

WRAP meets at Ferguson House

Steve Ress

The Water Resources Advisory Panel (WRAP) for the University of Nebraska met at Lincoln’s historic Ferguson House on Jan. 18 in advance of a reception for state legislators and staff.

The well attended meeting included comment from the University of Nebraska-Lincoln’s new Vice President and Institute of Agriculture and Natural Resources Harlan Vice Chancellor Michael J. Boehm, who presided over his first IANR “all hands” meeting earlier the same day.

Steve Goddard, Interim Vice Chancellor for Research and Economic Development (ORED) and Assistant Vice Chancellor Monica Norby gave a synopsis of recent research grants in ORED, noting that there continues to be emphasis in the area of the “Nexus of food, water and energy,” including the awarding of several ORED seed grants in this area. Other areas of current interest include food and water security initiatives and ORED support for the establishment of regional climate centers.



Lincoln’s historic Ferguson Mansion, home to the Nebraska Environmental Trust, was used for the January meeting of the Water Resources Advisory Panel.

Direction and funding for specific areas of research, including possibly climate-related research, could be in question with the new administration in Washington D.C., Norby said in answer to a question on the matter.

Peter McCornick, Executive Director of the Robert B. Daugherty Water for Food Global Institute (DWFI) said he had spoken with representatives of USAID on water and sanitation and that water security continues to be an emphasis on the international stage. McCornick also noted recent collaborative talks with the World Bank.

Chittaranjan Ray, Director of the Nebraska Water Center, briefed WRAP members on the recent award of a nearly \$1 million U.S. Department of Agriculture/NIFA grant in cooperation with project leader Colorado State University and other institutions to study adaptive management and water use in the Ogallala/High Plains Aquifer under changing climate.

Ray said he is also working with partners at Penn State University and others on developing a \$1 million CAP grant proposal with USDA to evaluate the human dimensions of water resource management work.

Jesse Starita of DWFI updated the group on the second round of student exchanges between UNL and the Government of India through the Water Advanced Research and Innovation, or WARI, fellowship program. Under the program, five UNL graduate students will study in India this year, Starita said.

Mark Brohman, Executive Director of the Nebraska Environmental Trust, said NET had just published its 2017 list of grant committee recommendations for

Continued on page 7

Inside

DIRECTOR’S NOTES	2-3
WATER TOUR	4-5
ADVISORY BOARD	8
GLOBAL CONFERENCE	10
WARI	13
KNOW YOUR WELL	14



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

The beginning of a new year is always a time to take stock and shift gears. In the environment we work in here at the University of Nebraska, we get some time over the holidays to get away from campus and regroup from summer and fall activities by our faculty, students and staff to reflect and get ready for a full slate of new activities and different directions that come with the start of a new semester.

Still, there was plenty to do before the holiday break.

In early November, I made a trip to India to help select the second group of students and fellows for the Water Advanced Research and Innovation (or WARI) fellowship program that is hosted by the Robert B. Daugherty Water for Food Global Institute (DWFI). As part of the program this year, WARI will award scholarships to five UNL graduate students to study in India, where they will conduct research at top-level Indian institutions.

Following that, I was invited to present two seminars at the Indian Institute of Technology in Bhubaneswar.

In early December, DWFI executive director Peter McCornick and I attended the Irrigation Symposium in Las Vegas, Nev. where Peter delivered one of the keynote addresses. I then moved on to some annual meetings in Denver, Colo. on our collaborative U.S. Department of Agriculture (USDA) grant studying our High Plains/Ogallala Aquifer, which we have detailed in these pages previously.

Also in December, I made a trip to California to meet with people at the California Department of Pesticide Regulation on a potential new project related to assessing leaching of new chemicals registered in that state. Then I met with engineers at Sonoma County Water Agency for analyzing data for a recent water well project they did. After that I visited the quarterly irrigation meeting at the Water Center of Fresno State University. I learned a great deal at that meeting.

The week just prior to the UNL shutdown for the holidays, Dan Snow, manager of our Water Sciences Laboratory, and Karen Hansen, DWFI's grants coordinator, and I worked on a proposal to USDA that was due by mid-January. Unfortunately, despite all our hard work, the proposal could not go forward due to one of the potential partners withdrawing at the last moment. If all grant proposals were funded, the process wouldn't be near the competitive challenge it certainly can be.

In our last issue of the Water Current, we shared information from our annual fall water symposium and water law conference, which were at Lincoln's Nebraska Innovation

Campus for the first time, but I was remiss in not mentioning that one of our staunchest champions, Dr. Earl Greene, was here and presented at the symposium. Earl, a hydrologist, provides science support to the chief scientist for water and is the associate director for water on national research program issues for the U.S. Geological Survey. It was very good to have him here to see our Nebraska Water Center for himself. Also noteworthy was having Dr. Rabi Narayan Sahoo visiting the symposium from the Indian Agricultural Research Institute. Dr. Sahoo is a world-renowned expert in the fields of hyperspectral remote sensing for precision agriculture and risk assessment and management of hydro-climatic hazards on natural resource degradation and agricultural sustainability.

The symposium and water law conference were both very successful and well attended and the facilities at our NIC campus are ideal for accommodating them. Special thanks to our project manager Tricia Liedle for taking the lead on the many set-up and administrative details that have to be taken care of in order to hold events such as these.

We are now well into the slate of seven speakers for our free, spring semester public water seminar series of lectures. This year the stand-alone lectures are themed to "The right water for the right use at the right time." If you have not attended these lectures before, I would encourage you to do so. They are held roughly every-other-Wednesday at 3:30 p.m. in the auditorium of Hardin Hall on UNL's East Campus. Our colleagues at UNL's School of Natural Resources administer the lectures and offer them for student classroom credit, as well. Like our annual water tour, these lectures are a long-standing tradition for the water center, dating back more than 40 years.

Another long-standing tradition is, of course, our annual water and natural resources tour. These began nearly 50 years ago as Extension irrigation tours when D. B. "Woody" Varner (as in Varner Hall) was UNL Chancellor.

