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University of Nebraska–Lincoln

WATER CURRENT

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Water Initiative Helps Attract Six New Faculty Members

By Steve Ress

Six new faculty members will significantly expand the University of Nebraska–Lincoln's research, service and teaching expertise in a number of key water-related disciplines when they join existing campus faculty over the coming year.

"We were extremely fortunate to be able to hire six new faculty, all of whom have extraordinary credentials, are coming from some of the finest institutions in the country and will help significantly in attaining our goal of being a national leader in water research and teaching," said Kyle Hoagland, director of the UNL Water Center.

All six were hired with assistance from the Water Resources Research Initiative (WRRI).

A fundamental goal of the WRRI, Hoagland said, is to better integrate existing water faculty at UNL, beginning with multidisciplinary search committees that were formed to select each of the six candidates.

Four of the six have joint appointments across academic units and both UNL campuses, including the School of Natural Resources (SNR) and the Departments of Geosciences, Biological Systems Engineering, and Agricultural Economics.

"The disciplines these faculty represent are not only cutting-

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June Tour Encompasses Diversity of Mining, Logging, Water Use and Natural Resources Management

By Steve Ress

The uniqueness and diversity of Nebraska's Sandhills and Pine Ridge made themselves apparent to this summer's water and natural resources tour with stops at a uranium mine, forested state park, and no-till garbanzo bean farm all within a short drive of each other.

"You don't fully understand and appreciate the uniqueness of our state until you drive it for a couple of days," one of the tour's 48 participants said.

This year's water and natural resources tour was June 28-30, beginning and ending in Kearney. The tour focused on local response to LB962 a year after the bill became law, as well as irrigation, mining and timber harvesting issues in Nebraska's Sandhills and Pine Ridge.

From the Platte River's Kearney Canal and Lake McConaughy to Chadron State Park and Crow

UNL associate forester Doak Nickerson takes tour participants on a walking tour of Chadron State Park for an open-air discussion of forest management and commercial logging.

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INSIDE

University of Nebraska Lincoln
Pioneering new frontiers.

Blueprint for Water Management in the Great Plains: The High Plains Aquifer

from the DIRECTOR

Kyle D. Hoagland

Water management in the western two-thirds of the U.S. is likely the most critical and immediate environmental and socioeconomic challenge for this country in the 21st century. Palaeoclimate experts now know that drought has been much more persistent in the past than in the 20th century, thus regions in the west and midwest that have experienced recent severe drought are likely getting a glimpse of what the future holds for agriculture and increasing competition for water by urban areas.

What we now call "drought" is likely to become the norm rather than the exception for much of the U.S. The High Plains Aquifer offers a unique and yet critical opportunity to learn how to better manage regional water resources now and into the future.

The High Plains Aquifer is the largest groundwater source in the Western Hemisphere and likely the world. It underlies 173,000 square miles of land across eight states, primarily Nebraska, Kansas, and Texas, with 67% of the aquifer volume beneath Nebraska. The aquifer contains an amount of water equivalent to Lake Huron, third largest of the Great Lakes — it's estimated that this water volume would cover an area the size of Colorado 45 feet deep.

Despite the vastness of this incomparable resource, today the aquifer is being pumped for agricultural irrigation at unprecedented rates, up to ten times the pace of replacement. From pre-irrigation development (ca. 1957) to 2000, an average of nearly 12 feet of depth has been lost from the aquifer, with alarming losses of more than 150 feet in parts of northwestern Texas and southwestern Kansas (USGS 2003).

In some areas, increasing energy costs to pump this groundwater from deeper in the aquifer have exceeded the benefit to agricultural production. Overall, pumping the aquifer has been described as, "an unrepeatable and irreversible experiment in continuous depletion" (Opie 2000).

Nebraska now ranks second only to California in the number of surface acres

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Kearney Hub reporter Lori Potter talks with UNL Water Center director Kyle Hoagland.

WATER CURRENT

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Meet the Faculty

J. David Aiken

Professor of Agricultural Economics (Water & Ag Law Specialist), University of Nebraska–Lincoln Department of Agricultural Economics, since 1976. Nebraska State Bar Association; American Agricultural Law Association.

Education:

B.A. Hastings College 1972
J.D., George Washington University 1975

Current Programming Areas:

— Surveying county livestock operation zoning regulations.
— Surveying water marketing policies in the western states.
— Surveying the development of the tributary ground water doctrine in the western states.
— Survey NRD ground water transfer policies.

Past Programming Areas:

— Surveyed state ground water statutes.
— Surveyed NRD ground water control area regulations.
— Traced the development of Nebraska instream flow policies.
— Evaluated the impact of endangered species requirements on Nebraska water rights.

Teaching Responsibilities:

— AECN256 agricultural law
— AECN357 environmental & natural resources law
— AECN256, AECN357, AECN456/856 water law and AECN457/857 environmental law are all available as correspondence courses through the UNL Extended Education & Outreach. AECN256 agricultural law was the first CASNR course to be offered as a UNL correspondence course.

Selected Publications:

— J. David Aiken, "Hydrologically-Connected Ground Water, Section 858, and the Spear T Decision," 84(2) *Nebraska Law Review* (Dec. 2005).

— J. David Aiken, "The Western Common Law of Tributary

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J. David Aiken

Kenneth G. Hubbard, Ph.D.

Meteorologist Hubbard has been director of the High Plains Regional Climate Center (HPRCC) at the University of Nebraska–Lincoln since its formation in 1987. He is a professor in the UNL School of Natural Resources and joined the UNL faculty in 1981. The Bridgeport native is a former assistant state climatologist for the Utah Department of Agriculture.

Kenneth G. Hubbard

The HPRCC, headquartered at UNL, was formed in 1987 and the membership includes seven affiliated universities: Colorado State University, Iowa State University, Kansas State University, University of Nebraska, North Dakota State University, South Dakota State University, and University of Wyoming. Its mission is to collect and summarize data in support of climate services in the region and to conduct applied research in support of climate decision making. There are currently more than 12 million accesses per year to products through various HPRCC web interfaces. Those interested in climate data and information should call (402) 472-6709.

Education:

Ph.D., Soil Science and Biometeorology, Utah State University, 1982.
M.S., Meteorology, South Dakota School of Mines and Technology, 1973.
B.S., Math and Physics, Chadron State College, 1971.

