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Water Current

Summer Water Tour to Visit Arkansas and Republican Rivers

by Steve Ress

Plan now to join the Kearney Area Chamber of Commerce and other sponsors for the summer water tour, "Back to the Future - Arkansas/Republican Rivers."

"This is a wonderful opportunity to join state legislators, water professionals and agricultural producers for an in-depth look at the results of the Arkansas River dispute between Colorado and Kansas, as well as current issues between Kansas and Nebraska on the Republican River," said Roger Jasnoch, President of the Kearney Area Chamber of Commerce.

The tour is August 11-13 and begins and ends at Kearney's Regency Inn.

Tour participants will be exposed to a variety of water use projects and water-related research in both Nebraska and Colorado as well as commentary on what could be at risk in the ongoing dispute between Nebraska and Kansas over Republican River water.

"We are very pleased that Mike Jess, Director of the Nebraska Department of Water Resources, has agreed to facilitate this educational forum," said Jasnoch.

The tour schedule includes the following highlights:

Tuesday, Aug. 11

Tours of the Cambridge diversion dam and UNL irrigation research station at the

Claude Cappel farm near McCook and a stop at the Nebraska Game and Parks Commission's Rock Creek Fish Hatchery near Parks before proceeding into Pueblo, CO. Participants will be able to talk about Colorado water issues with local officials, irrigators and producers. Local perspectives on the Arkansas River dispute will also be presented.

Dinner will be at the Pueblo Reservoir with Colorado legislators and officials.

(Continued on page 5)



The expansive concrete dam at the John Martin Reservoir near LaJunta, CO is one of the stops on a summer water tour being sponsored by the Kearney Area Chamber of Commerce, Nebraska Water Conference Council and others. The three-day tour departs Kearney Aug. 11 (photo: Steve Ress).

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EPA Help for Community Drinking Water Systems; Studying Corroded Systems

from the DIRECTOR



Bob G. Volk

We are extremely pleased to have recently published "*Wetlands - Understanding a Resource*," the latest in a series of water-related educational tabloids. Several of you have taken the time to send us notes of appreciation relative to the high quality of the publication and we thank you for your interest. Additional copies are available for personal use or for educational and informational programs by contacting our office. Several schools and wildlife and environmental organizations have requested copies for

science and environmental curriculums and educational programs.

The U.S. Environmental Protection Agency (EPA) has been sensitive to the needs of small communities and the problems many of these communities may be experiencing with their sometimes antiquated or inadequate drinking water systems. A recent EPA request for proposals is designed to have regional centers established at various locations in the U.S. to address these growing problems. The University of Illinois has taken the lead in the Midwest in writing a proposal to address this EPA initiative. We have provided input to that proposal, which if successful, would help fund assistance to small communities. As part of this, we have also requested funds for demonstration projects on the best and most economical way to treat drinking water for nitrate contamination.

The 1991 Lead and Copper Rule changed the way that water utilities deal with corrosion in their drinking water distribution systems. Over the past seven years, larger water systems have dealt with the sampling and public notification requirements of the rule. Now, smaller systems must deal with these same mandates. With small water systems, additional complexities are added to the corrosion issues in that many small groundwater-based

do not currently disinfect their water prior to distributing it. With the addition of a strong oxidant, such as free chlorine, it is likely that corrosion will greatly increase. In addition, small systems often lack the resources to undertake substantial (lead) pipe replacement projects in spite of potential funding sources such as the State Revolving Loan Funds. A general lack of knowledge on corrosion and limited experience in dealing with complex technical issues further hinder many small systems. We have proposed to study this problem and provide some solutions to it.

On another subject, the President has proclaimed 1998 the Year of the Ocean. I have been invited to attend a National Ocean Conference in California where President Clinton and Vice President Gore plan to be in attendance.

Also, please mark your calendar for the 1998 Summer Water Tour August 11-13. The tour, which begins and ends in Kearney, promises an in-depth look at the results of the Arkansas Rivers dispute between Colorado and Kansas, as well as commentary on issues pending between Kansas and Nebraska over the Republican River. Contact our office for more details or a registration form. Registration deadline is July 1.

Water Current

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State's First Constructed Wetland Treatment System Fills Unique Need

by Steve Ress

Nebraska's first constructed wetland is filling a rural Lincoln neighborhood's need for an inexpensive, safe and aesthetically pleasing facility to treat wastewater.