Planning on this year's tour, which will be in the central Platte River basin June 27-29, is proceeding well. Ben Beckman, our shared outreach coordinator and Steve Ress, our communications coordinator, in cooperation with Jeff Buettner and Holly Rahmann at The Central Nebraska Public Power and Irrigation District, have most of the tour's agenda, speakers and stops planned and are working their way through the details. 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. We expect it to fill very quickly once registration opens, probably in late April or early May. As planning proceeds, the latest information on the tour will be at watercenter.unl.edu.

A great piece of news to pass along in connection with our Water Sciences Laboratory is that UNL's Institute of Agriculture and Natural Resources and Colleges of Arts and Sciences, and Engineering have agreed to contribute a combined \$65,000 in subsidy to the lab for one year. This will help alleviate some financial challenges the lab had been planning for. We thank IANR associate vice chancellor Ron Yoder for his hours of hard work in pushing for this funding through our UNL colleges.

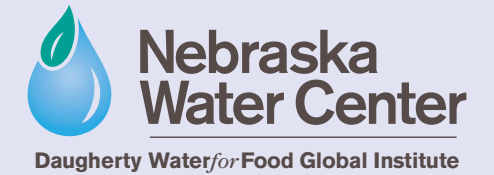
In mid-January we had the pleasure of hosting three of my fellow water center directors who conducted a five-year administrative review of our center. We thank Doug Parker, director of the California Institute for Water Resources; Colorado Water Institute director Reagan Waskom; and Maryland Water Resources Research Center director Kaye Brubaker for their efforts and their time in coming here to conduct the review. We look forward to their analysis of our water center and any advice they may have to help make us a better Nebraska Water Center.

Coming up, I will make use of some National Science Foundation funding to get six to eight people to India in connection with an Indo-U.S. science and technology workshop that I will be hosting in Bangalore, India in April.

I will be traveling to Washington, D.C. along with Ben Beckman (explain little more about him) for the annual meetings of the National Institute of Water Resources.

Anytime you are in Lincoln, come see us in the Nebraska Innovation Commons building on Nebraska Innovation Campus.

You can communicate with the water center at any time by emailing sress@nebraska.edu or going to our social media pages at twitter.com/NebrWaterCenter or facebook.com/NebraskaWaterCenter.



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

Designer
Taylor DeMaro

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





Water tour to Central Platte River basin June 27-29

Nebraska Water Center's Ben Beckman at a hydropower generation facility at Johnson Lake, near Lexington.

This summer's Water and Natural Resources Tour will look at surface and groundwater issues in the central Platte River basin June 27-29, 2017.

Water flowing through this critical stretch of the Platte River is heavily relied upon by all Nebraskans to support a broad range of important issues, ranging from agriculture and hydropower production to recreation and threatened and endangered species. It is arguably the single most important section of river in the entire state, according to Steve Ress, communicator for the University of Nebraska's Nebraska Water Center (NWC), part of the Robert B. Daugherty Water for Food Global Institute (DWFI).

NWC and DWFI co-sponsor and co-plan the tour along with The Central Nebraska Public Power and Irrigation District UNL's Institute of Agriculture and Natural Resources and others.

Competing demands on the basin's finite supplies of water will be central to the discussions and stops on this summer's tour as it delves into surface and groundwater irrigation, water rights, hydropower production and water for fish and wildlife and for recreation.

The tour begins and ends in Holdrege. It will visit an organic

farming operation, irrigation and hydropower production facilities, Natural Resources District projects, and look at the history and current directions for water use in the basin.

Points of interest will include Frito-Lay's Gothenburg Corn Handling Facility and Monsanto's Water Utilization Learning Center.

Cropping and irrigation experts at UNL's West Central Research and Extension Center in North Platte will speak on advancements in research and technology. Close by, recently completed water transfer and pipeline facilities built by the Nebraska Cooperative Republican Platte Enhancement Project (or NCORPE) will be visited.

Also on the tour's agenda are tours of Lake McConaughy and Nebraska Public Power District's Gerald Gentleman Power Station near Sutherland.

Time will be spent canoeing the Plum Creek Reservoir/Gallagher Canyon area 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 present as broad an overview of why this stretch of the river is so important to all of us in the three days we have," Ress said.

Tour information is online at watercenter.unl.edu as it



Both surface and groundwater irrigation are key to agricultural production throughout Nebraska. Many irrigators source water for their center pivots from both.



Power and canal facilities at Elwood Reservoir.



In addition to water for irrigation, power generation and wildlife, Lake McConaughy is one of the most visited recreational areas in Nebraska.



Lake McConaughy (top) and Lake Ogallala (bottom) are separated by Kingsley Dam (Nebraska Game Parks Commission photo).

becomes available. Organizers anticipate limiting registrations to about 55 people and to opening registration in early May. No advance seat reservations will be allowed.

The tours began as summer irrigation field tours initiated by then UNL Chancellor D.B. "Woody" Varner more than 40 years ago.

"Their scope and emphasis has evolved and broadened since then to encompass many other water, natural resources and environmental-related topics impacting Nebraska," Ress said.

The right water for the right use at the right time

Seven free public lectures are exploring seven aspects of “The right water for the right use at the right time” in this spring’s annual University of Nebraska-Lincoln water and natural resources seminar.

The lectures began in January and are held roughly every-other-week from 3:30 to 4:30 p.m. on Wednesdays through April 19. All lectures are in the first floor auditorium of Hardin Hall, on UNL’s East Campus.

Remaining lecture dates are Feb. 15, March 1 and 15, and April 5 and 19.

“Our water is a finite resource with an increasing number of demands placed upon it. We have become increasingly aware of how, why and when we use it and are maximizing efficiencies to make it go further and satisfy increasingly competitive demands and these lectures will shed light on some of the ways we are making progress on these issues,” said Nebraska Water Center director Chittaranjan Ray. NWC, part of the University of Nebraska’s Robert B. Daugherty Water for Food Global Institute, has organized and helped offer these annual spring lectures for

more than 40 years.

UNL’s School of Natural Resources cosponsors the seminar and offers it for student credit. All lectures are open to public attendance.

Individual lecture videos and speaker PowerPoint presentations will be posted at watercenter.unl.edu within a few days after each lecture.

