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WATER CURRENT

UNL Water Center — Part of the School of Natural Resources

Vol. 36, No. 2 Spring 2004

June Tour Focuses on Competing Uses for Platte River Water and Basin Development

By Steve Ress

Urbanization, increasing competition for water, continuing drought, and threatened and endangered species all figure in a mix of issues affecting the Platte River Basin that will be explored in a two and half day tour in early June.

The annual University of Nebraska/Kearney Area Chamber of Commerce Water and Natural Resources Tour leaves Kearney and Lincoln Monday, June 7 and concludes there Wednesday, June 9.

Urbanization in the Platte River basin is taking many forms, including an increasing number of high end, permanent residences, like these near Fremont State Lakes. This is one of the topics that will be examined during June's water and natural resources tour (photo: Rodney Verhoeff).

"This (the Platte) basin is increasingly becoming one of the most contentious in Nebraska in terms of shear variety of often times competing demands for its water and resources. It's safe to say this is one of the most closely scrutinized river basins in the state and one with issues affecting all Nebraskans, " said tour co-organizer Michael Jess, associate director of the UNL Water Center and water policy specialist in UNL's School of Natural Resources.

"Allocating Platte River resources to protect threatened and endangered Least Terns, Piping Plover, Pallid Sturgeon and Whooping Cranes are publicly prominent issues, but are often misunderstood. On the other end of a spectrum is the comparatively overlooked urbanization of the river and its associated sand pit lakes from Columbus to Omaha. Both of these issues will be examined on the tour, "Jess said.

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First Water Law, Policy and Science Conference Sets the Bar High

By Steve Ress

The combination of national, international and local water law experts playing to a packed house made UNL's first water law, policy and science conference a major success.

"If we continue attracting this level of speakers to address and spur discussion on water topics of regional and national importance, I can easily see this event becoming one of the premier water conferences in the

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Water Initiative Progresses; Water Research Coverage; Upcoming Tour

from the DIRECTOR

Kyle D. Hoagland

January's water faculty retreat (Winter 2004 *Water Current*) is already bearing fruit. The retreat spawned several large extramural grant proposals from interdisciplinary teams of researchers.

Dr. David Hage, UNL Department of Chemistry, headed a team of scientists who submitted a letter of intent (i.e. to submit a proposal) to the National Science Foundation's Environmental Molecular Science Institutes (EMSI) program, which was accepted. A full proposal entitled, "Emerging contaminants in agricultural watersheds" was submitted in March, with an interdisciplinary group of chemists, geologists, engineers and toxicologists from the University of Nebraska's Lincoln, Omaha and Medical Center campuses, focused on the occurrence, transport, fate, and effects of antibiotics in surface and ground waters. Antibiotics addressed in this proposal primarily emanate from confined animal feeding operations.

Dr. Wayne Woldt, UNL Department of Biological Systems Engineering, led a team of water faculty in submitting a planning grant to the National Science Foundation's (NSF) new environmental monitoring program: Collaborative Large-Scale Engineering Analysis Network for Environmental Research (CLEANER).

The proposed planning project, "An engineering analysis network for adaptive infrastructure management across the community-watershed interface" is driven by a need to protect environmental and water resources, while sustaining economic development. It seeks to increase understanding, integration, and management of key stages in the process of how communities handle their water needs. This precursor to a multi-million dollar grant proposal also included Drs. Mohamed Dahab Civil Engineering; Byrav Ramamurthy, Computer Science and Engineering; Xu-Hong Chen, Natural Resources; and Derrel Martin, Biological Systems Engineering.

Several other large, multi-disciplinary proposals are also in the works, including one for the new Hydrologic Observatory program at NSF to establish a series of surface water quality and quantity monitoring sites in the western Platte River basin as part of a nationwide network, and a NSF Integrative Graduate Education and Research Traineeship (IGERT) pre-proposal, headed by Dr. Sherilynn Fritz, Department of Geosciences, to co-train water science and water law/policy students, entitled "The water cycle and its societal dimensions — improving environmental decision making." The aim of this proposal is to educate students with strong disciplinary education in natural sciences or water law but with fluency in the cognate discipline, such that individuals can work effectively in the public sector on environmental issues.

A vast majority of attendees at March's First Annual Water Law, Policy and Science Conference ranked the event a great success. Thanks to

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WATER CURRENT

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Meet the Faculty

Clinton M. Rowe, Ph.D.

Education:

1988 Ph.D. in Climatology, University of Delaware
1982 M.S. in Geography/Climatology, University of Delaware.
1978 B.A. in Biology and Geography, University of Delaware.

Current Research/Extension Programs:

Sand Hills Biocomplexity: Integrating biogeophysical processes across space and time (with Wedin, Loope, Henebry and 11 others – $1.8 million)

Collaborative Research: Paleometeorological records from sand dunes and eolian sandstones (with Loope – $ $262,570)

Using Integrated Modeling Techniques to Investigate the Hydrological Cycle in the Nebraska Sand Hills (NOAA GCIP, with Hu, Anderson and Chen – $225,000)

Past Research/Extension Programs:

Seasonal Oxygen Isotope Records from Greenland Ice Cores as Indicators of Climate Variability (NSF Office of Polar Programs, with Kuivinen – $114,437)

Spatial and Temporal Variations of Surface Characteristics on the Greenland Ice Sheet as Derived from Passive Microwave Observations (NASA, with Anderson and Kuivinen – $334,197)

Teaching:

Physical Meteorology
Introduction to Atmospheric Science
Physical Climatology

Recent Publications:

— Loope, D.B., Steiner, M.B., Rowe, C.M. and Lancaster, N. (2003) Tropical westerlies over Pangean sand seas, *Sedimentology*, (accepted for publication).

Loope, D.B. and Rowe, C.M. (2003) Long-lived pluvial episodes during deposition of the Navajo Sandstone, *Journal of Geology*, 111: 223-232.

Chen, X., X. H. Chen, Q. Hu, C. Rowe, and M. Anderson, 2003. Geological and climatic controls on streamflows in the Nebraska Sand Hills, *Journal of American Water Resources Association*, 39, 217-228.

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Clint Rowe

Scott Summerside

Hydrogeologist and Associate Geoscientist, UNL School of Natural Resources. At UNL since 1994 (Conservation and Survey Division). Licensed professional geologist, State of Nebraska.

