

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

---

Water Current Newsletter

Water Center, The

---

Summer 2008

## Water Current, Volume 40, No. 3, Summer 2008

Follow this and additional works at: [https://digitalcommons.unl.edu/water\\_currentnews](https://digitalcommons.unl.edu/water_currentnews)



Part of the [Water Resource Management Commons](#)

---

"Water Current, Volume 40, No. 3, Summer 2008" (2008). *Water Current Newsletter*. 175.  
[https://digitalcommons.unl.edu/water\\_currentnews/175](https://digitalcommons.unl.edu/water_currentnews/175)

This Article is brought to you for free and open access by the Water Center, The at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Water Current Newsletter by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

# WATER CURRENT

Vol. 40, No. 3

SUMMER 2008



## Latest on Water Science, Economics and Law at October Colloquium

By Lorrie Benson, J.D.,  
Assistant Director,  
UNL Water Center

University of Nebraska—Lincoln and other researchers present their latest water-related research and programming in the areas of water science, economics, and law on Thursday, October 16 at Hardin Hall on UNL's East Campus.

The 2008 UNL Water Colloquium is a fast-paced, day-long event featuring dozens of oral and poster presentations by researchers and students. New this year will be research and programming presentations by researchers from state and federal agencies as well as private entities such as consulting firms. Many of the presentations focus on Nebraska-based research and programming.

"Nebraska is fortunate to have a vibrant water-related research and programming community. This year's colloquium features the best of the best from all the state's researchers, programmers and students," said Kyle Hoagland, director of the UNL Water Center and Water Resources Research Initiative.

In addition to presentations, the colloquium includes information about UNL's Water Sciences Laboratory as well as tours of some of Hardin Hall's laboratories.

The colloquium's agenda and registration information will be available online in early September at [watercenter.unl.edu](http://watercenter.unl.edu). Registration brochures will also be available. For more information, phone (402) 472-7372 or email [lbenson2@unl.edu](mailto:lbenson2@unl.edu).

UNL's Water Center, Water Resources Research Initiative, and Institute of Agriculture and Natural Resources sponsor the event.

## Water is Theme For UNL at September's Husker Harvest Days



It won't be Husker Harvest Days as usual for IANR and UNL Extension this year. Exhibits will now focus on rotating themes, beginning this year with "Water." Extensive changes have been made both inside and outside the Husker Red exhibit building. Come visit us at the show Sept. 9-11 (photo: Steve Ress).

University of Nebraska's Institute of Agriculture and Natural Resources (IANR) will highlight the latest in water research, education and programming within a framework unlike any other in their 31-year history of involvement with the Husker Harvest Days show in Grand Island this September.

"We are very excited to be rolling out a very new look and recommitting ourselves to research and extension excellence at Husker Harvest Days this year," said NU Vice President and IANR Harlan Vice Chancellor John Owens.

Beginning this year, UNL Extension experts and Agricultural Research Division scientists will concentrate their Husker Harvest

(continued on page 15)

### INSIDE

- |   |                                    |
|---|------------------------------------|
| 2..... Director's Notes                                 | 8-9 ..... Water and Climate Change |
| 3..... Meet the Faculty                                 | 10-11 .. Tour photos               |
| 4..... <a href="http://Water.unl.edu">Water.unl.edu</a> | 12..... News Briefs                |
| 4..... WRAP Reconvenes                                  | 14..... Emerging Contaminants      |
| 5..... Water Management Network                         | 20..... What's New at the WSL      |
| 6-7 ..... Hydroinformatics Collaboration                |                                    |



# What I Didn't Do During My Summer Vacation

## from the DIRECTOR



Kyle D. Hoagland

**W**ith a sigh of relief about what you won't have to read in my regular column this issue, I hopefully have your attention for the next three minutes, so here goes. Over the past several months, UNL Extension and the Water Center have been working cooperatively to create an exciting

new source of information regarding water in Nebraska: the University of Nebraska's water web site, which can be found online at [water.unl.edu](http://water.unl.edu).

To read more about why this web site was created, what we are attempting to accomplish by forming it, who was involved in its development, etc., please refer to the article on the water site elsewhere in this issue. I raise this topic again to emphasize a couple of major points (let's just call this for what it is: shameless advertising and application of a guilt trip). First, our aim in creating this new site was ambitious to say the least, namely to create a world-class web site with a wealth of water resources info, as a sort of one-stop-shop designed for a wide variety of users, from students to causal web browsers to water resource professionals (independent of their entry-level knowledge). Lorrie Benson and Sharon Skipton (with the help of many others, but they're the ones who lost sleep over this huge undertaking), have pulled off this important product for the first time in the history of UNL. Bravo!

Second, if you are sufficiently interested in water to be reading this column, it is incumbent upon

you to spend even a couple of minutes on this site. Although the site is brand new and very much still under construction, I can virtually guarantee satisfaction, regardless of your information needs or expectations. I also encourage you to visit the site regularly, as it's populated with new information and as it continues to evolve. Its focus is clearly Nebraska and the region, yet it contains links and information of use globally.

The other thing that I didn't do over my summer vacation was to complete an equally ambitious and, if I may apply an overused term, "cool" project: the Nebraska Water Map. Again, the Water Center's assistant director Lorrie Benson spearheaded this effort, with significant help from cartographer Les Howard in the School of Natural Resources. This project was truly collaborative with a wide array of state and federal partners, and not just in the usual sense of the word "partner." That is, the University of Nebraska-Lincoln, the U.S. Geological Survey, U.S. Bureau of Reclamation, Nebraska Game & Parks Commission, Department of Natural Resources, Department of

*(continued on page 15)*

## WATER CURRENT

Water Center  
University of Nebraska  
914 Hardin Hall  
Lincoln, NE 68583-0979  
Phone: (402) 472-3305  
Fax: (402) 472-3610  
E-mail: [sress1@unl.edu](mailto:sress1@unl.edu)

<http://watercenter.unl.edu>

Kyle D. Hoagland - Director  
J. Michael Jess - Associate Director  
Daniel D. Snow - Director of  
Laboratory Services, Water Sciences  
Laboratory  
Steven W. Ress - Editor  
Anne M. Moore - UNL CIT,  
Layout and Design

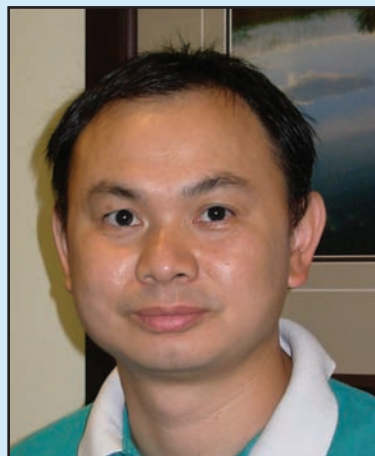
*This newsletter is published with partial*

*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.*

# Meet the Faculty

## Jinsheng You, Ph.D.

Jinsheng You is a research assistant professor in the University of Nebraska–Lincoln's School of Natural Resources and High Plains Regional Climate Center. Prior to coming to UNL, You was a research scientist, in



Jinsheng You

the Department of Civil and Environmental Engineering at Utah State University, where he also lectured on GIS in water resources, physical hydrology.