Remaining lectures:

- Feb. 15** WILLIAMS MEMORIAL LECTURE, Ryan Bailey, Colorado State University, “Water Quality Modeling for Groundwater, Surface Water, and Watersheds: Basic Theory and Applications”
- March 1** Jerry Kenny, Platte River Recovery Implementation Program, “The Platte River Recovery Implementation Program: What Has Been Ahead Accomplished and What Remains to be Done”
- March 15** Siamak Nejati, UNL, “Engineering Solutions for Cleaning Contaminated Water: Membranes for Membrane Distillation”
- April 5** KREMER MEMORIAL LECTURE: Menu Leddy, Orange County California Water District, “OCWD: Groundwater Replenishment System”
- April 19** Daran Rudnick, UNL, “Advancements in Irrigation Technology and Their Impact on Water Management”

Water use lecture educates students, public

Christine Reed, a professor at the University of Nebraska-Omaha, gave her lecture on “Integrated Management Planning of Surface and Groundwater in Nebraska” Jan. 18 at the University of Nebraska-Lincoln’s East Campus.

This event was the first in a series about efficient water use. The series is held in the spring and features a variety of speakers. Reed explained, when laying out the pieces of the puzzle, the first thing one must do is take into consideration how Nebraska differs from other states and other areas.

“One of the big takeaways is that Nebraska is unique in how it addresses groundwater,” Reed said.

Another way Nebraska differs from other states is changes in the water planning process come from a lower position of power within the state government, rather than from higher positions.

“Nebraska develops plans that fit the needs of the state,” Reed said.

One of the problems Reed addressed is the balance between river and aquifer resources. “It’s important to offset river depletions and put the water back into the river,” Reed said. Likewise, it’s crucial that Nebraska doesn’t pump too much groundwater, so as to drastically change the water levels in the aquifer.

She provided reading material before the event, so water science students who were present could learn about the water planning process better. After the seminar, Reed was available to discuss the issues talked about.

“I want to bridge the gap between (water) governance and science,” Reed said.

Steven Ress, a communications coordinator at the Nebraska Water Center, said the NWC has put on these events for more than 40 years. NWC partners with UNL’s School of Natural Resources to host the series, which focuses on a certain aspect of water use, water research, or a certain topic related to water that is of interest statewide. This year, the series focuses on water quality issues, while last year, the emphasis was on water and health.

“The seven individual lectures fit together, but they stand on their own,” Ress said.

While Reed’s seminar focused on management of surface and groundwater, upcoming seminars will discuss how to clean contaminated water, irrigation technology, and work being done on the Platte River.

(Editor’s Note: Reprinted in part from the *Daily Nebraskan*).

WRAP meets at Ferguson House

continued from page 1

funding. In total, Brohman said NET expected to fund nearly \$16.7 million in projects during the coming year through funds received via the Nebraska Lottery.

Since NET began funding projects in 1994, about 2,000 have been funded for a total of approximately \$260 million, Brohman said, noting NET has helped fund projects in all 93 Nebraska counties.

Lincoln attorney Lee Orton of the Nebraska Well Drillers Association updated WRAP on the coming seventh installment of the Water Leaders Academy, saying 20 young water professionals were enrolled. He noted the association’s continuing concerns over the decline of UNL’s Conservation and Survey Division, saying that CSD’s association with the well drillers dates back 90 years, to 1927.

The association and others are working with UNL toward a “Water, food and fiber” field day for school students that is being planned for Nebraska City.

Jay Remppe of the Nebraska Farm Bureau Federation talked about the overall state of Nebraska’s slowing farm economy, the bureau’s involvement in the Aquamart program and several WRAP members’ interest in providing more substantive feedback to NU leadership, such as feedback on specific university programs.

Lower Elkhorn Natural Resources District General Manager Mike Sousek updated WRAP on a \$300,000 cooperative groundwater management program study being undertaken in northeast Nebraska’s Bazile Creek area.

Craig Dedrickson of the Nebraska Natural Resources Conservation Service office talked about current and future directions for NRCS funding that will include such areas as water quality studies, water use efficiency and technology and soil health, among others.

Karina Schoengold, an environmental and resource economist in UNL’s School of Natural Resources, gave WRAP a presentation on “Optimizing Water Use through Adaptive Management: A USDA-funded Multistate Project.”

The next WRAP meeting is scheduled to be a breakfast affair in conjunction with DWF’s next global conference at 7:30 a.m., April 11 at Nebraska Innovation Campus in Lincoln.

WRAP is comprised of 15 members representing a cross section of Nebraska’s water community. They provide guidance to the University of Nebraska on state water research needs, education, and outreach. WRAP generally meets in January, April and September. Current members are:

Frank Albrecht, Nebraska Game and Parks Commission

Brian Barels, Nebraska Public Power District

Lydia Brasch, State Senator and Agriculture Committee Chair,

Nebraska Legislature

Mark Brohman, Nebraska Environmental Trust

Joel Christenen, Metropolitan Utilities District

Gordon “Jeff” Fassett, Nebraska Department of Natural Resources

Eugene Glock, Cedar Bell Farms

Dan Hughes, State Senator, Natural Resources Committee Chair, Nebraska Legislature

Jerry Kenny, Platte River Recovery and Implementation Program

Marian Langan, Audubon Nebraska

Jim Macy, Nebraska Department of Environmental Quality

Mike Sousek, Lower Elkhorn Natural Resources District

Lee Orton, Nebraska Well Drillers Association

Jay Remppe, Nebraska Farm Bureau Federation

Dayle Williamson, Office of U.S. Senator Ben Nelson (retired)



Advisory board meets, reviews of USGS-funded projects

Steve Ress

The Nebraska Water Center's advisory board met in December to review progress on a number of U.S. Geological Survey (USGS) funded research projects that are administered through an annual grants competition conducted by the NWC.

The board and research project leaders met on Dec. 12 at Nebraska Innovation Campus in Lincoln.

Among those attending were John Bender, Nebraska Department of Environmental Quality (NDEQ); Tom Franti and Suat Irmak, UNL Department of Biological Systems Engineering; Dana Divine, UNL School of Natural Resources and Conservation and Survey Division; Steve Thomas, UNL School of Natural Resources; Dan Miller, U.S. Department of Agriculture, Agricultural Research Service; Karrie Weber, UNL School of Biological Sciences and Department of Earth and Atmospheric Sciences; Peter McCornick, NU Daugherty Water for Food Global Institute; Dan Snow, Nebraska Water Sciences Laboratory (WSL); and Steve Ress and Ben Beckman, NWC.