"The use of CWs (constructed wetlands) for domestic wastewater treatment has been increasing in the U.S., but until recently limiting factors of colder conditions on the biological mechanisms associated with typical wetlands has not made them common here in the midwest," said University of Nebraska-Lincoln environmental engineer Mohamed F. Dahab.

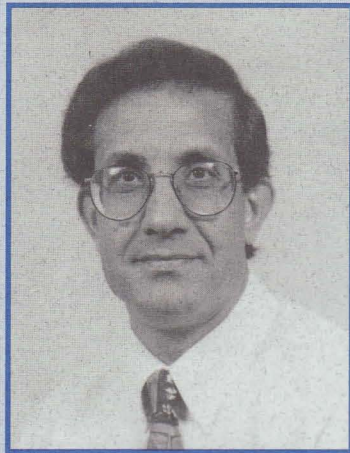
Several years ago, a traditional septic system serving Lincoln's "Firethorne" golf club and neighborhood failed, due in part to the area's tight, clay soils and high watertable.

Determining that a mechanical system would be cost-prohibitive for the 100-plus housing development, a New Mexico consultant was hired to develop a subsurface flow CW system that would add to, rather than detract from, the aesthetics of the neighborhood, as well solve their wastewater treatment problems at low cost.

Within a month after it began operating in late 1995, Dahab began an evaluation of the system to determine what its future applicability might be as an alternative for small community wastewater treatment in the seasonally varied midwestern state.

In nearly two years of intensive monitoring and sample analysis, one of Dahab's conclusions is that "It's possible for subsurface flow CW treatment systems to equal or even exceed mechanical plants for treating wastes."

Constructed wetlands, which can also be of a surface flow



Mohamed F. Dahab

variety, typically remove wastes through sedimentation, coagulation, adsorption, filtration, biological uptake and microbial transformation, making the life cycle of the covering plants an important part of the systems overall effectiveness in waste removal or reduction.

"It's a simple process: constructed wetlands maintain and perform these treatment functions by supporting plant and bacterial life that cycle excess nutrients through successive seasons of plant growth, death and decay," Dahab said.

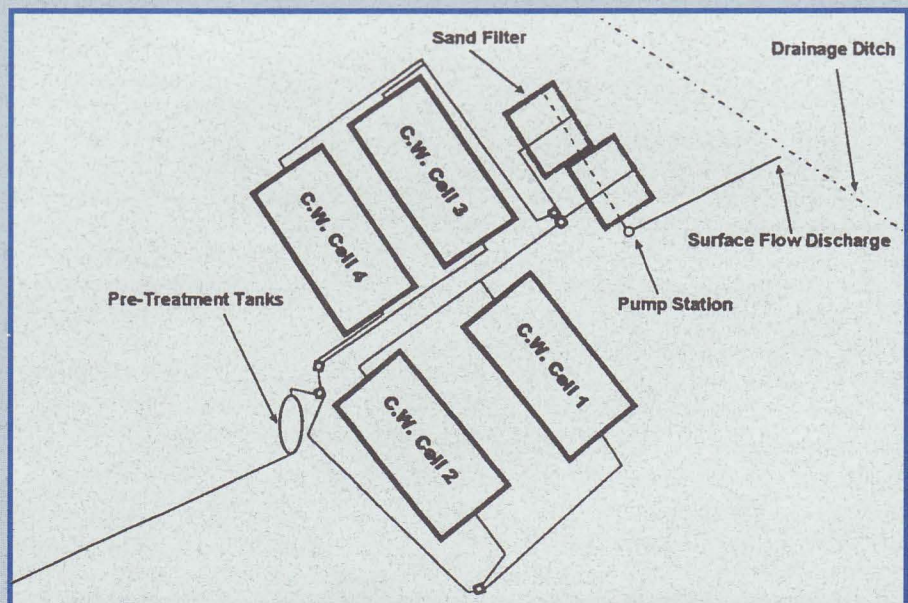
"It's well documented that CWs provide consistent treatment in temperate regions. What we hope is that our research will help prove they can also be advantageous and cost effective solutions to small communities with limited resources here in the plains," Dahab added.

The system itself consists of four gravel-based "cells" that support the wetland vegetative growth that is so important in the natural removal of wastes. Each cell has three vegetative cover zones, planted with common cattails, woody cattails, alkali bulrush and common reeds.

"Plants consume some of the nitrogen present in the wastewater, while their roots help oxidize the organic waste material," Dahab explained.

