

MEET THE FACULTY

Crystal J. Stiles, Ph.D.

Crystal Stiles is an applied climatologist, postdoctoral research associate, in the University of Nebraska-Lincoln's High Plains Regional Climate



Crystal Stiles

Center, which is part of UNL's School of Natural Resources. She has been with UNL since July 2014.

Previously she was an instructor in the Department of Geography and Geology of Western Kentucky University.

Education:

Ph.D., Natural Resource Sciences with specialization in Climate Assessment and Impacts, School of Natural Resources, UNL, 2014

M.S., Geoscience with emphasis in Meteorology-Climatology, certificate in Geographic Information Systems, Department of Geography and Geology, Western Kentucky University, 2009

B.S., Geography with emphasis in Meteorology-Climatology, Department of Geography and Geology, Western Kentucky University, 2005

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NEBRASKA WATER CENTER
at the University of Nebraska

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March Water Symposium and Water Law Conference at NU Law College

Steve Ress, Nebraska Water Center



The annual water symposium and water conference are March 19 and 20 at the NU College of Law in Lincoln.

LINCOLN, Neb. - Back-to-back one-day water symposium and water law conference will be at the NU College of Law in Lincoln March 19 and 20.

"On March 19 our focus will be research, practices and policy related to sustainability of the High Plains aquifer for food production and water supply, while the following day's events focus on Nebraska water law for practicing attorneys and other water law professionals," said Chittaranjan Ray, director of the Nebraska Water Center, which is part of the University of Nebraska's Robert B. Daugherty Water for Food Institute.

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June Water Tour To Republican River Basin

This summer's Water and Natural Resources Tour visits the Republican River basin in Nebraska and Colorado June 23-25.

"This is a great opportunity to visit a very unique area of southwest Nebraska and eastern Colorado that share....with Kansas....the unique challenges of dividing and cooperating in use of the basin's waters," said tour co-organizer Steve Ress of the University of Nebraska's Nebraska Water Center (NWC).

The tour last visited the basin seven years ago, so it's time for a thorough update on the myriad of issues in the basin that effect water users, producers, communi-



Water to help Nebraska comply with terms of the Republican River compact flows from the N-CORPE pipeline in Southwest Nebraska (Steve Ress photo).

ties and economies in the three states that share its water.

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From the Director
Chittaranjan Ray, P.E.

Research and Collaboration Progress; Summer Water and Natural Resources Tour; March Symposium and Water Law Conference

Though our winter weather has been frightfully cold since the beginning of the new year, it's also a time when activity really heats up at the Nebraska Water Center as we get ready for a number of spring and summer events and spend time exploring a number of research projects and proposals.

Our annual water symposium and water law conference are just around the corner. They will be held back-to-back at the University of Nebraska College of Law, on the University of Nebraska-Lincoln East Campus, on Thursday, March 19 and Friday, March 20.

The symposium's theme is "High Plains Aquifer: Sustainability for Food Production and Water Supply." We have a number of very good speakers and panelists scheduled to speak at the symposium, which I am very excited about. We had a number of partners on this that helped search out and engage speakers on some of the most pressing current and future issues with the aquifer. We are very happy to be able to present a number of different perspectives on the High Plains aquifer from beyond Nebraska's borders, which we think is most important in terms of overall perspective.

A full agenda for both the symposium and the following day's water law conference can be found elsewhere in this issue of the Water Current. Please look the agendas over carefully in this issue and then register for one or both events online at watercenter.unl.edu. We are looking forward to seeing you in March.

We are also in the midst of planning our summer water and natural resources tour with co-sponsors The Central Nebraska Public Power and Irrigation District, Nebraska Public Power District, Robert B. Daugherty Water for Food Institute and the Upper Republican Natural Resources District.

The tour will be in the Republican River basin of Nebraska, Kansas and Colorado June 23-25, beginning and ending in Holdrege. Our tour last visited the basin in 2008 and much has changed since then, in many respects, so this will be an excellent opportunity to get caught up on the issues in all three states that make use of basin waters and that cooperate in the three state compact agreement.

Our communicator, Steve Ress, tour host Mike Jess, and Tim Anderson from CNPPID drove the basin in late January, looking at potential tour stops and talking with potential presenters and we are very excited at the long list of potential topics and stops this joint planning has generated. Especially helpful in assisting with this process before and during the January setup trip was Nate Jenkins at the Upper Republican Natural Resources District and my counterpart at Colorado State University, Reagan Waskom, director of the Colorado Water Institute.

Since the last issue of the Water Current, we have been investing a good deal of time and energy to exploring potential research collaborations that we think will ultimately be of benefit to Nebraska water users and citizens.

Among these, we have proposed a significant project to the City of Holdrege to examine the mass of nitrate and pesticides present in the vadose zone and to estimate the arrivals of peak pulses in ground water.



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Crystal J. Stiles, Ph.D. *continued from page 1*

Examples of Current Research:

Stiles is the principal investigator of a potential proposal that may be submitted to the University of Nebraska's Rural Futures Institute, pending an invitation to submit a full proposal. She is the co-investigator of a NASA proposal to develop climate indicators and assessment products for future National Climate Assessments.

Examples of Past Research Programs:

Stiles recently completed her dissertation, "Improving Drought Management for Transboundary River Basins in the United States through Collaborative Environmental Planning." The project involved interviewing water managers and planning experts about drought management strategies, the role of collaboration and coordination in the planning process, and recommendations for drought planning for a transboundary basin based on experiences with successes and barriers.

Examples of Outreach Programs:

A significant portion of her appointment is dedicated to supporting activities of the National Integrated Drought Information System (NIDIS) in the Missouri River Basin. In particular, she has been engaging

with tribes to learn about their needs for improving climate monitoring and drought planning for their reservations. She is currently leading an effort to develop a quarterly climate and drought summary for the Wind River Indian Reservation in Wyoming.

Teaching Responsibilities:

Although teaching is not a part of Stiles' current appointment, she has previously taught courses in meteorology, climatology, geography, and natural resources for both UNL and Western Kentucky University.

