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Water Current

PART OF THE SCHOOL OF NATURAL RESOURCES AND AFFILIATED WITH THE ROBERT B. DAUGHERTY WATER FOR FOOD INSTITUTE

MEET THE FACULTY

Valery E. Forbes, Ph.D.

Valery Forbes is a University of Nebraska-Lincoln professor and director of UNL's School of Biological Sciences since January 2011.



She came to UNL from Denmark's Roskilde University where she was head of the Department of Environmental, Social and Spatial Change

Education:

- Ph.D., Coastal Oceanography, State University of New York at Stony Brook, 1988
- M.S., Marine Environmental Science, State University of New York at Stony Brook, 1984
- B.A., Biology, B.A. Geology, State University of New York at Binghamton, 1983

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2012 Water Tour To Visit Missouri River in July

Next year's Water and Natural Resources Tour will visit Missouri River basin flood areas July 17-19, 2012.

There is perhaps no better time to tour the immediate environs of the Missouri River in terms of what it can offer as learning opportunities," said UNL Water Center interim director Bruce Dvorak.

With this year's record flooding, the possibility that flood water could visit the basin again next summer, and the



This power plant near Nebraska City was nearly underwater from Missouri River floodwaters in June. The Water Center's annual water and natural resources tour will explore effects from the flood and lessons learned this coming July.

anticipated lingering effects of the Flood of 2011, it is a most opportune time for the tour *continued on page 14*

Spring Water Lecture Series Will Include Water Modeling Subset

By Steve Ress

The University of Nebraska-Lincoln's annual public water and natural resources seminar begins Jan. 11, 2012 and extends into late April. The lecture series continues a tradition of offering a wide range of water-related topics. About half the lectures will comprise a subset on surface water and groundwater modeling.

The UNL Water Center-sponsored series begins Jan. 11 and continues each Wednesday through April 25, except Feb. 15

and March 21. Lectures are 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.

The lectures begin with an introduction to modeling, including how they are created and calibrated and different approaches and uses for modeling. The Jan. 11 talk is the first in a sub-series of six or seven lectures on modeling that will be included in the overall series.

"Modeling may not immediately come to mind when you think about water, but it is an

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From the Interim Director

Bruce Dvorak

Weber Research Earns Impact Award; Fall and Coming Events; Summer Water Tour

I am pleased to announce that Karrie Weber, one of our young and aspiring faculty researchers, has been awarded the Nebraska Water Center's first "Impact Award" for her research that studies the movement of uranium-bearing minerals in groundwater, which holds promise for future breakthroughs in groundwater quality. Her work was selected for the award from among 10 Nebraska projects over the past three years. Selection was made by the science advisory committee of our Water Center Advisory Board. Selection of her research project also nominates it for the National Institutes of Water Resources (NIWR) national impact award.

Her research, "Nitrate stimulated oxidative dissolution of U(IV) bearing minerals leading to U mobility in Nebraska groundwater" is being conducted in collaboration with longtime UNL School of Natural Resources analytical chemist Dan Snow, who also directs our Water Sciences Laboratory.

Dr. Weber came to UNL three years ago. She is a geomicrobiologist and microbial biogeochemist in the University of Nebraska–Lincoln's School of Biological Sciences and has a joint appointment in UNL's Department of Geosciences.

Also receiving well deserved recognition since our last issue of the Water Current is Lee Orton, who received The Groundwater Foundation's 2011 Maurice Kremer Groundwater Achievement Award in October. The coveted, longstanding award recognizes Nebraskans who have made a substantive contribution to the conservation and protection of Nebraska's groundwater and Orton certainly qualifies with his more than 40 years of promoting stability,

consistency and professionalism not only in Nebraska's government water agencies but also in public organizations such as the Nebraska



Association of Resources Districts, Nebraska Well Drillers Association, Nebraska Irrigation Association and Nebraska Water Resources Association. Congratulations Lee.....well done and well and truly deserved.

While I'm mentioning people, I would be remiss in not mentioning what a terrific job our assistant director, Lorrie Benson did in organizing October's Water Law Conference and Climate, Water and Ecosystems (Shaping the Great Plains) symposium that were held at downtown Lincoln's Holiday Inn. We had a marked upturn in attendance compared to the last few years. Almost two-thirds of the symposium attendees were from NRDs, state or federal agencies, or other regional stakeholder groups. Our speakers and their topics seemed to meet with near universal acceptance from attendees. Both of these one-day events seemed to be very positive and well received. They were absolutely wonderful opportunities to talk with friends and colleagues, as well.

Related to conferences, we are still exploring the possibilities of at some point holding a "Nebraska water conference" to address uniquely state and regional water issues. We are examining what sorts of topics this might cover, what sort of venue it might be (one day, two days, etc.) and when would

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MEET THE FACULTY

Daniel Miller, Ph.D.

Dan Miller is a research microbiologist with the USDA Agricultural Research Service, Agroecosystem Management Research Unit (AMRU). He is an adjunct associate professor in University of Nebraska-Lincoln's Department of Agronomy and Horticulture since 2006 and in UNL's Department of Biological Systems Engineering since 2008.

Education:

Ph.D. Microbiology Cornell University, Ithaca, NY
B.A. Chemistry and Microbiology, University of Kansas, Lawrence, Kan.



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Valery E. Forbes, Ph.D. *continued from page 1*

Examples of Current Research:

Modelling nanoparticle toxicity: Principles, methods, novel approaches (ModNanoTox); EU 7th Framework Grant; with 5 partner organizations; May 2011 – April 2013; under negotiation.

Mechanistic effect models for ecological risk assessment of chemicals (CREAM); EU 7th Framework Initial Training Network Grant; with 12 partner organizations; 1 Sep 2009 – 31 Aug 2012; total grant is 5 mil EUR.

The reactivity and toxicity of engineered nanoparticles: risks to the environment and human health (NanoReTox); EU 7th Framework Grant; with 11 partner organizations; 1 Dec 2008 – 30 Nov 2012; total grant is 3.2 mil EUR.

The impacts of spatiotemporally varying pesticide exposures on the dynamics of aquatic invertebrate populations; Syngenta; cofinancing a PhD fellowship; until 2012; 600,000 DKK.

Examples of Past Research:

Integrating population modelling into ecological risk assessment; Research Institute for Fragrance Materials; Feb 2009-Feb 2010; \$100,000.

Effects of sediment-associated fragrance materials on aquatic invertebrates: the roles of bioavailability and biotransformation in sediment-dwelling invertebrates; Research Institute for Fragrance Materials; Nov 2005 - Dec 2008; 2.86 mil DKK.

Center for Integrated Population Ecology (CIPE); Danish Natural Sciences Research Council Grant; 2005 - 2009; 6.5 mil DKK.

Teaching:

Graduate student supervision. Has taught in the following areas at undergraduate and graduate levels: Environmental Risk Assessment; Aquatic Ecotoxicology; Statistics; Invertebrate Zoology; Marine Ecology; Functional Ecology of Benthic Invertebrates; Evolution; Oceanography, Written and Oral Communication Skills for Environmental Scientists.

Selected Publications:

Breitholtz M, Lundström E, Dahl U, Forbes VE. 2010. Improving the value of standard toxicity test data in REACH. Chapter 6, pp 85-98, In: *Regulating Chemical Risks: European and Global Challenges*. Eriksson J, Gilek M, Rudén C, (eds), Springer, Dordrecht.

Calow P, Forbes VE. 2010. Ecological risk assessment should be value-relevant but not value-biased. *Integr Environ Assess Manag* 6: 784-785.

Forbes VE, Olsen M, Palmqvist A, Calow P. 2010. Environmentally sensitive life-cycle traits have low elasticity: implications for theory and practice. *Ecol Appl*.20: 1449-1455

Ellegaard-Petersen L, Selck H, Prieme A, Salvito D, Forbes VE. 2010. Fate and effects of acetyl cedrene on *Capitella teleta* and sediment bacterial community. *Ecotoxicology*. 19: 1046-1058.

Forbes VE, Calow P. 2010. Contaminant effects on population demographics. Pp. 293-297, In: MC Newman (ed). *Fundamentals of Ecotoxicology*, 3rd edn. CRC, Boca Raton, FL.