Selected Current Research/ Extension Programs:

— Quality control of climate data — use of spatial regression techniques to identify potential outliers, which can then be checked by climate data specialists. Developing techniques for quality control of measurements.

— Testing of meteorological sensors — a test bed is maintained where data for different sensors can be collected for side-by-side comparison of the systems. Developing of algorithms for converting from one sensor type to another.

— Developing drought and irrigation tools — models of crop growth and development are used with climate data to assess the severity of drought and to estimate the effect of irrigation on crop yields.

— Networks: spatial resolution, sensor performance, microclimate of temperature shields.

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Water Initiative Helps Attract Six New Faculty Members *(continued from page 1)*

edge, but also integrative by nature in that they address, in general, ecosystem or larger scale water resources issues, new areas of inquiry and/or interfaces such as water-land-atmosphere and the human dimensions of water resources management.

"Consequently, these new faculty will help knit together our present faculty in new and innovative ways to address both basic and applied water resource challenges locally, regionally and globally," Hoagland said.

The six incoming faculty members are as follows:

Erkan Istanbulluoglu, a surface hydrologist, modeler and geomorphologist currently working as a postdoctoral associate at Massachusetts Institute of Technology, Cambridge, MA; **John D. Lenters,** assistant professor, climate modeler and surface water hydrologist in the School of Environmental and Physical Sciences, Lake Superior State University, Sault Ste. Marie, MI.; **Robert J. Oglesby,** senior research scientist in the Earth Science Department of the National Aeronautic and Space Administration's (NASA) Marshall Space Flight Center, Huntsville, Al.; **Karina Schoengold,** who recently earned a Ph.D. in water resource economics at the University of California, Berkeley; **Durelle T. ("Scotty") Scott,** a postdoctoral research associate in aquatic chemistry working on hydrology and nutrient fluxes in surface waters for the U.S. Geological Survey, Reston, VA.; and river ecologist **Steven A. Thomas,** a postdoctoral fellow with the Department of Ecology and Evolutionary Biology, Cornell University, Ithaca, NY.

Erkan Istanbulluoglu

Erkan Istanbulluoglu

Istanbulluoglu's research interests are in geomorphology, specifically modeling landscape evolution; coupling of erosion and vegetation dynamics; effects of vegetation and watershed disturbances on geomorphic processes; sediment transport; and natural hazard assessment. His interests extend to surface water modeling, ecohydrology, soil moisture dynamics, effects of basin geomorphology on hydrologic response; and the dynamic coupling of hydrologic, ecologic and geomorphic processes.

He received a Ph.D. in civil and environmental engineering with an emphasis in hydrology and geomorphology from Utah State University, Logan, UT and holds M.S. and B.S. degrees in agricultural engineering from Uludag University in Turkey.

He worked as a graduate research assistant at Utah State University's water research laboratory prior to being accepted as a postdoctoral associate at MIT in 2002.

He will be an assistant professor in the UNL Departments of Geosciences and Biological Systems Engineering, beginning in August.

John D. Lenters

John Lenter

Lenters is a seasoned researcher in climate modeling, land surface hydrology, physical limnology and Great Lakes hydrology and is interested in physical and hydrologic interactions between lakes and regional climate.

He will be an associate professor in the SNR and Department of Geosciences, beginning in July 2006.

Lenters received Ph.D. and M.S. degrees in atmospheric science with minors in hydrology and geophysics from Cornell University and graduated *magna cum laude* with a B.S. in mathematics and physics from Hope College, Holland, MI.

Following postdoctoral work at the University of Wisconsin-Madison, Lenters took his present position as an assistant professor in the Department of Geology and Physics, School of Environmental and Physical Sciences at Lake Superior State University.

He describes his long-term research plans as "Working towards an integrated understanding of the interactions among lakes, watersheds and the overlying atmosphere on climatically relevant timescales."

Lenters has taught in a variety of academic disciplines on the college level, including courses in climatology, tropical meteorology, atmospheric dynamics, hydrology, introductory physics and mathematics.

"One of the important lessons I learned as a teacher at LSSU is the need to instill a sense of curiosity in students and to help them develop strong critical thinking skills," he said. "Development of critical thinking skills is not only valuable but essential for training the next generation of scientists."

Robert J. Oglesby

Robert J. Oglesby

Oglesby joins UNL faculty as a professor of climate modeling in the Department of Geosciences and SNR in January 2006. He comes to UNL from his current position with NASA.

He has worked extensively with global and regional climate models for nearly 20 years and his research has keyed on such topics as potential future climate change due to greenhouse gases, understanding controls on very different climate states of the past, and understanding the climatic impacts of land surface-atmosphere interactions.

Prior to his position with NASA, he was a faculty member in the Department of Earth and Atmospheric Sciences at Purdue University for nearly 10 years.

Oglesby earned Ph.D. and M. Phil. degrees in geology and geophysics from Yale University and a B.S. (*summa cum laude*)

in physical geography from the University of California, Davis.

He has been the senior scientist, Global Hydrology and Climate Center, Marshall Space Flight Center, NASA since January 2001.

Oglesby's research interests are many and broad. "Highly interdisciplinary and focused on understanding important physical processes of climate. Much of my work is aimed at evaluating and understanding land surface-atmosphere interactions, with particular applicability to climate prediction on seasonal and longer time scales," he said.

Other broad-based research interests include sensitivity of climate to systematic changes in carbon dioxide, model improvements and validation, processes responsible for continental-scale glaciation and others.

"Using cutting edge global and regional climate models to help understand the complex web of physical processes that maintain the present-day climate; how it has changed in the past; and most importantly, how it many change in the future due both to natural causes and human-induced factors," are among his primary interests.

Oglesby has taught on the undergraduate and graduate levels in such areas as oceanography, climate-related studies, atmospheric dynamics and related fields.

Karina Schoengold

Karina Schoengold

Schoengold will join UNL faculty as an environmental economist in the SNR and Department of Agricultural Economics in August, having just completed her Ph.D. in agricultural and resource economics at the University of California at Berkeley.

"I have a strong background and research interests in applied microeconomics, specifically in environmental and natural resource economics," she said. Her dissertation research was on the topic of water pricing and allocation.

