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UNIVERSITY OF NEBRASKA–LINCOLN WATER CENTER

Winter 2012 Vol. 44, No. 1

Water Current

PART OF THE ROBERT B. DAUGHERTY WATER FOR FOOD INSTITUTE

MEET THE FACULTY

Juan Paulo Ramirez, Ph.D.

Juan Paulo Ramirez is a three-year visiting scientist and lecturer in the University of Nebraska–Lincoln's Department of Geography and GIScience.

Education:

Ph.D., Geography, University of Nebraska–Lincoln, 2002

M.A., Geography, University of Nebraska–Lincoln, 2000

B.A., Geography, Pontificia Universidad Católica de Chile, 1994

Examples of Current Research/Extension Programs (brief descriptions):

Evaluation of location-based services for police: GPS-enabled cell phones and laptops for applications of law enforcement patrol.

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Missouri River Water Tour Planning Progresses

Plans are progressing for this summer's Water and Natural Resources Tour that will visit some of last year's flooded areas of the Missouri River basin July 17-19.

Tour co organizers visited the proposed tour area and spoke with possible tour speakers for three days in mid-December.

"The challenge in organizing this tour is that the impacts of last spring and summer's flooding in the basin are so vast and there are so many possible topics to cover that it's a challenge of what not to include or what we can't work into the three-day tour," said co organizer and Nebraska Water Center communicator Steve Ress.

"The learning opportunities in terms of what the flood's impacts are and what they will continue to be in the near and long-term future are exceptionally varied and broad," said tour host and co organizer Mike Jess

In December, Ress, Jess, Jeff Buettner of Central Nebraska Public Power and

Metal bands on a light post near Peru show the height of flooding on the Missouri River in recent years. The highest band is from the summer 2011 flood. Recent flooding on the river is the subject of this summer's water and natural resources tour (Steve Ress photo).

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Irmak New Interim Director of Nebraska Water Center

By Steve Ress

Suat Irmak, a soil and water resources and irrigation engineer in the University of Nebraska–Lincoln's Department of Biological Systems Engineering, has been named interim director of the UNL Water Center.

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UNL irrigation engineer Suat Irmak (left) was recently named interim director of the Nebraska Water Center. Here he talks with NU President J.B. Milliken at a recent Husker Harvest Days show near Grand Island (Steve Ress photo).

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From the Interim Director
Suat Irmak

We Are Now the Nebraska Water Center Within the Robert B. Daugherty Water for Food Institute

I am very humbled and honored to have been named as the interim director of the Nebraska Water Center at a time when there is much to be done toward moving the center, and our University as a whole, ahead toward our long-held goals of being an international leader in water management, research, teaching, and extension/outreach. We are already well-positioned and well-equipped toward accomplishing these goals and the future looks very bright.

As of February 1 of this year, we have changed names slightly from the UNL Water Center to Nebraska Water Center. This name change reflects our new status as an entity within the University's Robert B. Daugherty Water for Food Institute, directed by Roberto Lenton who as you read this has just recently arrived on campus to take the reins of the Daugherty Institute. Our name change is significant in that it reflects our purpose, which will be to continue to focus on the core missions of research and programming that addresses the assessment and management of water resources, both agricultural and non-agricultural, in Nebraska and the surrounding region.

We will be an important and significant contributor in the Daugherty Institute's national and international missions of water resources management and best uses, but our traditional missions and emphasis on service to Nebraskans will continue as it always has.

The new name for our center reflects that continued commitment.

There will certainly be changes, challenges and opportunities as our new role within the Daugherty Institute unfolds during the coming year, but our primary function of service to Nebraska and Nebraskans is not in question.

It is not unusual for the Water Center to go through name and administrative changes. The center was created as the Nebraska Water Resources Research Institute (WRRI) in 1964 with Congressional passage of the Water Resources Research Act that year. We were, and still are, one of more than 50 such WRRIs that legislation created. One in virtually every state in the U.S. In the nearly 50 years since then, the center was first known as the Nebraska Water Institute and then changed its name to UNL Water Center in the mid-1970's.

During its years at UNL, it has stood alone, has been part of the Conservation and Survey Division, been part of the School of Natural Resources and been a part of the Institute of Agriculture and Natural Resources, all the while continuing its uninterrupted service to Nebraska and its links to water faculty and staff.

I look forward to learning my new role as center director this year, and to meeting and working with all of you. I will contribute to the core missions of the Nebraska Water Center to the best of my ability.

For those who don't know me, I have been a faculty member in UNL's Department of Biological Systems Engineering since 2003. In general, I have statewide responsibilities

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Terry Loecke, Ph.D.

Terry Loecke has been a research assistant professor in the University of Nebraska–Lincoln's School of Natural Resource since August of last year. As a research assistant professor his work as a terrestrial biogeochemist focuses on the effects of environmental variability (e.g., weather, atmospheric chemistry, and soil resource heterogeneity) on carbon, nitrogen, and water cycling in natural and agricultural ecosystems. This work aims to facilitate ecosystem managers in the decision making through the incorporation of process uncertainty and up-to-date environmental conditions into biophysical models. The research has relevance for understanding how ecosystem management effects greenhouse gas production and feedbacks on global change phenomena.

Education:

Ph.D., Crop and Soil Sciences, Michigan State University and W.K. Kellogg Biological Station (KBS), Hickory Corners, Mich., 2007.

M.S., Crop Production and Physiology, Agronomy Department, Iowa State University, Ames, Iowa. , 2002.

B.A., cum laude, Biology with an Environmental Emphasis, University of Northern Iowa, Cedar Falls, Iowa, 1999.

Examples of Current Research Programs:

Loecke's research attempts to understand how variable environmental conditions control nutrient cycling in managed ecosystems, such as agricultural landscapes and urban systems. He focuses primarily on the cycling of carbon and nitrogen as these elements play significant roles in agricultural management and environmental protection (e.g., greenhouse gas emissions and carbon sequestration).

Loecke has three on-going projects: 1) greenhouse gas balance under variable hydrologic conditions, 2) mechanisms and management opportunities for using up-to-date weather conditions to improve nitrogen fertilizer use efficiency, and 3) atmospheric carbon dioxide fertilization of forests for enhancing soil carbon sequestration.