Education:

B.S. Geology, University of Nebraska, 1989.
M.S. Water Resources Administration, Department of Hydrology and Water Resources, University of Arizona, 1991.

Scott Summerside

Scholarly Service (Survey):

From 1998 to 2003, I have responded to over 1000 requests for scholarly service on issues related to water quantity and quality, primarily in southeast and south-central Nebraska. These issues have direct impact on the quality of life in terms of economics, public health, and environmental quality. Service provided has aided in decision-making by individuals, businesses, and government agencies addressing such issues as water supply, water quality, safe drinking water, environmental quality, etc...examples include:

Water supply assistance and evaluations for several small towns, SIDs, rural water districts, several golf courses, many acreage developments, existing and proposed industry (new ethanol plants) and numerous individual landowners/businesses. Some of these are drought related during the past 2 two years, most consist of both water quantity and quality issues.

A current example is the work I have been doing with the mayor of Emerald and the Lower Platte South NRD in finding a new water supply for the Emerald SID in an area of multiple aquifer systems with complex recharge/discharge relationships where the availability of water is constrained by both natural and anthropogenic water quality problems. Emerald SID is facing water supply problems with its current wells due to Nitrate levels over the MCL and possible impacts from the current drought. By examining the geology, existing land use and water quality of the area, a potential site was identified in an area where the Dakota sandstone is near the land surface and likely receiving fresh water recharge. Subsequent water quality sampling reveals it is a fresh water recharge area that should make a good location for small capacity public water supply wells. Test wells are now planned. Appropriate well locations, depths and pump rates should prevent intrusion of underlying saline water.

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Helping Small Towns Reduce Arsenic in Drinking Water

By Steve Ress

Complying with new federal limits for arsenic in drinking water could be a budget-buster for some small Nebraska towns.

University of Nebraska water scientists are researching low-cost methods to reduce or eliminate arsenic in drinking water. Arsenic occurs naturally in groundwater. It is linked to certain types of cancer and other health concerns, including cardiovascular, hormonal and neurological problems.

Research Hydrogeologist David Gosselin leads a School of Natural Resources team that is working with 10 small Nebraska towns for these studies. These towns are among more than 75 small public water systems statewide where drinking water arsenic concentrations could exceed the U.S. Environmental Protection Agency's new standard of 10 parts per billion. This new limit, lowered from the current 50 parts per billion, takes effect in January 2006.

Most of these systems serve fewer than 3,300 people and compliance costs could easily top $120 million statewide, Gosselin said.

"There are a variety of strategies that can be applied to remove arsenic from water, but most of them are expensive, which is tough on small communities," he said.

UNL School of Natural Resources project coordinator Lynne Klawer monitors pH and temperature during a water main flush at Stromsburg that is part of a project to help small communities find lower-cost ways to reduce or eliminate arsenic in drinking water (IANR photo: Brett Hampton).

Traditional, expensive approaches include finding a new groundwater supply, which can be a trial and error process, or treating the contaminant.

This Institute of Agriculture and Natural Resources research shows arsenic amounts in a well can vary at different times. Communities need to consider this in developing well sampling plans to meet the new EPA standards and protect human health, he said.

For example, the length of time a well has been pumping before a sample is drawn can influence the amount of arsenic found in the sample. Limited testing of wells over 24 hours showed "arsenic concentrations can change over very short periods of time," he said.

"Significant variability in arsenic concentrations can occur within the first hour after the pump is turned on, which is typically when operators sample their wells," he said. "This potentially has huge implications for procedures used to sample public water systems."

Scientists are also investigating a potential low-cost method to remove arsenic from groundwater. It involves injecting groundwater high in oxygen into the aquifer. The oxygen-charged water causes iron oxides to form, similar to rust, that naturally attract and bond with the arsenic to remove it from water. These formations remain in the aquifer and do not pose a health risk.

This technique is used in Europe to remove iron and manganese, but more research is needed to adapt it for removing arsenic from Nebraska groundwater, which typically is low in iron.

"Preliminary modeling suggests it could work, but there are potential challenges posed by Nebraska's groundwater chemistry and aquifer geology that we need to investigate further," Gosselin said.

Another possible method for removing arsenic from groundwater within the aquifer would be to create a reactive barrier around the well's intake pipe. This would be composed of the normal gravel packing that surrounds the well's intake pipe underground, only using gravel treated with iron hydroxide, which chemically attracts and bonds with arsenic and other metals, such as uranium. As the water passes through this treated gravel barrier arsenic and other metals such as uranium will ~~be~~ naturally bond to the iron hydroxide-treated gravel and remain there as the water passes through the gravel packing.

The team has sampled wells in Benkelmen, Cambridge, McCook, Stromsburg, Shelton, Elwood, Lodgepole, Broadwater, Oshkosh and Anselmo.

Research continues and Gosselin hopes to develop some recommendations within the next year.

An advisory committee representing small public water systems, Nebraska Departments of Health and Human Services System and Environmental Quality, Nebraska Association of Resource Districts and the League of Municipalities helps guide this research.

The EPA, U.S. Geological Survey and Nebraska Department of Health and Human Services System helped fund this research.

GIS mapping tool helps officials track livestock diseases

By Steve Ress

Information about an emerging animal disease pops up on a computer screen.

In this case, the University of Nebraska-developed computer-based system is illustrating West Nile virus outbreaks in horses statewide. The same geographic information system, or GIS, could help track various livestock diseases, whether domestic, foreign or the result of bioterrorism.

It's among the latest tools developed by remote sensing and geographic information specialists at the university's Center for Advanced Land Management Information Technologies, or CALMIT, to help state and federal agencies anticipate, manage and respond to diseases, natural disasters and potential bioterrorism. The center is a leader in GIS and remote sensing research and development.

A CALMIT team devised the animal health GIS mapping system for the Nebraska Department of Agriculture and USDA after animal health officials sought help early last summer, explained Don Rundquist, a remote sensing scientist who heads CALMIT. Its development was part of a broader initiative to better prepare for potential outbreaks of foreign diseases, such as foot and mouth disease.

"Then when the West Nile virus threatened, state officials also wanted a way to reference where concentrations of livestock and domestic animals were and what their potential susceptibility to the disease might be," explained Jeff Arnold, CALMIT operations manager and project coordinator.