She also earned an M.S. in agricultural and resource economics at the University of California at Berkeley and a B.S. in mathematics and economics from the University of Wisconsin at Madison.

Her recent doctoral dissertation focused on estimating the effect of an increase in marginal water price on output choices, irrigation technology choice and applied water use.

Durelle T. Scott

Durelle T. Scott

Scott comes to UNL in August as an aquatic chemist in the Department of Geosciences from his present position with the USGS in Reston, VA, where he has been researching the influence of hydrologic retention on nutrient fluxes through a stream network.

Scott earned a Ph.D. in environmental engineering and M.S. in environmental and water resources engineering from the University of Colorado at Boulder and a B.S. in environmental and architectural engineering, also from the University of Colorado at Boulder.

His doctoral and postdoctoral research focused on the cycling of manganese and iron in freshwater streams and riverine carbon export in New Zealand, where he collected data from more than 50 rivers.

He has taught on both the undergraduate and graduate levels in the areas of water quality, applied stream ecology, and surface water quality modeling.

Scott's research focuses broadly on the importance of water quality and quantity "That will only intensify in the 21st century as human population increases and the earth's climate changes."

He said he was attracted to UNL because of the "Wealth of excellent scientists, educators and students" that will help him realize his research and teaching goals and "With whom I can endeavor to collaboratively enhance environmental science and provide connections among disciplines to solve tomorrow's environmental and water-quality issues."

Steven A. Thomas

Steven A. Thomas

A postdoctoral fellow at Cornell University and former research hydrologist in the private sector, Thomas' research combines ecology and hydrology to address nutrients in streams, microbiological activity and organic matter production, transport and processing.

"Simply put, I'm interested in understanding how the properties of one location impact the ecological properties of another. The flow of water links upstream and downstream habitats and longitudinal connection is a fundamental, though often ignored, aspect of ecology," he said.

He will come to UNL as an assistant professor of stream ecology in the SNR in January 2006.

These interests have led him to research topics such as organic particle dynamics in stream ecosystems, in-stream N removal and transport; hydrology, remote sensing and thermal heterogeneity in a floodplain river ecosystems; flow paths and the formation of biogeochemical hotspots; and others.

"My research is nested within the broader intellectual pursuit of understanding landscape integration at the watershed scale," he said.

He earned his Ph.D. from Idaho State University, M.S. from the University of Wyoming and B.S. in botany from the University of New Hampshire.

Thomas has taught at the graduate and undergraduate levels in biology limnology, and use of stable isotopes in ecology, among other topics.

Montana Water Center, Montana State University, Bozeman

The Montana Water Center is located at Montana State University (MSU), Bozeman, MT, where it sponsors water-related research and provides training and education to current and future water professionals.

Staff

Key staff at the MSU Water Center are: Gretchen Rupp, director; Don Potts, University of Montana, associate director; Marvin Miller, Montana Bureau of Mines and Geology, associate director; Rose Adams, accountant; Molly Boucher, computer support specialist; Barb Coffman, research engineer; Vince Cusomato, computer software engineer; Eve Davey, trout lab technician; Nick Dunbar, multimedia developer; Sue Faber, officer manager; Cal Fraser, wild trout lab manager; Liz Galli-Noble, assistant director for research; Ken Glynn, multimedia designer/developer; Tim Helwick, trout lab technician; Susan Higgins, assistant director for outreach; Kevin Kundert, assistant director for training; MJ Nehasil, interactive training specialist; Amy Rose, Whirling Disease Initiative outreach coordinator; Brooks Walch, computer software engineer; and Justin West, multimedia programmer.

Programs

The MSU Water Center sponsors an annual Montana water conference with the Montana Section of the American Water Resources Association. Another program of the center is the annual water school, where water and wastewater system operators from across the state receive four days of training and workshops for managing their local systems.

Twice per year, the MSU center coordinates down linking of American Water Works Association teleconferences for those in the drinking water industry.

Watershed symposiums are also held.

Publications

A variety of publications are available from the MSU Water Center, including *Wading into Water Rights, A Guide to Montana Water Quality Regulation and Water Management: The Montana Irrigator's Pocket Guide*. The center maintains a lending library of paper documents relevant to Montana water issues. See their web site (below) for publications listings and more information.

Electronic Resources

Montana Water Web site and E-News:
http://water.Montana.edu
Ecosystem Restoration Web site:
http://ecorestoration.Montana.edu

Completed/Ongoing Projects

Recently completed or ongoing research projects receiving support from the U.S. Geological Survey's 104(b) program include the following:

Quantitative assessment of the effectiveness of post-fire erosion control techniques. Scott Woods and Thomas DeLuca, University of Montana.

Pharmaceuticals in septic system effluent. William Woessner and Emily Godfrey, University of Montana.

Topography, groundwater dynamics, and soil frost: first-order controls on snowmelt runoff dynamics and plant species distributions across an upland-wetland transition. Brian McGlynn, Montana State University.

Understanding and predicting changes in the microbial ecology of mine tailings in response to the addition of dissolved organic carbon. Paul Sturman, Montana State University.

Potamopyrgus antipodarum and baetid mayflies: temporal variation and community level consequences. Billie Kerans, Montana State University.

Recharge assessment of the Anaconda Mine near Belt, Montana. Jon Reiten, Montana Bureau of Mines and Geology.

Technical Assistance

With help from the U.S. Environmental Protection Agency, the center has programs in place to help protect public health, improve water system sustainability and enhance regulatory compliance by small water systems in Montana. These include an "Operator Basics Training Series," a CD-ROM on "Sanitary Survey Fundamentals" and Source-Water Protection Training Guides for states within EPA Region V.

Initiatives

Ongoing initiatives at the center include the Whirling Disease Initiative, established by Congress in 1997 to conduct research to develop practical management solutions to maintaining viable, self-sustaining wild trout fisheries in the presence of the whirling disease parasite. Another is the Wild Fish Habitat Initiative, designed to enhance the success of habitat restoration projects. More information on research and programs related to both of these initiatives is available on the web site.

