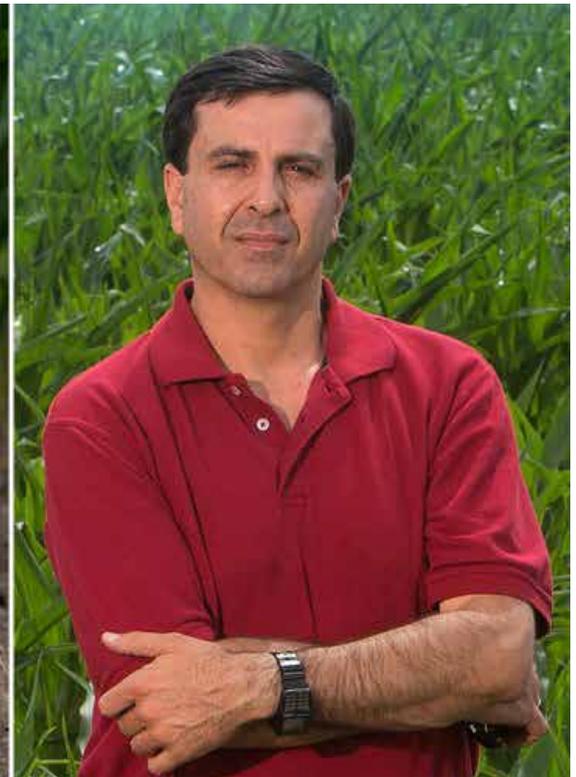
Governor Pete Ricketts visits UNL exhibits.



Students sign-up for IANR College of Agricultural Sciences and Natural Resources on-grounds scavenger hunt.



Nebraska Water Center communicator Steve Res (center left) and director Chittaranjan Ray (center right) talk to virtual water workshop participants about Husker Harvest Days. Res has coordinated IANR and Nebraska Extension exhibits for nearly 10 years.



NSF grant supports next-generation underground sensors

Mehmet Can Vuran, UNL Department of Computer Science and Engineering (left), and Suat Irmak, UNL Department of Biological Systems Engineering, are partnering on an NSF grant to develop underground sensor technology for crop irrigation.

University of Nebraska–Lincoln researchers have earned a \$450,000 grant from the National Science Foundation to develop a second generation of underground sensor technology that can automate decision-making when it comes to irrigating crops.

Mehmet Can Vuran, Susan J. Rosowski Associate Professor of Computer Science and Engineering; and Suat Irmak, Harold W. Eberhard Distinguished Professor of Biological Systems Engineering, said upgrades to the wireless technology will improve communication ranges and data rates.

“This will allow farmers to bury tens to hundreds of wireless soil sensors ... and receive real-time soil information without worrying about the impacts of machinery on the field,” Vuran said.

The researchers have tested previous iterations of their sensor technology at the South Central Agricultural Laboratory near

Clay Center, which aims to develop and refine irrigation-assisted practices that improve crop production. Developing next-generation sensors, Irmak said, should ultimately help farmers use water more efficiently during irrigation.

“Future irrigation systems will demand easier but robust and more autonomous control to simplify and enhance decision-making,” Irmak said. “This grant will also enable us to make advances in agricultural science, which has explicit research, Extension and education implications.”

The applications of their work could even extend beyond agriculture, Vuran said. Underground sensors with ranges and data rates “comparable to conventional wireless devices” might also be employed in smart-road infrastructure that helps keep tabs on highway conditions.

“This project will enable a wide array of novel solutions,” Vuran said, “from saving water resources for more food production to saving lives on roadways.”

Sittler is new domestic water and wastewater educator

Meghan Sittler has joined Nebraska Extension in Lancaster County as the domestic water and wastewater management extension educator, a new position at Lancaster County.

Sittler, who joined faculty and staff there in October, will primarily focus on developing and implementing programs related to both water quality and water quantity issues surrounding domestic water and wastewater use. She will work with individual homeowners, service providers, small community systems and large municipalities.

She grew up on a farm in southwest Lancaster County where her parents instilled a strong conservation ethic and an appreciation and concern for natural resources. From the University of Nebraska-Lincoln she earned a Bachelor's dual degree in Environmental Studies and Anthropology, a master's degree in Natural Resources with minors in political science and environmental planning, and a graduate certification in Public Policy Analysis.