The system tracks and monitors animals based on species, location, number, proximity to veterinarians, outbreaks and susceptibility to diseases and other factors. This program should help animal health officials protect Nebraska's livestock and poultry industries, and protect people from diseases that affect both animals and humans.

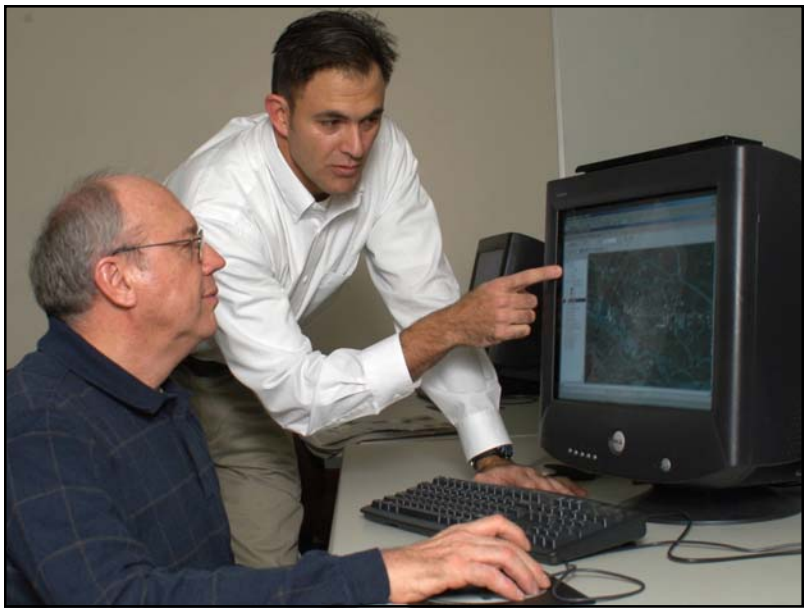
"We have information on locations of cattle, hogs, horses, chickens, turkeys, even buffalo and ostriches, among others," Arnold said.

Bundling complex information from diverse sources with geographic data over time makes information much more accessible, powerful and useful. While GIS use is expanding, CALMIT is a leader in the field and one of only a few such centers with the expertise and resources to create such sophisticated tools.

"GIS brings information to the fingertips that may formerly have been scattered in many locations and forms," Rundquist said. "Sometimes the information is there, but it isn't in a form that can be quickly referenced and used to deal with a crisis or disease."

The system includes livestock operations statewide – from small family farms to large confined animal feeding operations. Precisely locating those operations was challenging.

Researchers started with only longitude and latitude coordinates for 106 of Nebraska's thousands of livestock operations. Using commercial software and agency data, they've mapped about 10,000 livestock operations by section, township and range.



Don Rundquist and Jeff Arnold of UNL's Center for Advanced Land Management Information Technologies (CALMIT) check a map of livestock facility locations across Nebraska. The map is part of a geographic information system CALMIT developed to help animal health officials monitor animal diseases (IANR photo: Brett Hampton).

"We can be precise in pinpointing animal operations and displaying information like where, when and what type of diseases are occurring. These can be tracked over time and location to see patterns, like where West Nile is occurring," Arnold said.

This information is confidential. Only authorized state ag department and USDA officials can access it. CALMIT staff trained authorized state personnel to use the new system, which began operating last fall.

The program also could be adapted to track diseases nationwide, Rundquist said. CALMIT works with state and federal agencies on similar activities to help them better prepare for natural disasters and address issues related to homeland security.

CALMIT experts often consult with agencies on harnessing remote sensing and geographic information systems technologies.

"This didn't just happen over night," Rundquist explained. "We've been doing pioneering research in remote sensing and GIS technologies for years. That investment is paying off now because we have the expertise to develop practical tools to help state and federal officials address pressing security concerns."

The agencies involved help fund this research.

News from the Water Sciences Laboratory

A newly formed faculty advisory committee met in December to discuss current operations of the lab and strategies for improving its effectiveness. Committee members include Drs. Tala Awada, Jim Carr, Steve Comfort, Tom Franti, Ed Harvey, Alan Kolok (UNO), Matt Morley, Julie Shaffer (UNK), and Lora Stevens, all from UNL unless otherwise noted.

Based on recommendations from the advisory committee, new equipment has been ordered that will expand the analytical capabilities of the facility. Additional equipment will be ordered later this year. Funding for this equipment was obtained through the efforts of Drs. Kyle Hoagland and Sheri Fritz, from Program of Excellence funding as part of the Water Resources Research Initiative. Thus far, new equipment ordered includes:

UIC CM240 Total Inorganic Carbon Analyzer, which permits automated total inorganic carbon analysis of solids by acidification and coulometric detection. This system will complement existing carbon analysis capabilities and permit rapid, sensitive, and low cost analysis of large numbers of sediment samples for inorganic carbon content.

GV Instruments Platform XS Inductively Coupled Plasma-Quadrupole Mass Spectrometer (ICP-MS) which is a state-of-the-art bench-top collision-cell based ICP-MS permitting ultra trace (sub-ppb) analysis of metals and nonmetals, isotope ratio analysis, and speciation studies for a variety contaminants such as arsenic, mercury and selenium. This instrument complements existing mass spectrometry instrumentation and expands instrumental capabilities to include trace metals and other inorganic contaminants.

Eurovector Elemental Analyzer and GVI Isoprep C. These systems provide automated preparation of solid samples for stable isotope analysis and will be interfaced with existing Isoprime and AP2003 isotope ratio mass spectrometers. These two systems both increase the range **of** samples the UNL laboratory can analyze and decrease the time needed for processing solid samples (soils, sediments, nitrate, sulfate, phosphate, etc.) for the stable isotope analysis.

Teyona Damon is a new research technologist at the Water Sciences Laboratory. She is responsible for operation of instrumentation used for trace organics analysis. Damon is working on a graduate degree in natural research sciences and has bachelor's degrees in both geology and anthropology from UNL. She has more than three years experience in trace organics analysis, including operation of quadrupole mass spectrometry instrumentation, from MDS Pharma Services.