Several other members of the board attended via conference call.

NWC director Chittaranjan Ray introduced new advisory board members and WSL director Snow gave the board an overview of recent lab operations, including recent completion of a five-year administrative review.

WSL has increased its interactions with the advisory board as a result of that review, Snow said. WSL is also focusing on standardizing its business practices with the recent completion of a five-year business plan, which was completed in May 2016. Part of that plan includes seeking subsidies for WSL operations from several primary UNL colleges to help defray recent reductions in NRI support for the lab.

Recent USGS 104b seed grant recipients then gave short presentations on the status of their funded programs. These included:

Karrie Weber, UNL School of Biological Sciences and Department of Earth and Atmospheric Sciences: "Nitrate mediated Mobilization of Naturally Occurring Uranium in Groundwater."

Bing Wang, UNL Department of Food Science and Technology: "Energy-water reduction and wastewater reclamation in a milk processing facility." Presented by Carly Rain Adams

Amy Schmidt, UNL Department of Biological Systems Engineering: "Fate of Steroid Hormone Conjugates and E. coli from Manure in Soil: Potential Sources of Free Hormones and Pathogens in Forages and the Environment?"

Daran Rudnick, UNL West Central Research and Extension Center and Department of Biological Systems Engineering: "Economic, Environmental, and Crop Performance Assessment under Center Pivot, Subsurface Drip, and Furrow Irrigation systems in a Changing Climate in West Central Nebraska."

After the short presentations, Ray asked board members to review DWFI and NWC web pages that focus on the mission, vision, values, and goals of those two entities, as well as the top 10 challenges facing Nebraska water management. After review, each was asked to provide feedback on reshaping NWC's missions and goals to better address future water challenges in Nebraska as well as in working with DWFI to fill in needed focus areas in Nebraska without conflicting with their vision.

Ray also asked the board for their opinions on adding a producer voice to the advisory board and their opinions on

changing the funding/fundraising structure of the NWC to better allow it to fund long standing programs such as the Water and Natural Resources Tour and the Spring Water Seminar Series held in conjunction with UNL's School of Natural Resources.

Current members:

John Bender, Nebraska Department of Environmental Quality

John Berge, North Platte NRD

Dana Divine, UNL School of Natural Resources and Conservation and Survey Division

Bruce Dvorak, UNL Department of Civil Engineering

Tom Franti, UNL Department of Biological Systems Engineering

Richard Holland, Nebraska Game and Parks Commission

Shannon Bartelt Hunt, UNL Department of Civil Engineering

Suat Irmak, UNL Department of Biological Systems Engineering

Alan Kolok, UNO Nebraska Watershed Network

Peter McCornick, NU Robert B. Daugherty Water for Food Global Institute.

Dan Miller, U.S. Department of Agriculture/ARS

John Miyoshi, Lower Platte North NRD

Chittaranjan Ray, Nebraska Water Center and UNL Department of Civil Engineering

Jennifer Schellpeper, Nebraska Department of Natural Resources

Tim Shaver, UNL Department of Agronomy and Horticulture and West Central Research and Extension Center

Bob Swanson, USGS Nebraska Water Science Center

Steve Thomas, UNL School of Natural Resources

Karrie Weber, UNL School of Biological Sciences and Earth and Atmospheric Sciences

USGS 104b Projects for 2016

The Nebraska Water Center awarded annual U.S. Geological Survey (USGS) 104b project funds to three University of Nebraska-Lincoln research teams in November 2015 for fiscal year 2016.

Selected projects needed to pass a rigorous review by a panel of academic and professional colleagues. These projects were selected for funding from March 1, 2016 through Feb. 28, 2017:

Water Usage in the Food Industry, PI: Bing Wang, UNL Food Science; Co-PI: Rolando Flores, UNL Food Science, \$17,000.

Economic, Environmental, and Crop Performance Assessment Under Center Pivot, Subsurface Drip, and Furrow

Irrigation Systems in a Changing Climate in West Central Nebraska, PI: Daran Rudnick, UNL; Co-PIs: Chuck Burr, Derrel Martin, Tim Shaver, Greg Kruger, Francisco Munoz-Arriola and Matt Stockton, UNL, \$20,000.

Evaluation of Changing Irrigation Management on Ground Water Recharge and Quality, PI: Troy Gilmore, UNL; Co-PI: Daniel Snow, Nebraska Water Center/Nebraska Water Sciences Laboratory, UNL, \$15,000.

USGS program funds for these projects are issued under provisions of the federal Water Resources Research Act of 1984.

Heeren advancing VRI irrigation technology

Generations of Nebraska farmers have worked to optimize their crop production through irrigation. In recent years, Variable Rate Irrigation (VRI), which matches the water application rate of center pivot sprinklers to specific areas of a farmer's field that need more or less water, has garnered attention as a way to optimize water use and crop yields.

Additional VRI benefits may include decreasing pumping energy costs, lowering the frequency of stuck pivots due to over irrigation, avoiding chemigation over noncropped areas, reducing runoff and decreasing nitrate leaching. Now, University of Nebraska-Lincoln students and faculty members are putting VRI on the map.

Over the past several years, Derek Heeren, irrigation engineer in UNL's Department of Biological Systems Engineering, and a team of graduate students have been on the leading edge of VRI research. This fall, Heeren's team launched a free, online map that estimates potential pumping reductions by using VRI.

Here's how it works: Imagine a farmer in Loup City wants to know how much water he could save by adopting VRI technology. Using the map, he zooms in on a specific field to see that 0.3 inches per year (or 3 acre feet of water per year, depending on the size of the field) could be saved using VRI. Likewise, an adjacent field with different soil water storage capacity could save 0.5 inches per year or five acre feet.

"This is important to producers because they want to be confident about the benefits of a new technology before they invest in it. This is the first time that the benefits of VRI have been analyzed for a whole state," Heeren said.