### Education:

Ph.D., Civil Engineering, Utah State University, 2004.  
M.S., Hydrology and Water Resources, Hohai University, China, 1996  
B.S., Hydrology and Water Resources, Hohai University, China, 1993

### Research Interests:

Application of remote sensing and GIS, hydrological and environmental system modeling, water resources management, scaling hydrological processes, quality assurance of hydrology and weather data, climatology, hydrometeorology and climate change, snow hydrology and cold region hydrology, soil water conservation, drought risk assessment and management.

### Examples of Projects:

- Adding daily solar radiation and dew point temperature to historical weather records of the U.S. Cooperative Observer Network in the High Plains Region, \$68,927, August – December 2007. PI: Kenneth G. Hubbard, CO-PI: Haishun Yang, Kenneth G. Cassman, Achim Dobermann, Jinsheng You.
- Base funding for the operation of the HPRCC, UNL \$230,000, May 2006 – January 2007. PI: K.G. Hubbard, Collaborator: J. You, K. Dewey, X. Lin.
- Snow Hydrology: Subgrid parameterization of variability of snow-melt in a mountainous watershed. NASA project. In Utah State University. 1999–2003. PI: D.G. Tarboton, Department of Civil and Environmental Engineering, Utah State University. CO-PI: C.H.

*(continued on page 13)*

## Gary L. Stone

Gary Stone has been an extension educator at the University of Nebraska–Lincoln Panhandle Research and Extension Center, Scottsbluff since June 2007.

### Education:

B.S., University of Wyoming, Agricultural Mechanization, 1976.  
M.S., University of Nebraska–Lincoln, Mechanized Agriculture, 1977

### Current Activities and Areas of Interest:

- “Limited Irrigation No-Till Cropping Systems Demonstration for the Pumpkin Creek Watershed”; G. Hergert, D. Yonts, J. Schild & G. Stone, University of Nebraska–Lincoln.
- “Developing Consumptive Water Use Maps to Improve Water Management Using METRIC™

Remote Sensing Technology”; G. Hergert, A. Irmak, G. Stone, P. Penrose, University of Nebraska–Lincoln; R. Allen, J. Kjaersgaard, University Of Idaho.

- Invasive plants and noxious weeds, their management and control.

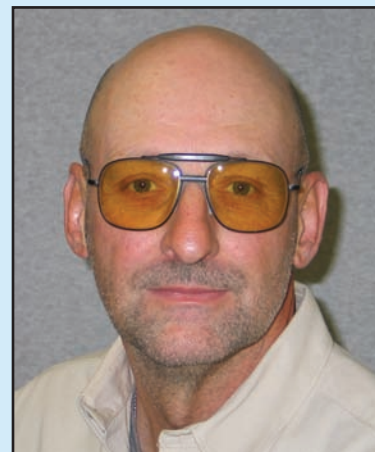
### Professional Experiences:

- Certified professional agronomist and certified manager of invasive plants, Goshen County Weed & Pest Control District, September 2006 to May 2007.
- Certified professional agronomist and sales territory manager, UAP Distribution, Inc., September 1993 to August 2006.
- Agricultural field representative, Jiridon Agri Chemicals, Inc., November 1979 to August 1993.
- Research assistant and agricultural technician, UNL Panhandle Research and Extension Center, May 1972 to November 1979.

### Professional Licenses and Certifications:

- Certified manager of invasive plants, November 2006 to current; certification done by the North American Weed Management Association.
- Certified professional agronomist, August 1998 to current.

*(continued on page 13)*



Gary L. Stone



# Water.unl.edu Gateway to All Things Water

A new Web site from the University of Nebraska–Lincoln provides access to a wide variety of UNL expertise on water issues.

UNL research and extension experts from a wide variety of water-related disciplines developed water.unl.edu as a truly collaborative venture.

“Water is our most important natural resource,” said Elbert Dickey, dean and director of UNL Extension. “It’s critical that Nebraskans have unbiased, research-based information to help them make the best decisions possible about how to manage water for its many uses.”

UNL experts involved in developing water.unl.edu come from a number of disciplines, including soil science, horticulture, landscaping, lake and pond management, irrigation, drinking water, wastewater treatment, crop production, livestock, watershed protection, well management, livestock manure management, climatology, fish and wildlife, remote sensing and GIS, toxicology, economics and water law and policy.

“The site focuses on both quality and quantity of water,” said Sharon Skipton, UNL Extension water quality educator. She and Water Center assistant director Lorrie Benson co-lead the site’s evolving content development team.

“It encompasses the day-in-day-out use of this all-important resource and also the development and maintenance of both agricultural and urban systems that assure safe, plentiful water will be available to future generations,” Skipton said.

“We encourage visitors to check the site regularly, because we have a lot more information to add, particularly for prospective students and those interested in knowing more about UNL water-related research,” Benson said. “The site will help prospective students make the links among water topics that interest them, academic majors and future careers.”

The site allows visitors to identify their personal interest – whether they’re a crop or livestock producer, landscape professional, prospective student, city dweller or rural resident, for example – and go immediately to content specific to their interest.

There are links to interactive tools, publications and other information, as well as links to other key university Web sites, including those for the UNL Water Center, the

National Drought Mitigation Center and the High Plains Regional Climate Center.

“UNL has rapidly become one of the top public universities in the country in terms of breadth of water research, outreach programming and undergraduate and graduate education. This site will help bring those many areas of expertise together as a fingertip resource that’s useable for the public,” said UNL Water Center director Kyle Hoagland.

“We’re billing this site as ‘your natural resource for reliable water information,’” Dickey said. “We encourage Nebraskans of all stripes to educate themselves about how to use water safely and wisely, and we believe this Web site will help do that.”

**Water.unl.edu**

## Water Resources Advisory Panel Expands; Members to Reconvene in September

**By Rachael Herpel,  
Outreach and Education Specialist,  
UNL Water Center**

The University of Nebraska–Lincoln’s Water Resources Advisory Panel (WRAP) will reconvene meetings on Tuesday, Sept. 16.