The laboratory has been busy analyzing a large number of samples for university research, as well as for state and regional water quality projects. Among the compounds and contaminants the lab has been contracted to analyze are pesticides and degradation products, antibiotics, munitions and degradation products, nitrogen isotopes, oxygen and hydrogen isotopes in water, nitrate, ammonia, dissolved organic carbon, and other dissolved nutrients.

New methods are continuously developed as needed to meet research needs. More information and a brochure listing methods available at the UNL Water Sciences Laboratory is on the Web at http://waterscience.unl.edu

From the Director (continued from page 2)

Dr. Sandra Zellmer at the College of Law, the list of distinguished speakers attracted more than 270 attendees.

The conference more than exceeded one of its principle goals, which was the free exchange of views and information among several water-related disciplines. Plans are already underway for next year's conference, and Dr. Zellmer has set the bar very high indeed! We now have every reason to believe that this event could soon become one of the premier water conferences in the country.

Thus, the Water Initiative at UNL has already begun to make a difference due to the diligent efforts of several water faculty, a trend that we have every reason to believe will continue to make a real difference in water research, education and outreach at UNL. Stay tuned!

In this edition of the *Water Current*, I want to draw your attention to coverage of the previously mentioned water law, policy and science conference as well as results of research to track animal diseases, control arsenic in small town drinking water supplies and to inventory Nebraska's waterfalls. All part of the broad spectrum of water and natural resources related research that goes on everyday here at the University of Nebraska.

You'll also find a description of our upcoming water and natural resources tour that is focusing on urbanization and threatened and endangered species issues in the Platte River basin. The tour is early this year, so please note the May 10 registration deadline if you are interested in attending.

June Tour Focuses on Competing Uses for Platte River Water and Basin Development (continued from page 1)

"We want to get some fresh perspectives on some basin issues that, on one hand, seem to be everyday news and on the other, may be more obscure," he said.

Omaha's Joslyn Castle, built just after the turn of the 20th Century, will be the backdrop for a summer water and natural resources tour presentation on promoting sustainable development by Cecil Steward of the Joslyn Castle Institute for Sustainable Communities (photo: Steve Ress).

Tour buses leave Lincoln and Kearney and rendezvous at Central Nebraska Public Power and Irrigation District's Jeffery Island wildlife restoration project near Overton. There, CNPPID biologist Mark Peyton and Bill Scharf of Northwestern Michigan College will explain habitat restoration efforts for Piping Plover and Least Tern nesting, as well as inventorying other wildlife species using the island.

A follow-on stop at a sandpit lake near Lexington, managed by Nebraska Public Power District, will give tour participants a chance to view nesting Terns and Plovers and their offspring with presentations by NPPD biologists Jim Jenniges and John Shaddel.

Lunch will be at the Audubon Society's Rowe Sanctuary near Gibbon.

As the tour continues east toward an overnight in Columbus, the next stop will be at the Central Platte NRD in Grand Island for a presentation by Grand Island Utilities Director Gary Mader on efforts there to contain and clean-up recent groundwater aquifer contamination that has threatened both private and municipal water wells.

A barbeque near the river is planned in conjunction with the overnight in Columbus.

The second day begins with a breakfast presentation on goals of the Lower Platte River Corridor Alliance by coordinator Rodney Verhoeff before the tour proceeds to Schuyler. There, Rebecca Rayman, director of the East-Central District Health Department will outline opportunities and challenges presented by immigration and increasing ethnic diversity in Platte, Colfax, Boone and Nance Counties.

"Her presentation will be made in the setting of Schuyler's historic Oak Ballroom, that was largely built by depression-era immigrants," Jess said.

Later that day, UNL Water Center director and lake ecologist Kyle Hoagland and School of Natural Resources geologist Matt Joeckel will respectively detail research to control algae blooms in sand pit lakes near Fremont and to detail the geology of the Platte River's sometimes imposing bluffs, many of which have proved attractive to, and yet have posed challenges to home development.

Prior to an overnight near Omaha's Old Market, the buses will stop at the city's historic Joslyn Castle for a presentation on the Joslyn Castle Institute for Sustainable Communities by UNL College of Architecture dean emeritus Cecil Steward.

The tour's final day begins with Greg MacLean and Randy Stahmer of HDR Inc. providing insight on water and wastewater planning in the Lower Platte River corridor at the Papio-Missouri NRD. Next is a stop at Schramm State Park, where UNL fisheries biologist Ed Peters will discuss research to track the movements and spawning activities of Pallid Sturgeon.

A final stop near Ashland looks at sand and gravel mining and sand pit reclamation efforts by Lyman-Richey Corp. real estate broker Carl Roberts. Renae Held and Chris Thody of the Tern and Plover Partnership will also talk about their work to enhance and preserve nesting habitat for Least Terns and Piping Plovers.

Schuyler's Oak Ballroom will be the site of a summer water and natural resources tour discussion of immigration and changing demographics that are affecting many communities in the Platte River Basin. The Work Project Administration built the ballroom in 1936 (photo: Rodney Verhoeff).

June Tour Focuses on Competing Uses for Platte River Water and Basin Development (continued from page 7)

After lunch, buses proceed to Lincoln and Kearney.

Tour co-sponsors are Central Nebraska Public Power and Irrigation District, Gateway Farm Show, Kearney Area Chamber of Commerce, Nebraska Water Conference Council, Nebraska Association of Resources Districts, Nebraska Public Power District, U.S. Geological Survey - Nebraska District, Farm Credit Services and UNL's Water Center and School of Natural Resources.

2004 WATER LAW, POLICY AND SCIENCE CONFERENCE

Registration includes all food, (except on-your-own dining in Omaha), motel, and motor coach expenses. Registration is $375 per person single occupancy or $325 per person double occupancy. To register, contact Kearney Area Chamber of Commerce event coordinator Sara Koperski at (800) 652-9435. Registration deadline is May 10 and participation is limited to the first 85 registrants.

UNL Vice Chancellor for Research Prem Paul opens the second day of March's First Annual Water Law, Policy and Science Conference (IANR photo: Brett Hampton).

Conference panelists (from left) Janet Neuman, Dave Aiken, Larry MacDonnell and Richard Howitt entertain questions on dealing with water scarcity and water marketing and it implications for humans and fish and wildlife (photo: Steve Ress).

Keynote presenter Sandra Postel of the Global Water Policy Project in Amherst, MA (IANR photo: Brett Hampton).