Examples of Past Research Programs:

Loecke's Master's research examined the nitrogen use efficiency of using livestock manure and composts in corn/soybean production systems. His Ph.D. research attempted to understand how the spatial distribution of organic soil amendments affects nutrient use efficiency, greenhouse gas production and carbon sequestration.

Teaching:

No formal responsibility, but Fall semester 2011 he was teaching AGR 269 – Principles of Soil Management.

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Juan Paulo Rameriz, Ph.D. *continued from page 1*

Submitted to the National Institute of Justice (NIJ). Geospatial Technology Program. September 2010 – September 2012. (2010-90905-NE-IJ). Co-Investigator. PI: Samal Ashok (Department of Computer Science and Engineering). US$ 454,645. Currently working on a book titled "Geography of Latin America: A Geographic Information System Approach."

Examples of Past Research/Extension Programs:

Analyzing land cover changes in a micro-watershed in Chile and the peasant mentality.

Examples of Outreach Programs:

Lecturing for the UNL's College of Education and Human Sciences - OLLI program.

Teaching:

Lecturing Geography of Latin America (online during Fall semesters, and regular lectures during Spring semesters).

Selected Publications:

Ramírez, J., DeKraai, M., & Speck, K. (2010). Program Evaluation for the PPW program. SAMHSA. 40 p.

Ramírez, J., & DeKraai, M. Program Evaluation for the ITT Program. Nebraska DHHS. 30 p.

Ramírez, J., DeKraai, M., & McLean, C. (2007). Program Evaluation for the GAP program. Nebraska DHHS. 200 p.

Ramírez, J. (2005 & 2006). Quick Guides for TNTmips GIS software. MicroImages, Inc. (available online at http://microimages.com).

Rundquist, D., A. Gitelson, D. Derry, J. Ramírez, R. Stark, and G. Keydan, 2001. Remote estimation of vegetation fraction in corn canopies. Proceedings, Third European Conference on Precision Agriculture, Montpellier, France, (G. Grenier and S. Blackmore, Eds), Vol. 1, pp. 301-306.

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International power: India Assumes the Role

By Alan S. Kolok, Ph.D., Aquatic Toxicologist, Department of Biology, UNO; Department of Environmental, Agricultural and Occupational Health, UNMC

Last November I had the good fortune to be able to travel to India for 10 days. It was an eye-opening experience in a number of ways beyond the street traffic, which was truly beyond description.

Cows, dogs and monkeys in the roadway added to the excitement of the breakneck driving of rickshaws, cars and trucks. Yet despite the chaos, the traffic did flow and we did eventually get to our destination.

UNO environmental toxicologist Alan Kolok.

Like many other Nebraskans, my only pre-visit knowledge of India was that of a developing country where a considerable amount of heavy industry, that previously operated in the U.S., had been outsourced. And my trip certainly confirmed this. When visiting the state of Odisha on India's northeast coast, we visited an aluminum plant, a steel plant and a coal mining operation and saw firsthand the devastation these industries were having on nearby villages. Villagers showed the telltale signs of silicosis and fluorosis, ailments that have become virtually unheard of in the U.S.

But the outsourcing of heavy industry is only one facet of the multisided crystal that is India. For as one faction of India rapidly embraces industrial advancement, much of the country remains agrarian, with subsistence farming remaining a dominant lifestyle. Cooking over wood or cow pie fires, women and children are often subject to very high levels of atmospheric particulate matter, and chronic respiratory health is a serious concern for much of the country's rural population.

My visit to India was not purely experiential, as I had been invited to speak at two scientific conferences. And just like the Indian traffic the conferences were both simultaneously chaotic and informative. Some of the topics pertained to the growing industrialization of the country, while others pertained to rural practices impacting agrarian communities.

Given the one-two punch of Indian industrial and agrarian pollution, I felt my talk was sharply out of place. After all, I had been invited to give lectures regarding emerging contaminants in U.S. waterways that are occurring at concentrations in the parts per billion range. In a country like India, with such dramatic and immediate environmental health concerns, what interest would there be in issues that could be perceived to be, in comparison, esoteric and only of concern to the very richest of nations?

Interestingly, the conferences I attended provided me with the answer to that question and did so (fortunately) before my time at the lectern. Both conferences began with a number of greetings and salutations from noted Indian officials and dignitaries.

Interestingly, all of them spoke toward India assuming its burgeoning role as an international power and leader. As such, global climate change and the sustainability of clean air and water were not only addressed, but were accepted as challenges that India must face if it is to be taken seriously as a world power.

It is fascinating that a country with such fundamental environmental problems, such as widespread air pollution to the point of lethality, would also focus on broad, global issues such as climate change and environmental sustainability.

Contrast the approach that India appears to be taking toward these chronic, global issues with the ongoing conversations currently overheard in the U.S., particularly during this election year. Our political conversations do not appear to be focusing on reducing greenhouse gases, or reducing the release of emerging contaminants into our own waterways, but rather ignores these issues entirely. If any environmental issue comes to the fore, the conversation seems to question its existence or validity rather than questioning the most efficacious path toward remediation.

As a water scientist, it was sobering to talk with Indian scientists and policy makers, and hear them say that what India lacks most of all is scientific information. If only they had the data, then policies could be legislated to enhance both the health of the environment and environmental health.

In contrast, it seems that here in the U.S. we have the scientific data and we know what the problems are, both locally and globally. The questions we continue to struggle with here appear to be whether or not we have the confidence and the courage to act upon the knowledge we already have.

New NebGuides Help Rural Nebraskan's Protect Private Drinking Water Supplies

By Sharon, Skipton, Jan Hygnstrom and Wayne Woldt, UNL Extension

A series of six new University of Nebraska–Lincoln Extension NebGuides will help rural families protect private drinking water supplies. The NebGuides, developed by UNL Extension faculty Sharon Skipton, Jan Hygnstrom, and Wayne Woldt, are online at "http://water.unl.edu/drinkingwater/publications" and can be downloaded free.

Groundwater provides nearly all drinking water in rural Nebraska and research shows that people are very conscious of, and place a high priority on, clean drinking water.