Prior to this new position with Extension, Sittler coordinated the Lower Platte River Corridor Alliance from 2008 to 2016. Additional work experiences include serving at the National Park Service as an archaeological technician, working for Lincoln Lancaster County Health Department as an environmental

educator, working as an advisor and instructor for UNL's Environmental Studies Program and School of Natural Resources, and as a research and outreach specialist at UNL's National Drought Mitigation Center.

She says she is extremely excited about the opportunity to join Nebraska Extension and focus on critical water resource issues both locally in Lancaster County and across the state.

(Editor's Note: From the November/December 2016 edition of "Nebline," Nebraska Extension in Lancaster County, <http://lancaster.unl.edu>).



NU agencies lead project to help MENA region respond to drought

Shawna Richter-Ryerson

Nebraska currently leads the U.S. in irrigated area with more than eight million acres and is the fourth largest user of groundwater, behind California, Texas, and Arkansas.

Nebraska agriculture relies on and enjoys a high level of research support from the University of Nebraska and particularly its Departments of Biological Systems Engineering, Earth and Atmospheric Sciences, Civil Engineering, School of Natural Resources, Center for Advanced Land Management Information Technologies, Robert B. Daugherty Water for Food Global Institute, Nebraska Water Center, and other collaborating units.

This leading role in water-related research is evident from few recent new projects this year:

An interdisciplinary team of UNL researchers is investigating the climate's effect on groundwater contamination from chemicals used in crop and animal production, including indirect effects from land use changes with support of Water Sustainability and Climate Program grant in the amount of \$600,000 funded jointly by National Science Foundation-U.S. Department of Agriculture program.

University of Nebraska-Lincoln researchers have earned a \$450,000 grant from the National Science Foundation

to develop a second generation of underground sensor technology that can automate decision-making when it comes to irrigating crops.

The National Drought Mitigation Center and the Robert B. Daugherty Water for Food Global Institute at the University of Nebraska are co-leading a \$4-million research effort with the Dubai-based International Center for Biosaline Agriculture. The project is designed to help the Middle East and North Africa region balance water consumption and increase agricultural productivity, with a focus on drought management.

The U.S. Agency for International Development is funding the one-year MENA Regional Drought Management System project. \$1 million of the total grant is designated for research activities conducted by the National Drought Mitigation Center, Robert B. Daugherty Water for Food Global Institute and Center for Advanced Land Management Information Technologies.

Strengthening education and research collaboration in area of water resources research will be mutually beneficial to the University of Nebraska and Sultan Qaboos University.



Researchers turn to the air to monitor wetland habitat conditions

Wayne Woldt (from left), Zhenghong Tang and Jacob Smith III are working on a project that uses drones to survey wetlands.

Funded through a \$203,220 Environmental Protection Agency award, the University of Nebraska–Lincoln’s Zhenghong Tang and Wayne Woldt plan to develop a methodology to use unmanned aircraft systems to conduct dynamic monitoring and precise assessments of playa wetland habitats. Areas the team plans to focus on include hydrological conditions, vegetation and energy levels, and wildlife usage in the Nebraska Rainwater Basin.

Surveying the public waterfowl production and wildlife management areas across the basin will require multiple field trips to complete the data collection during the spring and fall migratory seasons.

During the drone flights, the team will use multispectral sensors for detection of soil moisture levels and mapping of wetland inundation during spring migration season; thermal imaging cameras and oblique photogrammetry for evaluation of wildlife use and its distribution on playa wetlands; and 3D imagery for surveys of plant community conditions, estimations of energy availability and assessments of vegetation management effectiveness.

The use of UAS is a huge improvement over the traditional large, plane or ground

surveying methods commonly used. This method will provide improved imaging with greater resolution and detail in a cost-efficient, timely and flexible manner. The new surveying tools and applicable protocols will offer wetland managers a greater understanding of wetland spring inundation conditions. If this method proves effective, the methodology can be replicated elsewhere. Having this information for wildlife managers will advance conservation efforts.