Address

Contact the MSU Water Center at: Montana Water Center, 101 Huffman Building, Montana State University, Bozeman, MT 59717-2690; phone (406) 994-6690; FAX (406) 994-1774 or email water@montana.edu

Use Available Water Efficiently With Furrow Irrigation

By Sandi Alswager-Karstens, IANR News Service

When using furrow irrigation with limited water supplies, it's even more important to apply water uniformly and efficiently, a University of Nebraska–Lincoln irrigation engineer said.

"Producers in areas of the state that will be experiencing limited or restricted water supplies this growing season need to make good management decisions when it comes to using furrow irrigation, " said Dean Yonts, UNL irrigation engineer at the Panhandle Research and Extension Center at Scottsbluff.

Yonts recommends producers with limited water supplies, such as those in the Central Nebraska Public Power and Irrigation District, Republican River Basin or the North Platte Valley, eliminate runoff from the field and deep percolation below the soil's root zone.

"To some extent, when you go into a restricted water supply for several years, it's a new way of irrigating and you have to change your thought process from what's been the normal thing to do," Yonts said.

Typically in order to uniformly furrow irrigate a field, some runoff and deep percolation occurs as a result of trying to adequately irrigate the end of the field.

"Producers who normally need 15 inches of irrigation water, but only are getting 10 inches this season, will want to apply their water as effectively as possible," Yonts said. "If water is limited, this growing season and perhaps in the future producers, may want to totally eliminate runoff and deep percolation from their fields."

This will result in fields not being uniformly irrigated, but it does mean that water available for irrigation will be used for crop production.

To eliminate runoff and deep percolation Yonts recommends producers run shorter set times on their furrow irrigation system.

"Not running water across the soil for as long of a time period reduces deep percolation which puts water below the crops' root zone where it can't be used," he said.

By avoiding deep percolation, water will be kept in the crops' root zone where it will be used by the growing plants.

In addition, Yonts recommends producers not let water run off at the end of the field.

"If water supplies are limited and water stress on a portion of your planted acres is a sure thing, let the stress occur at the bottom end of the field," he said. "If there is no deep percolation or no runoff, you have nearly a 100 percent application efficiency."

Traditionally, furrow irrigation has a 50 percent to 60 percent application efficiency. A center pivot irrigation system typically has a 90 percent application efficiency.

"Not everyone can switch to a center pivot irrigation system so managing furrow irrigation better will increase its efficiency," he said.

"It comes down to the producer. Producers can try to irrigate their fields like they normally do and lose some of their water to deep percolation or runoff, or they can use all of their available water to make sure a portion of their field does receive adequate water and let the end of the field be stressed."

For more information about deficit furrow irrigation management, contact a local Nebraska Extension office.

2005 Water & Natural Resources Tour: A Year of Experience with Nebraska's New Water Use Regulations and Mining & Timber Production in the Pine Ridge

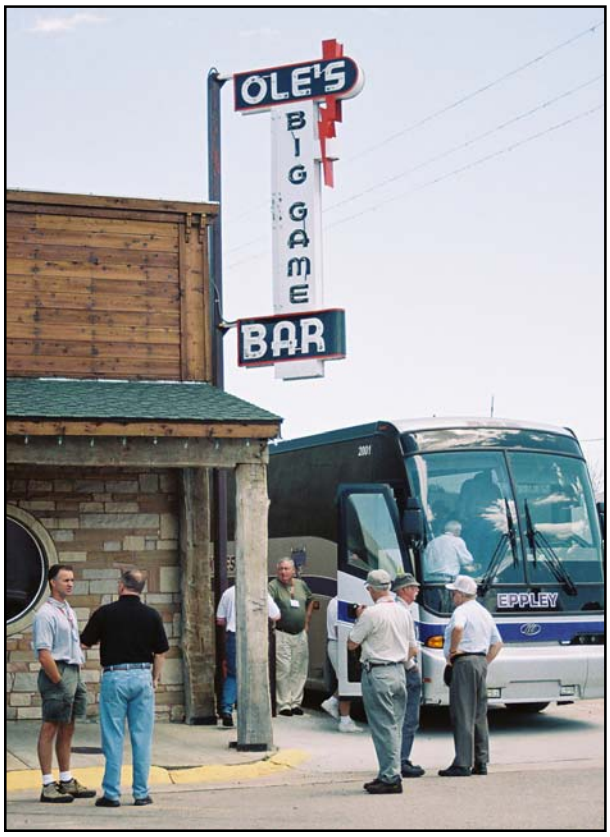
Off the bus for a walk through part of Crescent Lake National Wildlife Refuge. The remote refuge is located north of Osh Kosh and covers nearly 46,000 acres.

Gene Glock (cowboy hat) of the governor's water quality task force and Frank Kwapnioski of Nebraska Public Power District, talk to the tour at the Kearney Canal diversion dam.

Michael Klein, representing Central Nebraska Public Power and Irrigation District, talks about the Pumpkin Creek litigation at the community center in Bridgeport.

Lynn Webster of the Upper Niobrara-White NRD gets steaks smoking at Alliance.

The Platte River at the Kearney Canal diversion dam.



Last stop for lunch before the tour concluded in Kearney.... familiar landmark Ole's Big Game Bar in Paxton.

Crescent Lake National Wildlife Regue manager Neil Powers (third from left) talks to the tour group at the remote refuge north of Osh Kosh.

June 28 - 30, 2005

Taking a break on farm equipment at the Watson Farm near Hemingford.

Mark Watson talks about the benefits of no-till farming at the family farm near Hemingford.

This year's tour was co-sponsored by: Central Nebraska Public Power & Irrigation District, Gateway Farm Expo, Kearney Area Chamber of Commerce, Nebraska Association of Resources Districts, Nebraska Water Conference Council, Nebraska Public Power District and the University of Nebraska School of Natural Resources, Conservation & Survey Division and Water Center

(photos by Kyle Hoagland and Steve Ress)

Rainmakers: A Photographic Story of Center Pivots

We've all seen them, almost to the point of not paying them much attention, but a new book published by The Groundwater Foundation may just rekindle your interest in and appreciation for center pivot irrigation and the machines that power that evolving technology.

The 96-page coffee table book features the beauty, marvel and powerful technology behind center pivot irrigation. *Rainmakers: A Photographic Story of Center Pivots* takes the reader on a journey that explains how center pivot irrigation grows the food on which our nation, and much of the world, depends.