Layers of soil, sand, and gravel above groundwater aquifers provide some, but not complete protection from contamination. Groundwater can be contaminated when pollution sources are not managed carefully. Plus, replacement of a contaminated drinking water well can be expensive, with costs ranging from $4,000 to $10,000. By increasing knowledge and using careful management, rural families can greatly reduce the risk of contamination to private drinking water supplies, often with little or no cost or effort.

A typical rural Nebraska well head (Jan Hygnstrom photo)

The six new NebGuides will help rural families evaluate activities around their acreage or farmstead that can present a risk to their water supply. They also provide information on how to reduce water well risks and better protect family health. Some of the information will be reassuring, while some may encourage people to modify certain practices. Either way, people with private drinking water wells will have the information they need to do the best possible job of protecting their family's drinking water and investment.

If a well is poorly located, constructed, or maintained, pollutants such as bacteria or nitrate may contaminate groundwater serving as the drinking water source. A contaminated well can pose serious health threats to water users. The NebGuide "Protecting Private Drinking Water Supplies: Water Well Location, Construction, Condition, and Management" will help evaluate possible risks associated with their well.

Most rural families and acreage owners use a septic system or lagoon to treat wastewater and return it to the environment. A poorly designed, located, constructed, or maintained wastewater treatment system can contribute to groundwater contamination. Potential contaminants in household wastewater include disease-causing bacteria, infectious viruses, household chemicals and excess nutrients, such as nitrate. The NebGuide "Protecting Private Drinking Water Supplies: Wastewater (Sewage) Treatment System Management" will help evaluate the type of onsite wastewater treatment system in use, return of treated wastewater to the environment and potential threats to wells.

Runoff is excess water from irrigation, rain, or melting snow that moves across property. As it flows, runoff can collect and transport soil, pet waste, livestock manure, salt, pesticides, fertilizers, oil and grease, leaves, litter, and many other potential pollutants. Polluted runoff can flow down a poorly sealed or unplugged well where it can contaminate groundwater and drinking water. The NebGuide "Protecting Private Drinking Water Supplies: Runoff Management" will help people evaluate contaminants present or generated on their property, as well as recognize landscape management practices that could affect runoff quality and quantity.

Pesticides (herbicides, insecticides, fungicides and rodenticides) and fertilizers (nitrate and phosphorus) play an important role in the management of rural property. If pesticides and fertilizers are not

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Spring Lectures Continue Through April 25

The University of Nebraska–Lincoln's annual public water and natural resources seminar continues weekly through April 25.

The lectures are each Wednesday, except March 14 and 21, from 3:30 to 4:30 p.m. in the first floor auditorium of Hardin Hall, northeast corner of N. 33rd and Holdrege Sts, UNL East Campus, Lincoln. Some of the lectures are on Fridays as part of a series hosted by Environmental and Water Resources Engineering and the UNL Department of Earth and Atmospheric Sciences.

Lectures in the Water Center series get into surface and groundwater modeling, as well as topics such as managing Africa's water, valuing freshwater ecosystem goods and services, lessons learned from the 2011 Missouri River flood, in-stream flows and climate change impacts.

The final lecture in the series is a panel discussion looking at the realities of moving large amounts of water from where they are to where they may be needed. Panelists are Mark Pifher, Aurora Water; Don Blankenau, Blankenau Wilmoth LLP; and Terry McArthur, HDR Engineering, Inc. The discussion is scheduled for 90 minutes, extending the lecture to 5 p.m.

A complete lecture schedule is online at watercenter.unl.edu. Videos of most lectures, along with speaker PowerPoint presentations, will be posted on that web site within a few days of the lectures.

Remaining lectures: (3:30-4:30 p.m., UNL Hardin Hall unless noted):

Feb. 22 Can Technological Optimism Trump the Politics of Scarcity? Water Resource Management in the Middle East, Alon Tal, Ben-Gurion U. of the Negev

Feb. 29 Valuation of Freshwater Ecosystem Goods and Services, Walter Dodds, Kansas State U

March 2 Review of Water Quantity and Quality Applications of the SWAT Model in the USA, Raghaven Srinivasan, Texas A&M U., 11-12 p.m., Scott Engineering Center 111

March 7 Missouri River Mainstem Reservoir System – Lessons Learned from 2011 Flood of Record, Kevin Grode, U.S. Army Corps of Engineers

March 14 No seminar

March 21 No seminar (UNL Spring Break)

March 28 Integrating Hydrology and Economics: The Challenge of Practical Modeling, Richard Howitt, U. of California, Davis (modeling subset)

April 4 Environmental Flows in an Arid Landscape, Shannon Brewer, Oklahoma State U

April 11 Modeling and Forecasting a Groundwater-Dominated Ecosystem, David Steward, Kansas State U. (modeling subset)

April 13 Hydroinformatics: Optimization and Uncertainties of Integrating Data, Models and Decisions, Dimitri Solomatine, UNESCO Institute for Water Education, 11-12 p.m., Scott Engineering Center 111

April 18 Assessing the Ecohydrological Effects of Land Use Change Across Multiple Scales: From Leaves to Watersheds, Heidi Asbjornsen, U. of New Hampshire

April 20 A Physically-Based Approach to Assess the Impact of Climate Change on Canadian Water Resources, Ed Sudicky, U of Waterloo, 3:30-4:30 p.m., Bessey Hall Room 117

April 25 Economics, Engineering and Law: The Realities of Moving Large Quantities of Water Long Distances – Mark Pifher, Aurora Water; Don Blankenau, Blankenau Wilmoth LLP; Terry McArthur, HDR Engineering, Inc; 3:30-5 p.m.

Fourth Global Water for Food Conference Coming in May

"Blue Water, Green Water and the Future of Agriculture," the fourth global Water for Food Conference is May 30 through June 1 in Lincoln.

Plenary sessions will feature world-class speakers from academia, government and private sectors. A CEO panel will focus on "Industry and philanthropic perspectives on water for food."

Other conference events include:

- A View from the Field from an international group of producers.
- Women, water and food panel discussion.
- Technical sessions on characterizing groundwater resources and new crop technologies for improved performance in tough environments.
- Case studies on governing water management.
- A poster competition and much more!

Reuse of Municipal Wastewater Has Potential to Augment U.S. Drinking Water

With recent advances in technology and design, treating municipal wastewater and reusing it for drinking water, irrigation, industry, and other applications could significantly increase the nation's total available water resources, particularly in coastal areas facing water shortages, says a new report from the National Research Council.