Selected Publications:

Shulski, M., W. Baule, **C.J. Stiles**, and N. Umphlett, 2015 (submitted): Investigation of Nebraska's Variable and Changing Climate: A Historical Perspective. Submitted to *Great Plains Research*.
Smith, K.H., **C.J. Stiles**, M.J. Hayes, and C.J. Carparelli, 2015 (submitted): Support for Drought Response and Community Preparedness: Filling the Gaps between Plans and Action. In *Western Water Policy and Planning in a Variable and Changing Climate*, K. Miller, A. Hamlet, D. Kenney, and K. Redmond, eds., CRC Press – Taylor and Francis.

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University of Nebraska Public Water Lectures Underway

Seven free public lectures on current water issues and research come together to form the University of Nebraska's spring semester water seminar beginning in January.

The lectures will be held roughly every-other-week from 3:30 to 4:30 p.m. Wednesdays beginning Jan. 14 and running through April 22. All lectures will be in the first floor auditorium of Hardin Hall, northeast corner of N. 33rd and Holdrege Sts, on the University of Nebraska-Lincoln East Campus.

Lecture Wednesdays are Jan. 14 and 28, Feb. 11 and 25, March 11 and April 8 and 22.

"Each year we assemble a broad base of informative and educational talks on current state and regional water issues and current research that we hope are appealing to both students and the public," said Chittaranjan Ray, director of the Nebraska Water Center, which has helped organize and offer the annual water lectures since the 1970's.

Jasper Fanning, general manager of the Upper Republican Natural Resources District in Imperial, opens the series with a talk on the Nebraska Cooperative Republican Platte Enhancement (N-CORPE) pipeline designed to pipe groundwater into the Republican and Platte Rivers when needed to meet river flow requirements.

Other talks focus on UNL's groundwater monitoring program, uranium contamination in municipal water systems, high-resolution GIS monitoring of the water cycle, the value of groundwater, wellhead protection programs and groundwater models for decision-making.

On Jan. 21, an off week for the normal lecture series, Chuck Schroeder, executive director of the University of Nebraska's Rural Futures Institute will talk on the new NU institute and its missions.

Co-sponsoring the lectures with the Nebraska Water Center, part of the Robert B. Daugherty Water for Food Institute, is UNL's School of Natural Resources, which also offers the lecture series for student credit.

Remaining lectures in the spring semester series appear below. The complete January through April lecture schedule is online at watercenter.unl.edu. Individual lecture videos and speaker PowerPoint presentations will also be posted at that web site within a few days after the lecture.

- Feb. 25** Paul Houser, spatial analyst and remote sensing/GIS, George Mason University, "A vision for an ultra-high resolution integrated water cycle observation and prediction system."
- Mar. 11** Kremer Memorial Lecture: Michael Schneiders, president, Water Systems Engineering, Inc., "The value of groundwater."
- April 8** Ryan Chapman, wellhead protection coordinator, Nebraska Department of Environmental Quality, "Wellhead protection."
- April 22** Williams Memorial Lecture: T. Prabhakar Clement, Harold Vince Groome Jr. Endowed Professor, Department of Civil Engineering, Auburn University, "Worthiness of complex groundwater models for decision making – when should we say enough is enough?"

Dvorak, Ray Aim At Improving Water Quality For Small Communities

Karl Vogel, UNL College of Engineering

Decades of innovation have helped large American cities improve their public water systems, but smaller, rural systems are being left behind.

Three University of Nebraska-Lincoln faculty, led by UNL Department of Civil Engineering Professor Bruce Dvorak, are part of the Water Innovation Network for Sustainable Small Systems (WINSSS), a national project that hopes to bring up-to-date technology and safer water to America's small communities.

WINSSS, with a three-year, \$4.1 million grant from the U.S. Environmental Protection Agency (EPA), is headquartered at the University of Massachusetts-Amherst, with associate centers at UNL and the University of Texas at Austin.

At UNL, Dvorak will direct WINSSS operations, working alongside Chittaranjan Ray, professor of Civil Engineering and director of the Nebraska Water Center, part of the Robert B. Daugherty Water for Food Institute at the University of Nebraska and Rebecca Lai, UNL professor of Chemistry. Dvorak is a former interim director of the Nebraska Water Center.

The project has particular relevance in Nebraska, where most public water systems serve fewer than 10,000 people and normally have smaller funding and small operations staffs. Many small systems, Dvorak said, also have rates of public health violations three times that of larger cities.

"A large system, like Denver or Omaha, can hire consultants and researchers and develop new technologies," he said. "Small communities don't have that. And in Nebraska, given that not a lot of smaller communities are growing, there's not a lot of financial capacity.

"We're trying to develop markets and modify existing technologies to make them appropriate for small systems."

However, improving and updating small public water systems is not a simple task.

EPA had not previously put a lot of funding or research into updating these systems, Dvorak said.

"Many of the technologies work for Lincoln or Grand Island but are not well-adapted for a small community. The assumption has been that what works for big communities is the priority, and that small communities should figure out how to do this. It hasn't been real effective," he said.

"EPA wants researchers to start taking technologies – like off-the-shelf sensors and point-of-use devices – and adapt them for the unique situations of small water systems, so that entrepreneurs can start making them available for the actual systems."

Accomplishing that, Dvorak said, will require overcoming political hurdles, which include getting the new technology approved separately by each of the 50 states. WINSSS is trying to find ways to get research and testing information to multiple state regulatory agencies with the hope that when one state approves the new product, others will follow suit.

"Legislators and congressional delegations are concerned about finding cost-effective solutions for supplying safe drinking water for these small communities," Dvorak said. "What we're trying to do is reduce the risk."

Even though the EPA grant only covers the next three years, Dvorak expects the work will continue longer.

"We're being given three and a half years to do the first three years' work, but I see this lasting at least 10 years," he said. "We're trying to not just have scientists and engineers develop innovation, but set up a framework where we can go back and forth with government agencies and communities to figure out what makes sense now and for the future."

Water Center Awards USGS 104b Funds

Steve Ress, Nebraska Water Center

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

Projects selected for funding were required to pass a rigorous review by a panel of fellow academic and professional colleagues. For each of the four projects, the period of the funding grant is March 1, 2015 through February 28, 2016

Projects selected for funding by the review committee are:

Design of Multi-Scale Soil Moisture Monitoring Networks in Agricultural Systems Using Hydrogeophysics, PI: Trenton Franz, UNL School of Natural Resources, \$20,000.