The story is presented through dozens of instructive and often unique photographs that trace the history, development, and uses of center pivots.

"*Rainmakers* helps all of us appreciate the history and complexity of irrigation and how the technology nourishes our world," said UNL School of Natural Resources associate professor and Environmental Programs head Bob Kuzelka, who helped compile and edit the new book.

A collection of both professional and amateur photographs tells the story of this constantly evolving technology. The book includes a foreword by U.S. Congressman Tom Osborne, an essay by David Howe, and an epilogue by Groundwater Foundation founder and president Susan Seacrest.

"Some of the book's sponsors advertised far and wide for photographic contributions for the book and the result is some very unique and never before seen pictures that really help tell the story of center pivots," Kuzelka said.

Books are available for $34.95 each, plus shipping ($10.45 for one book and $1 for each additional book) from The Groundwater Foundation, P.O. Box 22558, Lincoln, NE 685422-2558; phone (800) 858-4844; fax (402) 434-2742 or visit www.groundwater.org.

What Agricultural Chemicals Are In the Maple Creek Watershed?

Two meetings will be held by the U.S. Geological Survey (USGS) to present the results of a study of the agricultural chemicals in the Maple Creek watershed.

The first is at 1:30 p.m., Aug. 16, at the Holiday Lodge Conference Center in Fremont. The second is Aug. 17, at 1:30 p.m. at the Schuyler Public Library, Schuyler.

USGS will discuss preliminary study results in and around Maple Creek to determine the sources, transport, and fate of agricultural chemicals being applied to area fields.

"We have been collecting data about the agricultural chemicals in all phases of the water cycle of the Maple Creek watershed, because Maple Creek is typical of agricultural land-use areas of eastern Nebraska," said Jason Vogel, USGS project chief. The study is part of the USGS National Water-Quality Assessment program, which can be accessed at water.usgs.gov/nawqa.

For more information on the meetings or the study, contact Ron Zelt at (402) 328-4140, or Vogel at (402) 328-4130, or go to the USGS Nebraska Water Science Center web site at ne.water.usgs.gov.

You can subscribe to USGS news releases at www.usgs.gov/public/list_server.html.

Meet the Faculty

J. David Aiken *(continued from page 3)*

Ground Water: Implications for Nebraska, 83(2) *Nebraska Law Review* 541-95 (2004).

— J. David Aiken, Balancing Endangered Species Protection & Irrigation Water Rights: The Platte River Cooperative Agreement, 3 *Great Plains Natural Resources Journal* 119-58 (1999).

— J. David Aiken, "Protecting the Hidden Resource: The Quiet Crisis in Nebraska Pesticide & Ground Water Protection Policies," 26 *Creighton Law Review* 639-96 (1993).

— J. David Aiken. "Instream Appropriations in Nebraska." In L. J. McDonald, T. A. Rice & S. J. Shupe (eds.) *Instream Flow Protection in the West* (rev. ed. 1993).

— J. David Aiken, Annette Higby & Nancy Thompson, *A Farmer's Handbook To Livestock Regulation in Nebraska* (Center for Rural Affairs, 1994).

— J. David Aiken, State Restrictions on Landownership By Aliens & Businesses, December 31, 1992 (*USDA Agricultural Handbook No. 702*, 1994).

— J. David Aiken, "Selling Nebraska's Water" in Smith (ed.), *Nebraska Policy Choices 1988*, 89-129 (University of Nebraska–Omaha) (1988).

— J. David Aiken, "New Directions in Nebraska Water Policy," *Nebraska Law Review* 66(1): 8-75 (1987).

— J. David Aiken, "Chapter 12 Family Farm Bankruptcies," *Nebraska Law Review* 66(4) 632-94 (1988).

— J. David Aiken, "Nebraska Ground Water Law and Administration," 59 *Nebraska Law Review* 917-1000 (1980).

— J. David Aiken. "The National Water Policy Review and Western Water Rights Law Reform," 59 *Nebraska Law Review* 327-44 (1980).

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Kennth G. Hubbard *(continued from page 3)*

— Canopy microclimate: Robotics, leaf wetness, penetration of UV and PAR.

— Surface energy budget: soil moisture, ET models.

Selected Past Research/Extension Programs:

— Development of a robotic platform for carrying sensors and associated programs to view a target from preselected positions at recurring intervals.

— Development of a soil moisture model.

— Effect of weather on livestock.

Teaching Responsibilities:

— Upper level course on bio-atmospheric instrumentation.

— Coordinate and team-teach a course on introduction to bio-atmospheric resources.

Selected Publications:

— Lin, X. and K.G. Hubbard. 2004. Uncertainties of derived dew point temperature and relative humidity. *J. Applied Meteorol.* 43(5): 821-825.

— Wu, Hong, K.G. Hubbard, and D.A. Wilhite. 2004. An agricultural drought risk-assessment model for corn and soybeans. *Internat. J. Climatology*. 24: 723-741.

— Lin, X. and K.G. Hubbard. 2004. Sensor and electronic biases/errors in air temperature measurements in common weather networks. *J. Atmos. And Oceanic Technology*. 21(7): 1025-1032.

— Hodges, L., M.N. Suratman, J.R. Brandle, and K.G. Hubbard. 2004. Growth and yield of snap beans (*Phaseolus vulgaris L.*) as affected by wind protection and microclimate changes due to shelterbelts and planting date. *HortScience* 39(5): 996-1004.

— Suyker, A.E., S.B. Verma, G.G. Burba, T.J. Arkebauere, D.T. Walters, and K.G. Hubbard. 2004. Growing season carbon dioxide exchange in irrigated and ranifed maize. *Ag. And Forest Meteorol.* 124: 1-13.

— Kunkel, K.E., D.R. Easterling, K.G. Hubbard, and K. Redmond. 2004. Temporal variations in frost-free season in the United States: 1895-2000. *Geophys.* Research letters. 31: 1-4.

— Shulski, M.D., E.A. Walter-Shea, K.G. Hubbard, G.Y. Yuen, and G.L. Horst. 2004. Penetration of photosynthecially active and ultraviolet radiation into alfalfa and tall fescue canopies. *Agron. J.* 96:1562-1571.