Nabe-Nielsen J, Sibly R, Forchhammer MC, Forbes VE, Topping C. 2010. The effects of landscape modifications on the long-term persistence of animal populations. *PLoS ONE* 5(1): e8932, doi:10.1371/journal.pone.0008932.

Forbes VE, Calow P, Grimm V, Hayashi T, Jager T, Palmqvist A, Pastorok R, Salvito D, Sibly R, Spromberg J, Stark J, Stillman RA. 2010. Integrating population modeling into ecological risk assessment. *Integr Environ Assess Manag*.6: 191-193.

Thorbeck P, Forbes V, Heimbach F, Hommen U, Thulke H-H, Van den Brink PJ, Wogram J, Grimm V, editors. 2010. *Ecological Models for Regulatory Risk Assessments of Pesticides: Developing a Strategy for the Future*. Pensacola and Boca Raton (FL): Society of Environmental Toxicology and Chemistry (SETAC) and CRC Press.

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Weber's Research Gets Water Center Impact Award

By Steve Ress

A research project aimed at studying the movement of uranium-bearing minerals in groundwater with an eye toward improving water quality has been selected the winner of the Nebraska Water Center's first "Impact Award" which also nominates it for the National Institutes of Water Resources (NIWR) national impact award.

Karrie Weber's study, "Nitrate stimulated oxidative dissolution of U(IV) bearing minerals leading to U mobility in Nebraska groundwater" was selected for the Nebraska Water Center award from among 10 Nebraska projects from the past three years, said Water Center interim director Bruce Dvorak.

"Selection was made by the science advisory committee of the Water Center's advisory board with award criteria based on three equally-weighted criteria of magnitude, timing and confidence which are part of the U.S. Geological Survey (USGS) 104b program criteria," Dvorak said.

Weber is a geomicrobiologist and microbial biogeochemist in the University of Nebraska-Lincoln's School of Biological Sciences, with a joint appointment in UNL's Department of Earth and Atmospheric Sciences.

Her research is being conducted in collaboration with UNL School of Natural Resources analytical chemist Dan Snow, who directs the Water Center's Water Sciences Laboratory.

"The selecting committee noted there is a strong expectation for improvements in drinking water supplies in Nebraska and elsewhere based on advancing understanding of the cause of elevated uranium concentrations, although the implementation may be several years away.

"This finding has significant implications for groundwater quality as nitrate levels increase in many agricultural regions and provides further motivation for greater groundwater protection, and insights to complex subsurface biogeochemistry that drives inorganic contaminant concentrations," Dvorak said.

Weber's research notes that high levels of uranium are found in groundwater in many portions of Nebraska. Recently more than 20 Nebraska public water supplies were above drinking water standards during recent monitoring, with many near the standard.

A 2011 USGS study found that four percent of private drinking water wells tested



Karrie Weber

for uranium above the health standard. Activities such as livestock operations and the application of nitrogen to agricultural fields and urban landscapes have resulted in elevated nitrate contamination of many surface and groundwater systems.

Weber's study attempts to understand uranium mobility in groundwater by examining the role played by indigenous microorganisms to dissolve uranium-rich minerals. The work is funded by the U.S. Department of Interior, USGS and NIWR.

Orton Receives 2011 Kremer Award

Lee Orton received The Groundwater Foundation's 2011 Maurice Kremer Groundwater Achievement Award in October.

The award was established in 1985 to recognize Nebraskans who have made a substantive contribution to the conservation and protection of Nebraska's groundwater. Orton received the award at the Foundation's National Conference, Oct. 4-6 at the Omaha Marriott Hotel in Omaha.

Selection Committee member, Bob Kuzelka said, "Lee has, for more than forty years, promoted stability, consistency and professionalism not only in Nebraska's government water agencies but even more importantly in public organizations such as the Nebraska Association of Resources Districts, Nebraska Well Drillers Association, Nebraska Irrigation Association and Nebraska Water Resources Association."

Groundwater Foundation President Jane Griffin described the selection of Lee Orton as the 2011 Kremer honoree as "highly deserving, Lee has dedicated himself to protecting and conserving groundwater throughout his distinguished career, what has moved him above and beyond is his passion for his work on behalf of the resource."

Orton has been actively involved in water issues in Nebraska since 1969.

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Guest Commentary:

Nebraska Water Management Ahead of the Curve in Ogallala Region

By Jasper Fanning, Ph.D., Upper Republican NRD

Not enough food to satisfy rising worldwide populations, tighter water supplies, a possible slowing of the rate of crop-yield increases – there’s a growing amount of buzz surrounding these and other predictions of future ag-related conditions. An obvious question often follows: How adequate are current water-management policies to address these challenges?

Let’s focus for a second on our part of the world, the multi-



Jasper Fanning

state region that lies atop the Ogallala Aquifer. The largest aquifer in the U.S. and one of the largest in the world, it’s a significant reason Nebraska is a Top 5 state in seven agricultural categories – value of ag and livestock products sold, sales of grains, sales of cattle and calves, and acres in corn and sorghum, to name a few.

Nebraska’s water-management scheme may not be perfect, no regulatory framework is. But the locally-based regulatory authority provided through Nebraska’s one-of-a-kind Natural Resources Districts and in cooperation with the state Department of Natural Resources has proven in many important facets to be the most effective framework in the Ogallala Aquifer region, positioning it to be a continued leader in agricultural production for generations to come. This isn’t just my opinion as a manager of an NRD. It’s shared by experts in a range of disciplines, from economics to environmental studies, and will likely attract more attention as other states look for ways to transition from virtually unimpeded agricultural water use to reasonably regulated use that protects water resources while still allowing the economy to thrive.

Kansas Gov. Sam Brownback recently hosted a conference in western Kansas attended by more than 300 people where he bluntly stated the need for his state to enact new policies to better manage water. His staff passed out maps showing that in some parts of southwest Kansas, the aquifer has declined by 100-150 feet, and that even though 200-300 feet of saturated thickness remain, officials there project that if more isn’t done to control use the aquifer in those areas won’t be usable in just 25-50 years. Those declines are roughly double the steepest aquifer declines in Nebraska. Kansas has the ability to do more to preserve its resources, but it largely hasn’t occurred because of a system that

for a variety of reasons discourages cooperative decision-making by local and state officials.

Similar declines have occurred in larger regions of the Texas panhandle that helped prompt my NRD to successfully push for NRDs to have the authority to regulate groundwater in the late 1970’s. Our district became the first in the state to impose allocations, doing so in 1980.

Groundwater districts in the Texas panhandle just recently developed plans for how to manage their groundwater and some of the plans are beginning to emerge. In a region near Lubbock that on average gets annual precipitation similar to what is received in my NRD, a so-called 50/50 target has been established. The goal is to deplete no more than 50 percent of what remains of the aquifer over the next 50 years. While laudable that Texas is taking steps to regulate groundwater use, similar measures here in Nebraska would be considered laughable because we all agree The Good Life should last forever, not just 50 years or so.

My intent isn’t to criticize other states or hold our system up as perfect, but I think what the comparison shows is that Nebraska is well ahead of the curve with water management relative to other states because at least we are in a position to make decisions based on local conditions.

Recently in this magazine, respected UNL ag economist Ray Suppala, who is retiring, said that with the enactment of LB962 in 2005 that provided for a cooperative water-planning process conducted by NRD and state officials that balances the interests of competing water users and considers sustainability objectives, Nebraska water planning is “the most progressive of any Western state.”

Environmentalists and economists often don’t agree, but they may well on this point.

Early this year, the Environmental Defense Fund’s former senior attorney for rivers and deltas, Mary Kelly, presented a study she did exploring water management in Nebraska compared to other states. She praised Nebraska’s system as preferable.

An excerpt from the paper: “These broad and flexible powers give Nebraska NRDs distinct advantages over similar districts in other states that rely on local control. Texas, for example, also relies on local districts as the preferred approach to ground water management, but...most districts have been created on county jurisdictional lines, not on aquifer or river basin boundaries.”

“Even with distinct surface water and ground water regimes,” Kelly says in another section, “some states centralize management in

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New Institute Director Praises Strong Foundation

The Robert B. Daugherty Water for Food Institute has a strong foundation on which to build an organization that will help the world produce more food with limited water. That's the assessment of the water expert named to lead the institute.