Climate Variability and Decision Support Tool for Optimizing Yields with Limited Water Available for Irrigation, PI: Jane Okalebo, UNL School of Natural Resources, Co-PI: Kenneth Hubbard, UNL School of Natural Resources, \$16,500.

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Franz Brings Soil-Moisture Monitoring Technology From Cornfield to Battlefield

Mobile cosmic-ray neutron rover has the potential to advance military decision-making through real-time soil moisture data collection and mapping

Dana Ludvik, Robert B. Daugherty Water for Food Institute

A cosmic-ray neutron rover may sound like something from a science-fiction film, but a University of Nebraska-Lincoln researcher is developing the high-tech tool to help the military better understand the harsh environment in which it operates.

Hydrogeophysicist Trenton Franz is exploring ways to use a soil moisture detector he helped create for agriculture to enable the military to quickly and reliably survey, monitor and map soils.



The mobile cosmic-ray neutron rover sits in the truck bed, but could potentially be mounted anywhere (School of Natural Resources photo).

"Soil water content affects a range of processes and decision-making, from irrigation management to optimize water usage to weather forecasting," said Franz, a Robert B. Daugherty Water for Food Institute Faculty Fellow. "The military, like many other sectors, needs better datasets."

For example, when considering whether to deploy soldiers in remote locations, a critical factor is travel time to that destination. Poor soil stability can cause tanks and other heavy machinery to get stuck in mud. Franz's cosmic-ray neutron rover would allow the military to make soil maps on-the-fly to better predict how long it will take to get somewhere with large equipment.

The rover provides accurate, real-time soil moisture estimates by measuring subatomic neutron particles in the air above the soil surface.

Cosmic rays, or particles, enter the earth's atmosphere and travel to the surface. Its neutrons are absorbed into the soil, but some escape back into the air. The amount that escapes depends on the soil's hydrogen content, which is largely determined by the amount of water

present. Measuring the level of neutrons in the air provides a reliable estimate of the water in the soil below.

The rover measures soil moisture every minute with a horizontal footprint of a 300-meter radius circle and a penetration depth of 30 centimeters.

One of the probe's most exciting features is its mobility, according to Franz.

"One could use the instrument to take mobile surveys from a vehicle, farm equipment or low flying aircraft," said Franz. "You could potentially mount it to the wall of a tank or drop it out of an airplane anywhere in the world and take measurements in a matter of minutes."

Despite its importance in many scientific disciplines, the ability to measure soil moisture is largely restricted to small and very large spatial scales, leaving a critical measurement gap.

Franz's research aims to reduce uncertainty in converting neutron counts in soil water content.

"Instead of gathering datasets using the labor-intensive practice of placing probes directly in the ground at multiple points or through satellite-based remote sensing, the rover allows us to gather valuable data that may be missing in-between," said Franz.

The tool is also being used to advance the military's climate modeling and weather forecasting capabilities. Data from the rover is fed into weather and climate models developed by the U.S. Army Engineer Research and Development Center's Cold Regions Research and Engineering Laboratory (CRREL) and the Air Force Weather Agency to refine and validate their models.



Trenton Franz stands next to a stationary cosmic-ray neutron probe mounted next to a weather station in South Dakota (School of Natural Resources photo).

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WRAP Meets at Historic Ferguson Mansion

Jesse Starita, Daugherty Water for Food Institute

The University of Nebraska’s Water Resources Advisory Panel (WRAP) convened at Lincoln’s historic Ferguson House – in the shadow of the State Capitol – on January 22 to discuss a range of water and natural resource issues. An open house followed the meeting and included several members of the State Legislature Natural Resources Committee.

NU Vice President and Institute of Agriculture and Natural Resources (IANR) Harlan Vice Chancellor Ronnie Green opened by informing WRAP of recent developments at Nebraska Innovation Campus (NIC) on the site of the former Nebraska State Fairgrounds. Green noted that phase I of NIC will finish July 1 and house UNL’s Department of Food Science and Technology and a cutting-edge, 45,000-square-foot greenhouse complex. Green said IANR is in the process of hiring 39 new positions that intersect with but are not directly within water areas.

Further, he mentioned an Association of Public and Land-grant Universities (APLU) white paper prepared by the National Water Working Group which included UNL’s Suat Irmak. The white paper outlines a \$100 million (annual) initiative by Land Grant Institutions to address the nation’s water security challenges. Green said NU is studying how best to proceed with the task force’s initial recommendations.

Daugherty Water for Food Institute Founding Executive Director Roberto Lenton briefed members about the Institute’s highly successful annual conference in Seattle, Ore. in October 2014. He said the next Water for Food Conference would likely be held at NIC in spring of 2016 and would center on a theme of public and private sector collaboration.

He then updated WRAP on several DWFI happenings, including a USDA-EPA water quality trading conference to be held September 15-17 at NIC; a soon-to-be-released policy report on Nebraska’s NRDs; the development of a website to share and promote an oral history about the formation of the NRDs; rapid growth in DWFI’s media presence thanks to recently hired Public Relations and Communications Director Molly Nance; and a DWFI/NWC open house March 5.

June Water Tour *continued from page 1*

“There have been substantial water use and litigation issues in the basin for more than 15 years amongst the three states that share its water by compact agreement. Those issues, along with surface and groundwater irrigation issues will provide for a very interesting and informative tour,” Ress said.

Use of basin water has remained contentious since Kansas initiated litigation against Nebraska in 1998 for non-compliance with terms

UNL Associate Dean of Extension Rick Koelsch highlighted the work of the Nebraska Agriculture Water Management Network. Koelsch noted the network now includes 1,200 producers representing 1.7 million acres and, since its inception 10 years ago, has saved approximately one million acre-feet of water through soil moisture sensors and conservation practices. Koelsch said UNL Extension’s educational programs around agricultural water use reached 4,500 producers and 1,550 youth last year.