WRAP provides valuable and influential guidance to UNL about priority water resources research, education and outreach programs.

Current WRAP members are: **Ann Bleed, P.E. and former director, Nebraska Department of Natural Resources; Mark Brohman, Nebraska Environmental Trust; Brian Dunni-**

**gan, Nebraska Department of Natural Resources; Eugene Glock, Cedar Bell Farms; Frank Kwapnioski, Nebraska Public Power District; John Miyoshi, Lower Platte North NRD; Marian Langan, Audubon Nebraska; Mike Linder, Nebraska Department of Environmental Quality; Kirk Nelson, Nebraska Game and Parks Commission; Jerry Obrist, City of Lincoln Water System; Lee Orton, Nebraska Well Drillers Association; Jay Rempe, Nebraska Farm Bureau Federation; Ed Schrock, farmer and former state senator; Dennis Strauch, Pathfinder Irrigation District; and Dayle Williamson, Office of Senator Ben Nelson.**

First convened in 2006, WRAP activities began with a statewide survey of research needs. WRAP members used the survey to develop a list of water research priorities, which were reviewed by NU water faculty at a forum in September.

A water faculty retreat was held the following month, when 10 specific research proposals were developed. In December, WRAP ranked the proposals and identified potential funding options.

In 2007 the Nebraska Department of Natural Resources partnered with NU water faculty to submit four proposals to the Nebraska Environmental Trust.

*(continued on page 13)*

# Agricultural Water Management Network

By Gary Zoubek,  
UNL Extension Educator

In some parts of the state, irrigation development, along with drought and reduced water flow into major rivers, has caused declines in groundwater levels. In early 2005, the Nebraska Agricultural Water Management Demonstration Network (Network) was formed in partnership with UNL Extension and Upper Big Blue Natural Resources District (NRD) from an interdisciplinary group involving growers from south central Nebraska.

It has since expanded across Nebraska with cooperating NRDs, the Natural Resources Conservation District (NRCS), and other partners.

Network goals are to help transfer high quality information to Nebraskans through a series of in-field demonstration projects and to implement newer tools and technologies to enhance crop water use efficiency and energy savings.

The Network is working hand-in-hand with growers and crop consultants on strategies to monitor soil water and crop water use for irrigation management. Two tools being demonstrated are ETgauges to measure reference evapotranspiration (ET) and Watermark Sensors to measure soil moisture.

Water is lost from a field by transpiration from crop leaves and evaporation from soil surfaces due to current climatic conditions. An ET gauge is an economical tool consisting of a tube filled with distilled water from which water evaporates through a ceramic top covered with canvas. This provides a local reference ET value that can be used in conjunction with the crop's stage of growth to accurately estimate crop water use.

Participating producers are encouraged to read ET gauges weekly.

New for this season, a statewide website application was developed where producers, NRD personnel, consultants, extension educators and others can post their weekly ET readings for others to use in monitoring crop water use for scheduling purposes. Go online to <http://water.unl.edu/cropswater/nawmdn>. The site has information from approximately 150 ETgauge locations in 27 Nebraska counties

that are being updated regularly. More than 300 producers statewide are using ET gauges. Additionally, many have also installed soil water sensors to estimate the water in the soil.

When combined with ET, soil type, crop stage and rainfall, farmers can make informed decisions on when and how much to irrigate.

Producers surveyed last year indicated they saved between two and three inches of water as a result of using these tools. It costs farmers an estimated \$1,000 to \$2,000 each time their center pivots make a revolution, so that amounts to a savings of \$2,000 to \$6,000.



(IANR photo by Brett Hampton)

According to the *2003 Farm and Ranch Irrigation Survey*, Nebraska has about 7.5 million irrigated acres, ranking it second to California in total irrigated acres. In Nebraska, approximately seven million of the 7.5 million irrigated acres utilized at least some groundwater and as of August 2007 more than 90,000 irrigation wells were operating. About 72 percent of Nebraska's irrigated land is irrigated with sprinkler systems, predominantly center pivots. Gravity irrigation accounts for an additional 28 percent of irrigated cropland, with the majority in furrow systems.

Corn is grown on 70 percent of the state's irrigated acres, followed by soybeans on approximately 19 percent.

For more information, go online to Nebraska Agricultural Water Management Demonstration Network at <http://water.unl.edu/cropswater/nawmdn>



# UNL and China Explore

**By Kelly Helm Smith, Communication Specialist  
UNL School of Natural Resources**

**W**ith its focus on water science and engineering, Hohai University in Nanjing, China, is a natural partner institution for the University of Nebraska–Lincoln, say scholars who are laying the foundation for long-term collaboration.

In the past year, UNL and Hohai researchers in computer

science, water and public policy have visited one another's campuses, with seed funds from the National Science Foundation in the United States, and its Chinese equivalent, the National Natural Science Foundation of China. A UNL delegation went to Nanjing in April for a two-week workshop, after having hosted a team from Hohai in October.

According to the project report, by 2025, as much as two-thirds of the world's population may face water shortages,

which can lead to economic crises, disease, famine and death, if people don't take action in time. Policy changes and water management will need to be informed by monitoring and early warning systems that track and model water usage and availability.

"Our long-term goal is to develop a cyber-infrastructure for global water research," said Ashok Samal, a UNL computer scientist who is one of the principal investigators of the NSF-funded project, "U.S./China Digital Government Collaboration: Building a Collaboratory in Hydroinformatics and Water Policy."

"The U.S. and China, being two of the world leaders as well as being two of the largest consumers of water, should play leading roles in this endeavor," Samal said. "Hohai has huge breadth. It's a full-service water university." Many of China's leading civil engineers and water scientists, such as the team that designed and built the Three Gorges Dam, are graduates of Hohai.

Because of Hohai's unique focus on water, "UNL is a natural counterpart," said Xun-Hong Chen, hydrogeologist in UNL's School of Natural Resources. "Water is an area of excellence at UNL." Chen has worked with Hohai previously and helped the UNL group forge connections. In fact, two of the Hohai team members had been his postdoctoral students.

While in Nanjing, SNR assistant professor John Holz, who specializes in water quality, met with about 40 graduate students from Hohai University and described how to apply to UNL. The Chinese government has committed to funding a certain number of Hohai students to study in the United States each year. "Some have already been in touch," Holz said. "This gave Hohai students an exposure to UNL and put us in a positive position for recruitment."

In addition to Samal, Chen, and Holz, the UNL delegation included Donald A. Wilhite,



At the headwater for the South-North Water Transfer Project in Yangzhou, Jiangsu Province, China, were, from left to right, Ashok Samal, Computer Science and Engineering (CSE) faculty; Peng Du, CSE graduate student; Deepti Joshi, CSE graduate student; Xun-Hong Chen, School of Natural Resources (SNR) faculty; Leen-Kiat Soh, CSE faculty; and John Holz, SNR faculty (School of Natural Resources photo).