First Annual Water Law, Policy and Science attendees listen to Sandra Postel's keynote address on the opening day of the conference (IANR photo: Brett Hampton).

Involve Public in Hard Decisions Regarding Science and Policy, Agency Head Says

By George Green,
SNR editorial assistant

When faced with difficult choices surrounding the science and public policy of the Platte River, habitat needs of endangered species, and water for human use, it is crucial to foster public discussion, said Roger Patterson, director of the Nebraska Department of Natural Resources.

"Agencies don't know everything," he said.

Patterson spoke at UNL's first annual Water Law, Policy and Science Conference at the UNL College of Law, March 4 and 5.

Speakers and panelists in the conference's final session, "'Best Available Science' in Context: The Platte and Missouri Rivers," highlighted the difficulty of determining when researchers have gathered enough information to allow decision makers to create policy.

Patterson recounted work on the Platte River in 1997 when he was part of a task force that proposed a cooperative, multi-state management program for the Platte River to ensure long-term vitality of the river and its native fish and wildlife. Some affected parties came forward in protest, Patterson said, forcing the committee to negotiate a compromise.

A cause of the dispute, Patterson said, was lack of consensus on the science involved.

In the end, he said, these types of debates come down to balancing

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UNL fisheries biologist Edward Peters spoke on the National Academy of Sciences review of the Platte River basin (photo: Steve Ress).

Lee Orton, UNL Vice Chancellor for Research Prem Paul and UNL Water Center director Kyle Hoagland were among those attending last month's First Annual Water Law, Policy and Science Conference at the UNL College of Law (IANR photo: Brett Hampton).

Dean of the UNL College of Law, Steven Willborn (IANR photo: Brett Hampton)

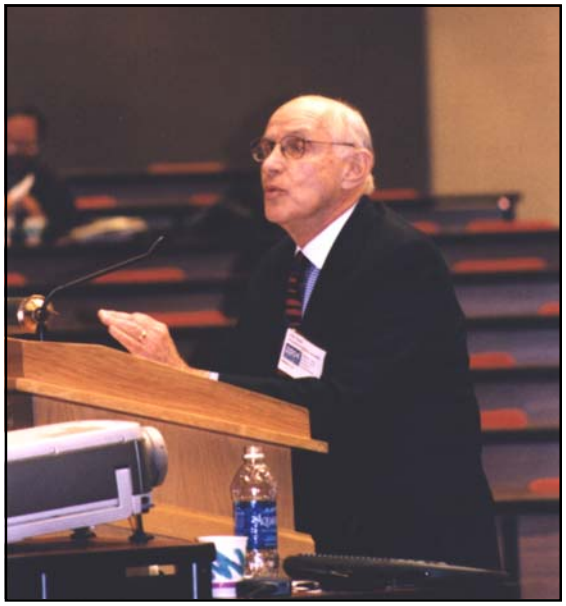
Governor Mike Johanns (IANR photo: Brett Hampton)

2004 Water Law, Policy and Science Conference

University of Arizona Professor of Law and noted environmental author Robert Glennon was the conference's dinner speaker at Morrill Natural History Museum on the UNL City Campus (IANR photo: Brett Hampton).

J.B. Ruhl of Florida State University College of Law addressed the conference on The National Academy of Sciences and the intersection of science and law (photo: Steve Ress).

Sandi Zellmer, Sheri Fritz and Prem Paul chat with Governor Mike Johanns prior to the start of the second day of presentations at the First Annual Water Law, Policy and Science Conference at the UNL College of Law (IANR photo: Brett Hampton).



Keynote presenter Joe Sax of the Boalt Hall School of Law at the University of California-Berkeley (photo: Steve Ress).

Pederson and Graduate Student Stay Busy Chasing Waterfalls

Anyone who has canoed the scenic Niobrara River in north-central Nebraska knows dozens of waterfalls flow from its tributaries like threads of cascading silk.

Now a University of Nebraska-Lincoln professor and a graduate student are cataloging the waterfalls as part of a two-year study paid for by the National Park Service.

Grad student Leonard Mason began scouring the wooded hills and valleys of the Niobrara in June, searching for any waterfall more than a few feet high. Many of them are back in the hills, away from the fast-flowing river.

"It's hard climbing ... He went up every tributary, took photographs and mapped the waterfall faces," said Darryll Pederson, a professor of hydrogeology and principal investigator for the study.

Mason found more than 180 falls along a 20-mile stretch between Cornell Dam and Rocky Ford, about twice as many as expected, Pederson said.

"There definitely are some more waterfalls," said Mason, who just returned from a four-day winter camping trip on the river.

Mason, 26, said he heard reports of a waterfall that may be as tall or taller than Smith Falls, the state's highest at 75 feet. He hasn't been able to confirm it because that waterfall and others are on private property.

"One landowner did not grant access," Pederson said. "He owns a large area of land. He may grant us access this year."

Mason said other landowners also declined to grant access to their land, so he knows he has not catalogued all the waterfalls. He plans to spend the last year of his study doing scientific research rather than mapping.

Mason used a global positioning system device to pinpoint the location of each waterfall. GPS is a satellite navigation system consisting of 24 satellites and ground support. Pederson said the data would allow National Park Service staff to find the waterfalls for future study.

"I think it's incredible," said Paul Hedren, park superintendent of the Niobrara National Scenic River. "Everybody talks about them, but nobody talks about them specifically."

Hedren, who is based in O'Neill, and his staff are in charge of protecting the 76-mile stretch of the Niobrara River, which was added to the nation's Wild and Scenic River System in 1991. As part of their duties as managers, they are responsible for knowing the natural resources of their park unit. That includes waterfalls.

Hedren said the research Pederson and Mason are doing will not only reveal the number of waterfalls in the 76-mile stretch but also hopefully answer how they were formed. His agency has paid $50,000 for the work, which may be published in a scientific journal. The study is believed to be the first of its kind for the Niobrara River.

Pederson said the falls along the Niobrara are unique because their faces are convex, meaning they have a bulging shape. Most waterfalls are just the opposite. Typically, water erodes the face of the falls into a V-shaped pattern and they migrate upstream over time.