Nebraska Water Center Director Chittaranjan Ray initiated his update by advertising the Center’s upcoming symposium and water law conference on March 19 and 20 at NU’s College of Law. Ray commented that the NWC’s Spring Seminar Series began with a successful talk by Upper Republican NRD Manager Jasper Fanning and features a total of eight speakers. He also said the annual water and natural resources tour will travel to the Republican River Basin in June. Lead sponsor for that tour will be the Central Nebraska Public Power and Irrigation District.

To complement NWC outreach activities, Ray apprised the panel of several recent research endeavors. These include a project to investigate nitrate and uranium in drinking water in Hastings and collaboration with the University of Massachusetts on an EPA grant looking at drinking water quality of several rural communities in Nebraska.

Following these and other updates from WRAP panelists, UNL Assistant Professor of Soil Science Humberto Blanco delivered an overview of his work. Nebraska Natural Resources Commission Member Scott Smathers described both the process and the proposed rules being developed to administer the Water Sustainability Fund.

At 3:30 p.m., with the formal meeting adjourned, the open house commenced. WRAP members and state senators got acquainted - or reacquainted, in some cases - over light hors d’oeuvres served in the historic home’s parlor. State Senators in attendance included Senators Friesen, Hughes, Kolowski, Lindstrom, McCollister, Schilz, and Schnoor.

of the three-state compact. The compact, dating to 1943, allocates 49 percent of the river’s water to Nebraska, 40 percent to Kansas and 11 percent to Colorado.

The river itself starts in the high plains of Colorado, flows east across northwestern Kansas and into Nebraska, then dips back into Kansas where it joins with the Smokey Hill River, forming the Kansas River.

“Agricultural producers, municipalities, recreation and fish and wildlife all depend on Republican River water in all three states, which have often made compliance with the compact difficult,” Ress said.

This summer’s tour begins and ends in Holdrege.

First day stops being considered include the University of Nebraska’s College of Technical Agriculture in Curtis; the N-CORPE (Nebraska Cooperative Republican Platte Enhancement) and Rock Creek augmentation pipeline projects in the Upper Republican Natural Resources District; and how area producers are effected by groundwater and surface water irrigation demands on water resources. The augmentation pipelines were designed and built to aid Nebraska compliance with stipulations of the three-state compact, but are controversial.

Water Quality-Related Thesis and Dissertation Committees Chaired or Co-Chaired

Patrick J. Shea, Ph.D., UNL School of Natural Resources

Ghadiri, H. 1983. Atrazine dissipation, stubble interception and retention in soils under various tillage systems. (Ph.D.)

Fredrickson, D.R. 1984. Effects of soil pH on the degradation and availability of chlorsulfuron in soil. (M.S.)

Petersen, B.B. 1985. Influence of wheat stubble residue on the activity and dissipation of three acetanilide herbicides. (M.S.)

Fredrickson, D.R. 1988. Soil mobility, octanol-water coefficients, and degradation of six sulfonylurea herbicides. (Ph.D.)

Sorenson, B.A. 1988. Effects of tillage, corn and wheat residue, and application time on metribuzin efficacy and dissipation in soil. (M.S.)

Stahnke, G.K.1989. Pendimethalin dissipation and the influence of preemergence herbicides on Kentucky bluegrass shoot and root growth. (Ph.D.)

Petersen, B.B. 1990. Interactions between agricultural chemicals and their effects on pesticide persistence in soil. (Ph.D.)

Schleicher, L.C., Jr. 1992. Efficacy and dissipation of pendimethalin and dithiopyr in a perennial ryegrass turf. (M.S.)

Smith, E.A. 1993. Effects of pore size distribution, compaction, and saturation cycles on bromide and atrazine movement through a surface soil. (M.S.)

Tyess, D.L.1996. Atrazine degradation in soil as influenced by microbial populations and soil characteristics. (M.S.)

Li, Z.M. 1996. Remediating trinitrotoluene-contaminated soil by Fenton oxidation. (Ph.D.)

Peterson, M. 1996. Potential for use of tall fescue and switchgrass for phytoremediation of trinitrotoluene-contaminated soil. (M.S.)

There will be discussions of the terms of the compact and what producers, NRDs and others are doing, along with an overview of the Nebraska Water Balance Alliance by producer Roric Paulmann.

Stops at historic Champion Mill in Nebraska and the Bonny Reservoir augmentation project near Wray, Colorado are also planned. Overnight will likely be in Wray.

On day two participants will hear more about water augmentation projects in the basin, as well as an overview of oil and natural gas drilling in the region. Heading east, the tour will look at the U.S. Bureau of Reclamation’s Swanson Reservoir and get an overview of USBR operations from their area office in McCook. A tour of Valmont Industries manufacturing facilities there is also planned.

Second night lodging will likely be in McCook.

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Hundal, L.S. 1997. TNT sorption and fate in munitions-contaminated soil: Implications for abiotic remediation. (Ph.D.)

Singh, J. 1997. Natural and accelerated detoxification of RDX and atrazine in contaminated soil and water. (Ph.D.)

Satapanajaru, T. 2002. Remediating chloroacetanilide-contaminated water using zerovalent iron. (Ph.D.)

Park, J. 2004. Remediating munitions-contaminated soil and water with zerovalent iron and surfactants. (Ph.D.)

Culp, R. 2004. Using a bioluminescence assay to assess the toxicity of munitions-contaminated water during remediation with reducing and oxidizing agents. (M.S.)

Boparai, H. 2006. Evaluating in situ redox manipulation for remediating pesticide- and explosive-contaminated groundwater. (Ph.D.)

Kronschabel, B.J. 2007. Graphite and carbide catalysts for contaminant remediation. (M.S.)

Kim, Jong S. 2007. Formation of nitrosamines from reaction of pharmaceuticals with nitrite and chloramine (M.S.)

Dhakal, K. 2011. Atrazine runoff in the Blue River Basin: Geomorphology, rainfall, and agronomic practices. (M.S.)

Wei, H-R. 2011. Formation, adsorption, and degradation of N-nitrosoatrazine in water and soil. (M.S.)

Hosseini, A. 2012. Modeling field-scale vulnerability to pesticide runoff. (M.S.)

Report Shows Continued Declines, Some Rises in State's Groundwater Levels

Mekita Rivas, UNL School of Natural Resources

The 2014 Nebraska Statewide Groundwater-Level Monitoring Report reveals that the state is still reeling from the effects of the 2012-2013 drought.