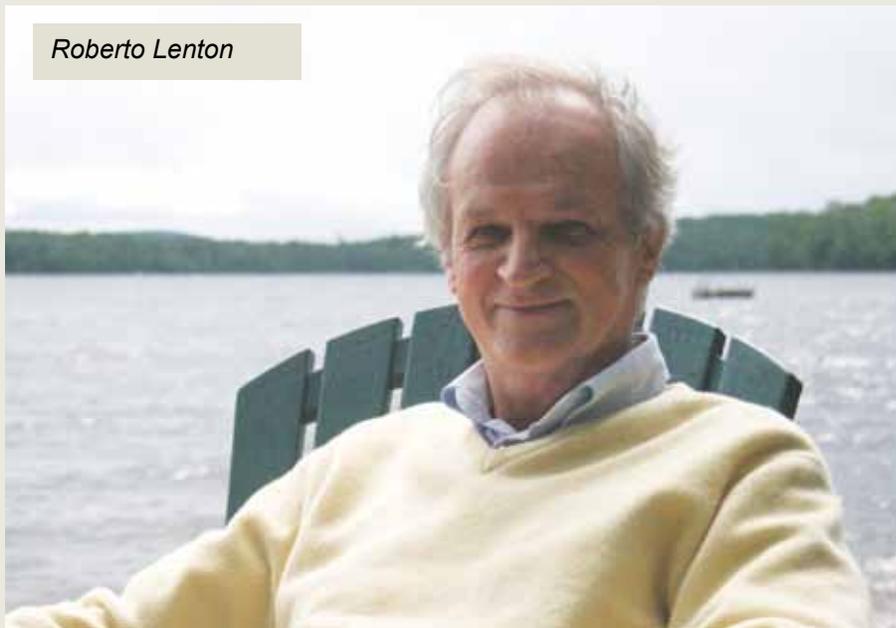
Roberto Lenton, one of the world's foremost experts in water management and development, was named founding director in August. His appointment begins in February 2012 after his responsibilities end as chair of the independent World Bank Inspection Panel. He will remain a panel member until August 2012.

Lenton said the institute has much to build on. Assets include "its base at a leading land grant university with a strong tradition of practical application of scientific knowledge; its location in the state of Nebraska, known as an innovator of good policies and practices in agricultural water management; the enormous talent of its faculty and research staff who have a long track record of addressing water and food security issues from a variety of disciplinary perspectives; its strong convening power, as illustrated by the annual Water for Food Conferences that have begun to shape the debate on this critical issue of our time; and the very generous founding gift from the Robert B. Daugherty Foundation that will enable the institute to get off to a rapid start."

"I am very excited by the opportunity to build on these strong foundations and enable the institute to fulfill its commitment to help the world use its limited freshwater resources effectively and ensure food security for current and future generations," Lenton said.

Lenton helped establish the International Water Management Institute in Sri Lanka and served as director general from 1987 to 1994. Under his leadership, IWMI grew from a small project-based organization to a major

Roberto Lenton



institute employing more than 300 people in 10 countries with an annual budget of over \$10 million.

"Dr. Lenton is an ideal choice for the founding director of the institute," said Prem S. Paul, vice chancellor for research and economic development. "His vast knowledge, global experience and international stature will serve Nebraska well as we strive to make this institute a world leader in the field of water for food. We look forward to working with him to build an internationally renowned institute."

A citizen of Argentina with degrees from the University of Buenos Aires and the Massachusetts Institute of Technology, Lenton also was director of the United Nations Development Programme's Sustainable Energy and Environment Division, program officer in the Rural Poverty and Resources program with the Ford Foundation, and an assistant professor at MIT. He also was senior adviser on water at Columbia University's Earth Institute.

Ronnie Green, Harlan Vice Chancellor of the Institute of Agriculture and Natural Resources, said Lenton brings a wealth of global experience to the Water for Food Institute. "Meeting the grand challenge of feeding a growing world population with more efficient use of scarce water resources requires great vision and we are tremendously excited to have someone of Roberto's caliber coming to lead us in this highly important initiative for Nebraska and the world."

Jeff Raikes, CEO of the Bill & Melinda Gates Foundation and a member of the Water for Food Institute board of directors, said, "Dr. Lenton is one of the most widely recognized leaders in the world in water circles. I don't believe we could have found a more qualified and respected founding director."

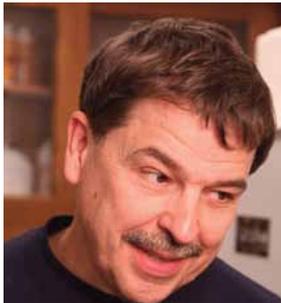
(Editor's Note: From 2011 University of Nebraska-Lincoln Office of Research and Economic Development.)

The 2011 Missouri River flood II: The past is prologue

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

When looking at stars in the night sky, the light that we are seeing was actually produced by that star years or decades earlier. The age of the light depends upon the distance from the star to earth, the further the distance, the older the light. Effectively, we are getting a glimpse of the past.

It is much the same when we look at water flowing past a point on a riverbank. The water flowing by originated somewhere upstream days, weeks or even months before.



UNO environmental toxicologist Alan Kolok.

As such, the water that we are seeing is actually an image, in a matter of speaking, of the past.

For example, if you stand at the point where the Mississippi River enters the Gulf of Mexico, some of the water that is rushing by came from the river's headwaters in Lake Itasca, Minnesota. Those drops of water represent a snapshot into Lake

Itasca's past, three months previously, just as certainly as the light we see as a star represents a glimmer of its past.

It's not the same for a lake. While lake water does have a residence time, that time period can be so long that the water in the lake is effectively not changing. For example, the residence time for water in the great lakes is a snappy 2.6 years in Lake Erie but only a stodgy 196 years in Lake Superior. When we look at a sunset over Lake Superior, the water that we see will be, to a large part, the same water that could be viewed by our great grandchildren.

The dynamics of a river are important relative to its interaction with contaminants. Contaminants that are water soluble will be carried downstream, while the journey downstream for fat soluble contaminants will be influenced by where the compound is found: bound to sediment particles, bound to organics in the water, or bound to organics in living organisms.

Even those particles that are strongly bound to sediment particles will ultimately make the journey downstream, although their journey may be slower and more punctuated with periods of resettlement back into the underlying sediment bed. Furthermore, the total contaminant load in water when it reaches the river delta is really a function of the total contaminant load that has been flushed via runoff into the river, minus what has been removed by binding to sediments or other organic material, including the river's biota.

As discussed in last quarter's *Water Current* article, the 2011 Missouri River flood is providing an interesting case study relative to how

river dynamics influences downstream environments. The ultimate downstream environment influenced by these waters is the Gulf of Mexico, and one consequence of upstream river dynamics is enrichment of the Gulf with essential nutrients for algal growth.

When these algae die, they decompose resulting in a region in the Gulf known as the dead zone. How did the recent flood influence the dead zone in the Gulf of Mexico?

It really didn't. While there was speculation that the dead zone of 2011 could be the largest on record (exceeding 10,000 square miles) the dead zone was only 6,700 square miles, much smaller than originally expected.

It is possible Tropical Storm Don had something to do with that, as it could have remixed this region of the Gulf, so that much-needed atmospheric oxygen was infused into the water. The loading of nutrients and contaminants into the Gulf might have been at record proportions, however the surge of additional oxygen into the water might have altered its impact.

Alternatively much of the nutrient and contaminant load from the Missouri River flood might not have reached the Gulf at all.

Considering that the Missouri River is over 2,300 miles long, there are a number of dams and constriction points along the way where sediments, contaminants and nutrients can be waylaid on their march to the sea. Furthermore, the scouring of sediment and soil in the Nebraska region of the Missouri River undoubtedly led to sediment deposition somewhere downstream, well upstream of the Gulf. (If only those sediments could have reached the Barataria-Terrebonne Estuary in the Mississippi River delta, one of the fastest disappearing landmasses on earth. At least then our loss, as profound as it was, would have been someone else's immediate and dramatic gain).