“Conducting timely monitoring and accurate assessment is extremely important for wetland managers to implement appropriate conservation programs to increase the quantity and quality of wetlands,” said Jeff Drahota, U.S. Fish and Wildlife Service biologist with the Rainwater Basin Wetland Management District. “This Unmanned Aircraft System provides an advanced new tool to conduct more rapid, precise monitoring and assessment for playa wetlands.”

In the past, environmental disruptions such as reduction in water flow because of upstream diversions, sediment, invasive species and poor water quality have contributed to major losses in playa habitat. By keeping a closer eye on the

situation, wildlife managers will be able to identify threats before they negatively influence the wetlands or reach a point that will be very costly and time intensive to restore. With successful adoption of the proposed methodologies, this project has the potential to transform reactive wildlife management to a proactive and efficient system.

The data analyzed during the assessment stage will help close the information gap and help wildlife managers implement proven restoration practices, choose more effective treatments and create a better understanding of this delicate ecosystem throughout its annual cycle.

“It is important to test and verify the innovative UAS methodology in wetland monitoring and assessment,” Tang said. “This project is a great first step to an exciting new way to conserve our wetlands.”

Tang is an associate professor of community and regional planning in the College of Architecture. Woldt is an associate professor of biological systems engineering. Tang and Woldt are co-principal investigators on the research project.

Nebraska Water Center holds August retreat at Wilderness Ridge

The Nebraska Water Center held a very successful water faculty research retreat at Lincoln's Wilderness Ridge on Aug. 30.

"We wanted to give everyone in

the water research disciplines another opportunity to get together and discuss potential collaborations and cooperation on research grants before the fall academic semester began," said Nebraska Water Center (NWC) director Chittaranjan Ray.

The retreat's intent was to form a small number of interdisciplinary groups that can prepare proposals to federal, state and local agencies. Representatives from collaborating agencies and organizations were also invited to share research priorities and areas for potential collaboration.

Attending faculty members shared five-minute PowerPoint or slideshow

presentations giving an overview of their current and future research interests. These presentations began the retreat and consumed much of the morning's activities.

In the afternoon, federal, state and organizational representatives took their turns discussing ideas for collaborative work with University of Nebraska water faculty prior to late afternoon small group brainstorming sessions and a closing session to review potential opportunities for the coming year.

"These retreats have been very successful at getting people talking about potential partnerships and opportunities," Ray said.



Nebraska Water Center director Chittaranjan Ray (right) opens August's research retreat at Wilderness Ridge.



Mark Brohman, executive director of the Nebraska Environmental Trust, presents at the August retreat.

Water resources research at the University of Nebraska

Nebraska currently leads the U.S. in irrigated area with more than eight million acres and is the fourth largest user of groundwater, behind California, Texas, and Arkansas.

Nebraska agriculture relies on and enjoys a high level of research support from the University of Nebraska and particularly its Departments of Biological Systems Engineering, Earth and Atmospheric Sciences, Civil Engineering, School of Natural Resources, Center for Advanced Land Management Information Technologies, Robert B. Daugherty Water for Food Global Institute, Nebraska Water Center, and other collaborating units.

This leading role in water-related research is evident from few recent new projects this year:

An interdisciplinary team of UNL researchers is investigating the climate's effect on groundwater contamination from chemicals used in crop and animal production, including indirect effects from land use changes with support of Water Sustainability and Climate Program grant in the amount of \$600,000 funded jointly by National Science Foundation-U.S. Department of Agriculture program.

University of Nebraska-Lincoln researchers have earned a \$450,000 grant from the National Science Foundation to develop a second generation of underground sensor technology that can

automate decision-making when it comes to irrigating crops.

The National Drought Mitigation Center and the Robert B. Daugherty Water for Food Global Institute at the University of Nebraska are co-leading a \$4-million research effort with the Dubai-based International Center for Biosaline Agriculture. The project is designed to help the Middle East and North Africa region balance water consumption and increase agricultural productivity, with a focus on drought management.

The U.S. Agency for International Development is funding the one-year MENA Regional Drought Management System project. \$1 million of the total grant is designated for research activities conducted by the National Drought Mitigation Center, Robert B. Daugherty Water for Food Global Institute and Center for Advanced Land Management Information Technologies.