“From the spring of 2013 to the spring of 2014, water levels continued to decline following the extended period of drought from early 2012 through the summer of 2013,” said Aaron Young, survey geologist at the Conservation and Survey Division in UNL’s School of Natural Resources.

However, easing drought conditions for the eastern half of the state and better water use practices accounted for lower declines. On average, water levels declined half a foot from spring 2013 to spring 2014, compared to average declines of 2.55 feet from spring 2012 to spring 2013.

Southeastern Nebraska saw some of the largest declines in groundwater levels, with some wells recording declines of up to five feet.

“Declines in these areas resulted from below normal precipitation values, possibly combined with delayed response of the aquifer to drought conditions in 2012,” Young said.

Notable areas of groundwater level rises of one to 10 feet occurred in the southern Panhandle, Perkins, Holt and Colfax counties, in addition to localized areas throughout the state.

In the spring of 2012, northern Colfax County experienced groundwater level declines of more than 20 feet. In the spring of 2014, water levels rebounded two to 10 feet in the same area.

The spring of 2013 saw the setting of many records, including unprecedented one-year declines of almost 25 feet in some wells. In spite of water levels continuing to fall throughout the state in the spring of 2014, conditions were much less severe, Young said.

“Although water levels have declined for much of the state over the last few years, conditions are far from dire,” he said. “Declines experienced in some parts of the state will recover if we experience a number of wet years.”

In 2013, precipitation values for Nebraska were on average 1.32 inches below normal – compared to 10.34 inches below normal in 2012, according to the High Plains Regional Climate Center. The increased precipitation in 2013 drastically reduced the demand for irrigation water, which eased the strain on groundwater pumping.

Groundwater-level monitoring began in Nebraska in 1930. The annual reports and maps have been produced by the Conservation and Survey Division in the School of Natural Resources at UNL since the 1950s.



Statewide groundwater-level monitoring reports depict the change in water levels from spring to spring at different time scales. The reports study the rates of drawdown and recharges measured in regional wells, and give a general depiction of the current state of groundwater levels on a yearly basis. The reports also compare historical trends of regional water levels over extended periods of time. Collecting data is a collective effort between the United States Geological Survey, U.S. Bureau of Reclamation, Nebraska Natural Resources Districts and Central Nebraska Public Power and Irrigation District.

The 2014 Nebraska Statewide Groundwater-Level Monitoring Report is \$12 and available for purchase from the Nebraska Maps and More Store on the first floor of Hardin Hall at 33rd and Holdrege Streets. The book can also be purchased online at nebraskamaps.unl.edu and amazon.com. To place an order by phone, call (402) 472-3471.

From the Director *continued from page 2*

We are requesting funds for a small project to complete the state nitrate map that UNL faculty member Mary Exner and others completed for the eastern part of the state. Exner and Roy Spalding, founding director of our Water Sciences Laboratory, recently retired from UNL and moved out of state. Since then, there have been several inquiries from both in and out of state to complete that important data.

NWC was not successful on funding of a large proposal on the sustainability of the High Plains/Ogallala aquifer on N-S and E-W gradients. NWC and our research collaborators worked with Colorado State University (lead), Oklahoma State University, USGS (Lincoln), USDA-ARS (Ft. Collins), and the Climate Hub in Ft. Collins and the proposal was submitted to the USDA in June 2015. NWC will work with our partners for a revised/modified version of the proposal once the call from NIFA-USDA comes out this year.

In November, the NWC’s working group talked about possible research proposals and collaborations in several areas. Internal arrangements have been made to designate leads for these proposals aimed at NIFA (USDA), NSF, and USEPA.

Also since our last Water Current, Tony Carr joined us as a visiting fellow in early November. He will be here until early May. Tony is researching issues related to water productivity for various crops under irrigated and non-irrigated systems, using data largely from our Natural Resource Districts. This is part of an internship he has under his master’s program “Transnational Ecosystem-Based Water Management” at the University of Nijmegen in the Netherlands and University of Duisburg-Essen in Germany.

Seo Jin Ki (post-doctoral researcher) from the University of Hawaii was here in the late fall to work with me on an ongoing project we had at the University of Hawaii to assess the leachability of pharmaceuticals compounds in various soils in Hawaii. Post-doctoral researcher Matteo D’Alessio and Seo Jin Ki worked together to determine half-life and sorption distribution coefficients for 8 tropical soils at three depths and used that information to examine leaching potential of various compounds in a GIS framework. This screening tool is being used by the State of Hawaii for various decisions (pesticide registration, wastewater reuse, monitoring waiver etc.).

Water Center Awards *continued from page 4*

Fate of Manure-Borne Antimicrobials Monensin, Lincomycin, and Sulfamethazine and Potential Effects to Nitrogen Transformation in Soil, PI: Daniel Snow, Nebraska Water Center, Robert B. Daugherty Water for Food Institute (Nebraska Water Sciences Laboratory), Co-PI: Matteo D’Alessio, Nebraska Water Center/Nebraska Water Sciences Laboratory, \$20,000.

Development of Smart Alginate Hybrid Beads for Eco-Friendly Water Treatment, PI: Jaehong Shim, Visiting Scientist/Postdoctoral Assoc., UNL School of Natural Resources, Co-PI: Patrick Shea, UNL School of Natural Resources, \$15,000.

Stipulations for awarding the funds, normally done annually, are based in part on the more than 50 Water Resources Research Institutes being required to “Plan, conduct, or otherwise arrange for competent applied and peer reviewed research that fosters – improvements in water supply reliability; exploration of new ideas that address water problems or expand understanding of water and water-related phenomena; the entry of new research scientists, engineers, and technicians into water resources fields; and the dissemination of research results to water managers and the public.”

Program funds are issued under provisions of the federal Water Resources Research Act of 1984.

From Cornfield to Battlefield *continued from page 5*

Franz first developed the tool to create more efficient irrigation systems, enabling farmers to better manage water resources. To explore military applications, Franz received a one-year exploratory grant funded by CRREL in association with UNL’s Great Plains Cooperative Ecosystems Studies Unit and coordinated through Kurt Preston, associate vice chancellor in UNL’s Office of Research.