"We are searching for the keys on why they are developing like that," Pederson said. He and Mason have some theories:

- The waterfalls are active year-round because they are spring fed, so there is no freeze-thaw action on the waterfall face. Freeze-thaw action does take place on the sides of the waterfalls, so the material on the sides erodes faster.
- Algae, diatoms and lichens growing on the waterfall face may be enough to protect it. The banks on either side of the waterfalls are not protected in a similar manner.
- Groundwater is seeping out of the face of the waterfalls and cementing the rocklike material together, making it harder than on either side of the falls and protecting the face from erosion.

Pederson believes most of the erosion on the Niobrara is caused by a groundwater freeze-thaw cycle and not by river flows. They plan to do further research this winter and spring.

Mason has some spectacular photographs of groundwater discharges, Pederson said.

The research may be useful outside of the Niobrara River Valley as well. Pederson said many rivers in Nebraska have severe erosion problems. In some places, the banks have been cut away and bridges have collapsed.

Most people believe the bank erosion is caused by water, but Pederson said his study might show the

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First Water Law, Policy and Science Conference Sets the Bar High

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country," said conference organizer and UNL associate professor of law Sandi Zellmer.

"Finding Solutions to Multi-jurisdictional Water Conflicts" was the theme of the March 4 and 5 conference at UNL's College of Law on East Campus. The day-and-a-half public conference attracted nearly 270. It was a premier event for UNL's Water Resources Research Initiative that supports a broad spectrum of interdisciplinary water-related research.

Conference attendees represented attorneys and law professors in many legal disciplines, as well as state and federal regulatory agencies, natural resources districts, academics and students, largely from UNL's College of Law and School of Natural Resources.

"I was especially pleased with the level of student involvement, which was the highest of any previous Nebraska water conference," Zellmer said. More than 30 students attended all or parts of the conference.

Speakers and panelists addressed a variety of complex and timely water issues revolving around a theme of how best to reach sustainable water management decisions that satisfy the needs of both people and fish and wildlife. Topics included alternative dispute resolution, water marketing through sales, leases or other transfers, and using the best available science to help resolve legal conflicts. Water conflicts from across the country were discussed and placed into context related to water resources allocations in the Platte and Missouri Rivers.

"A conference goal is to foster ongoing dialogue and research among legal experts, scientists, engineers, economists and other water-related disciplines to better understand the oftentimes competing ecological and human needs for water and to reach sustainable management solutions," Zellmer said.

Keynote speakers were Sandra Postel, director of the Global Water Policy Project based in Amherst, Mass., who opened the conference addressing "Water for Life: Rethinking Management in an Age of Scarcity," focused on security, agriculture and the value of water.

Joseph Sax, noted water and environmental law author, professor and The Order of the Coif Distinguished Scholar at the University of California-Berkeley Boalt Hall School of Law spoke on the future of western water law and Robert Glennon, Morris K. Udall Professor of Law and Public Policy at the University of Arizona and author of *Water Follies: Groundwater Pumping and the Fate of America's Fresh Waters,* spoke to those attending Thursday night's banquet at the Nebraska State Museum.

Panelists and presenters included Roger Patterson, director, Nebraska Department of Natural Resources; Betsy Rieke, area manager, U.S. Bureau of Reclamation, Carson City, Nev.; John Davidson, University of South Dakota Law School; Jay Stein, chair, committee on water resources, American Bar Association Section on Energy and Natural Resources (2002-2003), Santa Fe, N.M.; and Gerald E. Galloway, former U.S. Section Secretary, International Joint Commission, Washington, D.C.

UNL Vice Chancellor for Research Prem Paul opened the conference on March 4 and Governor Mike Johanns reopened the event the following day.

"The conference will continue as an annual venue for leading experts to discuss different aspects of current water issues. While this year's conference focused on legal issues, future conferences will explore water science and policy," said UNL Water Center director and Water Resources Research Initiative co-leader Kyle Hoagland.

"Based on the high level of presenters and attendance, this initial conference has set the bar very high for subsequent events, which is a challenge we fully expect to meet," Hoagland said. Next year's conference is expected to center on water policy issues.

Conference papers are available for $16, plus $6 shipping and handling by contacting Jacki Vogel at (402) 472-7550 or e-mailing jvogel2@unl.edu. Law review articles by conference speakers will be in a symposium issue of the *Nebraska Law Review* slated for publication late this fall. More conference information is available on the Web at http://snr.unl.edu/waterconference2004/.

Conference sponsors were the Water Resources Research Initiative, College of Law, Institute of Agriculture and Natural Resources, School of Natural Resources and Water Center, as well as the Nebraska Water Conference Council, Rocky Mountain Mineral Law Foundation and Nebraska Bar Association-Natural Resources Section.

Pederson and Graduate Student Stay Busy Chasing Waterfalls

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freeze-thaw action is at work in other places, including Southeast Nebraska.

Seeping groundwater and springs feed some streams and tributaries, he said. If that is the case, those responsible for trying to halt riverbank erosion may have to try other methods to solve the problems.

For anyone thinking about following in Mason's footsteps to try and discover new waterfalls, think again.

"If you go up there you will probably get poison ivy," he said.

More importantly, the vegetation is fragile and people tramping along small streams will damage it further.

"There's a lot of evidence of people being up there," Mason said. "If people are going up the river, respect it like it was your house."

(Editor's Note: Reprinted from the Lincoln Journal-Star).

Meet the Faculty

Clinton M. Rowe (continued from page 3)

Anderson, M.R., Rowe, C.M., Radell, D., Kaiser, J.W., Hu, Q., and Chen, X. (2003) Impact of Sand Hills' soil properties on summer precipitation, *Seventeenth Conference on Hydrology*, American Meteorological Society, P1.10.

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Radell, D.B., Rowe, C.M., and Anderson, M.R. (2003) Model sensitivity study and statistical precipitation validation of the 11 June 2000 nocturnal MCS in Nebraska, *Tenth Conference on Mesoscale Meteorology*, American Meteorological Society, P1.4.

Rowe, C.M., Anderson, M.R., Kaiser, J. and Radell, D. (2002) Warm-season land-atmosphere interactions in the Nebraska Sand Hills, *Sixteenth Conference on Hydrology*, American Meteorological Society, J71-J74.

Anderson, M.R., Rowe, C.M., Kaiser, J. and Radell, D. (2002) Regional precipitation variations and atmospheric conditions over the Sand Hills region of Nebraska, *Thirteenth Symposium on Global Change and Climate Variations*, American Meteorological Society.