His former graduate student Tsz Him Lo analyzed potential pumping reductions through VRI as part of his master's thesis. Utilizing U.S. Department of Agriculture's NRCS Soil Survey Geographic database, Lo looked at the field-average amount of root zone available water capacity that is unutilized by conventional irrigation in over 49,000 center pivot irrigated fields in Nebraska.

This data was then used to quantify potential for irrigation reductions by maximizing the use of precipitation (via soil water storage). Since VRI is a cost to producers, this research helps them decipher whether those costs are offset or even outweighed by cost savings in pumping reductions.

Results showed that, for Nebraska, two percent of pivots could have a pumping reduction of at least two inches per year. Producers should also consider potential yield increases from VRI when deciding whether to invest in the technology.

Heeren is one of 84 University of Nebraska faculty contributing research and expertise to the Robert B. Daugherty Water for Food Global Institute (DWFI).

"Nebraska as well as the global community is interested in food production and conserving water resources. DWFI is at the forefront of these challenges. VRI is a technology that allows us to manage water and crops more precisely," he said

2017 Water for Food Global Conference: Water for Food Security: From Local Lessons to Global Impacts April 10-12

Vaccines. Irrigation. Cell phones. Apps. These life changing, globally accessible advancements were first created in someone's garage, or kitchen or office.

The 2017 Water for Food Global Conference, "Water for Food Security: From Local Lessons to Global Impacts," 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 system help farmers in the Mekong Delta of Vietnam? Can irrigation technology be scaled for smallholder farming communities around the world? How do national policies affect agriculture and water security in other regions and countries?

The 2017 global conference will feature plenary and parallel sessions to explore the research, technology and education that are advancing food and water security for our world:

- Expanding access to irrigation for smallholder farmers in sub-Saharan Africa
- Developing market-based approaches to drought management
- Enhancing high productivity irrigated agriculture, highlighting challenges and opportunities from the Great Plains to sub-Saharan Africa
- Improving water management and governance for food security in great river basins of the world

- Monitoring and mitigating drought and water variability extremes in agriculture
- Transforming water policy to develop sustainable and equitable water management practices in local regions around the world
- A View from the Field – how farmers from different parts of the world are using technology and best practices to increase yields
- Engaging students, stakeholders and future leaders through science literacy and citizen science to examine the relationships between water, food and energy, as well as agriculture and public health

Join leading researchers, producers, business managers, government and NGO directors, students and other participants from across the U.S. and around the world for three days of learning, sharing and networking. Conference partners include: IWMI, USDA, USAID, FANRPAN, Valmont, iDE, KickStart, OEM, NDMC, NOAA, USGS, ARD, EDF, and the World Bank.

Featured Speakers

- A.G. Kawamura, former California Secretary of Agriculture, third generation fruit and vegetable grower from Orange County and co-chair of Solutions from the Land, an organization developing a roadmap for 21st century agricultural systems.
- Chandra Madramootoo, President of the International Commission on

Irrigation & Drainage, and Dean of McGill University's Faculty of Agricultural and Environmental Sciences

- Sithembile Ndema Mwamakamba, Climate Smart Agriculture Programmes Manager, FANRPAN; responsible for coordinating FANRPAN's climate smart agriculture policy research and advocacy projects.
- Steven Schonberger, Lead Operations Manager, World Bank; responsible for the World Bank's programs in the Middle East and North Africa and the Western Balkans.

Special events

- Student poster competition
- Photography competition and exhibit
- Opening reception at the Sheldon Museum of Art featuring international foods, entertainment and a visual exhibit exploring the Dust Bowl era in the U.S.
- Nebraska bar-be-que dinner and entertainment in the 100-year-old Creekside Barn in Roca
- Closing reception with live music following the Heuermann Lecture by A.G. Kawamura

Registration: Early Bird: \$450 through March 10. Regular Registration: \$550 March 11 through April 1. Discounted rates available for university faculty, staff and students

DWFI Faculty Fellows and Students: Flat fee of \$150 (for notices going to Faculty Fellows). University faculty, staff: Flat fee of \$250 (for notices going to academic list).



Sheri Fritz

Fritz awarded elite visiting professorship in Sweden

Scott Schrage

A trans-Atlantic research network stemming back to graduate school has led Sherilyn Fritz to a prestigious visiting professorship at Sweden's Lund University.

Fritz, a George Holmes University Professor of Earth and Atmospheric Sciences, will spend the spring and summer of 2017 as the Swedish Research Council's Tage Erlander Visiting Professor. Established in 1981 to honor Sweden's longest-serving prime minister, the professorship is annually awarded to one international researcher in the natural sciences or engineering.

"I'm totally thrilled to have this opportunity," Fritz said. "The research collaboration that will be the centerpiece of my stay there is outside my specific area of expertise, so I'll learn a lot of new things."

Fritz's expertise straddles the geological, biological and atmospheric sciences. She has spent much of her career studying the fossil record of diatoms – microscopic algae that have inhabited lakes for

millions of years – to reconstruct the prehistory of climate change.

She embarked on that research path as a doctoral student, when Fritz's adviser also connected her with a couple of research groups in Sweden. Fritz maintained and expanded that network over the years, spending her 2003 sabbatical at Lund and part of 2012 in Stockholm. Those account for just two of her many trips to the country, whether to attend conferences and workshops or simply visit colleagues who gradually became good friends.

Last year, Fritz reached out to a Swedish colleague about involving his research group in a study of Wyoming's Yellowstone Lake, which lies partly inside a volcanic crater and offers a unique opportunity to investigate hydrothermal dynamics.

"When the announcement for this distinguished professorship came up, he suggested that I apply for it as a good means of collaborating more extensively,"

Fritz said. "His department was really enthusiastic about nominating me and the possibility of having me in residence, so the broad-scale enthusiasm and multiple opportunities for networking propelled me to apply."

Fritz also plans to collaborate with colleagues in Stockholm and Gothenburg who study questions about South America that she has devoted more than 20 years to answering. Most recently, that research has investigated how upheaval in the Andes Mountains, fluctuations in Amazon River deposits and shifts in climate have affected species diversity and extinction in the South American tropics.