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June Tour Encompasses Diversity of Mining, Logging, Water Use and Natural Resources Management *(continued from page 1)*

Butte uranium mine, the tour covered several hundred road miles and a large swath of central and western Nebraska.

Former aide to U.S. Senator Bob Kerrey and current chair of the governor's water policy task force, Gene Glock was the first to speak to the group at the Kearney Canal diversion dam, whose 1882 water right is the oldest in the Platte River valley.

Glock spoke of the task force's ongoing work to resolve issues of over-appropriation of water resources and a moratorium on new surface water/groundwater diversions.

At Lake McConaughy, the group toured the new Nebraska Game and Parks Commission visitor's center at Kingsley Dam and saw golf course and residential developments on the lake's southwest shore from the Bayside Golf Club.

From there, the tour moved west and north to Crescent Lake National Wildlife Refuge, a nearly 46,000-acre preserve dotted with prairie lakes and wetlands and home to more than 275 species of birds.

Few in the group had ever seen the remote refuge where manager Neil Powers and project manager Steve Knode took them on walking tours under a cloudless sky and warm afternoon sun.

From there, the bus next stopped at the Museum of the Fur Trade in Chadron before an evening meal in the pine studded hills of Chadron State Park, Nebraska's oldest state park.

A planned look at commercial timber harvesting near Chadron the following morning was exchanged for a walking tour of Chadron State Park with UNL associate forester Doak Nickerson since logging had temporarily stopped due to mud from heavy spring rains in the area.

Nickerson spent the morning talking about forest management and commercial logging in Nebraska, which last year exceeded tree cuttings in neighboring Colorado.

Before lunch at Chadron State College, the tour visited CSC's heating and cooling plant, which runs off boilers heated by wood chips from area logging operations.

Crow Butte uranium mine near Crawford for an introduction to mining operations was the next stop. Crow Butte is one of only two operating uranium mines in the United States and annually harvests about 800,000 pounds of fuel-grade uranium from naturally occurring deposits of the substance that are extracted from groundwater underlying the mine. The remote facility employs about 50 and has been in operation for more than 10 years.

The bus then moved south to Box Butte Reservoir near Alliance and then to a no-tillage farming demonstration on behalf of the Upper Niobrara White Natural Resources District (UNWNRD) at the Watson Farm near Hemingford.

Farm co-owner Mark Watson talked to the group on how no-till works on a variety of row crops, including garbanzo beans (or chick peas), which are typically seen on salad bars and are the primary ingredient in Humus, a popular Indian staple.

The day ended with a steak fry at the city park in Alliance by UNWNRD staff.

On the morning of the tour's third and final day, presentations were made at the community center in Bridgeport on the Pumpkin Creek dispute and on water supply difficulties being faced by growing municipalities in the Panhandle.

Pumpkin Creek speakers included Steven Smith of Pahlke, Smith, Snyder, Petit & Eubanks, Scottsbluff, and Michael Klein of Holdrege, representing Central Nebraska Public Power and Irrigation District.

Speaking on municipal water supply were Sidney Mayor David Weiderspon and Keith Rexroth, a South Platte NRD board member.

Following lunch at Ole's Big Game Bar in Paxton, the tour concluded at Kearney.

This year's tour cosponsors were Central Nebraska Public Power and Irrigation District, Gateway Farm Expo, Kearney Area Chamber of Commerce, Nebraska Water Conference Council, Nebraska Association of Resource Districts, Nebraska Public Power District and the University of Nebraska–Lincoln's School of Natural Resources and Water Center.

Much of the Crow Butte uranium mine, near Crawford is unseen, marked only by a series of groundwater extraction and injection wells. Crew Butte is one of only two working uranium mines in the United States (photo: Kyle Hoagland).

Ed Hoffman (center) explains the wood-chip powered alternative energy plant at Chadron State College that both heats and cools campus buildings. A percentage of the wood chips the plant utilizes come from commercial logging operations in the surrounding Pine Ridge (photo: Steve Ress).

From the Director *(continued from page 2)*

irrigated for agriculture, with well over 7 million acres irrigated in Nebraska. Despite pumping for irrigation, the aquifer beneath Nebraska has not declined significantly on a percentage basis from predevelopment to 2002 (11 million acre-ft); however, from 2002 to 2003 alone, water in aquifer storage in Nebraska declined by 8.1 million acre-feet (maf — an acre-foot equaling just over 325,000 gallons), indicating a recent increase in the rate of depletion. The most prudent course of action is to monitor and model the High Plains Aquifer in Nebraska now, in order to better manage it for future generations, to avoid the severe declines already being experienced in other states.

What do we need to *know* to better manage this critically important water resource? Fundamentally, the data and modeling needs are mirrored even in developing nations worldwide, that is sufficient knowledge of the three-dimensional geology, groundwater levels, and variations in hydraulic head with depth, which dictate subsurface flow patterns and rates.

Current data are insufficient to allow reliable predictive models to be formulated, largely due to the enormous geographic and vertical dimensions of the aquifer, and its inherent complexities. More importantly, the dynamic nature of the aquifer is at the same time the least well understood and the most critical characteristic for its sustainable management. In particular, aquifer *recharge* is the primary missing variable that links the aquifer to the rest of the hydrologic cycle, specifically to the climate system.

Sustainable long-term management of the High Plains Aquifer clearly involves more than geology and water science. Currently, ground water management in states overlying the aquifer operate under variations of no fewer than four legal doctrines, including rule of capture (absolute ownership), reasonable use, correlative rights, and prior appropriation. These very different and sometime conflicting approaches to ground water allocation for the same aquifer resource are further complicated by the complex web of compacts, cooperative agreements, and ongoing legal disputes over water that serve as the backdrop for any attempt to manage the aquifer in a sustainable manner. Thus, we need to better integrate the science of the societal dimensions of water management with the hydrologic science and the modeling tools to attain more realistic and workable solutions.

What does the *region* need to *do* to better manage this critical water resource?

First, we as an entire region of people must recognize the fundamental importance of this resource and the immediate need to manage it in a sustainable way, including approaches that cooperate across state boundaries. This will require new policies and new ways of thinking, a role that universities fill through research and training the next generation of leaders in water management.