It adds that the reuse of treated wastewater, also known as reclaimed water, to augment drinking water supplies has significant potential for helping meet future needs. Moreover, new analyses suggest that the possible health risks of exposure to chemical contaminants and disease-causing microbes from wastewater reuse do not exceed, and in some cases may be significantly lower than, the risks of existing water supplies.

Wastewater reuse is poised to become a legitimate part of the nation's water supply portfolio given recent improvements to treatment processes," said R. Rhodes Trussell, chair of the committee that wrote the report and president of Trussell Technologies, Pasadena, Calif.

"Although reuse is not a panacea, wastewater discharged to the environment is of such quantity that it could measurably complement water from other sources and management strategies."

The report examines a wide range of reuse applications, including potable water, non-potable urban and industrial uses, irrigation, groundwater recharge, and ecological enhancement.

The committee found that many communities have already implemented water reuse projects — such as irrigating golf courses and parks or providing industrial cooling water in locations near wastewater reclamation plants — that are well established and generally accepted. Potable water reuse projects account for only a small fraction of the volume of water currently being reused. However, many drinking water treatment plants draw water from a source that contains wastewater discharged by a community located upstream; this practice is not officially acknowledged as potable reuse.

The report outlines wastewater treatment technologies for mitigating chemical and microbial contaminants, including both engineered and natural treatment systems. These processes can be used to tailor wastewater reclamation plants to meet the quality requirements of intended reuse applications.

Concentrations of chemicals and microbial contaminants in reuse projects designed to augment drinking water supplies can be comparable to or lower than those commonly present in many drinking water supplies. The committee emphasized the need for process reliability and careful monitoring to ensure that all reclaimed water meets the appropriate quality objectives for its use.

Costs of water reuse for potable and non-potable applications vary widely because they depend on site-specific factors, the committee said. Water reuse projects tend to be more expensive than most water conservation options and less expensive than seawater desalination and other new supply alternatives.

Although the costs of reclaimed water are often higher than current water sources, the report urges water authorities to consider other costs and benefits in addition to monetary expenditures when assessing reuse projects.

For example, water reuse systems used in conjunction with a water conservation program could be effective in reducing seasonal peak demands on the drinking water system. Depending on the specific designs and pumping requirements, reuse projects could also have a larger or smaller carbon footprint than existing supply alternatives or reduce water flows to downstream users and ecosystems.

Water reuse regulations differ by state and are not based on risk-assessment methods, the report says. Adjustments to the federal regulatory framework could help ensure a high level of public health protection, provide a consistent minimum level of protection across the nation, and increase public confidence in potable and non-potable water reuse.

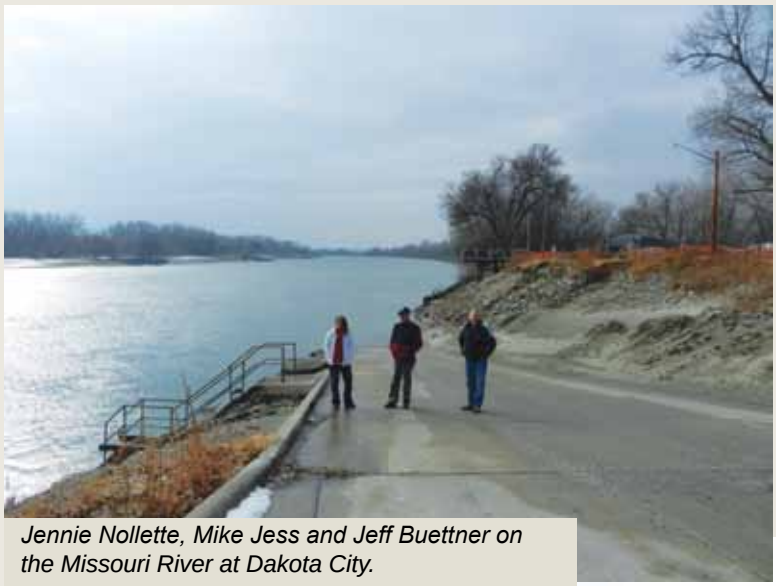
The report notes that existing legislative tools could be applied to improve the quality of water for reuse, including updating the National Pretreatment Program's list of priority pollutants to include a wider inventory of known toxic substances. Also, it lists 14 areas of research to help guide the country on how to apply water reuse appropriately. Such research would require improved coordination among federal and nongovernmental organizations.

The study was sponsored by the U.S. Environmental Protection Agency, U.S. Bureau of Reclamation, National Science Foundation, National Water Research Institute, Centers for Disease Control and Prevention, Water Research Foundation, Orange County Water District, Orange County Sanitation District, Los Angeles Department of Water and Power, Irvine Ranch Water District, West Basin Water District, Inland Empire Utilities Agency, Metropolitan Water District of Southern California, Los Angeles County Sanitation Districts, and Monterey Regional Water Pollution Control Agency.

The National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council make up the National Academies. They are independent, nonprofit institutions that provide science, technology, and health policy advice under an 1863 congressional charter.

Panel members, who serve pro bono as volunteers, are chosen by the Academies for each study based on their expertise and experience and must satisfy the Academies' conflict-of-interest standards. The resulting consensus reports undergo external peer review before completion. For more information, visit http://national-academies.org/studycommitteprocess.pdf.

Organizers take December trip to Missouri River to Begin Planning July Water and Natural Resources Tour



Jennie Nollette, Mike Jess and Jeff Buettner on the Missouri River at Dakota City.

Tour organizers visited Fontennelle Forest, a possible stop on the July tour, near Bellevue.

Paving material piled-up near Interstate 29 and farm outbuildings and grain bins toppled-over and sinking into the ground gave evidence to last summer's flood damage near Hamburg, Iowa.

Jim Kruse (center), manager of the Logan East Rural Water System, accompanies Jeff Buettner and Mike Jess on a tour of a flood-damaged house on the banks of the Missouri River near Tekamah.

Scott Olson (center) of Lee Valley, Inc., Tekamah, gives Jeff Buettner, Jim Kruse, Mike Jess and Jennie Nollette a close look at farm ground that was devastated by flood waters last spring and summer. At this location, and others nearby, floodwaters often cut 30-foot deep channels through fields.