Loope, D.B., Rowe, C.M. and Joeckel, R.M. (2001) Annual monsoon rains recorded by Jurassic dunes, *Nature*, 412(no. 6842): 64-66.

Ashley, W.S., Anderson, M.R. and Rowe, C.M., (2000) Synoptic-scale conditions associated with the 31 May 1998 derecho, *Twentieth Conference on Severe Local Storms*, American Meteorological Society.

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Scott Summerside (continued from page 3)

— Providing hydrogeologic information to evaluate the potential to develop groundwater source heat pumps (both open and closed loops) for many individual landowners businesses and schools. Rising natural gas prices in recent years have created the need to save energy costs through use of geothermal loops.
— Conducting field trips, presentations, worksops and other outreach activities for Nebraska Well Drillers Association, (including professional geologists and license holders of other water professionals.
— Well head protection delineations
— Technical assistance to NRDS to assist in their groundwater management activities
— Assistance to state agencies on groundwater related issues and projects

Current Survey Projects:

— Update and revision of testhole log books for Webster and Nuckolls Counties in S. Central Nebraska as part of the Nebraska Cooperative Hydrologic Study (COHYST)
— Confined Aquifer Delineation Project (Upper Big Blue NRD): Identify areas in the NRD where groundwater exists primarily under confining conditions through the use of GIS-based mapping of hydrogeologic characteristics. Also estimate areas prone to well interference problems as well as drought induced ground-water depletion.

Other Recent Survey Projects:

— Characterization of the hydrology and geology of the Harlan County Lake area.
— Effects of earthquakes on groundwater levels in Nebraska observation wells.
—Update and revision of regional 1x2 degree water-table configuration maps of the State of Nebraska (NDEQ Source Water Assessment Program).
— Aquifer tests at study sites in the alluvial valleys of the Republican River Basin (DNR).
— Update county test hole log books to meet hydrogeologic data needs of Nebraska resource managers (Republican River Basin Study, Lower Platte River Corridor Alliance, early COHYST work)

Publications:

— Summerside, S, October 2003. Nuckolls County Test-hole Logs. Nebraska Water Survey Test-Hole Report No. 65.
— Summerside, S., R. Vasek, D. Gosselin, and M. Jess. June 2003. A Reconnaissance Scale Assessment of Confining Conditions within the Ground-water System of the Principal Aquifer in the Upper Big Blue NRD , Conservation and Survey Division Contract Report for the Upper Big Blue NRD 14 p., and 9 maps.
— Chen, X., J. Goeke, J. Ayers,, and S. Summerside. 2003. Observation Well Network Design for Pumping Tests in Unconfined Aquifers, Journal of the American Water Resources Association, 39 (1), 17-32.
— Joeckel, R. M., M. Carlson, S. Summerside, and J. Leach. 2003. Earthquake History, Seismicity, and Related Tectonics in Nebraska. Geological Society of America, Abstracts with Programs 37th Annual Meeting North-Central Section, Kansas City, Missouri, March 24-25, 2003 , 35 (2), 51.
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— Diffendal, R.F., Jr., D.R. Mohlman, R.G. Corner, F.E. Harvey, K.J. Warren, S. Summerside, R.K. Pabian, and D.A. Eversoll. 2002. Field Guide to the Geology of the Harlan County Lake Area, Harlan

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Involve Public in Hard Decisions Regarding Science and Policy, Agency Head Says

(continued from page 9)

enough information, because researchers never have enough, with taking a particular action based on sufficient public input.

In addition to local leaders and national and international experts, several UNL faculty moderated and contributed to discussions on building consensus in multi-jurisdictional water disputes, water scarcity, water marketing and sales, and water as property.

Ed Peters, UNL School of Natural Resources fisheries biologist, built on Patterson's discussion of Platte River management.

Last year, he said, U.S. Department of Interior requested the National Academy of Sciences and its investigative arm, the National Research Council (NRC), further study the basin to evaluate some aspects of a 1997 cooperative agreement between Nebraska, Colorado and Wyoming about the Platte.

The NRC committee, which Peters was a member of, was charged with studying habitat requirements of threatened or endangered whooping cranes, interior least terns, piping plovers and pallid sturgeon.

"We have concerns about their existence in the river," Peters said.

Peters said the NRC also asked the committee to examine the validity of in-stream flow recommendations for the river.

Several physical changes have significantly altered the river from its native form, he added. Stream flows and water quality have changed, as have streamside habitats, he said.

"We don't have the same patterns of flow," he said.

The 14-member committee included experts in ecology, engineering, hydrology, geomorphology, geography, endangered species law and policy, agriculture and economics.

Outside experts have reviewed the committee report, which is expected to be published soon.

Gerald E. Galloway, vice president of Enterprise Engineering Group, Titan Corporation, Fairfax, VA, participated in a similar NRC committee that studied the Missouri River.

Like the Platte, the Missouri River has been mired in controversy for quite some time, Galloway said.

For more than 15 years, the U.S. Army Corps of Engineers has struggled to create a new set of rules for the operation of its six mainstream Missouri River dams. Five years ago the U.S. Environmental Protection Agency and the Corps requested that the NRC investigate.

"The Missouri River ecosystem is in trouble," he said.

Policy makers need to get people together who have a stake in the river to discuss the issues, he said. The NRC committee that Galloway served on recommended that the Corps and U.S. Fish and Wildlife Service cooperatively develop a strategy of adaptive management, he said.

In another conference presentation, J.B. Ruhl, professor at Florida State University College of Law, said some researchers and policy makers are over-selling peer review as the solution to scientific data debates.

"Peer review will smother agencies with work," he said. It is expensive and it fails to acknowledge that scientific data accounts for only part of management decisions. Human needs and desires also influence judgments.

Professor John H. Davidson, University of South Dakota School of Law. offered concluding remarks on the subject, saying that perhaps the most productive way to frame the role of science in these issues is as "a base from which to meet and talk."

"We must find ways for a more productive debate between science and government," he said.

Meet the Faculty

Scott Summerside (continued from page 13)

County, Nebraska- with a History of Events Leading to Construction of Harlan County Dam : Conservation and Survey Division, University of Nebraska, Lincoln, Nebraska, Educational Circular 16, 61 p.