Passing students asked to pose with members of UNL's delegation to Hohai University in Nanjing, China (School of Natural Resources photo).

# “Hydroinformatics Collaboratory”

director of the School of Natural Resources; Alan Tomkins, director of UNL's Public Policy Center; Sarah Michaels, p, UNL Department of Political Science; Leen-Kiat Soh, associate professor of Computer Sciences; and Deepti Joshi and Peng Du, UNL graduate students in Computer Sciences.

Chinese representation at the workshop included many researchers and graduate students from Hohai University, as well as officials and researchers from China's Ministry of Water Resources, Bureau of Hydrology and Water Survey of Jiangsu Province, and nongovernmental organizations.

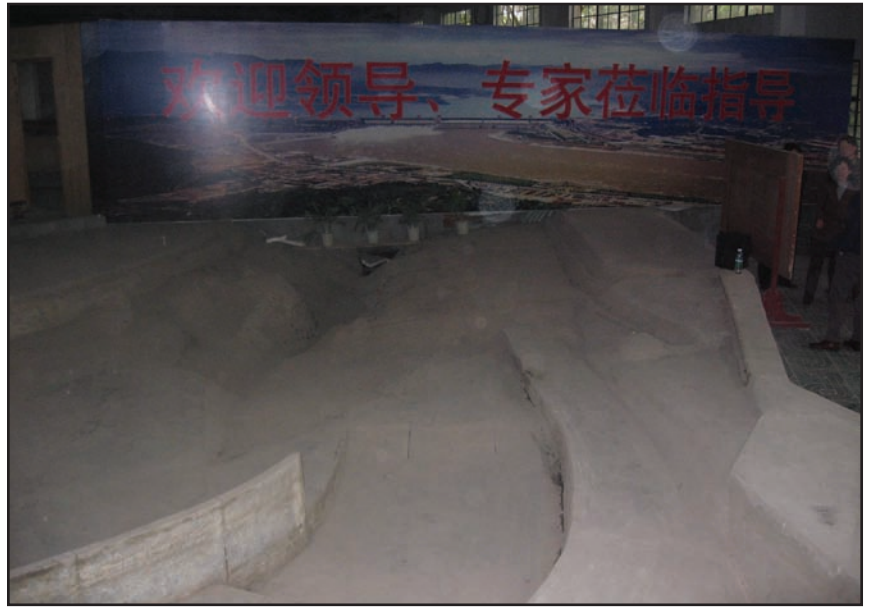
The goals of the April workshop were to catalog hydrological data collection methods; to summarize ground and surface water modeling methods; to discuss decision-making policies related to water resources; and to examine what computational techniques are needed for data mining and fusion.

Future partnership activities are likely to include:

- Short courses taught at Hohai by UNL and Hohai faculty, giving UNL students a chance to work at Hohai University's laboratories.
- Hohai graduate students funded mostly by the Chinese government coming to study water-related topics at UNL.
- Visiting scholars from China at UNL.
- Projects focusing on issues of water quality and water supply.
- New uses of computing technology to enable citizens, scientists and policy makers to incorporate the best available information into decision making.

Samal envisioned applying what are now cutting-edge uses of web technology, such as “volunteer geographic information computing,” where people all over the world can add data and information to a central database on water.

It could also incorporate information about water, going back several hundred years. The question, Samal said, is, “How do we combine information of different qualities, resolutions and time periods, to answer some interesting questions?”



This model of China's famed Three Gorges Dam is one kilometer long at Nanjing Hydraulic Research Institute, China Ministry of Water Resources (School of Natural Resources photo).



Chinese hydrologic research includes extensive physical modeling. John Holz, right, listened to an explanation of available facilities at Hohai's Hydraulic Engineering Lab from Xi Chen, Hohai University faculty. In the background were from left, Deepti Joshi, CSE graduate student; Sarah Michaels, Political Science faculty; and Alan Tomkins, Public Policy Center director (School of Natural Resources photo).



# Water and Climate Change:

By G. Tracy Mehan III

**T**he consequences of climate change are being felt, most acutely, in waters and watersheds throughout the United States. Water supply, water quality, natural flow regimes, and the human beings and ecosystems depending on them are all being deeply affected, imposing mounting new pressures on watershed management and on water and wastewater utilities.

According to a recent study by the American Water Works Association Research Foundation and University Corporation for Atmospheric Research, the best science suggests that the global climate cycle will become more intense, resulting in heavier but less frequent periods of precipitation. The science points to the possibility of longer periods of drought alternating with spells of heavy rainfall and runoff, usually very polluted. Greater variability in runoff and variation in flow regimes would make the maintenance of optimal reservoir levels more difficult, reducing the reliability of water storage.

Increased reliance on groundwater during extended dry spells would reduce aquifer levels and discharges to surface water bodies with unintended consequences for aquatic systems. Shorter periods of snow accumulation in mountainous regions, especially at lower altitudes, would result in reduced snow pack, which, along with earlier melting in the spring, would lead to reduced flows in late summer when water is scarce and demand rises. Floods, droughts, hurricanes, and wildfires -- as well as the soil erosion they cause -- would increase, threatening water quality, aquatic habitats, and utility infrastructure. And rising sea levels would lead to saltwater intrusion and flooding of infrastructure in coastal zones.

Treatment costs could increase for drinking water and wastewater utilities due to heavier runoff carrying sediment, nutrients, and other pollutants. This is commonly referred to as nonpoint source pollution, a major present obstacle to water quality because most of its diffuse sources are not regulated by the federal Clean Water Act.

In 2003 the U.S. General Accountability Office surveyed water managers and determined that even under normal or nondrought conditions, 36 states anticipated water shortages in localities, regions, or the entire state in the next 10 years. Under drought conditions, 46 states expected shortages over the same period. With increasing population and declining groundwater levels, the freshwater supply appeared to be reaching its limits

in some locations. Moreover, construction of new, large reservoirs has tapered off, and existing storage is threatened by age and sedimentation.

Problems have surfaced even in the humid Southeast, as current shortages in Georgia and Alabama have made painfully clear. In the arid West, specifically in the Colorado River basin, a kind of perfect storm is brewing. The Colorado watershed covers 240,000 square miles and seven states, including California and parts of Mexico.