The visiting professorship will further allow Fritz to bring aboard a young scholar who can assist with her research. During the fall semester, Fritz served on the dissertation committee of a French doctoral student – now postdoctoral researcher – who Fritz said has "the perfect skill set" for the Yellowstone project.

"So I'm thrilled to be able to provide a vehicle for her to continue her career in geosciences, especially because positions for young scientists are even more difficult to find in Europe than in the United States," Fritz said.

With mere weeks to go before she departs for Sweden, Fritz said her excitement transcends the academic. The chance to again embrace the cultural charms and natural wonders of Scandinavia, she said, have her eager to set foot in a country at once foreign and familiar.

"Day-to-day life has many wonderful aspects – riding bicycles everywhere; lots of attention to healthy and thoughtfully prepared food, and to being outside and interacting with the natural world; watching the days get longer as you go from deep, dark winter toward mid-summer – so it will be fun to have new routines in my daily life."

Kraus receives Four States' Headgate Award

Don Kraus, general manager of The Central Nebraska Public Power and Irrigation District (CNPPID), received the Four State Irrigation Council's 2017 Nebraska Headgate Award for service to Nebraska's irrigated agricultural community.

Kraus has more than 40 years service to CNPPID, beginning in 1971 as an electrical engineer. He manages CNPPID delivery of irrigation water to more than 109,000 acres in south central Nebraska and providing generation of hydroelectric power from four plants with the capacity to produce 113 megawatts of electricity.

CNPPID's project also provides benefits for groundwater recharge, recreation, and fish and wildlife habitat. It owns and operates Lake McConaughy, the state's largest reservoir that recently celebrated its 75th anniversary.

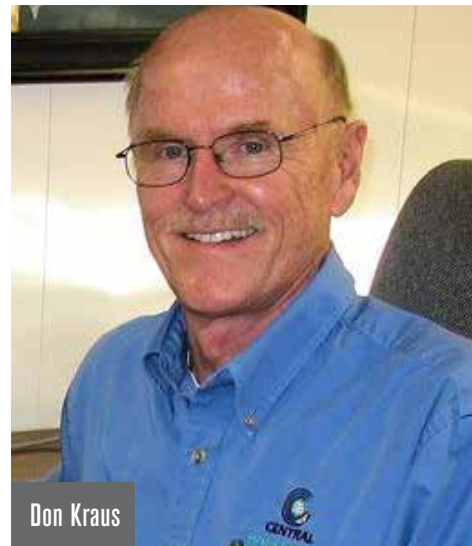
Kraus has served as president of Nebraska Chapter of the National Society of Professional of Engineers; president of the Nebraska Power Association; and president of the Groundwater Foundation.

He chairs the Platte River Cooperative Hydrology Study and sits on the board of the Natural Resource Commission.

He has embraced the challenges that the irrigation and power industry have given him and understands it is essential to protect, extend and conserve the vital resources for future generations while also supporting our state's economy.

"It is important to listen to your customers and take care of your employees," he said, when asked about his approach to management. "You rely on both. It is also very important to build relationships with others who have responsibilities to manage water resources."

Under Kraus, CNPPID has been a primary partner with the Nebraska Water Center in planning and managing the University of Nebraska's annual water and natural resources summer tour. CNPPID has long supported water and natural resources research and education at NU.



Don Kraus

The Four States Irrigation Council was established in 1952 to serve as a forum for irrigators to exchange ideas and information and discuss specific irrigation-related issues to learn if other members have explored solutions to problems. Member states are Nebraska, Colorado, Wyoming and Kansas.

Kraus becomes the ninth CNPPID employee or board member to receive the Headgate Award, joining Tim Anderson (2012); Robert Petersen (2009); Don Schepler (1999); C.J. Hargleroad (1989); Dick Dirmeyer (1983); Stan Matzke (1967); Ralph Canaday (1962) and George Johnson (1958).

WARI scholarships available to UNL students

Jesse Starita

Water is a vital necessity for human development, the environment and the economy. Because of its global importance, the Government of India and its Department of Science and Technology, the University of Nebraska-Lincoln (UNL), the Robert B. Daugherty Water for Food Global Institute (DWFI) at the University of Nebraska and the Indo-U.S. Science and Technology Forum have partnered to foster cooperation between students and scientists from both countries through the Water Advanced Research and Innovation (WARI) Fellowship program.

WARI is a dynamic and transformative program for students pursuing advanced academic research and/or other water-related careers and scholarship opportunities are now available.

Scholarships

WARI will award scholarships to five UNL students to study in India this year, where they will conduct research at top-level Indian institutions. Students should be enrolled at the graduate level in a water-related program, such as agronomy, agricultural economics,

biological sciences, chemistry, earth and atmospheric sciences, engineering, hydrology, political science or natural resources.

Additionally, students' research should be clearly aligned with either DWFI's subject areas of focus or WARI's research categories. More information about WARI can be found online at waterforfood.nebraska.edu/wari.

Selected students will begin their research abroad this summer, for three to six months. Scholarship benefits include a room and board stipend (\$1,100/month) for accommodations in India; paid airfare up to \$1,500; and a lab work stipend up to \$1,000. Graduate students may also apply for a supplemental scholarship through Nebraska's Education Abroad office. Academic credit may be awarded as part of this scholarship and should be arranged through the student's program. To be eligible for an Education Abroad scholarship, the student must receive credit for the internship.

Students should work with their advisors to prepare applications. UNL will send all applications to partners in India, who will help select candidates and university placements based on the candidate's field of study and research interests. Students may independently arrange mentors and institutions in India, but should indicate so in the application.

Applications may be downloaded at waterforfood.nebraska.edu/wari and are due by March 17. Submit applications to wari@nebraska.edu. Questions can be addressed to Jesse Starita at jstarita@nebraska.edu, or phone 402.472.5317.

New WARI fellowships and internships for 2017

The University of Nebraska's Robert B. Daugherty Water for Food Global Institute (DWFI), the University of Nebraska-Lincoln (UNL), Department of Science and Technology (DST), the government of India, and the Indo-US Science and Technology Forum (IUSSTF) have announced their list of candidates selected for the prestigious 2016-17 Water Advanced Research and Innovation (WARI) Fellowship Program.