Dark marks on signs and buildings show how high Missouri River floodwaters got last summer near Rock Port, Mo.

Sand from last summer's flood is still piled high on the Iowa side of the Missouri River as seen from South Sioux City.

(Steve Ress photos)

WRAP Meeting Brief

By Rachael Herpel

The University of Nebraska Water Resources Advisory Panel (WRAP) met for the first time in 2012 on Thursday, Jan. 26. Ronnie Green, NU Vice President and Instittute of Agriculture and Natural Resources Harlan Vice Chancellor, described how the Water Center's mission and role will continue serving Nebraskans as part of the Robert B. Daugherty Water for Food Institute. Now a part of the Water for Food Institute, rather than merely affiliated with it, the UNL Water Center will also see a slight name change to Nebraska Water Center with the new alignment.

Both the Water Center and Water for Food Institute will eventually move to Innovation Campus, the former Nebraska State Fairgrounds, as part of Phase I development of the campus.

Green also welcomed UNL Department of Biological Systems Engineering irrigation engineer Suat Irmak as the Nebraska Water Center's new interim director, replacing Bruce I. Dvorak, who was interim director from September 2009 to November 2011 and who recently accepted the position of interim chair of the UNL Department of Civil Engineering.

Green told the gathered WRAP membership that a national search will be conducted for a permanent center director and asked WRAP members to become engaged in this search. He also described to them the progress being made on the water faculty cluster hire and how policy will be the focus of this next cluster hire.

WRAP members discussed current efforts by the legislature and a group of Nebraskan volunteers to study water funding development options, noting that partnerships are key to the amount and quality of work being done in the state.

Michael Hayes, director, and Brian Fuchs, climatologist, of the UNL-based National Drought Mitigation Center, gave a presentation on "Drought in the Southern Plains: What to Expect in 2012." Hayes said described the 2011 drought's severity; impacts on agriculture, livestock, and the environment; and public water supplies. Fuchs described how conditions to date compare with those preceeding the 2011 drought.

Suat Irmak *continued from page 1*

Irmak replaces former interim director Bruce I. Dvorak, who left the Water Center last November to become interim chair of the UNL Department of Civil Engineering. Dvorak had been interim director of the center since September 2009.

Irmak is expected to be the Water Center's director for much of the coming year as a national search for a new permanent center director gets underway in earnest, according to NU Vice President and Institute of Agriculture and Natural Resources (IANR) Harlan Vice Chancellor Ronnie Green.

Effective Feb. 1, the Water Center also changed names slightly, becoming the Nebraska Water Center within NU's Robert B. Daugherty Water for Food Institute.

"There are natural and compelling reasons to closely link the Nebraska Water Center and the Daugherty Institute as the University of Nebraska works toward becoming a world leader in water research and management," Green said, "The new alignment will place the water center in a strong position to continue leading programs that address assessment and management of water resources, both agricultural and non-agricultural, in Nebraska and the surrounding region."

"To that end, Suat's leadership will be critical as we move ahead," Green said.

Irmak is well known to irrigators and water professionals throughout Nebraska and the U.S. with some of his research focusing on the impacts of climate change on water resources and agro-ecosystem; management practices to improve crop water productivity; measurement and modeling of evapotranspiration, surface energy balance, and biophysical and environmental properties of agro-ecosystems; and extensive Extension programming directed at agricultural water management and pressurized and gravity irrigation systems.

"I am honored, humbled and pleased to be stepping into a leadership role in the Nebraska Water Center at a time when the university is focusing so much of its energy and resources on becoming a world player in so many areas of water research and management that are critical to our state, nation and the world," Irmak said.

He is an associate professor in UNL's Department of Biological Systems Engineering.

Irmak holds a B.E. in Agricultural Structures and Irrigation Engineering from the University of Cukurova, Adana, Turkey; an M.E. in Agricultural Structures and Irrigation Engineering from the University of Mediterranean, Antalya, Turkey; and a Ph.D. in Agricultural and Biological Engineering with emphasis on soil and water resources engineering from the University of Florida, Gainesville, Fla,

The Nebraska Water Center, which has been known by several names over the years, was created as the Nebraska Water Resources Research Institute with Congressional passage of the Water Resources Research Act in 1964. It is one of more than 50 such institutes forming a national network.

From the Director *continued from page 2*

in soil and water resources engineering research and Extension for various agro-ecosystems. My primary research and education programs are related to water management; irrigation engineering; evapotranspiration; interactions of microclimate-surface-plant physiology; water productivity of various agro-ecosystems, including natural grasslands, irrigated and rainfed agricultural systems, and riparian systems; changes in climate variables and their impacts on water resources and agro-ecosystem productivity; and environmental biophysics.

I am the leader of two large networks: Nebraska Agricultural Water Management Network (NAWMN) (http://water.unl.edu/web/cropswater/nawmdn), and Nebraska Water and Energy Flux Measurement, Modeling, and Research Network (NEBFLUX) (http://bse.unl.edu/faculty/Suat/nebflux.pdf).

Before moving on to other topics, I also want to throw my voice into the chorus of many others here at the University in thanking Bruce Dvorak for his thoughtful, devoted, and excellent service as interim director of the Water Center from September 2009 to November 2011. Bruce's many talents are now well placed in his new role as interim chair of the UNL Department of Civil Engineering, where we wish him the very best.

As you read through this issue of the *Water Current*, please note that planning is continuing toward our July water and natural resources tour of the Missouri River. Interest in this tour, due to last year's unprecedented flooding, is running very high and we expect seats on the tour bus to fill very quickly once registration details are announced in the next couple of months. If you are interested in the tour, please keep a close eye on our web site for information and registration details.

I also want to bring your focus again to our continuing spring semester water seminar series lectures. These began early last month and will continue weekly through late April. As always, there are a wide variety of water-related speakers and topics that were carefully selected as being relevant to current water-related issues and challenges. New this year is that several of the lectures form a surface and groundwater modeling subset that we thought was important to offer due to the growing interest in modeling. A complete list of remaining lectures can be found within this issue, or online at watercenter.unl.edu. Lectures are free to the public, so please attend any that might interest you.