— Summerside, S., M. Ponte, V. Dreeszen, S. Hartung, M. Khisty, and J. Szilagyi. March 2001. Update and Revision of Regional 1x2 Degree Water-Table Configuration Maps for the State of Nebraska , Conservation and Survey Division Contract Report for the Nebraska Department of Environmental Quality, 9p.

— Summerside, S. 2001. Configuration of the water table circa 1995, Fremont and Omaha Quadrangles, Nebraska: Nebraska Water Survey Map GM-54c , 1 Sheet, scale 1:250,000.

— Hartung, S. and S. Summerside. 2001. Configuration of the water table circa 1995, Sioux City Quadrangle, Nebraska : Nebraska Water Survey Map GM-54i, 1 Sheet, scale 1:250,000.

— Summerside, S. and J. Szilagyi. 2001. Configuration of the water table circa 1995, Valentine Quadrangle, Nebraska: Nebraska Water Survey Map GM-54j, 1 Sheet, scale 1:250,000.

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Water News Briefs

Interesting Sites

National Drinking Water Clearinghouse
www.ndwc.wvu.edu

National Watershed Coalition
www.watershedcoalition.org

Estimated Water Use in the United States 2000
water.usgs.gov/watuse

UNL Water Sciences Laboratory
http://waterscience.unl.edu

High Plains Regional Climate Center
http://www.hprcc.unl.edu

UNL Climate and Bio-Atmospheric Studies
http://snrs.unl.edu/cbas

UNL Meteorology Program
http://zephyr.unl.edu

UNL Department of Geosciences
http://www.geosciences.unl.edu

Great Plains - Cooperative Ecosystem Studies Unit
http://greatplains.cesu.unl.edu/

Water Transfers and Marketing

Reports on *Water Transfers and Marketing in Nebraska* and *2003 Changes to Water Transfer Law in Nebraska — Addendum*, both by Water Center associate director J. Michael Jess and both published in April 2003 by UNL's Conservation and Survey Division, are available at no charge by contacting the UNL Water Center at (402) 472-3305 or emailing sress1@unl.edu

Monitoring Science and Technology Symposium

"Unifying Knowledge for Sustainability in the Western Hemisphere," is the Monitoring Science and Technology Symposium that will be at the Adam's Mark Hotel, Denver, CO, Sept. 20-24.

The symposium offers numerous break-out sessions on topics such as knowledge for sustainability and challenges; using information and knowledge required in assessment and management applications for sustainability, ecosystem condition assessment, GIS/remote sensing, statistical methods spatial modeling, ecosystem condition assessment and many other topics.

For more information, go to http://www.monitoringsymposium.com or contact the USDA Forest Service, Rocky Mountain Research Station, NRRC, 2150 Centre Ave., Building A, Suite 348, Fort Collins, CO 80526-1891, phone (970) 295-5961.

Getting Research-based Information on Water and Pollutants to Those Who Need It

By Steve Ress

Becoming a one-stop shop for information on watershed management and agricultural nonpoint source pollution is a goal of the Heartland Regional Water Quality Coordination Initiative.

The new initiative, developed by leaders of water quality extension programs at Iowa State University, Kansas State University, the University of Missouri and the University of Nebraska, U.S. Environmental Protection Agency and state regulatory agencies, helps focus information and resources on improving water quality, primarily in the areas of watershed management and nonpoint source pollution.

"Animal manure management, nutrient and pesticide management and community involvement in watershed management are top priorities," said UNL extension educator and program coordinator for the Heartland project in Nebraska, Jamie Boehm.

Objectives are to improve local watershed management programs and increase cooperation among institutions, agencies and organizations developing materials and programs on watershed management, Boehm said.

"We want to improve the flow of educational materials and training opportunities available to educators, natural resource managers and crop and livestock producers, including those with confined animal feeding operations (or CAFOs)," she said.

Heartland works closely not only with producers and agri-business professionals, but also with Cooperative Extension and state agency personnel conduct meetings and other activities dealing with watershed management and nonpoint source pollution abatement.

UNL faculty involved in helping form and lead the new initiative include livestock bioenvironmental engineer Richard K. Koelsch and nutrient management specialist Charles S. Wortmann.

The Heartland Regional Water Quality Coordination Initiative can be accessed on the Web at www.heartlandwq.iastate.edu, or by contacting Boehm at jboehm2@unl.edu or phone (515) 294-1496.

You Get the Last Word

Is the *Water Current* delivering the information you need and want?

Each spring we ask our readers that in a series of questions you'll find below. This gives us a better idea of where your interests lie and what kinds of information you want from the UNL Water Center.

Please take a few minutes to fill-out and return this annual reader survey. As a reward for your efforts, we will enter your name in a drawing for one of three Water Center coffee mugs.

To be eligible for the drawings, return your completed survey to Steve Ress, UNL Water Center, P.O. Box 830844, University of Nebraska, Lincoln, NE 68583-0844 or FAX it to (402) 472-3574 by Friday, June 11. UNL subscribers may return surveys via campus mail to 103 NRH, EC, 0844.

Please mail or FAX the entire page (so we have your name and address for the drawings). Responses to the survey will be held in strictest confidence and will be used only by the newsletter's editorial staff.

1. **Rank in order of importance, the usefulness of the following general areas of the *Water Current* (1 - most important to 6 - least important):**

   ___ News Briefs

   ___ Meet the Faculty

   ___ Previews articles of upcoming events, seminars, conferences, etc.

   ___ Director's Notes

   ___ Articles on NU water and environmental research and outreach activities

   ___ Guest editorials/columns

2. **What articles or topical areas would you like to see in upcoming issues of the *Water Current*?**

   _____

   _____

3. **What are your primary water and environmental interests?**

   _____

   _____

4. **Do you read each *Water Current* you receive?**

   ___ Yes ___ No

5. **Do you circulate your *Water Current* to anyone else?**

   ___ Yes (if so, how many others _____)

   ___ No

6. **Should the *Water Current* be distributed**

   More often ___ less often ___ remain a quarterly ___

7. **Do you ever access the virtual copy (PDF) of the *Water Current* on the Water Center's web site at http://watercenter.unl.edu?**

   ___ Yes ___ No

8. **What can we do to improve the appearance and/or readability the *Water Current*?**

   _____

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