The program will award the following five Indian early-career faculty with WARI Fellowships and six Indian Ph.D. students with WARI Internships to conduct water-related research under the mentorship of UNL faculty.

Fellows

Paromita Chakraborty, Ph.D., assistant professor, SRM University, Chennai

Richa Kothari, Ph.D., assistant professor, Babasaheb Bhimrao Ambedkar University, Lucknow

Shaik Rehana, Ph.D., assistant professor, International Institute of Information Technology, Hyderabad

Rajendran Selvakumar, Ph.D., associate professor, PSG Institute of Advanced Studies, Coimbatore

Riddhi Singh, Ph.D., assistant professor, Indian Institute of Technology – Hyderabad

Interns

Ram Chavan, Ph.D. student, Birla Institute of Technology & Science, Goa

Omkar Damodar Gaonkar, Ph.D. student, Indian Institute of Technology – Madras

M. Jahangeer, Ph.D. student, Indian Institute of Technology – Roorkee

Anurag Kumar, Ph.D. student, Indian Institute of Science Education and Research, Kolkata

Ashish Kumar, Ph.D. student, Indian Institute of Technology – Bombay

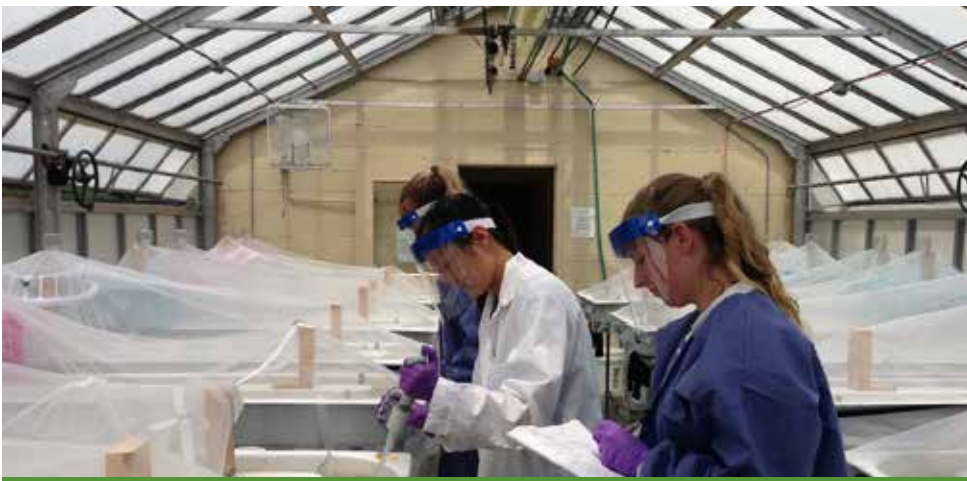
Swati Suman, Ph.D. student, Banaras Hindu University

DWFI and UNL recently partnered with the government of India's Department of Science and Technology and the Indo-U.S. Science and Technology Forum to nurture and increase cooperation between students and scientists from both countries under the guise of WARI.

WARI helps Indian students and scientists gain access to world class research facilities at UNL, promote cooperative research in many water science and engineering arenas and help pave the way for the next generation of scientists and technologists from India to work with their peers in the U.S., leading to long-term research and development connections.



The Central Nebraska Public Power and Irrigation District supports UNL water research and education and has long been a managing partner in the annual water and natural resources tour, shown here in Colorado's Poudre River canyon.



Alexis Borbon and other researchers take notes about their control streams for a study on amphetamines in waterways.

SNR graduate research on amphetamines draws attention

Shawna Richter-Ryerson

CNN picked it up. So did the United Press International news wire service. And US News & World Report.

In the articles, the study on the amount of amphetamines found in waterways in the rural Baltimore, Maryland, area, didn't seem immediately linked to the University

of Nebraska-Lincoln, let alone the School of Natural Resources.

But the research was driven by SNR master's graduate Alexis Paspalof, now Alexis Borbon, during her studies here, and her samples were analyzed by the Nebraska Water Sciences Laboratory at SNR under

lab director Dan Snow, Borbon's advisor.

"This is maybe one of 10 studies ever done on this topic," Snow said from the lab on Nebraska's East Campus. "The study's authors are trying to answer why knowing the levels of amphetamines in waterways is important. People should care because it could be having unintended consequences."

Borbon initiated the research because of her interest in how amphetamines in waterways may be affecting ecosystems.

"My father is a water treatment operator in California," she said from her home in Florida. "Growing up, we would spend a lot of time discussing water quality issues and things that potentially could be an issue in the future. At one point, I remember he had come home from a conference where he had listened to a talk about the presence of pharmaceuticals in the environment. I was really intrigued by the implications this meant for water ecosystems."

When she started her graduate degree under Snow, she knew that's what she wanted to study.

"When I first began researching this topic, I quickly found there were hundreds of different chemicals that could be measured," she said. "This is the main reason why there are such few studies. The topic is just a massive undertaking, and it's difficult to know where to start."

Borbon decided to start with Adderall, which contains amphetamine. The drug frequently is prescribed for people with attention-deficit hyperactivity disorder, but also is known to be used illegally. Borbon knew research focused on it would be relevant – and likely interesting – to a large segment of the population.

Snow got her in contact with colleague Emma Rosi-Marshall with the Cary Institute of Ecosystem Studies who subsequently introduced her to Sylvia Lee, a post-doctoral researcher who now is working for the Environmental Protection Agency. Together, they and researchers Erinn Richmond with Monash University and John Kelly with Loyola University-Chicago started the project.

Over a three-week period, the group collected water samples from six streams on the Gwynns Falls and Oregon Ridge watersheds near Baltimore, Maryland. The samples were brought back to the Water Sciences Laboratory to be analyzed using state-of-the-art equipment for measuring low concentrations of

pharmaceuticals. The equipment can accurately identify chemical compounds in water and their concentration down to a few parts per trillion. The Nebraska Water Sciences Laboratory is one of eight or 10 in the country with the capability to test environmental samples at this low concentration.

At the same time, the group created control "streams" where they purposely added amphetamines as a comparison and measured their breakdown, also over a three-week period. (Amphetamines, like other drug compounds, decrease naturally overtime.)