Perhaps this is where the analogy between light shining from a distant star and water flowing from a distant mountainous tributary breaks down.

The light from a star, traveling through the vacuum of space, probably does not change appreciably over its long voyage. The quality of the water, however, dramatically changes based upon the water added to it from other tributaries and upon its interaction with sediments particulates suspended in the water.

The water within a river is history, but it is not merely the record of past events, but rather is an ever-changing system that contains remnants of the past that are constantly being modified by the present.

That the estimates for the dead zone were so inconsistent with the observed data, suggests that there is more for us to understand about this very dynamic and fascinating system.

Water Center Advisory Board Meets in October

By Steve Ress

The Water Center Advisory Board (WCAB) met October 21 to review the work and recommendations of its subcommittees and to consider how it might help as the Water Center more closely affiliates with the Robert B. Daugherty Water for Food Institute.

This marked the second meeting of the WCAB, who's members have been interacting with and helping to advise Water Center faculty and staff on a number of programs and projects over the summer via several subcommittees.

After a brief welcome by Water Center interim director Bruce Dvorak, Water Center assistant director Lorrie Benson told assembled board members the Oct. 12 and 13 Water Law Conference and climate change/ecosystems symposium at Lincoln's Holiday Inn had both been unqualified successes, marked by much stronger attendance than the past few years.

Special guest for the meeting was new UNL Institute of Agriculture and Natural Resources associate vice chancellor Ron Yoder, who updated the group regarding the Water Center's affiliation with the Daugherty Institute and what that could mean for both entities once

the institute's director, Roberto Lenton, arrives on campus in February, 2012.

Yoder said that IANR Vice Chancellor Ronnie Green was meeting, in the next several days, with Lenton in Washington D.C. discussing, among other things, the future of the Water Center in terms of how it may fit with the Daugherty Institute and what new opportunities that could mean for both entities. He said that no decisions regarding affiliations of the two entities would likely be made until after Lenton has an opportunity to consider it carefully, however.

Yoder did say the connection between the two entities would be "strong" and that the Daugherty Institute is hoping to build on the strength and successes of the Water Center.

Several WCAB members responded to Yoder's presentation by acknowledging that the new institute will bring new research and outreach opportunities to UNL for both entities, but were also concerned about the implications of the specific details of the possible relationship between the Water Center and the Daugherty Institute. They noted that agricultural water use and water quality were key to much

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WRAP Meeting Brief

By Rachael Herpel

The University of Nebraska Water Resources Advisory Panel (WRAP) met September 15, in the Whittier Building, which houses the Robert B. Daugherty Water for Food Institute.

Recognized for their service to WRAP, their terms having ended over the summer were Frank Kwapnioski, H2Options Engineering, LLC; John Miyoshi, Lower Platte North NRD; and Dennis Strauch, Pathfinder Irrigation District.

New WRAP members welcomed were Brian Barels, water resources manager, Nebraska Public Power District; Lyndon Vogt, general manager, Upper Niobrara-White NRD; and Jerry Kenny, executive director, Platte River Recovery Implementation Program. Returning to the panel are Frank Albrecht, assistant division administrator, Realty and Environmental Services Division, Nebraska Game and Parks Commission; and Mike Linder, director, Nebraska Department of Environmental Quality. Ronnie Green, NU Vice President and Institute of Agriculture and Natural Resources Harlan Vice Chancellor noted it was his one-year anniversary of meeting with this group.

Green offered the latest on the Water for Food Institute, noting that Roberto Lenton would begin February 1, 2012 as the institute's founding director. Marc Andreini joined the Water for Food Institute as an international research fellow on July 1. As a result of NU's partnership with UNESCO-IHE, Ed Harvey is in the Netherlands to help establish a joint graduate degree program and develop research partnerships and collaborations in the area of water and food production. Current plans focus on developing an executive management short course.

In five years Green expects the Water for Food Institute to have leveraged resources and shown measurable progress in reducing the amount of water used for irrigating crops at both the local and global level, thus achieving "more crop per drop."

While the University of Nebraska already has over 100 faculty working in water arenas, a recent gaps analysis was done to identify what was missing and needed to achieve even more. A "Cluster Hire of Faculty Addressing the Efficient and Sustainable Use of

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UNL Extension Works with Afghan Farmers to Improve Techniques and Efficiencies

By Vaughn Hammon and Jenny Rees, UNL Extension Educators

Greetings from Afghanistan. My name is Vaughn Hammon, Extension Educator with University of Nebraska–Lincoln Extension on assignment in Afghanistan working with local agriculture producers.

Agriculture in Afghanistan is very similar to agriculture in the U.S. in the very early 1900's. Issues that dictate what Afghan farmers grow are similar to those facing American agriculture producers. Some of these include market, price, transportation and WATER. Water is the overriding factor that determines if the Afghan farmer has a chance of success.

Afghanistan has a rich culture dating back thousands of years and agriculture has played a central role in their history. It has a predominately dry continental climate. Negligible precipitation occurs during the growing season in the majority of the country's cultivatable land. Most of the annual precipitation occurs at the higher elevations of the Hindu Kush mountain range. Afghan producers have been irrigating for centuries and do it much the same way they did hundreds of years ago. They have learned how to harvest seasonal moisture primarily from the mountains and divert, collect, store and move it throughout their arid land. This is accomplished successfully, but inefficiently through ancient, manual, labor-intensive methods.

Currently Afghanistan uses two types of irrigation systems which they call the informal and formal systems. Informal systems are developed and managed by communities, with no government assistance. Community resources dictate their success. Farmers using informal systems are allocated specific amounts of water, which are allocated to each farmer in proportion to sweat-equity the farmer puts forth in maintaining the system and to cash paid by the farmer.



Nebraska ADT2 team members undergo resources training prior to deploying to Afghanistan in July.

In Afghanistan, a crude open canal transports water one-quarter mile to where it will be used to irrigate crops.



Surface water accounts for 30 percent of irrigation water and supplies 86 percent of the irrigated land. The infrastructure used includes diversion structures called surbans; main, secondary and tertiary canals that are predominantly unlined and made of earth, conveyance structures such as culverts, siphons and aqueducts and then access points. Small earthen retention dams are also used to capture runoff from the mountains.

Groundwater systems tap into shallow groundwater sources through springs, karez, and wells. Springs are an important water source for rural communities and their survival. An estimated 5,600 spring-fed irrigation systems provide water to approximately 188,000 hectares. The spring-fed systems are generally lower volume systems and are often supplemented by other water sources. Water allocation is again based on sweat equity and cash payment.

The karez extracts groundwater through a series of sub-surface tunnels and canals to gravity-feed water to communities for distribution. These underground tunnels and canals can stretch several kilometers and some are hundreds of years old. It is estimated that there are 7,000 karez responsible for irrigating 170,000 hectares of land. These are operated and maintained by individual communities and are long-term sources of good, quality water.

Wells are the final water source in the informal system. Information is sketchy due to the war and loss of many records. The last good records date to the 1960's. At that time, less than 1 percent of the water came from wells. Traditionally wells are shallow and

continued on page 16

UNL Water Center Hosts Annual Water Law Conference and Climate, Water and Ecosystems – Shaping the Great Plains symposium Oct. 12 & 13 in Lincoln (symposium cosponsored by USGS Nebraska Water Science Center)



John Guretzky and Dave Wedin, both of UNL, talk at the Oct. 13 Climate, Water and Ecosystems symposium.

Tricia Liedle (center) of the Water Center registered guests for the water law conference and ecosystems symposium, both events that were held at Lincoln's downtown Holiday Inn.

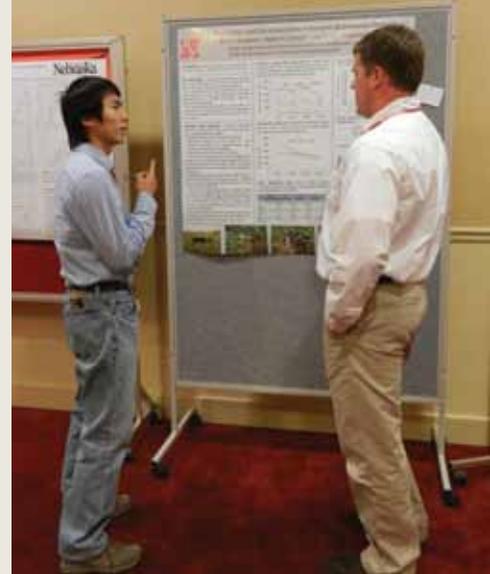


Water law conference moderator and panelists (from left) Anthony Schutz, Don Blankenau, Stephen Mossman and David Cozad.