What does the *State of Nebraska* need to *do* to better manage this critical water resource? With Nebraska overlying 67 percent of the aquifer and agriculture serving as the mainstay of the state's economy, we and our children clearly have more to gain or lose than others in the region by how we respond to our current challenges in managing this aquifer. Fundamentally, Nebraska must make a commitment to becoming a model for sustainable water management, a process that has begun through recent state legislation and closer working ties between state natural resource agencies and its University.

What does the *University of Nebraska* need to *do* to help manage this critical water resource? The University of Nebraska must become *the* national leader in water science, law and policy.

This process has already begun as well; UNL has made a major commitment to this goal via the Water Resources Research Initiative. Six outstanding new water faculty have recently been hired (see this issue), an annual national water conference has been established, and several new research teams have been formed to address complex water management issues.

Building upon these successes and our existing strengths in climate change, lake and stream ecology, geology, hydrology, remote sensing, irrigation management, and drought mitigation, we are now in an excellent position to further elevate UNL to become the national leader in water research and education.

The stakes are high, we have much to lose by not forging ahead, and in light of current trends in urbanization, climate change, and the impacts of drought on rural sustainability, the time to commit to this endeavor and take action is now.

Upcoming Events

In addition to more detailed information on the six new faculty hires I mentioned previously, please take a few moments to review the coverage in this issue of the June Water and Natural Resources Tour. A diverse group of 48 participated in that tour, which I think gave attendees a very good overview of the surface and groundwater challenges we are facing in central and western Nebraska, as well as giving all a look at the uniqueness of our Sandhills and Pine Ridge.

The Water Center and several other units within the UNL School of Natural Resources will be represented at September's Husker Harvest Days show in Grand Island in September. The Water Center's display, in the Husker-Red IANR building, will feature information on the toxic blue-green algae blooms that have closed so many lakes and ponds over the past couple of summers. Free algae test kets will be available at the show for those who would like a sample of their lake or pond water tested for the presence of algal toxins.

Initial planning has begun for both the 2006 Water Law, Policy and Science Conference and Water and Natural Resources Tour and we hope to have some initial information available to you on both those events in the next issue of the *Water Current*.

Emergency Water Purification Methods

There are several simple methods that can be used in emergency situations to disinfect small quantities of contaminated water for consumptive uses such as drinking, cooking and brushing teeth.

Bacteria inside solid particles such as soil are harder to kill than bacteria in the water itself. If the water source is cloudy or muddy, first clarify the water by letting it settle.

After most the suspended particles have settled to the bottom of the container, gently pour the clear water off the top into a second container, being careful not to agitate the liquid more than necessary.

Pouring it through a clean cloth or other filter media such as a coffee filter should then filter this water. Disinfect the filtered water by boiling or by chlorination.

To disinfect by boiling, bring the water up to a rolling boil and boil for at least five minutes. Add an extra minute for each 10,000 feet of elevation. Boiled water tends to have a flat taste.

Reoxygenating the water by pouring it back and forth between two clean containers will improve its taste.

To disinfect by chlorination, use ordinary household chlorine bleach. Be sure to use bleach that does not have fragrances, soaps, or other additives.

Common bleach should contain 5.25 percent sodium hypochlorite. Add eight drops per gallon for clear water and 16 drops per gallon for cloudy water.

Stir the water and allow it to stand for 30 minutes to give the chlorine time to kill the microorganisms present.

For chlorine to be effective, it should be detectable by odor and taste after the 30-minute waiting period. If the water does not taste and smell of chlorine at that point, add another dose and let stand for another 15 minutes.

If the chlorine taste in the water is too strong after disinfection, pour it from one clean container to another several times. This will drive some of the chlorine off as a gas, lowering the level of chlorine in the water and improving its taste.

(Editor's note: From *The Nebline*, University of Nebraska Extension in Lancaster County, June 2005, Vol. 19, No. 6, pp 7).

We're Updating!!

We are updating our mailing list. If you have a change of address, title and/or name, or would like to have your name added to or removed from the *Water Current* mailing list, please let us know. Also, if you know of anyone who might be interested in receiving our publications, please give us their names and we will be glad to add them to our mailing list.

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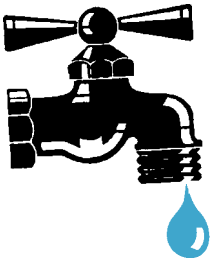

Water News Briefs

Decade of "Water for Life" Declared

2005 to 2015 is being declared the International Decade of "Water for Life" by the United Nations and governments seeking to galvanize efforts to meet internationally agreed targets of halving the number of people without access to safe drinking water and basic sanitation by 2015.

Ministers and government delegates met in April in New York to take policy decisions on practical measures and options to accelerate progress toward these and other water-related goals at the Commission for Sustainable Development's 13th session.

"Water for Life" decade was launched on World Water Day on March 22 and calls upon the international community to strengthen efforts to increase access to water and sanitation for all.

The decision to establish the decade was made by the General Assembly during its 58th annual session. This is the second international decade on water-related issues under UN auspices.

The first, the International Decade on Drinking Water Supply and Sanitation was 1981 to 1990.

For more information on this initiative, go to www.un.org/waterforlifedecade.

Nebraska Drinking Water Facts

The following drinking water statistics can be found in "Factoids: Drinking Water and Ground Water Statistics for 2004" by the U.S. Environmental Protection Agency. The full report can be viewed online at www.epa.gov/ogwdw/data/pdfs/data_factoids_2004.pdf

Nebraska has:

- 606 Community water systems serving 1,416,485 people.
- 188 Nontransient/noncommunity water systems serving 43,547 people.
- 583 Transient/nonCommunity water systems serving 87,732 people.

Nebraska had health-based violations as follows: (health-based violations include Maximum Contaminant Levels, Maximum Residual Disinfectant Levels, and/or Treatment Techniques): 134 violations water serving 387,901 people.

(From Sharon Skipton, UNL extension educator).

Making Every Drop Count

Starting with the largest water users in the house, here are some ways to conserve water in the home.

The toilet, shower/bath, and clothes washer account for two thirds of water used in an average household. Faucets typically account for another 16 percent of the consumption.