Recently, a blue-ribbon scientific committee of the National Research Council of the National Academies reviewed data from tree-rings studies, which provide a much longer-term view of weather and climate than do stream gauges, which extend back only 100 years. The tree-ring data go back 300, 500, even 800 years or more. The committee found that average annual flows vary more than previously assumed and that extended droughts are not uncommon and are even, as *The New York Times* put it in a February 2007 headline for a story on the Southwest's arid conditions, "normal."

Moreover, future droughts may be longer and more severe because of a regional warming trend. The evidence suggests that rising temperatures will reduce the Colorado River's flow and water supplies. 2002 and 2004 were among the 10 driest years on record in the upper basin (Colorado, New Mexico, Utah, and Wyoming). Water storage in the basin's reservoirs dropped sharply during this period. Water flows into Lake Powell were 25 percent of the average. Add to this the rapid increases in population in states such as Arizona (a 40 percent rise since 1990), Colorado (30 percent growth in the same period), and Nevada (Viva Las Vegas!), and you can see why water is becoming as precious as oil.

The reality of this situation will require tremendous resilience in adapting and, where the opportunities present themselves, even mitigating the untoward impacts of climate change on the hydrologic cycle and aquatic systems. The case for immediate and sustained action, in terms of adaptation, is very compelling. Adaptation offers immediate, tangible, cost-effective, and, therefore, politically viable methods for coping with climate change in the context of water. Adaptation will not be easy. It will surely require systemic economic and social transformation amounting to a culture change in Americans' attitudes to the value of water in all its aspects — chemical, physical and biological.

On a technical level, no single climate model will yield reliable projections of future climatic conditions.

# Perfect Storm in Sight

Climate change models will have to be “downscaled” to the relevant watershed level but informed by robust data collection and monitoring. Nonetheless, a recent report sponsored by the American Water Works Association (AWWA) argues strongly that prudence dictates “planning for uncertainty,” which entails implementing “precautionary, adaptive strategies designed to foster utility systems and operations that are robust, resilient and flexible in anticipating alternative climate scenarios.”

This primer also recognizes that the real solution goes beyond the confines of the individual utility itself. It contends that a broader approach known as Integrated Water Resources Management is the most effective means by which to engage all stakeholders and customers in assessing the management options available across the entire watershed. Generous conservation programs funded through the U.S. Department of Agriculture have had tremendous success in reducing soil erosion. However, the Soil and Water Conservation Society, looking at historic and predicted precipitation rates, foresees increases in soil erosion ranging from four percent to 95 percent and increases in runoff from six percent to 100 percent on cropland. Absent additional protective measures, these increases “could reverse much of the progress that has been made in reducing soil degradation and water pollution from cropland in the United States.”

While all major water and wastewater utilities are newly focused on the challenges directly posed by climate change, other climate-related concerns have also emerged. Wastewater utilities remain attuned to legislative developments because they generate substantial emissions of carbon dioxide, methane and nitrous oxide -- all greenhouse gases. They may have to limit these emissions, or they may be able to sell credits based on converting, say, methane, into energy. And all utilities are feeling the pinch of rising energy costs. The water sector consumes three percent of total electricity generated by the U.S. electric power industry. Energy accounts for roughly one-third of utilities’ operating costs, and energy costs are expected to increase more than 20 percent in the next 15 years, which will drive the quest for greater energy efficiency and conservation.

We need to get the price right, both for the water itself and the infrastructure that protects it. The U.S. subsidizes water use: Most utilities barely capture the full cost of treating and delivering water. We may have

the lowest water and waste-water rates of all the free-market democracies. We need to move to full-cost pricing and, if possible, conservation-based pricing in order to overcome the paradox of water and diamonds as noted by Adam Smith, who observed that diamonds are priceless, but water is cheap. Only in this way will water users be encouraged to conserve and husband this most valuable resource.

Corporations must recognize the business case for sustainable water use. Many, such as Intel, Coca-Cola, and other water-dependent companies, are already doing so. Stewardship of water resources, both in the plant and the surrounding community, would appear to meet sustainability’s “triple bottom line” in terms of economics, the environment and equity.

We need to develop efficient water markets, subject to reasonable environmental regulation, to facilitate the movement of water from low-value agriculture to other high-value uses while protecting flows for fish and wildlife. In most Western states, the vast majority of the water is controlled by agriculture due to the long-standing legal doctrine of prior appropriations (“first in time, first in right”). In Nevada, agriculture consumes 90 percent of the water; the Strip in Las Vegas, with 15 of the world’s 20 largest hotels, complete with fountains and sea battles, accounts for less than one percent of the state’s water use while producing 60 percent of its economic output. Cities, water trusts and environmental groups are willing to buy these water rights, even at outrageous prices, to protect their values and meet their water needs.

Mitigating the effects of climate change is preferable. Adapting to it will be essential over the long haul, especially in the case of managing America’s precious water resources.

*(Editor’s Note: G. Tracy Mehan III is an environmental consultant based in Arlington, Va. and a former assistant administrator for water at the U.S. Environmental Protection Agency. This article is reprinted with permission from G. Tracy Mehan III, “Water and Climate Change: Perfect Storm in Sight,” The American Prospect Online: May 27, 2008. [www.prospect.org](http://www.prospect.org). The American Prospect, 2000 L Street NW, Suite 717, Washington, D.C. 20036. All rights reserved).*

# 2008 Water & Natural Resources Tour Republican River Basin of Kansas & Nebraska

## Sponsors:

**Central Nebraska Public Power & Irrigation District**

**Farm Credit Services of America**

**Gateway Farm Expo**

**Kearney Area Chamber of Commerce**

**Nebraska Association of Resources Districts**

**Nebraska Public Power District**

**The Flatwater Group**

**University of Nebraska School of Natural Resources**

– **Conservation & Survey Division**

– **Water Center**



June tour participants saw the Republican River at nearly unprecedented high flows due heavy late spring rainfall in much of the basin.



Among those speaking on a Republican River issues panel at the Superior Estates Winery in Superior were (from left) Rex Buchanan, deputy director of the Kansas State Geological Survey; Nebraska State Senator Tom Carlson; James Schneider, Nebraska Department of Natural Resources; David Barfield, chief engineer, State of Kansas; and Kansas state senator Janis Lee.



Nebraska state senator Tom Carlson (from left); Mike Clements, general manager of the Lower Republican NRD; and UNL Water Center associate director Mike Jess were some of the presenters at a riparian vegetation management site on the Republican River, just downriver from Harlan County Dam.



Tour participants get a look at Harlan County Dam near Republican City.





Tour leader Mike Jess talking to participants on the bus about the next stop on the June tour.



Listening to speakers at Milford Reservoir in Kansas are (from left) Bob Meyer, Don Hughes, Ralph Best and Mary Harding.