Strengthening education and research collaboration in area of water resources research will be mutually beneficial to the University of Nebraska and Sultan Qaboos University.



2016 Kremer award recognizes Carlson's long service to groundwater

Tom Carlson

Nebraska State Senator Tom Carlson is this year's recipient of the Maurice Kremer Groundwater Achievement Award from The Groundwater Foundation.

Carlson was presented the award at the joint Nebraska State Irrigation Association and Nebraska Water Resources Association Conference on November 21 in Kearney.

The Kremer Award is presented annually by The Groundwater Foundation to an outstanding Nebraskan who has made a substantive contribution to the conservation and protection of Nebraska's groundwater. The Groundwater Foundation is a nonprofit organization based in Lincoln, with a mission to educate people and inspire action to ensure sustainable, clean groundwater for future generations.

"Senator Carlson's work ethic and deep passion for our state's most important natural resource, groundwater, is reflected in his accomplishments during his tenure as a state senator," said Groundwater

Foundation president Jane Griffin. "Our state has benefited from his deep passion for our natural resources."

The Kremer Award is chosen annually by a committee appointed by The Groundwater Foundation's Board of Directors. It is named for Senator Maurice Kremer, who spent 20 years in the Nebraska Legislature where he was best known for his contributions toward protecting the state's water resources.

"During his two terms in the Unicameral, Senator Carlson was a leading proponent and tireless advocate for legislation to improve the sustainability of Nebraska's water resources," said selection committee member Don Kraus, general manager of The Central Nebraska Public Power and Irrigation District.

Carlson actively sponsored and championed LB 1098, which established the Water Sustainability Fund in 2014 to guarantee a future for Nebraska's stressed

water resources. Through his efforts, almost \$30 million dollars were accumulated to finance water sustainability research in Nebraska in 2015/2016 and will finance water sustainability research into the future. He also worked on legislation related to the Republican River Sustainability Task Force and the extension of funding for the Riparian Vegetation Management Task Force.

Selection committee member and past Kremer recipient Jim Goeke said, "Tom Carlson gets groundwater in Nebraska! He understands the relationship between groundwater and surface water and appreciates Nebraska's enviable groundwater resources."

For more information on the Kremer award, visit www.groundwater.org/action/recognition/kremer.html. For more about The Groundwater Foundation visit www.groundwater.org.

April 2017 next Water for Food Global Conference Water for Food Security: From Local Lessons to Global Impacts

Plans are underway for the Water for Food Global Institute's 8th Global Conference to be held April 10-12, 2017, at the Nebraska Innovation Campus Conference Center in Lincoln. The event is expected to draw more than 400 participants from across the U.S. and several countries around the world, and hundreds more via live online video streaming.

The conference deals with an issue that lies at the heart of WFI's approach to addressing its research focus areas in Nebraska and around the world and is based on the premise that global breakthroughs come from local action. This conference will apply that perspective to the work being done to ensure water and food security for future generations. How can lessons learned from

Nebraska's groundwater management through the NRD system help farmers in the Mekong Delta of Vietnam? Can a farmer in Ohio combat drought by adopting soil management practices used in Rajasthan, India?

The goal of ensuring global water and food security requires complex interrelationships among environmental, economic and social forces and examining our understanding of technology, natural resources, natural science and the environment, socio-political realities, cultural differences and public-private contexts.

Amphetamine pollution disrupts urban stream ecology

Brooks Hays

Both prescription and illegal drugs can become concentrated in local waterways. New research shows amphetamine levels can become high enough in some urban streams to alter the base of the food chain.

As part of an ecological monitoring project, researchers at the Cary Institute of Ecosystem Studies measured the levels of several drug types in streams in and around Baltimore, Md. A mix of urban and rural sites within the Gwynns Falls watershed were tested.

Traces of several drugs, including amphetamines, were found at all of the sites. The highest concentrations of illegal drugs were measured at stream sites closest to the city of Baltimore.

“Around the world, treated and untreated wastewater entering surface waters contains pharmaceuticals and illicit drugs that originate from human consumption and excretion, manufacturing processes, or improper disposal,” lead researcher Sylvia S. Lee said in a news release.