Wastewater enters the cells from a series of two fiberglass pretreatment tanks that act as settling

(continued on page 4)



This diagram shows the constructed wetland wastewater treatment system that is the first of its kind of Nebraska. Wastewater enters the system at left and exits, through subsurface flow at the upper right.

Legislative Shuffle Adds to Nebraska's Water Law

by Robert D. Kuzelka

The admonition for watchful citizens appearing over the north entrance to the Nebraska State Capitol was appropriate as the second session of the 95th Nebraska Legislature drew to a close.

State senators proved to be masters at both "gutting" or substituting into bills which had advanced in the legislative process and creating "Christmas tree" bills which include a wide variety of issues.

The unicameral system by "Sine die" on April 14 probably was not what the late George Norris had intended to be a citizen-friendly process. Out of this legislative "Shell game" came some significant additions and changes to Nebraska's water-related laws.

Of greatest challenge to the legislative watcher was LB 1161, which survived substitutions, additions and the Governor's veto. By the end of the session, it even required an amendment for clarification by yet another bill, LB 1209. Key water-related provisions of this true "Christmas tree" include:

- Providing cost-share dollars to install measuring devices on wells in the Republican River alluvium.
- Changing the exemption from well permitting in the Ground Water Management and Protection Act for wells designed to pump under 50 gallons per minute (gpm).
- Authorizing public water supply systems the ability to create and control well head protection areas.
- Allowing natural resources districts to establish weather modification programs.
- Adopting the Geologists Registration Act.

A Livestock Waste Management Act is now state law, after passage of LB 1209. This evolved from three separate bills, substantially changing the way the Nebraska Department of Environmental Quality (NDEQ) addresses livestock waste control facilities. It also modifies permits for dams which retain livestock waste as administered and checked by the Nebraska Department of Water Resources (NDWR).

LB 395 establishes a process to promote voluntary self evaluation to determine whether a person or organization is in compliance with environmental requirements. It grants limited confidentiality to the results of voluntary environmental audits. Noncompliance would have to be remedied for the confidentiality to be retained.

The Nebraska Department of Agriculture (NDA) will administer a new cost share program to provide incentive for installation of buffer strips. LB 1126 is projected to provide the program with from \$200,000 to \$500,000 per year from an annual increase in pesticide registration fees.

The Nebraska legislature provided other new water-related funding through LB 656 for the newly created Niobrara Scenic River Council and through LB 1108 for state participation in the Cooperative Agreement for the Platte River.

On a somber closing note, LB 1108 also provides funds to NDWR and the State Attorney General for defense of the anticipated lawsuit with Kansas on the Republican River.

(Editor's Note: Kuzelka is assistant to the director of the UNL Water Center/Environmental Programs and associate professor in the School of Natural Resource Sciences).

State's First Constructed Wetland Treatment System Fills Unique Need

(continued from page 3)

basins and sludge depositories. Out-flow from the four cells goes directly into a dosing tank and then into a two-cell sand filter. The filtered wastewater is then collected in a concrete-lined wet well and from there is periodically discharged to an adjacent drainage ditch.

Intensive sampling conducted through the summer, fall and winter of 1996-97 determined that the CW treatment system at Firethorne was highly effective in removing soluble and suspended solids and organics, as well as bacteria. Under federal law, these parameters are used to measure the performance of wastewater treatment facilities. Average waste reductions were, in most cases, 95 percent or higher, meeting or exceeding all mandated treatment criterion.

Additional pluses for the system include its extremely low operational and maintenance costs and the natural, wetland vegetative cover that blends well with surrounding landscapes. There also tends to be little or no offensive odor associated with the system, Dahab said.

"They can be constructed on land that may not be suitable for building, farming or other uses, thus making good use of what might otherwise be marginal properties," he said.

Dahab is a professor in UNL's Departments of Civil Engineering and Biological Systems Engineering and a registered professional engineer in both Iowa and Nebraska.

This research was funded in part by the UNL Water Center/Environmental Programs and UNL Center for Infrastructure Research.

Water Tour to Visit Arkansas and Republican Rivers (Continued from page 1)

Wednesday, Aug. 12

The first stop will be a tour of the Bessemer Ditch and Pueblo Reservoir. A stop in Rocky Ford, to sample the area's world famous cantaloupes, is planned as is a tour of Bents Old Fort, a frontier-era trading post and National Historic Monument.