Franz’s research is an example of how the University of Nebraska uses its resources and expertise in water to help address challenges beyond the state. Soil is a vital component of our environment. Understanding soil water content helps us grow more food with less water — and better prepare troops on the front lines.

For additional information on Franz’s research, visit <http://tfranz2.wix.com/trenton-franz#!research/ca4p>.

Water and Natural Resources Tour to Republican River June 23-25

SPONSORED BY: The Central Nebraska Public Power and Irrigation District
Nebraska Public Power District
Nebraska Water Center
Robert B. Daugherty Water for Food Institute
Upper Republican Natural Resource District



Nate Jenkins, Mike Jess and Tim Anderson at Champion Mill historic site during a tour set-up trip in January.



Tim Anderson looks over pipeline augmentation water flowing toward Medicine Creek near Wellfleet.



Southwest Nebraska farm and ranch land under January cold and snow.



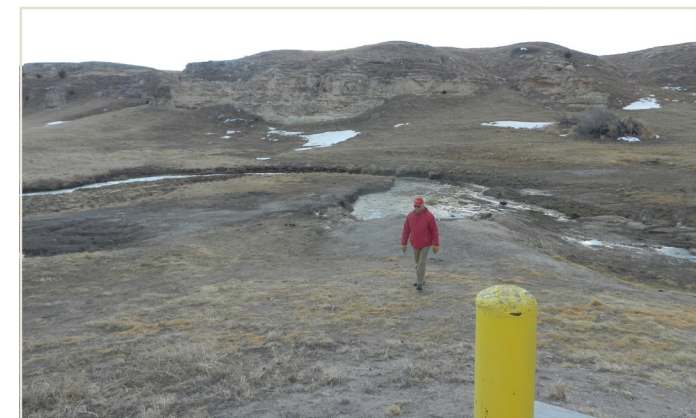
Artesian wells at Cox's Pond and Cabins, near Champion.



A canal system, administered by local irrigation districts and built by the U.S. Bureau of Reclamation, supplies surface irrigation water to many producers in southwest Nebraska.



Compact compliance water flowing from the NCORE pipeline in southwest Nebraska.



Augmentation waters flow south through a canyon north of Parks.



Tim Anderson and Mike Jess at the Courtland Canal which serves irrigators in both Nebraska and Kansas.



NCORPE pipeline water flowing into Medicine Creek.



Nate Jenkins of the Upper Republican NRD talks with tour host Mike Jess.

March Water Symposium and Water Law Conference *continued from page 1*

Cosponsoring the annual events are NU’s College of Law, the U.S. Geological Survey Nebraska Water Science Center, Robert B. Daugherty Water for Food Institute and the Natural Resources Section of the Nebraska State Bar Association.

“We have very strong agendas for both events and hope those interested will register for both,” Ray said.

March 19’s speakers all focus on some aspect of sustainability and use of the High Plains, or Ogallala, aquifer which underlies approximately 174,000 square miles in portions of South Dakota, Nebraska, Wyoming, Colorado, Kansas, Oklahoma, New Mexico and Texas.

Jim Butler of the Kansas Geological Survey will talk about a first order approach for assessing prospects for sustainability of the aquifer in western Kansas; UNL’s Jesse Korus will follow with a presentation on the geology and hydrology of the aquifer and Steve Peterson of the USGS Nebraska Water Science Center will discuss modeling water flow in the northern part of the aquifer.

Other symposium speakers include Nebraska and Texas producers Roric Paulmann of the Nebraska Water Balance Alliance and Glenn Schur of the Texas Alliance for Water Conservation, along with researcher Anthony Kendal of Michigan State University.

Four local studies of the aquifer will be presented in the afternoon by Steve Sibray of UNL’s Conservation and Survey Division; Lyndon Vogt of the Central Platte Natural Resources District; Nick Brozovic of the Daugherty Water for Food Institute; and Nathan Schaepe of the USGS Nebraska Water Science Center.

A panel discussion of use and sustainability of the High Plains Aquifer into the future concludes the day’s agenda.

The following day’s presenters will cover the latest in regulatory and statutory changes in Nebraska water law, focusing on litigation and new developments directly impacting water law locally and regionally.

This includes federal impacts on water law, such as water quality

efforts under the Clean Water Act in places like Florida, the Chesapeake Bay region or the Mississippi River watershed that could impact Nebraska.

“Clean Water Act jurisdictional rules will also be covered, along with Endangered Species Act impacts,” said organizer Anthony Schutz of NU’s College of Law.

Conference keynote speaker is Ann O’Connell, assistant to the Solicitor General of the United States.

“She specializes in original actions before the U.S. Supreme Court and will discuss the U.S. position in such actions and how her office develops those positions,” Schutz said.

Innovations and developments in integrated management will be discussed by Jasper Fanning of the Upper Republican NRD and Jim Schneider of the Nebraska Department of Natural Resources and then a panel will discuss subjects related to NRD administration concerning handling claims and disputes before them, Schutz said.

A session on ethics in the water law arena by The Honorable James E Doyle IV, Judge of the District Court, 11th Judicial District, Nebraska closes out the conference.

Though the water conference focuses on information of interest to practicing attorneys, it is open to all. NUs College of Law and the Natural Resources Section of the Nebraska State Bar Association are cosponsoring this event.

Continuing legal education credits are available for Nebraska, Iowa and Colorado.

Information on both events, including detailed agendas and online registration, is at watercenter.unl.edu. Registering for either day is \$175. A discounted rate of \$290 applies if registering for both days. Registration increases by \$50 per event after Feb. 19. Online registration is at <http://go.unl.edu/cic>.

Questions can be directed to Tricia Liedle at 402-472-3305 or pliedle@nebraska.edu

June Water Tour *continued from page 7*

On day three, participants will hear from representatives of the Frenchman-Cambridge Irrigation District, how ag producers cope and prosper in the often water-strapped basin and get an overview of the U.S. Army Corps of Engineer’s Harlan County Dam, construction of which was prompted by a 1935 flood in the basin that killed more than a hundred people and did millions of dollars in property damage during the depths of the Great Depression.