A catered dinner on the stage of the restored Brown Grand Theatre in Concordia, Kan. was part of the tour's first night's stop entertainment.



Kenneth Nelson, general manager of the Kansas Bostwick Irrigation District speaks to the tour at the Courtland, Kan. Community Center.



University of Nebraska–Lincoln and Kansas State University researchers gave presentations on joint runoff conservation research near Keith



Jim Nelson talks to Kansas state senator Janis Lee at Superior.



The summer tour group stopped for a group photograph at the "Geographic Center of the Lower 48 States" east of Norton, Kan.

(Photos by Steve Ress and Lorrie Benson)



# Water News Briefs

## Answers To Last Issue's Photo Quiz

Thanks to all who submitted answers to the photo quiz on page 18 of the Spring 2008 *Water Current*.

This was the first time *Water Current* published a photo quiz and it proved popular enough that we'll do it again in an upcoming issue.

Here are the answers on where the photos were taken (all are in Nebraska, unless otherwise noted):

1. **Ballard Marsh**
2. **Barge traffic on the Mississippi River, Hannibal, Mo.**
3. **Long Pine Creek**
4. **U.S. Army Corps of Engineers habitat project, Missouri River**
5. **Sunrise on the Missouri River**
6. **Republican River south of Red Cloud**
7. **Crescent Lake National Wildlife Refuge north of Oshkosh**
8. **Guernsey Dam, North Platte River, Wyoming**
9. **Snake River Falls, Cherry County**
10. **Lake McConaughy near Ogallala**
11. **Platte River near Ashland**

Full credit for a correct answer was given if the answer was close.

## Real-Time Water Quality Info

Real time water-quality data are now easily accessible online through the USGS WaterQualityWatch website (<http://water.usgs.gov/waterwatch/>).

Continuous real-time information on water quality is a vital asset that helps safeguard lives and property and ensures adequate water resources for a healthy economy.

Real-time water quality measurements are available at more than 1,300 sites across the United States in streams with watersheds as small as a few square miles to more than a million square miles in the Mississippi River. Measurements include streamflow, water temperature, specific conductance, pH, dissolved oxygen and turbidity.

"Real-time water information is breaking new ground in science and technology and is proving to be very useful, helping local water managers make important daily decisions, such as regarding drinking water, water treatment, recreation and public safety on beaches throughout the U.S." said Matthew Larsen, USGS Acting Associate Director for Water.

The public also uses the on-line data to decide whether conditions, such as water temperature or turbidity, are favorable for recreational activities such as fishing, boating or swimming.

As the science advances, real-time measurements for relatively simple parameters such as temperature, conductance

and turbidity can be used to help predict more health-related conditions, such as if *E. coli* levels will exceed safety standards at beaches. For example, predictions of *E. coli* are part of a system used by the City of Wichita to ensure public safety during the Annual Riverfest in May of each year ([http://ks.water.usgs.gov/Kansas/rtqw/sites/07143672/htmls/ytd/p31648\\_ytd\\_all\\_uv.shtml](http://ks.water.usgs.gov/Kansas/rtqw/sites/07143672/htmls/ytd/p31648_ytd_all_uv.shtml)).

Access additional USGS real-time water information sites by visiting WaterWatch for surface water information (<http://water.usgs.gov/waterwatch/>) and Ground-Water Watch (<http://groundwaterwatch.usgs.gov/>).

## New Professional Journal

*Water Quality, Exposure and Health* is a new professional journal that will begin publishing next year. The multidisciplinary journal focuses on global human health consequences from exposure to water pollution in natural and engineered environments. It will provide scientists a platform to exchange ideas and share information on research for the solution of health effects of exposure to water pollution.

The journal will publish original research articles and integrative reviews that are relevant to this theme and it is now accepting papers. For more information, go online to [springer.com](http://springer.com) or contact editor-in-chief Mustafa M. Aral, Georgia Institute of Technology at [mustafa.aral@ce.gatech.edu](mailto:mustafa.aral@ce.gatech.edu) or co-editor-in-chief Andrew A. Meharg, University of Aberdeen, United Kingdom, at [a.meharg@abdn.ac.uk](mailto:a.meharg@abdn.ac.uk).

## What's New at the Water Sciences Laboratory (continued from page 16)

may vary depending on the sources and environmental conditions.

Because each form, or species, has unique properties and toxicity it is often desirable to detect and quantify the chemical form present.

So far, the lab has developed two different approaches to quantify species of arsenic and selenium. A liquid (ion) chromatograph interfaced with our

inductively coupled plasma-mass spectrometer (ICP-MS) permits on-line separation of the inorganic and organic forms of dissolved arsenic. The second method uses a hydride generator (HG) system interfaced with the ICP-MS.

Because the formation of hydride in the system depends on the form of the element, it can also be used for detection of the species present in the

sample. Each approach has advantages, and the HG system offers the added benefit of improving method sensitivity for hard-to-ionize elements such as arsenic and selenium.

Go online to <http://watercenter.unl.edu/WaterSciLab/WSL.asp> for more information and to access our new brochure.



## Water Resources Advisory Panel Expands; Members to Reconvene in September

(continued from page 4)

As a result, WRAP's top two projects, along with a project informed by the WRAP process, were funded by the Nebraska Environmental Trust and initiated in 2007.

These projects are:

- **Riparian Vegetation Impacts on Water Quantity, Quality, and Stream Ecology**, which documents the complex behavior and response of river systems to riparian vegetation removal. Primary investigators are Durelle Scott, John Lenters, Erkan Istanbuluoglu and Kyle Herrman. The University of Nebraska Institute of Agriculture and Natural Resources and the University of Nebraska Rural Initiative provided initial funding for this project.
- **Quantifying Evaporation, Crop Evapotranspiration, and the Water Balance for Tilled and Untilled Fields**, which measures the annual, seasonal, monthly and weekly evapotranspiration losses from no-till and conventional till fields to determine the surface evaporation difference

between the two tillage practices. The primary investigator is Suat Irmak.

- **Enhancing the Value of Water through Management Education**, which provides irrigators, and those advising irrigators, with the knowledge and skills necessary to obtain maximum value from a constrained water supply. This project is led by Ron Yoder.

For project updates and to identify follow-up steps, WRAP will meet on September 16. The WRAP will also review a new website — <http://watercenter.unl.edu/researchdb/researchdb.asp> — that features information on the university's water-related research projects. Site visitors can choose to organize the information by political subdivision, topic, or researcher. New information is added to the site as it becomes available.

For more information on WRAP or the research website, phone (402) 472-4977 or email [rherpel2@unl.edu](mailto:rherpel2@unl.edu).

