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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 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

March Water Symposium and Water Law Conference at NU Law College

Steve Ress, Nebraska Water Center

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, communities and economies in the three states that share its water.

continued on page 6
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 that helped search out and engage speakers on some of the most pressing current and future issues with the aquifer.

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 investigating a great deal of time and energy to exploring potential collaboration—laborations 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 groundwater.

The University of Nebraska 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 website within a few days after the lecture.

Feb. 25 – Paul Houser, spatial analyst and remote sensing/GIS, George Mason University, “A vision for a high-resolution integrated water cycle observation and prediction system.”


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?”

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:


Students in 2008 submitted a request to develop climate indicators and assessment products that would help search out and engage speakers on some of the most pressing current and future issues with the aquifer.

The January setup trip was Nate Jenkins at the Upper Republican Natural Resources District in Imperial, opens the series with a talk on 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.

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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 Holdrge 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 Chit- paranjan Ray, director of the Nebraska Water Center, which has helped organize and offer the annual water lectures since the 1970s.

Lester Fanning, general manager of the Upper Republican Natural Resources District in Imperial, opens the series with a talk on 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.

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Water Current

Dvorak, Ray Aim At Improving Water Quality For Small Communities

Steve Ross, 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, $16,300.

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. Their 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.

Dvorak 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 Current Awards USGS 104b Funds

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Use of basin water has remained contentious since Kansas initiated an informative tour,” Ress said.

“Water current litigation against Nebraska in 1998 for non-compliance with terms 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. The river then continues east to the Nebraska-Kansas border, where it flows into the Missouri River. Water Current litigation against Nebraska in 1998 for non-compliance with terms 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. The river then continues east to the Nebraska-Kansas border, where it flows into the Missouri River. Water Current
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.”

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 recharge 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. To place an order by phone, call (402) 472-3471.
Nate Jenkins of the Upper Republican NRD talks with tour host Mike Jess.

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

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.

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

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

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

Augmentation waters flow south through a canyon north of Parks.

NCORPE pipeline water flowing into Medicine Creek.

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

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

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

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

WINTER 2015 • WATER CURRENT

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

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

SPONSORED BY:
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. Jesu Koros 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 Kendall of Michigan State University.

Four local studies of the aquifer will be presented in the afternoon by Steve Sibuy 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 Schenier of the Nebraska Department of Natural Resources and then a panel will discuss subjects related to NRD administration concerning handling claims and disputes before, 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.

Through the water conference focuses on information of interest to practicing attorneys, it is open to all. NU’s 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. Online registration is at http://go.unl.edu/cic.

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

On day three, participants will hear from representatives of the Frenchman-Cambridge Irrigation District, how ag producers cope on day three, participants will hear from representatives of the Frenchman-Cambridge Irrigation District, how ag producers cope
**LETTER TO THE EDITOR**

While looking for resources about all water conservation and water education, I found your page - [http://watercenter.unl.edu/Links.aspx?others](http://watercenter.unl.edu/Links.aspx?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 sessions, 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://watercenter.unl.edu/Links/articles/guide-to-water-conservation/](http://watercenter.unl.edu/Links/articles/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


**NWC Social Media**

Like and follow the Nebraska Water Center on Twitter and Facebook

[twitter.com/NebWaterCenter](http://twitter.com/NebWaterCenter)

[facebook.com/NebraskaWaterCenter](http://facebook.com/NebraskaWaterCenter)

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**New Mailing Addresses**

**Daugherty Water for Food Institute**

2021 Transformation Drive, Suite 3220

P.O. Box 886201

Lincoln, NE 68586-6203

**Nebraska Water Center**

2021 Transformation Drive, Suite 3220

P.O. Box 886201

Lincoln, NE 68586-6204

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**Small Hog Farms continued from page 16**

Small hog farms 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 stringencies,” 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.

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


[http://watercenter.unl.edu/aboutus/whos/people/faculty-member.asp?pid=1111](http://watercenter.unl.edu/aboutus/whos/people/faculty-member.asp?pid=1111)

[http://digitalcommons.wku.edu/theses/95/](http://digitalcommons.wku.edu/theses/95/)

E-mail: costiles@unl.edu

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**LETTER TO THE EDITOR**

While looking for resources about all water conservation and water education, I found your page - [http://watercenter.unl.edu/Links.aspx?others](http://watercenter.unl.edu/Links.aspx?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 sessions, 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://watercenter.unl.edu/Links/articles/guide-to-water-conservation/](http://watercenter.unl.edu/Links/articles/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

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...