UNL graduate student Jonathan Traylor (left) explains his poster during a break in the climate, water and ecosystems symposium.



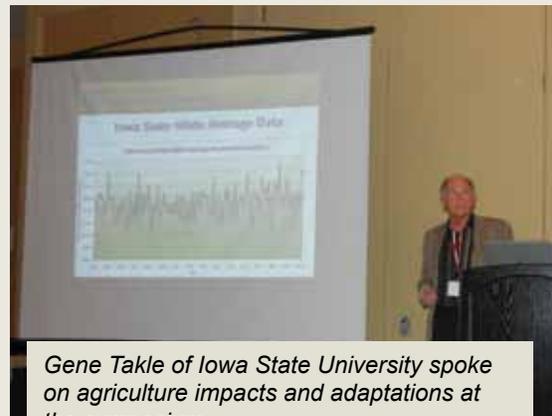
John Guretzky of UNL's Department of Agronomy and Horticulture (right) discusses his poster during a viewing session at the climate, water and ecosystems symposium.



Jerry Obrist of the Lincoln Water System talks on drinking water and wastewater during the symposium's impacts and adaptations session.



Meghan Sittler of the Lower Platte River Corridor Alliance (left) demonstrates a new data program at the climate, water and ecosystems symposium.



Gene Takle of Iowa State University spoke on agriculture impacts and adaptations at the symposium.



Gene Takle of Iowa State University and William Badini of HDR, Denver, Colo., talk during the symposium's lunchtime poster viewing session.



Kyle Hoagland, Bob Swanson and Craig Allen enjoy a moment during a break in the symposium.



Adell Amos of the University of Oregon School of Law spoke on the realities of climate change law and practice at the water law conference.

(Steve Ress photos)

Kremer Award *continued from page 4*

Beginning his career as legal counsel for the Nebraska Soil and Water Conservation Commission which later became the Natural Resources Commission, Lee was actively involved with the law portions of the framework study of the Nebraska Water Plan and with several special recommendations of the plan. His work involved many aspects of Nebraska Water Law Study and extensive activity with the implementation of Nebraska's Natural Resources Districts.

Orton was the first executive director of the Nebraska Association of Resources Districts for 10 years before entering private practice which he devoted to water resources matters, representing business and agribusiness on all nature of water resources problems.

Today he is principle of the Orton Law Office and remains actively involved with natural resources and environmental issues. He also serves as executive director of the Nebraska Well Drillers

Association, Nebraska State Irrigation Association, and the Nebraska Onsite Waste Water Association and works with the Bureau of Reclamation, irrigation and public power districts and other environmental programs and issues.

Past Kremer recipients: 1986, Vincent Dreeszen; 1987, Maurice Kremer; 1988, Eugene Reed; 1989, Val Kuska; 1990, Warren Fairchild; 1991, Ralph Marlette; 1992, Ted Filipi; 1993, Robert B. Crosby; 1994, Virginia Smith; 1995, Fred Salmon and Family; 1996, Frank A. Smith; 1997, Robert B. Daugherty; 1998, Les Sheffield; 1999, Richard Harnsberger; 2000, Wayne Madsen; 2001, Jim Goeke; 2002, Eugene Haarberg; 2003, Chris Beutler; 2004, Darrell Watts; 2005, Roger Patterson; 2006, Senator Ed Schrock; 2007, Jim Cook, 2008, Ann Bleed; 2009, Vance Anderson; 2010, Michael Jess.

Nebraska Center Advisory Board *continued from page 8*

of what the Water Center has historically done, but also said there is a wide range of water-related research, teaching and outreach conducted at UNL that is not linked to agriculture and that those areas need to continue being a Water Center focus. They felt the WCAB should be proactive in reminding university leadership of the importance of a strong Water Center as an anchor to broad-based water research and outreach.

Reports were then given on what the WCAB's four primary subcommittees had been working on over the summer:

Outreach and Communications: Discussions have focused on speakers, topics and venues for the 2012 water and natural resources tour that will focus on the Missouri River and recent flooding in the basin. Water Center assistant director Lorrie Benson has also been asking the group for possible themes and dates for a Fall 2012 symposium, as well as their thoughts on possibly organizing a future Nebraska Water Conference. If such a conference is reinstated (the last was held about 10 years ago) the one-day Water Law Conference could be folded into it.

Science Advisory: Subcommittee members helped choose a first-ever state "Impact" research award winner, who's name will be entered in a national impact research award sponsored by the National Institute for Water Resources (NIWR) Karrie Weber of UNL's School of Biological Sciences was chosen for the state award. Members are also reviewing three USGS 104b proposal submissions. External reviewers

will also help determine which of these proposals are accepted for USGS funding.

Research Support: It was reported that subcommittee discussions have revolved around building interdisciplinary research teams and engaging research faculty with external stakeholders to address state research needs.

Water Sciences Laboratory: Lab director Dan Snow delivered an overview of the lab and the services it provides to research faculty and students. He noted that outside funding for the lab is becoming increasingly competitive at the same time that the lab must become more self-sustaining. Subcommittee members are working with Snow in helping to identify what analytical equipment is most important for replacement or repair in order to preserve and enhance the lab's capabilities. About two-thirds of lab users are from NU, the other one-third being primarily federal or from other academic or government institutions.

WCAB members are John Bender, Nebraska Department of Environmental Quality; Alan Kolok, University of Nebraska, Omaha and University of Nebraska Medical Center; John Miyoshi, Lower Platte North NRD; Ron Zelt, USGS Nebraska Water Science Center; Rick Holland, Nebraska Game and Parks Commission; Steve Gaul, Nebraska Department of Natural Resources; and Dean Eisenhauer, Valery Forbes, John Gates, Sarah Michaels, Steve Thomas and Tim Shaver, all of UNL.

be the best time to hold it. We know there is considerable interest in reviving something along the lines of the annual Nebraska Water Conferences the Water Center used to hold, but need to flesh-out the thought process on this a bit more. If you have ideas, please let me know. We are also asking our Advisory Board for their thoughts on this.

There is much currently in the news about what we have learned from last summer's historic flooding on the Missouri River and what the possibilities may be for additional flooding in the basin this coming spring. In light of that, a decision has been made to conduct next year's Water and Natural Resources Tour on the Missouri River and surrounding area July 17-19, 2012. The tour could be looking at flood-affected areas of the river from Gavins Point Dam, south to Nebraska City and will likely headquarter in Omaha. There is no better time to tour this area and see what we can learn from last spring and summer's epic flood.

We want to approach the tour from a "lessons learned" standpoint, so we anticipate exploring a very wide range of topics, including 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 others. The challenge will be in deciding what speakers and topics we have to leave off the agenda within the limits of the three-day tour. We already are receiving some welcome advice and planning assistance from many members of our faculty, our advisory board and area Natural Resource District managers, all of which we welcome.

We are also pleased to welcome the USGS Nebraska Water Science Center as a tour sponsor and co-planner.

More details of the tour will be published online at watercenter.unl.edu as they become available.

In closing, I am excited about our spring Water Seminar series. An important component of the seminar series are speakers related to groundwater and surface water modeling. We have a slate of internationally respected modelers speaking in the series, as well as sessions that address important Nebraska topics. Please read the article about the Seminar series on page 1. We hope you will participate in the series.

Nebraska Water Management *continued from page 5*

a state resource agency, as opposed to locally-based regulation. In theory, there are potential benefits to this approach assuming state decision-makers are more insulated from local political pressures, but it is certainly no guarantee of sustainable management. And, in some cases, local interests may be more aggressive than state policy makers in protecting their resources."

Water-resource conditions in Ogallala Aquifer states illustrate the truth of that last sentence. As the NRDs approach their 40th anniversary of protecting lives, property, and the future, it's Nebraskans who are to thank for establishing a system that could

be a template for water and resource management beyond the state's borders.