## Meet the Faculty

### Jinsheng You (continued from page 3)

Luce, USDA Forest Service, Rocky Mountain Research Station, Boise, ID.

- Quality Control Tools in National Climate Data Center, 2003-2006. Cooperator, N.Guttman, NCDC, Asheville, NC.
- Quality assurance of Applied Climatic Information System (ACIS) and Automated Weather Data Network (AWDN). NOAA project, HPRCC, UNL. 2003-2006. Cooperator: K.G. Hubbard.
- Nebraska soil moisture project, HPRCC, UNL. 2003-2006. PI: K.G. Hubbard

#### Publications:

- You, J., K.G. Hubbard, S. Goddard, 2007: Comparison of Methods for Spatially Estimating Station Temperatures in a Quality Control System. *International Journal of Climatology*, in press.
- You, J., K.G. Hubbard, 2007: Relationship of Flagging Frequency to Confidence Intervals in the Statistical Regression Approach for Automated Quality Control of Tmax and Tmin. *International Journal of Climatology*. In press.
- You, J., K.G. Hubbard, S. Nadarajah, K.E. Kunkel, 2007:

Performance of Quality Assurance Procedures on Daily Precipitation. *Journal of Atmospheric and Oceanic Technology*. Vol. 24, No. 5, pages 821-834.

- Luo, B., J. You, 2007: A Watershed Simulation and Hybrid Optimization Modeling Approach for Water Quality Trading in Sediment Load Abatement. *Advances in Water Resources*, 30 (9): 1902-1913. doi:10.1016/j.advwatres.2007.03.001.
- Hubbard, K.G., N. Guttman, J. You, Z. Chen, 2007: An Improved QC Process for temperature in the Daily Cooperative Weather Observations. *Journal of Atmospheric and Oceanic Technology* 24 (2): 206-213
- Chen, Z., S. Goddard, K.G. Hubbard, W.S. Sorensen, J. You, 2006: A Serially Complete U.S. Dataset of Temperature and Precipitation for Decision Support Systems. *Journal of Environmental Informatics* 8 (2): 86-99.
- You, J., K.G. Hubbard, 2006: Quality Control of Weather Data during Extreme Events. *Journal of Atmospheric and Oceanic Technology* 23(2): 184-197

#### Email:

[jyou2@unl.edu](mailto:jyou2@unl.edu)

### Gary L. Stone (continued from page 3)

- Certified professional weed science, August 1998 to December 2003.
- Certified crop advisor, June 1995 to current; certifications done by ARCPACS, a federation of certifying boards in

agriculture, biology, earth and environmental sciences – American Society of Agronomy

#### Email:

[gstone2@unl.edu](mailto:gstone2@unl.edu)



# A Primer on Emerging Contaminants

By Alan S. Kolok, Ph.D.

Department of Biology, College of Arts and Sciences,  
University of Nebraska, Omaha

**W**e've all seen the headlines: pharmaceutical compounds in drinking water, reproductive abnormalities in male fish downstream from wastewater treatment plants, agrichemical pesticides feminizing male frogs, and the list goes on.

Fortunately, most of the newspaper headlines relate to distant parts of the country far removed from Nebraska. Still, the headlines leave us uneasy; are these issues relative to Nebraska, might these contaminants influence human health, and if so, what, if anything should be done about it?

In this and upcoming issues of the Water Current, we'll take a closer look at the issue of 'emerging contaminants' particularly focusing on recent findings from scientific literature and on topics that are directly germane to Nebraska.

The term "emerging contaminant" is a confusing one in that the compounds aren't necessarily emerging onto the contaminant radar screen. Nevertheless, while the name may very well be a poor choice, it has become part of the modern lexicon (in fact it even appears in the UNL Water Center's list of Nebraska's Top-10 Water Challenges!) and we appear to be stuck with it for some time.

The U.S. Geological Survey (USGS) defines emerging contaminants as chemical and/or microbial constituents that have not historically been considered to be contaminants. They go on to suggest that sources for these contaminants can be municipal, agricultural and industrial, and that these compounds may require shifts in our traditional thinking about contaminants.

How emerging contaminants are forcing paradigm shifts in toxicology warrants closer attention.

In toxicology, it is axiomatic that 'dose makes the poison'. In fact the root of this expression can be traced all way back to Paracelsus (1493-1541) who is often credited as being the "Father of toxicology."

Indeed, most of us have a relationship with doses of toxic compounds that parallels 1970's Supreme Court Justice Potter Stewart's feelings on obscenity....we may not be able to quantify what it is, but we certainly know it when we see it!

Our inherit understanding of what is, and is not toxic, in the case of emerging contaminants, can be incredibly misleading. Some emerging contaminants are toxic at

levels so low that their continued biological effect appears to stretch the imagination. It has been reported that concentrations of emerging contaminants are biologically active at concentrations in the part per billion (ppb) range.

To put this in perspective, consider that one ppb is equivalent to a teaspoon of liquid poured into an Olympic-size swimming pool. How can such low concentrations of a compound result in adverse biological effects?

It's important to recognize that some emerging contaminants either mimic, or are, biological signaling molecules. Signaling molecules, such as hormones, travel in the blood and cause activation of cellular processes, and they do their jobs at remarkably low concentrations.

The naturally occurring estrogen, 17 $\beta$ -estradiol, which is responsible for sexual development in females (women and fish alike) is doing so at levels that average about 100 ppb. Clearly, signaling molecules manifest dramatic effects at astonishingly low concentrations!

If a male, (again, humans and fish alike) is exposed for prolonged periods to exogenous estrogen (or compounds that mimic estrogen) it is not all surprising that feminization (or demasculinization) may be the outcome.

A further complication associated with emerging contaminants is that there may be no 'no effect' dose.

Again, taking our cue from classic toxicology, if dose does indeed make the poison, then there ought to be a dose below which no adverse effects occur. Once again, this need not be true when dealing with biological signaling molecules (or molecules that mimic them). The reason is obvious, if signaling molecules already exist within the bloodstream, then any exogenous addition to that baseline concentration of these molecules can very well have effects on the signals these molecules are sending.

So where does this leave us?

Some emerging contaminants are (or can mimic) our very own biological signaling molecules. Furthermore, these molecules (often termed endocrine disrupting compounds) can manifest their effects at astonishingly low concentrations.

While not all emerging contaminants are endocrine disruptors, the low dose paradigm may apply to many other biologically active compounds, including exogenous pharmaceuticals.

In the next installment, we'll take a closer look at pharmaceutical compounds, what they are, where they come from and why they are a growing concern.