What researchers found was that in both the created streams and the natural ones, the levels of amphetamines were high enough to affect the stream ecosystem. They found growth of bacteria on surfaces was suppressed, bacterial and diatom communities changed, and aquatic insects emerged earlier.

"The results were very surprising," Borbon said. "The most surprising information was seeing the change in bacterial communities and insect emergence. This was data that was not processed until much later, so when we finally got the data and Dr. Lee put the paper together, it was cool to see what else was really going on."

Both Snow and Borbon hope the line of research continues with a focus on the potential problems or changes in the environment an increasing presence of pharmaceuticals may cause, but also to determine what is or isn't a biological effect of the drugs' presence in waterways.

"It will help put it in perspective," Snow said. "It would help us answer the: 'So, what?'" The other researchers agree.

"Ultimately, solutions will lie in innovations in the way we manage waterways," Rosi-Marshall told the Cary Institute.

Borbon helped collect and process the water samples in 2013 and 2014. She graduated with her master's degree in natural resources and conservation from Nebraska in 2015. This paper was published in the Aug. 25, 2016, edition of the journal *Environmental Science & Technology* and immediately started making headlines.

"Having your research be publicized is such an incredible feeling," Borbon said. "It was very humbling to learn so much knowledge came from what I originally thought would be such an insignificant project."

Grant brings "Know your well" program to 16 Nebraska schools

Students at more than a dozen Nebraska schools will learn about possible contaminants in their well water, how to test for them and learn differences between field and laboratory methods, under a new Nebraska Environmental Trust (NET) project being conducted by a consortium of water experts at the University of Nebraska-Lincoln.

"It's about helping people understand what might be in their well water and how to test water. It's about helping rural residents be informed consumers and replacing indifference or uncertainty with knowledge," said UNL graduate student Chris Olson, who is helping to manage the NET "Know your well" project.

The program, designed for training students in assessing the quality of drinking water derived from rural domestic wells, will involve science and agricultural education programs and FFA chapters at 16 high schools throughout Nebraska, Olson said.

Over the three-year life of the project, each school group will be given a test kit for measuring water parameters and will be provided

with training needed to properly use the kits, Olson said.

"Students and their teachers also will be trained on collecting information about the well and various factors that might influence the quality of water from those wells," said Olson's faculty advisor Dan Snow, who manages the Water Sciences Laboratory at UNL that is part of the Nebraska Water Center.

"Some of the well parameters they will learn about and make part of their water quality study include type of well, status of the well seal at the land surface, topographic position of the well, distance of the well from cropland, chemicals used, and susceptibility for run-off on the property, among others.

A mobile app will be developed as part of the project to ease data entry and will be used directly by the students.

Water samples tested by the students will be compared with analysis of the same samples by research technicians at the WSL, Snow said.

It's important for students to learn both about contaminants and

the wide variety of ways to measure and analyze them, Olson said.

Most Nebraskans rely on groundwater drawn wells for their drinking water and few of domestic wells are regularly tested, he said, noting "It can be an expensive, time-consuming and confusing process."

Contaminants in well water, many associated with agricultural pesticide and fertilizer use, as well as those that occur naturally, can be a constant threat to those sourcing their domestic water needs from a private well.

"National surveys confirm that domestic wells have a variety of contaminants that are potentially detrimental to health, including radon, arsenic, uranium, nitrate, fluoride, pesticides and many others," Snow said, noting that many factors can contribute to occurrence of pesticides in groundwater, including type of aquifer, well depth and age, well type, land use around the well (farmland, lawn, or garden), topography around the wellhead, and window of time between pesticide application and a significant rains, among others.

"All of this and more will be part of the education program that goes with the actual sampling and testing of well water samples," said Olson.

Collected samples will be analyzed for Nebraska specific pesticides, nitrate and coliform bacteria by faculty and staff at the WSL. Researchers will analyze the gathered data and the well testing results to determine parameters that seem to have most effects on well water quality. Annual workshops will be conducted at UNL to provide students and teachers with feedback, updates, interaction with UNL faculty and staff, and project results.

Once the project is finalized, the potential application of the program to other school districts with verification sampling will be explored in a next phase.

UNL faculty cooperating on the program in addition to Snow include Nebraska Water Center director Chittaranjan Ray, Ashok Samal of UNL's Department of Computer Science and Engineering, and Matt Kreifels of UNL's Department of Agricultural Leadership, Education and Communication.

Funding for the project, which began in the late summer of 2016, is through a three-year grant from the Nebraska Environmental Trust.

The WSL and Nebraska Water Center are part of the Robert B. Daugherty Water for Food Global Institute at the University of Nebraska.

ADDRESS SERVICE REQUESTED

Nebraska's Top 10 Water Challenges

Water Quantity

1. Effects of water consumption and conservation practices on instream-flows, groundwater recharge and water supplies (municipal and industrial); realizing the maximum water use efficiency for irrigation.
2. Potential effects of climate change, especially impacts of increased climate variability, on the availability and use of water resources of Nebraska.
3. Potential for high efficiency irrigation to improve sustainability of production agriculture in Central/Western Nebraska.
4. Development of tools and technologies for sensing soil moisture, control of irrigation and pumping systems, and data analysis.

Water Quality

5. Solutions to increasing incidence of nitrate, uranium, arsenic, and other contaminants in drinking water sources.
6. Management of non-point source (NPS) nutrient and sediment inputs in lakes, streams and reservoirs, including toxic algae treatment and prevention, and maximum contaminant loadings (MCLs) for nutrients in Nebraska.
7. Understanding the consequences of surface and groundwater contamination from emerging contaminants such as steroids, antibiotics, pesticides, surfactants, nanomaterials, and disinfectants from wastewater sources.

Water Institutions

8. Alternatives and solutions for aging water infrastructure, including drinking water distribution systems, wastewater treatment, irrigation systems, dams, levees and canals.
9. Improvements to water economics models and water policies, including establishing water markets and water banking, recreation, and wildlife habitat.
10. Creating effective social systems to influence individual and institutional behavioral change for sustainable water resources management

This listing is unranked and it recognizes that several challenges may fit into more than one of the three sub-categories