(Editor's Note: Fanning, who holds a Ph.D. in agricultural economics, has been general manager of the Upper Republican Natural Resources District in Imperial since 2004. The article strictly reflects the views and opinions of the author. Guest submissions to the Water Current are encouraged, with the Water Center reserving all rights to edit and publish any and all submissions at receives).



Groundwater Foundation President Jane Griffin (right) presents a Groundwater Guardian plaque to Rachael Herpel as part of a designation ceremony held at the foundation's 2011 national conference in October. Herpel represented the Mayor's Water Conservation Task Force, which has served as Lincoln's Groundwater Guardian Community Team since 1995, and the UNL Water Center, a Groundwater Guardian Affiliate for two years.

Nebraska WRAP *continued from page 8*

Water for Food” funded by IANR and the Water for Food Institute is underway and will result in the addition of a systems agronomist (targeted hire), a crop simulation modeler, an irrigation engineer, a ground/surface water modeler and geospatial hydrologist, and a hydrogeophysicist to NU faculty.

When asked about recent efforts by the university to focus on agriculture policy, Green mentioned that the next cluster hire will occur in this area, and the university intends to develop an agriculture policy group in the next five years.

John Gates, an assistant professor in UNL’s Department of Earth and Atmospheric Sciences, presented his research on tracer hydrology. Gates described using natural tracers to understand how aquifers are recharged and replenishment rates are determined.

For example, his research shows that mean recharge in the Nebraska High Plains aquifer is 1.5 inches per year, while mean recharge in the Texas High Plains aquifer is 0.1 inches/year. The difference is soils – Nebraska benefits from the porous Sandhills, while Texas has very clay-like soils. Gates also pointed-out that Texas has quite a bit more data about natural tracers than Nebraska does; thus he is currently working on the Nebraska Groundwater Tracers Project to add a new level of precision to his analysis. He also noted - there

is nothing permanent about recharge rates, which are impacted by variables such as vegetation (e.g., salt cedars in the Sandhills) and others.

WRAP members reviewed information being assembled as part of the Nebraska legislature’s LR 314 interim study to examine all possible sources of revenue that could be used to establish a dedicated funding source for water management activities in Nebraska. Information about available research, data sources, and studies are being compiled as part of the study.

Jim Schneider, deputy director of Nebraska Department of Natural Resources, concluded the meeting by describing the department’s plan to develop INSIGHT, an Integrated Network of Scientific Information and GeoHydrologic Tools, to provide a series of web-based interactive maps, freely available to the public, that are directly linked to basin specific data on water supply and demand. INSIGHT will provide a one-stop shop where water managers can access hydrologic data and analyses maintained by the state. Release of the tool is planned for July 2013. This tool should serve to meet the basic-specific research needs identified and prioritized by WRAP in 2008-2009.

Water Tour *continued from page 1*

to visit the basin and nearby points in Nebraska and Iowa, Dvorak said.

The tour will visit points of interest on and near the Missouri River from South Sioux City to perhaps Nebraska City, likely headquartering for overnights in Omaha.

“We anticipate exploring issues connected to the recent flooding including 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,” said UNL Water Center communicator Steve Ress, a member of the tour’s organizing committee.

Former Nebraska Department of Water Resources director and retired UNL professor Mike Jess will host the tour, which is expected

to begin and end in Omaha.

More details will be published as planning gets underway later this fall. Tour organizers expect to drive the proposed tour route and talk with possible presenters in mid-December.

Tour itinerary and registration materials will be published in the next six months.

Initial tour cosponsors include Central Nebraska Public Power and Irrigation District, Kearney Area Chamber of Commerce, U.S. Geological Survey Nebraska Water Science Center and UNL’s Water Center, School of Natural Resources and Robert B. Daugherty Water for Food Institute.

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

Daniel Miller continued from page 3

Examples of Current Research:

Miller's current research in the AMRU focuses on microbial activities and communities in manure-impacted environments. Microbes involved in nutrient transformation/loss are of particular interest with ongoing projects focused on nitrogen transformations in an ammonium-contaminated groundwater plume, nutrient losses from dairy wastewater applied to agricultural fields, and nitrogen utilization and losses during the operation of a vegetative treatment system treating beef cattle feedlot runoff. Two microbial processes, nitrification and denitrification, control the fate and potential transport of nitrogen within all three systems. Both of these processes are investigated through field and laboratory work. In the laboratory, potential activities of these groups are measured using incubations and other classical microbiology techniques. Microbial community abundance and diversity is also investigated in these field samples using the latest molecular methods (DGGE and qPCR).

Understanding manure decomposition, odor compound accumulation, and subsequent odor compound emission from manure-impacted environments is also a research priority. Odor compound emissions are the result of a combination of anaerobic decomposition, potential odor compound consumption, and numerous environmental factors affecting odor compound volatilization. Microbes play a role in all three areas, and understanding what controls their activities could help control odor compound emissions. Ongoing odor research projects include reduced sulfur production and emission from cattle feedlot soils, and a project investigating seasonal changes in odor compound content and relative emission from manure storage structures and in soils receiving that manure as fertilizer. Samples collected in the field are assessed in the laboratory using primarily GC-MS. Microbial community structure in these environments is also investigated using advanced molecular and biochemical utilization profile techniques.

Examples of Past Research:

Past activities at the USDA-ARS U.S. Meat Animal Research Center (MARC) focused on describing the effect of animal diet on manure composition and the biochemistry of odor compound formation in cattle feedlot soils and swine manure slurry pits with the objective of decreasing odor emissions from animal feeding operations. Recent collaborations with researchers at MARC examined the potential environmental impacts of feeding distiller's by product in beef cattle feedlots. These projects focused on identifying the specific substrates in manure that fuel odor compound formation. A combination of biochemical techniques to directly measure loss of protein

and carbohydrate while monitoring the accumulation of specific odor compounds provided insights into how certain fractions of undigested feed are fermented into the most offensive odor compounds. Based upon these results several collaborative studies with animal nutritionists were conducted to evaluate low-odor diets.

Selected Publications:

- Vincent V. H., J. E. Wells, E. D. Berry, and D. N. Miller. Odor production and *Escherichia coli* concentrations in manure slurries of feedlot steers fed 0 or 40% corn or wet distillers grains with solubles. *J. Environ. Qual.* 39:1498-1506. 2010. <http://hdl.handle.net/10113/45084>
- Miller, D. N., and R. L. Smith. Microbial characterization of nitrification in a shallow, nitrogen-contaminated aquifer, Cape Cod, Massachusetts and detection of a novel cluster of nitrifying Beta-proteobacteria. *J. Contam. Hydrol.* 103:182-193. 2009.
- Smith, R. L., L. K. Baumgartner, D. N. Miller, D. A. Repert, and J. K. Böhlke. Assessment of nitrification potential in ground water using short term, single-well injection experiments. *Microb. Ecol.* 51:22-35. 2006.
- Böhlke, J. K., R. L. Smith, and D. N. Miller. Ammonium transport and reaction in a contaminated ground-water plume: Application of isotope tracers and isotope fractionation studies. *Water Resources Research* 42:W05411, doi:10.1029/2005WR004349. 2006.
- Smith, R. L., S. P. Buckwalter, D. A. Repert, and D. N. Miller. Small-scale, hydrogen-oxidizing-denitrifying bioreactor for treatment of nitrate-contaminated drinking water. *Water Res.* 39:2014-2023. 2005.
- Miller, D. N. and E. D. Berry. Cattle feedlot soil moisture and manure content: I. Impacts on greenhouse gases, odor compounds, nitrogen losses, and dust. *J. Environ. Qual.* 34:644-655. 2005. <http://hdl.handle.net/10113/7181>
- Miller, D. N., J. B. Yavitt, E. L. Madsen, and W. C. Ghiorse. Methanotrophic activity, abundance, and diversity in forested swamp pools: Spatiotemporal dynamics and influences on methane fluxes. *Geomicrobiol. J.* 21:257-271. 2004. <http://hdl.handle.net/10113/16957>
- Miller, D. N. and V. H. Varel. Swine manure composition affects the biochemical origins, composition, and accumulation of odorous compounds. *J. Anim. Sci.* 81:2131-2138. 2003. <http://hdl.handle.net/10113/8519>

Email:

dan.miller@ars.usda.gov

Afghan Farmers *continued from page 9*

hand dug. Most wells of this nature are only capable of irrigating approximately three hectares. Recently, with help from coalition forces, more wells are being dug with modern equipment, but the numbers are relatively small compared to other methods of sourcing water. New wells are deeper and capable of watering a much greater area.