A visit with representatives of the Nebraska Bostwick Irrigation District is also planned.

Additional detail planning will be done before the complete tour itinerary is publicized, Ress said.

Current tour sponsors in addition to the NWC include NU’s Robert B. Daugherty Water for Food Institute, The Central Nebraska Public Power and Irrigation District in Holdrege, Nebraska Public Power District and the Upper Republican Natural Resources District in Imperial.

Tour host is Mike Jess, former director of the Nebraska Department of Water Resources and retired UNL faculty member.

“No one knows the issues in the basin or the workings of the three-state compact better than Mike,” Ress said.

Additional information will be posted online at watercenter.unl.edu and at facebook.com/NebraskaWaterCenter as it becomes available.

HIGH PLAINS AQUIFER: SUSTAINABILITY FOR FOOD PRODUCTION AND WATER SUPPLY

THURSDAY, MARCH 19, 2015

7:30 a.m.	Registration (continental breakfast available)	Afternoon Sessions	
8:15 a.m.	Welcome and announcements, Chittaranjan Ray, NU Nebraska Water Center	Moderator:	Dan Snow, NU Water Sciences Laboratory
Moderator:	Bob Swanson, USGS Nebraska Water Science Center	2-2:20 p.m.	Local studies #1: “Sustainability and Groundwater Management in Western Nebraska,” Douglas R. Hallum and Steven Sibray, UNL Conservation and Survey Division
8:30-9:00 a.m.	“A Simple, First-Order Approach for Assessing Prospects for Sustainability of the High Plains Aquifer in Western Kansas,” James Butler, Kansas Geological Survey, University of Kansas	2:20-2:40 p.m.	Local studies #2: “Water Sustainability Projects in the Central Platte NRD,” Lyndon Vogt, Central Platte Natural Resources District
9-9:30 a.m.	“Geology and Hydrology of the High Plains/Ogallala System,” Jesse Korus, UNL Conservation and Survey Division	2:40-3 p.m.	Local studies #3: “Innovations in High Plains Water Management Institutions,” Nick Brozovic, NU Robert B. Daugherty Water for Food Institute
9:30-10 a.m.	“Modeling of Water Flow in the Northern Part of the High Plains/Ogallala Aquifer,” Steve Peterson, USGS Nebraska Water Science Center	3-3:20 p.m.	Local studies #4: “USGS 2010 Water Use Compilation: The Nation, High Plains, and Nebraska,” Nathan Schaepe, USGS Nebraska Water Science Center
10-10:30 a.m.	Break	Panel Discussion	
Moderator:	Jesse Korus, UNL Conservation and Survey Division	3:45-5 p.m.	“Use and Sustainability of the Aquifer into the Future” (invited): Jerry Kenny, Platte River Recovery Implementation Program; Scott Smathers, NRCS; Jim Schneider, Nebraska Department of Natural Resources; Pat O’Brien, Upper Niobrara White NRD; Lee Orton, Nebraska State Irrigation Association; John Heaston, The Nature Conservancy; Rick Kellison, Texas Alliance for Water Conservation
10:30-11 a.m.	“Managing Water for Nebraska Farmers,” Roric Paulmann, Nebraska Water Balance Alliance	5 p.m.	Adjourn
11-11:30 a.m.	“Managing Water for Texas Farmers,” Glenn Schur, Texas Alliance for Water Conservation		
11:30-12 p.m.	“Simulating the Land Surface Response to Drought and Climate Change Across the High Plains,” Anthony Kendal, Michigan State University		
12-1 p.m.	Lunch		
1-2 p.m.	Poster sessions		

NEBRASKA WATER LAW CONFERENCE

FRIDAY, MARCH 20, 2015

Afternoon Sessions			
8:30-9:30 a.m.	“Water Law Update,” David J. Bargaen, Rembolt, Ludtke, LLP and LeRoy Sievers, Nebraska Department of Natural Resources	12:45-1:45 p.m.	“Innovations and New Developments in Integrated Management Planning”: Jasper Fanning, Upper Republican NRD; and Jim Schneider, Nebraska Department of Natural Resources
9:30-10:30 a.m.	“Federal Impacts on Water Law,” Michael S. Mostek; Tom Wilmoth, Blankenau, Wilmoth & Jarecke, LLP; and Michael J. Linder, Koley Jessen PC, LLO	1:45-2:45 p.m.	“Practice and Procedure in Natural Resources Districts,” Russ Barger; Don Blankenau, Blankenau, Wilmoth, & Jarecke, LLP; Daniel L. Lindstrom, Jacobsen, Orr, Lindstrom & Holbrook, PC, LLO
10:30-10:45 a.m.	Break	2:45-3 p.m.	Break
10:45-11:45 a.m.	Keynote Speaker: “Department of Justice Positions,” Anne O’Connell, Assistant to the Solicitor General of the United States	3-4 p.m.	“Ethics in the Water Law Arena,” The Honorable James E. Doyle IV, Judge of the District Court, 11th Judicial District, Nebraska
11:45-12:45 p.m.	Lunch	4 p.m.	Adjourn

Water Resources Research National Competitive Grants Program For FY 2015

The U.S. Geological Survey (USGS) in cooperation with the National Institutes for Water Resources requests proposals for matching grants to support research on the topic of improving and enhancing the nation's water supply, including evaluation of innovative approaches to water treatment, infrastructure design, retrofitting, maintenance, management, and replacement; exploration and advancement of our understanding of changes in the quantity and quality of water resources in response to a changing climate, population shifts, and land use changes; development of methods for better estimation of water supply, both surface and groundwater, including estimation of the physical supply and of the economic supply of water; development and evaluation of processes and governance mechanisms for integrated surface/ground water management; and the evaluation and assessment of conservation practices.

Any investigator at an accredited institution of higher learning in the U.S. is eligible to apply for a grant through a Water Research Institute or Center (such as the Nebraska Water Center) established under the provisions of the Water Resources Research Act of 1984, as amended.

Proposals involving substantial collaboration between USGS and university scientists are encouraged. Proposals may be for projects of 1-3 years in duration and may request up to \$250,000 in federal funds.