As the Water Center team, we are looking forward to working with all of you during the coming year.

Extension Water NebGuides *continued from page 5*

stored, handled, and applied properly, they can move through soil into groundwater. The NebGuide "Protecting Private Drinking Water Supplies: Pesticide and Fertilizer Storage and Handling" will help in evaluating storage, use, and disposal of these products.

Consider the wide variety of products used in households and on rural property - paints, solvents, oils, cleaners, wood preservatives, batteries, adhesives, etc. Also, consider the amount of these products that go unused or are thrown away. Minimizing amounts of these substances, along with practicing proper disposal procedures, can protect groundwater that is the source of drinking water. The NebGuide "Protecting Private Drinking Water Supplies: Hazardous Materials and Waste Management" will help in evaluating management of products such as ash, building/wood maintenance products, vehicle/metal equipment maintenance products and wood preservation products.

The NebGuide "Protecting Private Drinking Water Supplies: An Introduction" serves as an introduction to wellhead protection and as a summary action plan. People can return to the guide after reading each of the other NebGuides in the series. Space is provided to list risks they identified on their property and identify one or more possible actions they can take to reduce that risk. The NebGuide can be referenced often as families implement their plan to reduce risks to their drinking water supply and protect their financial investments.

This series of publications is the result of collaborations between UNL Extension, Nebraska Department of Health and Human Services, Nebraska Department of Environmental Quality, Nebraska Well Drillers Association and Nebraska Onsite Waste Water Association. Partial funding was provided by Nebraska Well Drillers Association, Nebraska Onsite Waste Water Association and the Water Well Standards and Contractors' Licensing Board. Publications were modified from UNL Extension Farm*A*Syst publications which were adapted from material prepared for the Wisconsin and Minnesota Farm*A*Syst programs.

Acid Rain Study Show Substantial Decreases, But More Progress Is Needed

Measurable improvements in air quality and visibility, health, and water quality in many acid-sensitive lakes and streams, have been achieved through emissions reductions from electric generating power plants and resulting decreases in acid rain. These are some of the key findings in a report to Congress by the National Acid Precipitation Assessment Program, a cooperative federal program.

The report shows that since the establishment of the Acid Rain Program, under Title IV of the 1990 Clean Air Act Amendments, there have been substantial reductions in sulfur dioxide (SO_2) and nitrogen oxides (NO_x) emissions from power plants that use fossil fuels, which are known to be the primary causes of acid rain. As of 2009, emissions of SO_2 and NO_x declined by about two-thirds relative to levels in the 1990s. These emissions levels declined even further in 2010, according to recent data compiled by the U.S. Environmental Protection Agency.

Because emission reductions result in fewer fine particles and lower ozone concentrations in the air, in 2010 there were thousands fewer premature human deaths, hospital admissions, and emergency room visits annually leading to estimated human health benefits valued at $170 to $430 billion per year.

"The SO2 program includes use of a creative emissions cap-and-trade program that combines the best of American science, government, and market-driven innovation," said Dr. John P. Holdren, director of Office of Science and Technology Policy and assistant to the President for science and technology.

Despite these emission reductions, the report also indicates that full recovery from the effects of acid rain is not likely for many sensitive forests and aquatic ecosystems. For example, in the Adirondack Mountains of New York, an especially sensitive region, 30 percent of the lakes were receiving acid rain during 2006-08 in excess of the level needed to prevent harm.

Based on models that analyze various emission scenarios, the report concludes that beyond current SO_2 and NO_x emission levels, future emission reductions would likely promote additional and more widespread recovery as well as to prevent further acidification in some U.S. regions.

"The principal message of this report is that the Acid Rain Program has worked. The emissions that form acid rain have declined and some U.S. areas are beginning to recover," said Doug Burns, lead author and director of the NAPAP and also a U.S. Geological Survey hydrologist. "However, some sensitive ecosystems are still receiving levels of acid rain that exceed what is needed for full and widespread recovery. We have every reason to believe that recovery will continue with further decreases in emissions which is why further emission reductions would be beneficial."

"The principal message of this report is that the Acid Rain Program has worked. The emissions that form acid rain have declined and some U.S. areas are beginning to recover."

Acid rain occurs when emissions of SO_2 and NO_x react in the atmosphere with water, oxygen, and oxidants to form acidic compounds. These emissions may be transported hundreds of miles away from their emitting sources, and have the potential to impact large areas and populations.

The report, *National Acid Precipitation Assessment Program Report to Congress 2011: An Integrated Assessment,* is available online at http://ny.water.usgs.gov/projects/NAPAP/

Meet the Faculty *continued from page 3*

Terry Loecke, Ph.D. *continued from page 3*

Selected Publications:

Loecke, T.D., C.A. Cambardella, and M. Liebman. *Accepted Pending Revisions.* Synchrony of net nitrogen mineralization and maize nitrogen uptake following applications of composted and fresh swine manure in the Midwest U.S. Nutrient Cycling in Agroecosystems.

Grandy, A.S., C. Kallenbach, T.D. Loecke, S.S. Snapp. *In Press.* The biological basis for N mineralization-immobilization dynamics and their management in agroecosystems. *Invited chapter for an edited volume (eds. T. Cheeke, D. Coleman, & D. Wall) entitled: 'Microbial ecology in sustainable agroecosystems'*

Loecke, T.D. *In Press.* The influence of heterogeneity on soil microbial processes in agroecosystems: theory, evidence, and opportunities. *Invited chapter for an edited volume (eds. T. Cheeke, D. Coleman, & D. Wall) entitled: 'Microbial ecology in sustainable agroecosystems.'*

Groffman, P.M., D. Osmond, N. Nadkarni, C. Driscoll, E. Andrews, A. Gold, S. Allred, A. Berkowitz, M. Klemens, T. Loecke, M.A. McGarry, K. Schwarz, and M. Washington. 2010. The Role of Interface Organizations in Science Communication and Understanding. Frontiers in Ecology and the Environment 8:306-313.

Loecke, T.D. and G.P. Robertson. 2009. Soil heterogeneity in the form of aggregated litter alters maize productivity. Plant and Soil 325:231-241.