Formal irrigation systems exist with assistance of the central Afghan government. These are large irrigation systems financed, maintained and regulated through the government. Afghanistan currently has 10 such systems; all supplied by water sourced from major waterways and storage dams. They are running well below capacity and are in very poor condition due to the current state of the government.

Both informal and formal systems share some common characteristics. The transfer of water from the source to the farmer is done most commonly through a series of open canals of varying size down to a simple one-foot deep ditch. Local farmers typically farm areas known as jeribs. A true jerib is equivalent to about 0.49 acres. In reality, few jeribs are that size. The average Afghan farmer cultivates three to five jeribs. Each is surrounded by a 12 to 18 inch soil dike. Open canals bring water to the jeribs. At that point, the farmer will dig an access to his jerib, flooding it with water. When adequate water has been applied, the farmer will backfill the access point to stop the flow of water. When beds are utilized, water is directed into furrows between the beds. In orchard plantings, the water is channeled to each individual tree for irrigation.

The concept of using buried pipe to move water from the source to fields is almost unthinkable primarily due to cost, but also because of tradition and culture. Farmers know and understand the irrigation methods that have been used for hundreds of years. They believe the

old methods have served them well, and believe they remain the best option. The average farmer has been successfully growing crops this way for generations, and it is part of the farming culture to spend the day with shovel in hand diverting water throughout the jerib to the different crops that need irrigating.

We are trying to demonstrate how use of buried pipe for

water transfer to jeribs will increase efficiency. Educated Afghans understand and welcome this new approach and can see the advantages while others see no need for the added expense. Our hope is to demonstrate that water transferred through pipes will cut down on the time and amount of water used to irrigate crops.

We are also trying to introduce drip irrigation to fruit and vegetable producers.

Farmers have a hard time understanding that a dripping emitter is actually capable of supplying

adequate water for crops. The delivery system plays a role because most often there is little or no water pressure involved. Water has to be transferred to an elevated holding tank to achieve enough pressure to drip-irrigate a larger area. Once again, cost and tradition are major barriers in converting from the old ways.



An Afghan "jerib" with dikes to hold irrigation water.



A recently dug irrigation ditch in Afghanistan.

At Home in Nebraska...

I'm Jenny Rees, a UNL Extension Educator currently serving as UNL's agricultural point-of-contact for Nebraska National Guard Agribusiness Development Team 2 (ADT2) to help them with reach-back. "Reach back" is conducted primarily by email and/or Facebook where soldiers send questions, provide pictures, or explain issues they are experiencing. Because UNL Extension is well connected and has a

wide breadth of research-based resources, I send the information from the soldiers to Extension Specialists or Educators best qualified to help. They, in turn, respond to our soldiers. We have an excellent group of faculty dedicated to this effort and, thus far, we've been able to provide information back to our soldiers in 24 hours or less! Additional partners include the USDA's Natural Resources Conservation Service (NRCS) and the National Agroforestry Service.

The 58 Nebraska National Guard soldiers serving on ADT2 all have some agricultural experience and volunteered for this mission. Soldiers are training qualified local Afghans to be Extension Educators; to take knowledge to the rural people and improve their lives and sustainability. They are also developing research and demonstration farms, teaching classes in poultry and beekeeping production, working with local universities, and conducting watershed, irrigation, and wheat distribution projects. Thirty years of war resulted in a huge loss of agricultural knowledge and has set the country back 100 years compared to where production agriculture in Nebraska is today. If we can teach the Afghan people how to sustainably grow their own food to feed and provide for their families, then hopefully they won't have to rely on the poppy and drug markets which feed terrorism.

The 12 soldiers of the "ag team" responsible for training the Afghan people had the opportunity to get to know UNL Faculty through pre-deployment training conducted in the areas of wheat/specialty crops/irrigation/old equipment, livestock and veterinary practices, fruits/vegetables/greenhouses, water quality, food preservation, and beekeeping. Extension Educator Gary Zoubek and I coordinated training involving over 25 UNL Extension Specialists and Educators at Scottsbluff, Lincoln, Nebraska City, and the ARDC near Mead. Our UNL team is currently training ADT3 and has been able to improve our training as we received more information regarding conditions in Afghanistan and training suggestions from ADT2. We also have developed a clearinghouse of all training materials, resources, and photos for the Nebraska ADT teams at <http://cropwatch.unl.edu/militaryresources>.

Our ADT2 soldiers along with UNL Extension Educator Vaughn Hammond are making great strides toward helping the Afghan people. I'm so proud of them and thankful for their service! Here's wishing all of them a safe and productive remainder of their deployment!

Spring Lecture Series *continued from page 1*

increasingly critical tool used for water management, both for quantity and quality. UNL is increasingly interested in modeling and this series is designed to help explore the different aspects of modeling UNL could get more involved with. The speakers for these lectures are tops in their fields, with many known internationally for their modeling work," said Water Center assistant director and seminar organizer Lorrie Benson.

"After Jan. 11, subsequent lectures will give everyone a better understanding of the different types of models being developed and used, ranging from large, global, theoretical models to very applied models for specific uses, such as predicting water quality in agriculturally-dominated landscapes. One lecture will explore how human dimensions aspects, such as economics, are incorporated into models," Benson explained.

Modeling sub-series partners include Earth and Atmospheric Sciences Stout lecture series, Environmental and Water Resources Engineering lecture series and Geography lecture series, with support from the Robert B. Daugherty Water for Food Institute

"Many of the modeling lectures will be part of the Water Center series on Wednesday afternoons, but others will be included in the other series mentioned above," Benson said.

Other lectures in the weekly series will delve into topics such as water resource management conflicts in the Middle East, valuing freshwater ecosystem goods and services, in-stream flows, and cli-

mate change impacts. The final lecture of the series will look at factors to consider in moving water resources from where they are to where they are needed. This lecture is tentatively scheduled to be a panel presentation that will include the director of Aurora (CO) Water, a utility with significant experience in buying water and building pipelines. Other invited speakers include an engineer with experience building pipelines, and Don Blankenau, a Nebraska water lawyer to address the legal and political factors to consider.

There will be no lecture on March 21 due to UNL spring break. No lecture is scheduled on Feb. 15, with Benson urging people to attend the E.N. Thompson Forum on World Affairs lecture at 7 p.m. on Thursday, Feb. 16 where Mogens Bay and E. Robert Meaney will discuss whether a global water crisis is avoidable. That lecture is at Lincoln's downtown Lied Center for Performing Arts and is free to the public, but tickets are required. For more information on the lecture and E.N. Thompson Forum, go to enthompson.unl.edu.

UNL's School of Natural Resources, Robert B. Daugherty Water for Food Institute and Institute of Agriculture and Natural Resources help sponsor the Water Center lecture series.

A complete schedule for all lectures is on the Water Center website at watercenter.unl.edu. Videos of most lectures, along with speaker PowerPoint presentations, will be posted on the Water Center web site within a few days of lectures.

NEWS BRIEFS

USGS Study

A new USGS study evaluates the occurrence of 23 trace elements and radon in groundwater samples from over 5,000 wells collected nationwide from 1992-2003. The report presents trace element occurrence, describes factors that influence the spatial distribution of trace elements, and compares concentrations to human-health benchmarks. A news release and the full report can be accessed online at <http://water.usgs.gov/nawqa/trace/pubs/sir2011-5059/index.html>.

Selected Highlights:

About 20 percent of untreated water samples from public, private, and monitoring wells contain concentrations of at least one trace element, such as arsenic, manganese and uranium, at levels of potential health concern.

Differences in the concentration of trace elements are related to the climatic conditions and land use of the area.

Basic geology and geochemistry of water samples helps to predict risk of trace elements exceeding human-health benchmarks.