Toilets: About 20 percent of toilets leak. Consumers can lose 200 or more gallons of water per day from a leaky toilet. A toilet leaking 22 gallons per day means 8,000 gallons per year of wasted water and unnecessary expense.

Put a few drops of food dye in the toilet tank. If after 15 minutes, color appears in the bowl, you have a leak that should be repaired. Typically, this means the toilet flapper needs replacement or the water level adjusted.

Toilets installed before 1993 may use up to eight gallons of water per flush. New toilets use 1.6 gallons per flush. Pressure and vacuum assisted and jet action toilets were designed to improve waste removal. Dual flush toilets use 0.8 and 1.6 gallons per flush. If your present drain system blocks often, select a toilet rated high for "drain carrying."

Toilet dams, 1.6-gallon flappers, or water-filled plastic containers can be installed in older toilet tanks, but reduced flow can affect flushing. About three gallons of water may be needed in the tank to flush properly. Avoid using bricks that can crumble and affect operation.

Clothes Washer: Adjust water levels to the laundry load size and soil. Typically, full loads use less total water.

Horizontal axis (usually front loading) clothes washers are more water conserving, using about one third as much water as a vertical axis (usually top loading) machines. In addition, new features are making some top loaders more efficient.

Look for the "EnergyStar" label and compare the amount of water used for same tub capacity. Some washers sense the load size and soil of water and fabric and adjust the water level. High-pressure rinses to spray clothes during the rinse cycle reduce water consumption. Adjustable water level settings allow you to choose the level for the load.

Showers: Older showers can use up to six to eight gallons of water per minute (gpm) fully opened. As of 1994, new showerheads use no more than 2.5 gpm.

Take short showers. Showers with water-conserving showerheads use less than 2.5 gpm, while baths may use 30 to 50 gallons of water. A quick shower usually draws less water than a bath.

Faucets: A leaky faucet can waste 10-20 gallons or more a day and damage materials. Faucet repairs may be as simple as changing an inexpensive washer or O-ring.

Faucet aerators restrict the water going through the faucet by about 50 percent, adding air to make the flow appear the same. Faucet aerators with flow rates of 1.5 gpm or less are available for a few dollars.

Other ways to reduce water use: Wash patio furniture, cars, plant containers, wastebaskets and other items near or on the lawn to reuse the water. Use an environmentally safe mild cleaner and avoid strong cleaners that may harm plants.

Use brooms instead of a hose to clean patio, decks, sidewalks and driveways.

Use a rinse basin or sprayer for rinsing hand-washed dishes or items instead of running water.

Reduce toilet flushes by not using them as waste paper baskets.

On-demand water softeners use less water than the traditional water softeners by responding to actual water use and water hardness rather than a timed schedule.

Check for leaks by turning off all water taps. Record the water meter reading; compare the reading three to four hours later.

(Editor's Note: Courtesy of University of Nebraska–Lincoln Extension. For more information go to www.ianr.unl.edu/pubs/ or to US. EPA Water Saver Home and Water For Kids at www.epa.gov/water/water_efficiency.html)

Smart Watering Techniques Conserve Water In The Yard

With continuing water shortages, applying simple water conservation tips when practicing lawn care is beneficial for both homeowners and the environment.

Instead of developing high water bills or allowing lawns to be drier and discolored, compromise by working with nature. The most efficient time to water lawns is in the early morning, from 4-10 a.m. At this time, the sun is barely out, the temperature is cooler and winds are milder than during the day so there is less water loss due to evaporation. Also try leaving clippings on the lawn after mowing as a good nutrient source as well as a way to keep moisture in the ground.

Another way to work with nature is to put out large containers to catch rainwater for more efficient watering use later. Don't let water containers sit uncovered long enough that mosquitoes use the standing water for a breeding ground.

Conserve moisture by mowing Kentucky bluegrass lawns to 2.5 to 3 inches and tall fescue lawns to about 3 or 4 inches. Think about reducing the number of fertilizer applications or the amount of fertilizer applied so the grasses don't grow as quickly and thus don't use as much water. Otherwise, consider allowing certain turfs, such as Kentucky bluegrass and buffalo grass, to go dormant. When doing this, limit foot traffic and mowing on dormant turf and irrigate it if no rain falls for three weeks.

Design home landscapes so plants with similar water needs grow side-by-side. Group ornamental plants into low, moderate and high water users and water them accordingly, taking into consideration the time of year, actual precipitation, and weather conditions. Also, try to put the plants in places where they'll grow and use water most efficiently, considering characteristics such as sun and shade, dryness and wetness. Planting native and adapted plants that are drought-resistant decreases the need for supplemental irrigation once the plants are established. Surround garden plants with a two- to three-inch layer of mulch to reduce evaporation and weed competition for available soil moisture. Soils can be amended with compost, manure or leaf mold to improve their water-holding capacity and infiltration of soils as well as plant vigor and health during dry conditions.

Water plants to the bottom of their roots. Determine root depth and water infiltration by sticking a screwdriver or soil probe into the ground. When pulled out of the ground, the probe should be moist, not dry or soggy wet. Then try to keep soil moist about two-inches deeper than the deepest living roots or, if the root depthis unknown, to eight or nine inches into the ground. Woody plants should be watered more deeply and infrequently to promote extensive rooting. New plants require supplemental irrigation at first — consider watering them by hand so they get enough water without all the surrounding plants having to be watered in the same way. When over seeding, irrigate lightly and frequently to accommodate the new turf plants' shallow root system.

Maintain irrigation systems by keeping track of the weather and the watering systems. Use empty coffee cans, tuna cans, or other containers to measure the amount of water sprinklers put out and adjust the run time so it delivers the required amount, changing run time seasonally as plants' water needs change and subtracting any rainfall. Once a month, inspect automatic sprinkler systems. Look for turf growth around the heads of the sprinklers, broken or damaged heads, clogged nozzles and other complications. Adjust sprinkler heads as plants grow or decorative items such as decks are built and start blocking the spray pattern. Make sure they don't spray sidewalks or other surfaces water will flow off. When watering on a slope, run sprinklers until there is runoff, then stop. After three hours, water the slope again. Aerating soil in fall or spring increases infiltration.

(*Editor's Note*: From John Fech, UNL extension educator and Roch Gaussoin, UNL turfgrass specialist)

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