Colorado Department of Water Resources officials will facilitate a tour of the John Martin Reservoir in the rich agricultural region of Rocky Ford and LaJunta. Rolling commentary will center on the effects of the Arkansas River dispute from points of view of state and local officials and producers.

The tour overnights in Goodland, KS, where dinner with Kansas legislators is planned.

Thursday, Aug. 13

After departing Goodland, the tour will travel to Harlan Reservoir with commentary on what's at risk in the Republican River dispute. Lunch will be at the reservoir, where Governor E. Benjamin Nelson has been invited to give a legislative perspective of the current dispute.

Participants can expect to be back in Kearney by mid-afternoon.

Tour cost is \$295 per person,

which includes all food, lodging and motor coach expenses. The deadline for paid registrations is July 1 and registrations go directly to the Kearney Area Chamber of Commerce/Water Tour, P.O. Box 607, Kearney, NE 68848. For more information, phone (800)652-9435 or FAX (308)236-8785.

In addition to the Kearney Chamber, the tour is sponsored by Central Nebraska Public Power and Irrigation District, Nebraska Public Power District, Nebraska Water Conference Council, Gateway Farm Expo and UNL Water Center/Environmental Programs.

NU Study Ranks Small Towns's Ability to Pay for Sewer and Water

By Dan Holder,
IANR news assistant

A University of Nebraska-Lincoln agricultural economist's study shows small towns vary widely in their ability to pay for sewer and water services.

Ray Supalla of NU's Institute of Agriculture and Natural Resources ranked 439 Nebraska towns with populations under 5,000 on their ability to pay for such services.

The analysis found Lorton, population 61, in Otoe County ranked first, meaning it is least able to spend money on civic projects, while Malcolm, population 372, in Lancaster County ranked 439th, meaning it could afford to spend the most. The towns are ranked from 1 to 439, with one being least able to pay and 439 being most able.

Many government grants to communities for public services are based on median income per household the middle number in a series arranged by size. However, Supalla believes using median income alone as a guide for awarding government grants is inequitable, so he included additional factors: per capita income, household income distribution and property valuation per household. Property taxes levied were considered, but not included. The formula, which he calls the financial capacity index, helps adjust for differences in towns with high

property valuations but low household incomes, so-called property-rich but income-poor towns.

Two southeastern Nebraska towns exemplify this contrast. Burr, population 75, in Otoe County has a low median household income of \$13,333, but a high property valuation per household of \$61,516. Based on median household income, Burr is poor. Its rank of 25th out of 439 communities makes it among the least able to pay for public services. But based on property valuation, it is one of the wealthiest communities, with a rank of near the top, 389th out of 439.

In contrast, Nemaha, population 188, in Nemaha County has a higher median household income at \$21,875, which ranks 313th, but a lower property valuation per household \$26,778, which ranks 58th. Thus, Nemaha's median household income is relatively high, but its property valuation is relatively low.

Based on Supalla's financial capacity index, which considers both income and wealth, Burr is ranked 281st and Nemaha is ranked 154th in ability to pay for public services. That means Burr is more able to pay for such services than Nemaha.

Historically, federal funds have been available to help rural communities meet the cost of sewer and water treatment programs. As the federal government turns over greater responsibility for funding public services to

states, small towns face higher costs and/or reduced services unless state or local governments can retain existing funding levels.

Towns with many low-resource residents may need more government assistance for civic projects, but they don't always get the help they need, Supalla said.

"Some towns are more aggressive and have more staff to apply for government grants," he said.

Small towns want to and must meet public health and environmental standards, Supalla said. But they often need greater flexibility in meeting them. For example, a small town may want to use a lagoon to treat wastewater rather than build an expensive water treatment plant. Supalla's study develops a framework for an economically efficient, fair sewer and water assistance program, he said. The ability-to-pay concept also could apply to other policy issues, such as welfare reform, state aid to education or tax reform.

Over time, Supalla said he hopes his research will help assure that shrinking government dollars go to "the really needy communities."

Supalla's research was conducted for the Partnership for Rural Nebraska, a collaboration of NU, the State of Nebraska and the U.S. Department of Agriculture, in cooperation with IANR's Agricultural Research Division.



Water News Briefs

Twenty Most Endangered Rivers

American Rivers, a nonprofit environmental organization, released its list of the 20 most endangered U.S. rivers.

The Hanford Reach of the Columbia River is listed as most endangered due to agricultural and urban development and nuclear waste contamination.