Successful applicants must match each dollar of the federal grant with one dollar from non-federal sources. Proposals must be filed at <https://niwr.net/> by 5:00 PM, Eastern Time, Thursday, February 19, 2015 and must be approved for submission to the National Competitive Grants Program not later than 5:00 PM, Eastern Time, Thursday, March 12, 2015 by the Institute or Center through which they were submitted.

SF-424 (Application for Federal Assistance) and SF-424B (Assurances) portion of the application package must be submitted through <http://www.grants.gov> not later than 5:00 PM Eastern Time, Thursday, March 12, 2015 by the university at which the Institute or Center is located. Funds have not yet been appropriated for this program for FY2015. The Government's obligation under this program is contingent upon the availability of funds.

USDA NRCS Accepting Applications for Conservation Stewardship Program

The U.S. Department of Agriculture's Natural Resources Conservation Service has \$100 million available this year through the Conservation Stewardship Program (CSP). CSP is a voluntary program that provides financial and technical assistance to help farmers and ranchers conserve and enhance soil, water, air, and related natural resources on their agricultural and forestry land.

Although applications are accepted all year, farmers, ranchers and forest landowners should submit applications by Feb. 27, 2015, to ensure they are considered for this year's funding (applications received after that date will be considered for future funding). This year's investment may result in the enrollment of up to 7.7 million acres in the program by private landowners.

CSP has been a very successful program for Nebraska's farmers and ranchers. Over 2,300 CSP contracts occur in all 93 counties and cover 5.1 million acres in Nebraska.

CSP is available statewide to individual landowners, legal entities, and Indian tribes. Eligible land includes cropland, grassland, prairie, improved pastureland, non-industrial private forestland, and agricultural land under the jurisdiction of an Indian tribe. Contracts are set at five years and include all the land controlled by an operator.

The 2014 Farm Bill brought changes to CSP including expanding conservation activities, called enhancements, available to participants to protect natural resources on their land. These enhancements include cover crops, intensive rotational grazing, wildlife friendly fencing, and more. There will also be additional funding opportunities available to irrigators through the Ogallala Aquifer Initiative.

Applications should be submitted to local NRCS offices. As part of the CSP application process, applicants will work with NRCS personnel to complete a resource inventory of their land, which will help determine the performance of existing and new conservation activities. The applicant's conservation performance will be used to determine eligibility, ranking and payments. For more on technical and financial assistance available through conservation programs, visit www.nrcs.usda.gov/GetStarted or a local USDA service center.

LETTER TO THE EDITOR

Dec. 3, 2014

While looking for resources all about water conservation and water education, I found your page - <http://watercenter.unl.edu/Links.asp#others>

As a retired Special Education teacher, I'm keeping busy by volunteering at my library on the weekends (Can't let my brain rot away haha!) We hold kid-oriented learning session, which have been a huge success! We're covering various sustainability topics at the moment, and your page has been a big help! We've referenced it quite a bit! One of the kids found another good conservation guide that's not listed on your site: <http://www.berkeyfilters.com/articles/a-guide-to-water-conservation/>

Everyone loved it - including me! It lists some good water saving tips with a ton of additional references to check out! I was wondering if you could include it somewhere on your website for me?

If there is anything that I've learned in my years of Special Education, it's that encouragement is such a powerful thing! I'd love to show the group they're on the right track! I'll be meeting with them tomorrow!

Keep up the good work!!

Bill

william.jackson@socialstudieshelp.com

Small Hog Farms *continued from page 16*

have increased by 121 percent and the inventory of all farms combined would have increased by 17 percent, the researchers note.

However, the impact of environmental regulations on large confinement operations depends on the nature of the rules, Azzam said. Some rules can encourage growth while others inhibit it; for example, if a farmer is required to incur a large fixed cost such as an expensive manure treatment system, it might be profitable to increase the number of hogs in the operation. But if the rules require an increase in operating expenses, such as requiring manure used



as fertilizer to be spread more thinly, it might be more cost-effective to reduce the number of hogs.

"Industry shifts to greater total inventory in large farms have been in spite of, not because of, increasing environmental stringency," Azzam and his colleagues, which also included Gibson Nene of the University of Minnesota-Duluth, concluded in their article. It was published recently in the Canadian Journal of Agricultural Economics.

"For regulators who are concerned about both environmental quality and the protection of small family farms, environmental regulation does not seem to adversely affect the viability of such operations," the authors wrote.

Crystal J. Stile, Ph.D. *continued from page 3*

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Report, Chicago, IL, available at http://www.drought.gov/media/pfiles/NIDIS_EPC_ChicagoWorkshopReport_Final.pdf.

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NWC Social Media

Like and follow the Nebraska Water Center on Twitter and Facebook



twitter.com/NebrWaterCenter



facebook.com/NebraskaWaterCenter

New Mailing Addresses

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Study shows environmental regulation may have helped small hog farms endure

Leslie Reed, University Communications

Hog farms have become fewer and larger in recent decades, even as federal and state environmental regulations governing them have become stricter.

In a new study, UNL agricultural economists Azzeddine Azzam and Karina Schoengold examined how environmental regulation has shaped the industry in the top 10 hog-producing states. Their conclusion: Environmental regulation has slowed the growth of large confinement operations and actually helped keep more small farmers in business than otherwise would have survived.

Livestock feeding operations have been subject to environmental regulations since 1976. Federal regulations, enacted under the Clean Water Act, require large confinement operations and some medium-sized ones that discharge pollutants to obtain a permit and to develop a plan for manure storage and disposal.

Many states have adopted additional regulations stricter than those imposed by the Environmental Protection Agency. They include zoning restrictions to limit where hog confinement facilities can be built; larger buffer zones from nearby residences; construction and operating



permits and odor control requirements. Farms with fewer than 2,500 hogs are exempt from state and federal regulation.

Because small farms did not have the expense of complying with

environmental regulations, they benefited from prices pushed upward because of the smaller supply produced by regulated large confinement operations, the UNL study showed.

It further found that between 1995 and 2005, the actual inventory of small hog farms declined by 61 percent, the actual inventory of large hog farms increased by 95 percent, and the actual total hog inventory of all farms combined increased by 9 percent.

Absent environmental regulation, the inventory of small hog farms would have declined by 69 percent, the inventory of large farms would

continued on page 15