Loecke, T.D. and G.P. Robertson. 2009. Soil resource heterogeneity in terms of litter aggregation promotes nitrous oxide fluxes and slows decomposition. Soil Biology & Biochemistry 41:228-235.

Grandy, A.S., T.D. Loecke, S. Parr, and G.P. Robertson. 2006. Long-term trends in nitrous oxide emissions, soil nitrogen, and crop yields of till and no-till cropping systems. Journal of Environmental Quality 35:1487-1495.

Loecke, T.D., M. Liebman, C.A. Cambardella, and T.L. Richard. 2004. Composting and timing of application affect corn yield response to solid swine manure. Agronomy Journal 96:214-223.

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2012 Water Tour *continued from page 1*

Irrigation District and Jennie Nollette of the Kearney Area Chamber of Commerce looked at tour venues and spoke with possible speakers from South Sioux City to Sidney, Iowa.

"Evidence of last summer's devastation from the flood is still very evident and in many cases startling," Ress said.

Organizers looked at effects from the flood in South Sioux City and Dakota City before heading south to the Decatur, Tekamah and Blair areas, where they looked at how the flood had effected roads, bridges, pipelines, homes, agricultural land and even a wildlife refuge.

The group spoke with local farmers, representatives of Natural Resource Districts and municipal water providers, as well as with the U.S. Army Corps of Engineers, Omaha Public Power District, Omaha Airport Authority and others.

"In total, we hope to explore issues connected to the recent flooding to include river management and use, post-flood reconstruction of infrastructure and agricultural lands, fish and wildlife and natural resources issues, what effects the flood has had on agriculture and life in the basin, emergency response to the flood and many other issues," Ress said.

Other topics of local and historical interest, to possibly include sites connected with Lewis and Clark's Corps of Discovery expedition and even a historic windmill factory museum, are being considered as part of the overall tour in July.

Overnight stops will likely be in downtown Omaha, where the tour most

likely will begin and end, and at Nebraska City's Lied Lodge and Conference Center.

Co organizers will make another trip to the proposed tour area in early spring in order to finalize stops and speakers and to develop a tour route and other details.

"After that we will publish a tour itinerary and registration details," Jess said.

Tour cosponsors include Central Nebraska Public Power and Irrigation District, Kearney Area Chamber of Commerce, U.S. Geological Survey Nebraska Water Science Center, UNL Nebraska Water Center, and NU's Robert B. Daugherty Water for Food Institute.

Tour questions should be directed to Ress at sress1@unl.edu or by phoning (402) 472-9549.

Tour itinerary and registration details will be posted online at watercenter.unl.edu as soon as they are available. Prior tour participants and others who have expressed interest in this summer's tour can also expect to receive a registration mailing from the Kearney Chamber later this spring.

NEWS BRIEFS

Sustainable Water Management Conference

Registration is open for the American Water Works Association (AWWA) 2012 Sustainable Water Management Conference, March 18-21 in Portland, Ore.

Partnering on the event are leading water organizations including the USEPA, ICLEI – Local Governments for Sustainability, Water Environment Federation, and the WateReuse Association. Additionally, the American Water Resources Association, the Portland State University Institute for Sustainable Solutions, and the Water Research Foundation developed the technical program.

The four-day event features two workshops and more than 25 technical sessions and will offer attendees information on the benefits of robust sustainability planning and how it leads to cohesive communities and utility system optimization.

For more information and registration details, go to www.awwa.org/2012sustainable.

AGU Award to Cardenas

The AGU Hydrologic Sciences Early Career Award, the highest award bestowed upon young scientists (not more than six years after earning a Ph.D.) was presented late last year to UNL alumnus Bayani Cardenas at the Fall 2011 meting in San Francisco, Calif., according to Vitaly Zlotnik of UNL's Department of Earth and Atmospheric Sciences.

Cardenas graduated with an M.S. from UNL's Hydrogeology program in 2002.

The AGU has more than 50,000 members worldwide, representing earth scientists from more than 100 countries. The largest section is hydrology with approximately 8,000 members.

Cardenas' award citation can be viewed online at:

http://sites.agu.org/fallmeeting/scientific-program/lectures/bowie-and-named-lectures/6dec/

USGS Water Level Report

The U.S. Geological Survey (USGS) has recently published *Changes in Water Levels and Storage in the High Plains Aquifer, Predevelopment to 2009* by V.L. McGuire. The fact sheet is a summary of water-level changes in the High Plains Aquifer, predevelopment to 2009, 2007 to 2008 and 2008 to 2009 and change in water in storage from predevelopment to 2009.

The report is available online at http://pubs.usgs.gov/sir/2011/5089/ . Print copies of the report can be requested by phoning (402) 328-4100 or emailing info_ne@usgs.gov or hoagland@usgs.gov . A limited number of print copies of the report are also available from the UNL Water Center on a first-come, first-served basis while supplies last.

The USGS Nebraska Water Science Center is online at http://ne.water.usgs.gov/.

Wastewater Reuse to Augment Water Supply Needs

As the nation searches for solutions to water supply challenges, the reuse of treated wastewater is attracting increased attention.

A new report from the National Research Council examines wastewater reuse's potential to augment available water resources for both drinking water and industrial and environmental purposes. The study analyzed current technologies, costs, and health and environmental risks associated with wastewater reuse, and evaluated whether the practice is a viable approach for meeting future needs.

Advance copies of *Water Reuse: Potential for Expanding the Nation's Water Supply Through Reuse of Municipal Wastewater* are available by contacting the Office of News and Public Information at (202) 334-2138 or by emailing news@nas.edu.