Second is the Missouri River, which has essentially been transformed into a barge canal due to channelization and dams. Many Missouri River fish and wildlife species are present at less than 10% of historic levels.

The other 18 are: the Pocomoke (MD), Apple (WI), Potomac (WV, PA, MD, VA), Walla Walla (OR, WA), Kansas (KA), the Blackfoot (MT), Pinto (AZ), Wolf (WI), Rogue/ Illinois (OR), Taku (AK, BC), Crooked (AR), the Kern (CA), Colorado (CA, Mexico), Lower Snake (WA), Mattaponi (VA) and Uinta (UT).

For more information, see the American Rivers World Wide Web Site at <http://amrivers.org>.

Chlorinated Drinking Water Under Fire

Growing evidence suggests excessive exposure to trihalomethanes, a group of chemicals found in chlorinated water, may increase risk for a host of serious health effects. A new report released by the California Department of Health Services indicates

that chlorinated drinking water may increase the risk of miscarriages, birth defects and provide a partial explanation for our current epidemic of cancers. The U.S. Environmental Protection Agency (EPA) has proposed reducing as much as half the allowable levels of trihalomethanes (THMs) in drinking water over the next decade, with a long-term goal of eliminating the chemicals. Seventy percent of U.S. cities chlorinate.

(Editor's Note: Taken in part from Nancy Evans and Marguerite Young, SAN FRANCISCO CHRONICLE, April 14 1998).

Former NRCS Chief to Speak at Conference

Former NRCS Chief Paul Johnson, known for speaking on agricultural and community stewardship, will address The Groundwater Foundation's 14th annual fall symposium.

"It's Just Common Sense: Practical Approaches to Better Groundwater Management" will be Sept. 9 and 10 at the Hilton La Palácio del Rio, San Antonio, TX. The symposium's goal is to highlight recent advances in groundwater protection practices and products in both urban and rural settings. All types of results-focused practices will be showcased: high tech and common-sense; cutting edge and low-cost.

"The 1998 symposium represents the Foundation's most useful, collaborative symposium in years and helps set a framework for, and benchmarks from which, we can measure future groundwater protection action," said Groundwater

Foundation President Susan Seacrest.

To register, contact the Foundation at (800)858-4844, FAX (402)434-2742 or e-mail wendy@groundwater.org. Questions should be directed to Wendy Conrad at (402)434-2740.

Call for Papers — Bringing Groundwater to Life

The Groundwater Foundation is calling for presentations for "Bringing Groundwater to Life," Priming the Pump and Groundwater Guardian national conference, that will be held in Anaheim, CA, November 12-15.

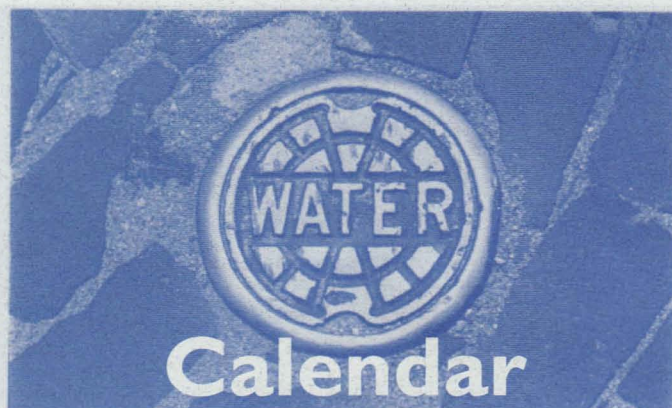
Top priority will be given to presentations featuring innovation, sustainability and direct benefit to groundwater. To be considered as a presenter, prepare a brief paragraph of 250 words or less.

Abstracts must be received no later than July 15. If selected, you will be notified by August 15. Presenters will be responsible for their own travel and lodging, but will be eligible for a reduced registration fee.

Presentation topics include education and outreach, pollution prevention, public policy, conservation, best management practices and program administration. Presentations should focus on building teams, identifying and reaching audiences, selecting age and interest-appropriate activities, getting results, evaluating impact and organizing an activity into distinct and understandable components. A variety of presentation formats are available.

For a registration brochure or more information, call The Groundwater Foundation at 1-800-858-4844. Abstracts may be submitted to The Groundwater Foundation, P.O. Box 22558, Lincoln, NE 68542-2558, FAXed to (402)434-2742 or emailed to cindy@groundwater.org

The conference will be held at the Hyatt Alicante Hotel, Anaheim, CA.