About 10 percent of wells that had a trace element concentration in excess of human health benchmarks actually contained two or more trace elements exceeding human health benchmarks.

This study is part of the USGS National Water-Quality Assessment Program, which has assessed the physical, chemical, and biological characteristics of streams, rivers, and groundwater across the Nation since 1991.

\$15.3 Million Contract Awarded for Red Willow Dam Modification

U.S. Bureau of Reclamation (USBR) Commissioner Michael L. Connor said that SEMA Construction of Centennial, Colorado, has been awarded a \$15,346,900 contract to conduct extensive modifications of Red Willow Dam.

The dam, located 10-miles northwest of McCook, was slated for repair after USBR examinations in October 2009 discovered a

sinkhole on its face. Subsequent investigations revealed embankment cracking, prompting USBR to lower Hugh Butler Lake, which is impounded by Red Willow Dam.

“This investment will ensure Red Willow Dam will continue to serve the people of Nebraska and the nation for future decades. This contract helps us restore one of our key structures and helps create job opportunities,” Conner said.

After Reclamation identified the dam safety issue, a Corrective Action Study was initiated in February 2009, and dam repair alternatives were evaluated. USBR issued a preferred alternative and a subsequent modification report was prepared and submitted to Congress for consideration and subsequent approval earlier this year.

Red Willow Dam is an earthfill embankment that forms a reservoir of 86,630 acre-feet. An ungated concrete spillway is located in the right abutment. An outlet works through the base of the dam provides for river and irrigation releases for downstream diversions.

New Edition of *Modeling Water Quality in Distribution Systems*

American Water Works Association (AWWA) has republished a new edition of *Modeling Water Quality in Distribution Systems*.

As water flows through the distribution system to the consumer it may go through unwanted changes in quality. Computer modeling is a realistic simulation of the water quality in utility distribution systems, tracking the water as it moves through the system to determine where and how quality might be compromised. By utilizing this technology, utilities can understand and prevent changes in water quality, ensuring that the tap water that reaches customers is the same high quality water that left the treatment plant.

Written by modeling expert and EPANET developer, Robert M. Clark, *Modeling Water Quality in Distribution Systems* guides utilities in choosing and implementing a realistic computer simulation of a wide range of operational and design variables - including various scenarios to model and monitor TTHMs, disinfectant decay, chemical reactions, supply-and-demand over time, hydraulics, tank mixing, blended waters, pipe system layouts, and many other parameters.

Modeling Water Quality in Distribution Systems is now available through AWWA's online bookstore at awwa.org/bookstore.



Read us on your
iPhone or Android.

Links to Images of Recent Flooding and Flood Damage on the Missouri River

The following links to recent flood and flood damage photos of the Missouri River basin were provided via John Wilson, UNL Extension Educator in Tekamah, Burt County, Nebraska

According to Wilson “Here are two sources of images that document the flood damage from late May up through Sunday, Oct. 2... and I know there will be more posted later. I think all of these were taken between Omaha and Sioux City... and the majority of them were taken on both the Nebraska and Iowa sides of the Missouri River adjacent to Burt and Washington counties.”

- <http://www.leevalley.net/missouririverflood.htm>
(Images taken May 28 through August)

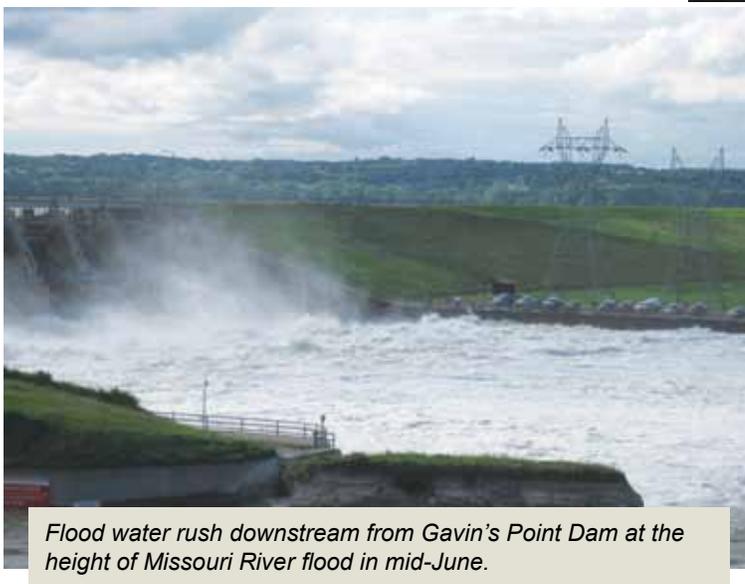


Omaha's skyline, seen over Missouri River flood waters last June.

- <http://www.flickr.com/photos/leevalleyfloodpics>
(Images taken since September 1)

Local farmer Scott Olson, who has a private pilot's license, took the images. He, along with his brother and father also run a farm machinery dealership north of Tekamah called Lee Valley Farm Equipment and farm primarily on the Missouri River bottom.

Olson has taken a lot of pictures over the last four-plus months and will continue to do so. They had about 500 acres that were affected by the flood as well. You will be able to pick out their farm because the images have a caption about the “River Farm.”



Flood water rush downstream from Gavin's Point Dam at the height of Missouri River flood in mid-June.

Wetlands Report *continued from page 20*

communities and provides vital habitat for a diversity of important wildlife species.” The southeast United States, primarily freshwater wetlands of the Atlantic and Gulf coastal plain, and the Lower Mississippi River experienced the greatest losses. Losses were also observed in the Great Lakes states, the prairie pothole region, and in rapidly developing metropolitan areas nationwide.

The reasons for wetland losses are complex and reflect a wide variety of factors, including changes in land use and economic conditions, impacts of the 2005 Gulf Coast hurricane and climate change impacts.

Further examination of wetland condition on a national level has been initiated by the U.S. Environmental Protection Agency in conjunction with USFWS and other federal, state and Tribal partners.

Wetlands provide habitat for fish, wildlife, and a variety of plants. They are nurseries for many saltwater and freshwater fishes and shellfish of commercial and recreational importance. They are also important landscape features because they hold and slowly release flood water and snow melt, recharge groundwater, act as filters to cleanse water of impurities, recycle nutrients, and provide recreational opportunities for millions of people.

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Five-Year Survey Shows Wetland Losses Slowing

America's wetlands declined slightly from 2004-2009, underscoring the need for continued conservation and restoration efforts, according to a report by the Department of the Interior's U.S. Fish and Wildlife Service (USFWS).

The findings are consistent with USFWS's Status and Trends Wetlands reports from previous decades that reflect a continuous but diminishing decline in wetlands habitat over time.

The report, which represents the most up-to-date, comprehensive assessment of wetland habitats in the U.S., documents substantial losses in forested wetlands and coastal wetlands that serve as storm buffers, absorb pollution that would otherwise find its way into the nation's drinking water, and provide vital habitat for fish, wildlife and plants.

"Wetlands are at a tipping point," said Secretary of the Interior Ken Salazar. "While we have made great strides in conserving and restoring wetlands since the 1950s when we were losing an area equal to half the size of Rhode Island each year, we remain on a downward trend that is alarming. This report, and the threats to places like the Mississippi River Delta, should serve as a call to action to renew our

focus on conservation and restoration efforts hand in hand with states, tribes and other partners."

"This report offers us a road map for stemming and reversing the decline," said USFWS Director Dan Ashe. "It documents a number of successes in wetlands conservation, protection and reestablishment, and will be used to help channel our resources to protect wetlands where they are most threatened and reduce further wetland losses."

Net loss was estimated to be 62,300 acres between 2004 and 2009, bringing the nation's total wetlands acreage to just over 110 million acres in the continental U.S., excluding Alaska and Hawaii.

Rate of gains from reestablishment of wetlands increased by 17 percent from the previous study period (1998 to 2004), but the wetland loss rate increased 140 percent during the same time period, meaning national wetland losses have outpaced gains.

"In a five year period, we lost over 630,000 acres of forested wetlands, mostly in the Southeast – an area equal to half a million football fields each year," Ashe said.

"We should all be concerned about the substantial loss of this diminishing resource, which helps ensure good water quality for local

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