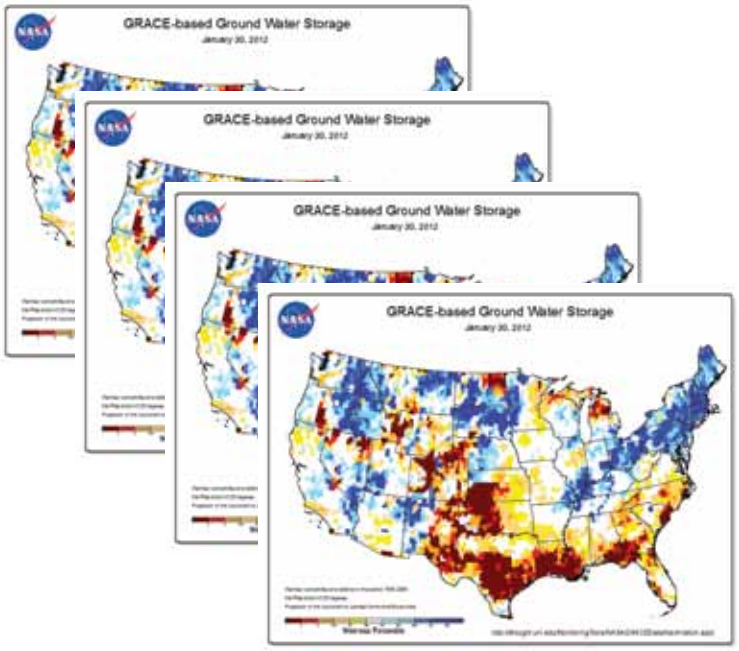
Read us on your iPhone or Android.

Texas Drought Visible in Groundwater Maps

By Kelly Helm Smith, National Drought Mitigation Center, UNL

Record-breaking Texas drought that has fueled wildfires, decimated crops and forced cattle sales also has reduced groundwater levels there to some of the lowest levels seen in more than 60 years, according to new national maps produced by NASA and distributed by the National Drought Mitigation Center at the University of Nebraska–Lincoln.

Recent maps show large patches of maroon over eastern Texas, indicating severely depressed groundwater levels. The maps, produced weekly by NASA's Goddard Space Flight Center in Greenbelt, Md., are publicly available online at drought.unl.edu.



"Texas groundwater will take months or longer to recharge," said NASA hydrologist Matt Rodell. "Even if we have a major rainfall event, most of the water runs off. It takes a longer period of sustained greater-than-average precipitation to recharge aquifers significantly."

The maps are based on data from NASA's Gravity Recovery and Climate Experiment (GRACE) satellites, which detect small changes in the Earth's gravity field caused by the redistribution of water on and beneath the land surface. The paired satellites travel about 137 miles (220 km) apart and record small changes in the distance separating them as they encounter variations in Earth's gravitational field.

To make the maps, scientists used a sophisticated computer model that combines measurements of water storage from GRACE with a long-term meteorological dataset, to generate a continuous record of soil moisture and groundwater that stretches back to 1948. The meteorological data includes precipitation, temperature, solar radiation and other ground- and space-based measurements.

The color-coded maps show how much water is stored now as a probability of occurrence in the 63-year record. The maroon shading over eastern Texas, for example, shows that the level of dryness as of late November 2011 occurred less than two percent of the time between 1948 and the present.

The groundwater maps aren't the only maps based on GRACE data that the Drought Center publishes each week. It also distributes soil moisture maps that show moisture changes in the root zone down to about three feet (1 meter) below the surface, as well as surface soil moisture maps that show changes within the top inch (2 cm) of the land.

"All of these maps offer policymakers new information into subsurface water fluctuations at regional to national scales that has not been available in the past," said the Drought Center's Brian Wardlow.

The maps provide finer resolution or are more consistently available than other similar sources of information, and having the maps for the three different levels should help decision makers distinguish between short-term and long-term droughts.

"These maps would be impossible to generate using only ground-based observations," Rodell said. "There are groundwater wells all around the United States, and the U.S. Geological Survey does keep records from some of those wells, but it's not spatially continuous and there are some big gaps."

The maps also offer farmers, ranchers, water resource managers and even homeowners a new tool to monitor the health of critical groundwater resources.

"People rely on groundwater for irrigation, for domestic water supply and for industrial uses, but there's little information available on regional to national scales on groundwater storage variability and how that has responded to a drought," Rodell said.

"Over a long-term dry period there will be an effect on groundwater storage and groundwater levels. It's going to drop quite a bit, people's wells could dry out, and it takes time to recover."

The maps are the result of a NASA-funded project at the Drought Center and NASA Goddard to make it easier for the weekly U.S. Drought Monitor to incorporate data from the GRACE satellites. NASA's Jet Propulsion Laboratory in Pasadena, Calif., developed GRACE and manages the mission for NASA. The groundwater and soil moisture maps are updated each Tuesday.

The maps can be viewed at http://go.unl.edu/mqk.

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What's New at the Water Sciences Lab

By Daniel Snow, Director of Laboratory Services

In 2011 the UNL Water Sciences Laboratory processed nearly 4,000 samples for a wide range of tests ranging from standard nutrient analyses to specialized cyanotoxins and stable isotope methods.

High throughput nutrient analyses are now possible using two autoanalyzer systems including the Seal AQ2 discrete chemistry analyzer and a Hach Lachat Quikchem 8500 flow injection analyzer system. The Lachat analyzer, transferred from another unit and installed early in 2011, should help support new faculty research in both surface and ground water quality by providing rapid turn-around of results.

New methods for algal toxins developed last year include a suite of methods for specific algal neurotoxins thought to occur seasonally in blue-green algae (cyanobacteria). One of the compounds in the method - anatoxin-a - is an amine alkaloid with known acute neurotoxicity causing paralysis and respiratory arrest in exposed animals.

This method was developed by an environmental toxicology graduate student for his research on non-protein amino acids in lake water, fish and aquatic plants, and is in addition to the liquid chromatography-mass spectrometry (LC/MS) analysis for microcystins.

Our stable isotope methods now include oxygen isotope (oxygen-18) analysis of either nitrate or phosphate, which may help in distinguishing sources of these nutrient contaminants in either surface or ground water systems.

Other new developments at the laboratory include preparations for a new state-of-the-art noble gas mass spectrometer and high vacuum gas purification system. A major research instrumentation grant, awarded in 2011, will fund purchase of a Thermo Helix SFT noble gas mass spectrometer to be used primarily for analysis of helium isotopes in ground water age dating. Water ages are excellent indicators of renewability because higher rates of ground water replenishment result in more rapid flushing of water through an aquifer system. Helium-tritium age dating is one of a very few methods available for accurate estimation of recently (less than 50 years) recharged groundwater.

Few North American laboratories currently have this capability and it is expected that NU faculty will collectively leverage the new instrumentation to expand support for water resource projects focused on water resource renewability, water quality, and dynamic earth systems. It is an exciting time to be in water!