JUNE

5-9: Balancing Resource Issues: Land, Water, People, San Diego, CA. Annual conference of the Soil and Water Conservation Society, 7515 Northeast Ankeny Road, Ankeny, IA 50021-9764. Phone (515)289-2331 or email swcs@swcs.org

8-11: The Ninth Global Warming International Conference and Expo. Advanced registration due by January 25, 1998. Registration deadline March 1, 1998. Hong Kong University of Science and Technology. Conference FAX hotline is +1 630-910-1561. Exhibitors welcome.

10-13: The Groundwater Foundation's Groundwater University, Jeffrey Lodge, Brady. For junior and senior high students. For more information, call 1-800-858-4844 or (in Lincoln) 434-2740.

14-17: "NETC98, Connect with the Future," St. Louis, MO. Where extension educators can learn to put technology to work. For information phone Dave Klostermann, University of Missouri-St. Louis (314)516-5958 or email dave_klostermann@ccmail.umsi.edu.

14-19: Nebraska Range Shortcourse, Chadron State College, Chadron. Contact Dr. Lowell Moser, Department of Agronomy, University of Nebraska-Lincoln, P.O. Box 830915, Lincoln, NE 68583-0915, phone (402)472-1558 or email agro043@unlvm.unl.edu.

17-19: "Legends and Lessons In The Pine Ridge," 1998 Nebraska Environment Education Association (NEEA) conference, Fort Robinson State Park. For information, contact Syd Hime at (402)476-2729 or email hime@nrcdec.nrc.state.ne.us

28-July 1: Advances in Urban Wet Weather Pollution Reduction, Cleveland, OH. Examining issues related to urban wet weather pollution in communities. Contact Nancy Blatt or Dave Trouba at the Water Environment Federation at (703)684-2400.

JULY

5-9: Balancing Resource Issues, Hyatt Regency, San Diego, CA. The Soil and Water Conservation Society's annual conference. For more information phone (515) 289-2331, FAX (515) 289-1227, email: swcs@swcs.org World Wide Web Site: <http://swcs.org>.

7-9: National Monitoring Conference, Silver Legacy Hotel, Reno, NV. Registrations available by calling (405) 848-0722, or on the World Wide Web at <http://gwpc.site.net>.

7-10: Treatment Innovation for the Next Century: Innovation 2000. A joint conference of

the Water Environment Federation, the European Water Pollution Control Association and the Chartered Institution of Water and Environmental Management, with support of Anglian Water. Conference focuses on innovation in wastewater treatment and water cycle management. Contact Nancy Blatt or Dave Trouba at the Water Environment Federa-

tion at (703)684-2400.

12-15: Water Environment Federation's Residuals and Biosolids Management Conference, Bellevue WA. Eighteen technical sessions and field trips. For information, call WEF at (800)666-0206 or email confinfo@wef.org.

29-31: Ecosystem Restoration: A national symposium to bring together ecosystem restoration practitioners and researchers. Baltimore Marriott Inner Harbor Motel (reserve by July 10). To register, or for more information, phone (703) 698-6101 or electronically at <http://www.epa.gov/ttnbmrml/ceri.htm>

AUGUST

11-13: 1998 Summer Water Tour of Nebraska, Colorado and Kansas. "Back to the Future - Arkansas and Republican Rivers" Sponsored by Kearney Area Chamber of Commerce, Central Nebraska Public Power and Irrigation District, Nebraska Public Power District and Nebraska Water Conference Council. For information, call (800)652-9435 or write: Kearney Area Chamber of Commerce Water Tour, P.O. Box 607, Kearney, NE 68848.

SEPTEMBER

9-10: "It's Just Common Sense: Practical Approaches to Better Groundwater Management," The Groundwater Foundation's 14th annual fall symposium. To register phone (800)858-4844, FAX (402)434-2742 or e-mail wendy@groundwater.org. For questions, contact Wendy Conrad at (402)434-2740.

20-24: National/International Biodiversity and Water Resources Symposium: "Wetlands '98, Integrating Wetland/Floodplain Ecosystems into Water Resources/Watershed Management." Regal Riverfront Hotel, St. Louis, MO. Coordinated by Institute for Wetland Science and Public Policy, The Association of State Wetland Managers. For information, contact The Association of State Wetland Managers at (518)872-1804 or FAX (518)872-2171.