## From the Director *(continued from page 2)*

Environmental Quality, The Groundwater Foundation, Natural Resources Conservation Service, Nebraska Public Power District and Central Nebraska Public Power & Irrigation District not only provided financial support in some cases, but also provided direct data and several reviews of the map along the way! The water map pulls together a wide array of information on water resources in Nebraska, in the form of maps, graphics and photos. It's designed as a reference and educational tool, and we guarantee even the most savvy water expert will learn something new. Watch for this water map – it's outstanding and it's free!! If you would like to pre-order a copy of this poster-sized map, please contact the Water Center at 402-472-3305 or email a request to: [piedle2@unl.edu](mailto:piedle2@unl.edu).

## Water is Theme For UNL at September's Husker Harvest Days *(continued from page 1)*

Days exhibits and presentations into more defined topical areas of current interest and concern to Nebraskans statewide.

"Though the "D" word (drought) may not be on the tip of everyone's tongue to the extent it has been the last five years, water is still very much a defining issue to everyone in the state, as we are by no means fully recovered from drought conditions statewide and for those reasons, we chose water to begin a new tradition of theme-based focus for our Husker Harvest Days presentations," said UNL Dean of Extension Elbert Dickey.

Among the issues IANR exhibits will address this year are understanding and mitigating the effects of drought, what groundwater is and how it works, drinking water and wastewater treatment, and irrigation and water use monitoring.

Other displays in the IANR building will focus on ongoing research on the benefits of conservation buffer strips, subsurface drip irrigation and UNL water-related research and extension programming that is occurring in each of Nebraska's 49 legislative districts.

A central information booth will help answer questions on a variety of extension and research-related topics, provide copies of helpful NebGuides and direct those needing help to Extension experts in their local area.

IANR's "Market Journal" television program also returns with new presentations in the Market Journal tent next to the Husker Red exhibit building, where it will present 30-minute discussions on crop and livestock marketing and the 2008 federal farm bill.

Presenters on the marketing programs are Darrell Mark, Extension marketing specialist; Roy Smith, Plattsmouth grain producer and marketing consultant; and Arlan Suderman and John Otte, grain and livestock marketing columnists for *Nebraska Farmer* magazine.

Discussing the 2008 farm bill are Brad Lubben, extension public policy specialist, and Paul Brugener, extension economic research analyst who will be joined by representatives

Finally, the Water Center has been at the center of a complete makeover of the Institute of Agriculture and Natural Resources' (IANR) and UNL Extension's presence at the annual Husker Harvest Days agricultural show in Grand Island, next month.

Beginning with this year's show, and continuing for the foreseeable future, IANR's presence will be "theme-based," concentrating on one or two specific areas of research and Extension programming. Naturally enough, this year's debut theme is "Water."

Our communications coordinator, Steve Ress, has been heading the effort to bring these changes in the show about, with the help of a UNL Extension steering committee. Please visit us at the show, which will be Sept. 9-11.

of the U.S. Department of Agriculture Farm Service Agency and Natural Resources Conservation Service.

Grain marketing programs are on Tuesday, Sept. 9 at 11 a.m. and Wednesday, Sept. 10 at 11 a.m. and 1 p.m. Farm bill programs are Tuesday, Sept. 9 at 1 p.m. and Thursday, Sept. 11 at 11 a.m.

Each program encourages studio visitors to ask questions of the panelists.

Also on display at Husker Harvest Days will be the new high definition television Market Journal remote production van that supports Market Journal programming.

There will be plenty for potential students and their families to see, as well. They will be able to explore a full range of enrollment options and find information on courses of study through the College of Agricultural Sciences and Natural Resources, School of Natural Resources and the Nebraska College of Technical Agriculture at Curtis, among others. The very successful Nebraska Leadership Education/Action Development (or LEAD) program also will be represented at the show.

"We very much enjoy being a part of Husker Harvest Days and being available to help answer questions while we showcase some of the best in research and extension programming that UNL has to offer," said UNL Husker Harvest Days coordinator Steve Ress. "IANR faculty and staff have been a part of Husker Harvest Days since the very first show in 1978 and we're very proud of that tradition."

IANR show themes will change to reflect areas of concern and focus for the state's producers, agribusinesses and natural resources concerns, probably every year or every other year, Owens said.

Husker Harvest Days is Sept. 9-11 near Grand Island. UNL's familiar Husker Red exhibit building is located on the south side of the showground at Lot 321.

# What's New at the Water Sciences Laboratory

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

**S**ummer is always a busy time at the UNL Water Sciences Laboratory.

Researchers, students and agencies are collecting samples or running experiments for projects and studies. For example, out of nearly 2,000 samples logged at the lab last year, more than half were received between May and September.

Many samples were scheduled for several tests and some needed new methods developed and validated prior to being analyzed. A few of the new methods available at the lab this year include:

- Pharmaceutical residues in wastewater
- Stable isotope analysis of solids
- Arsenic and selenium speciation

Traces of prescription, over-the-counter (OTC) and even illicit pharmaceuticals are being detected in municipal and residential wastewater effluent. These contaminants are not removed by traditional wastewater treatment systems.

Because of this, stimulants such as caffeine, analgesics like acetaminophen, and some antibiotics may in some cases be used as tracers or “fingerprints” of wastewater.

There is a need to study their behavior in aquatic systems because little is known regarding the environmental fate and effects of these chemicals. Because these are polar (water soluble) contaminants, these methods make good use of the lab's liquid chromatography-mass spectrometry (LC/MS) instrumentation.

High precision measurement of stable isotopes is finding many new uses in water research.

The lab now has the capability for measuring hydrogen, carbon, nitrogen and oxygen isotopes in dissolved and solid minerals, and tissues from plants and animals. We continue to receive many samples for nitrogen isotope analysis of nitrate as an indicator of nitrogen sources, as well as for stable isotopes in water as tracers for water movement.

The capability for solids permits development of methods for isotope analysis of carbonates to support climate change research, organic matter and dissolved minerals for ecological and geochemical studies. These new methods utilize automated sample processing systems reducing the time and cost for analyses.

Traces of arsenic, selenium and other elements occur naturally in surface and groundwater from weathering of rocks and minerals. The chemical form of these elements

*(continued on page 12)*

The University of Nebraska–Lincoln does not discriminate based on gender, age, disability, race, color, religion, marital status, veteran's status, national or ethnic origin or sexual orientation.

Printed with soy ink on  
15% post-consumer recycled paper



**ADDRESS SERVICE REQUESTED**

Nebraska  
UNIVERSITY OF  
Lincoln  
WATER CENTER  
103 Natural Resources Hall  
P.O. Box 830844  
Lincoln, NE 68583-0844