In follow-up tests, researchers built an artificial stream and studied the effects of amphetamines -- found in drugs for ADHD as well as illicit drugs like cocaine and ecstasy -- on small aquatic plants and animals.

“We have every reason to suspect that the release of stimulants to aquatic environments is on the rise across the globe, yet little is known about the ecological consequences of this pollution,” said Emma J. Rosi-Marshall, a freshwater ecologist at the Cary Institute. “We found that when artificial streams were exposed

to amphetamine at a concentration similar to what we found in parts of the Gwynns Falls watershed, there were measurable and concerning effects to the base of the aquatic food web.”

Test streams with high concentrations of amphetamines were released featured less biofilm growth, altered bacterial and diatom communities and early-emerging aquatic insects.

“As society continues to grapple with aging wastewater infrastructure and escalating pharmaceutical and illicit drug use, we need to consider collateral damages to our freshwater resources,” Rosi-Marshall added. “More work is needed on the ecological fate of these pollutants and the threat they pose to aquatic life and water quality. Ultimately, solutions will lie in innovations in the way we manage wastewater.”

Editor’s note: this article appeared in Environmental Science and Technology in August and was widely reported in such publications as Scientific American and US News and World Report and by news networks such as CNN. The Nebraska Water Sciences Laboratory, part of the Nebraska Water Center and Daugherty Water for Food Global Institute, did much of the analytical work for this project and a former student of lab director Dan Snow, Alexis Paspalof, did the field work and mesocosm experiments in Emma Rosi-Marshall’s lab at the Cary Institute for Ecosystems Research about two years ago. Rosi-Marshall’s post-doctoral student, Sylvia Lee, did the final write up, and all of the biological analyses.

The conference will feature plenary and parallel sessions to explore the research, technology and education that are advancing food and water security for our world, including:

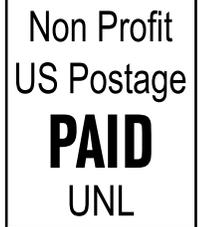
- Market-based approaches to drought management
- Water management and governance in great river basins of the world
- Monitoring and mitigating drought and water variability extremes in agriculture
- Expanding access to irrigation for smallholder farmers in sub-Saharan Africa
- Water governance challenges and solutions in local and regional contexts
- Nebraska Water Productivity report – collecting and analyzing data on water use in the production of different agricultural crops and livestock in Nebraska

- View from the High Plains – how farmers from different parts of the High Plains Aquifer are managing this resource for irrigation
- Data and technology – how to harness both to make better decisions for effective water use and increasing agricultural production
- Engaging students and the public in a citizen science project to examine the relationships between water, agriculture and public health

The conference schedule and registration will be distributed in January. Plan now to join your colleagues for three days of learning, collaborating and working toward solutions for a more water and food secure world.

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Applications being solicited for summer student research program in Czech Republic

International research experiences for students, or IRES, is looking for U.S. science and engineering students who want to spend part of their summer doing collaborative research in the Czech Republic.

IRES is a National Science Foundation-funded program open to U.S. undergraduate and graduate students majoring in the sciences or engineering fields," said Nebraska Water Center director Chittaranjan Ray.

"This part of the IRES program wants to facilitate U.S.-Czech Republic student research experience on research on vadose zone for understanding water and chemical transport at various scales between the University of Nebraska-Lincoln and the Czech Technical

University (CTU) at Prague in the Czech Republic," Ray explained.

It will held at CTU May 28 to July 21, 2017 and the application process is now open.

Participants will live on-campus in CTU dormitories and will work collaboratively with Czech students and researchers in the laboratory and at field sites within various watersheds in the Czech Republic. Students will also analyze data for pore structure for undisturbed soil cores to examine preferential flow pathway and measure hydraulic conductivity of unsaturated soils in the field.

Students chosen for the program will receive a \$350 per week living allowance, \$550 per week stipend and round trip

airfare to Prague. Cultural activities and travel within the Czech Republic are included in the summer program.

Ray is leading the program in collaboration with CTU's Michal Snehota and Martin Sanda.

Program applications must include: a completed application form, essay describing reasons for interest in the program and any previous research experience, college transcripts, and two letters of recommendation.

More information on IRES and the application process are online at ires.unl.edu. Application deadline is Feb. 15, 2017.