OCTOBER

28-31: Conference on Shared Rivers: "River Basin Management to Meet Competing Needs," Park City, UT. Co-sponsored by U.S. Committee on Irrigation and Drainage and U.S. Bureau of Reclamation. For information, call (303)628-5430, e-mail stephens@uscid.org or go to www.uscid.org

New Tabloid Available

Get your camera and hiking boots...or maybe your hip waders... and be sure to take along a copy of "Wetlands - Understanding A Resource," a new publication on Nebraska wetlands from the University of Nebraska-Lincoln.

"The tabloid presents an overview of Nebraska's often unique and sometimes rare wetlands, as well as identifies and explains different types of wetlands and the challenges we face in preserving them," said Bob G. Volk, director of UNL's Water Center/Environmental Programs.

The tabloid contains information on the dynamics and importance of wetlands; a pull-out map of Nebraska's major wetland complexes; information on wetland plants, animals and habitats; wetland policy issues, a special youth page and a listing of agencies dealing with wetlands. More than a dozen wetland-related Internet sites can also be used to start an electronic search on the subject.

"The rate of decline in wetland acres is beginning to subside, but there is still much to be done if these ecosystems are to be preserved for future generations. For example, Nebraska's Rainwater Basin wetlands along the Platte River once covered more than 100,000 acres. Today only about one third of those acres remain," said Volk.

Many state and federal agencies joined NU in sponsoring the publication, which is being distributed at no charge through Natural Resource District offices, Nebraska Natural Resource Conservation Service offices, University of Nebraska Cooperative Extension offices, Educational Service Units, Nebraska Game and Parks Commission state and district offices, Nebraska Department of Roads tourist information centers and others.

Copies are available by contacting UNL Water Center/Environmental Programs at (402)472-3305 or by e-mailing sress@unlinfo.unl.edu.

MSEA Water Quality Project Tops Team Awards

by Molly Klocksinn
and Steve Röss

A water quality project won this year's "Team Effort Award" from NU's Institute of Agriculture and Natural Resources (IANR).

The Management Systems Evaluation Area (MSEA) Water Quality Project team received \$10,000 to continue their work in improving groundwater quality, said Glen Vollmar, IANR interim associate vice chancellor. The annual team awards honor IANR faculty and staff teams who produce results in research, teaching, extension, service or international programs, Vollmar said.

Irv Omtvedt, NU's vice chancellor for agriculture and natural resources, presented the awards during the annual IANR Conference at UNL on April 16.

In 1990, NU and U.S. Department of Agriculture scientists launched the MSEA program to research and demonstrate agricultural systems that protect and improve groundwater quality. In the years since the program was launched, a large body of knowledge has been assembled about the impacts of various management practices impacting groundwater quality.

Irrigation engineer Darrell Watts, soil scientist Jim Schepers and hydrochemist Roy Spalding (director of the Water Sciences Laboratory and associate director of the Water Center/Environmental Programs at UNL) make up the lead team for the project.

From 1991 to 1997, Water Sciences Laboratory faculty and staff constructed more than 40 multi-level test wells, which were sampled thrice yearly at up to 16 different depths ranging from 12 to 55 feet. Samplings were analyzed primarily for pesticides and nitrate-nitrogen present in groundwater at the MSEA site, near Shelton.



Winning IANR's top team award for 1998 were (standing, from left) Dr. Roy Spalding, Dr. Dan Snow, Mark Burbach, Julie Chaplin, David Cassada (holding the ceremonial check) Pat Larsen and Jeff Toavs. The award will help the team continue groundwater quality research at the MSEA site near Shelton (photo: Steve Röss).

Nearly 10,000 samples were ultimately collected and analyzed by the WSL.

WSL faculty and staff involved with the program have included Spalding, as principal investigator; Dan Snow, coordination of analysis; Mark Burbach, field activities coordinator; David Cassada, pesticide analysis; Pat Larsen, data management and statistical evaluation; Jeff Toavs, sample collection; and Julie Chapin, sample preparation and storage.

Cooperating agencies include IANR's Agricultural Research Division and Cooperative Extension Division; UNL; the USDA's Agricultural Research Service and Natural Resources Conservation Service; the Nebraska Research Institute; the Central Platte Natural Resources District; and the U.S. Geological Survey. During 1991-1997, the project has involved 28 researchers and extension personnel.

WATER CENTER/ENVIRONMENTAL PROGRAMS

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