Diego Riveros-Iregui, Ph.D.

Diego Riveros-Iregui is an assistant professor of watershed hydrology in the University of Nebraska–Lincoln’s School of Natural Resources. He came to UNL in August 2010. His professional interests are in watershed hydrology; eco-hydrology; land-atmosphere interactions; ecosystem-climate-water interactions; biogeochemistry in moisture-limited regions; stable isotope hydrology/ecology; land-use change hydrology; soil physics; and complex terrain hydrology.

Education:
Ph.D., Ecology and Environmental Sciences, Montana State University, Department of Land Resources and Environmental Sciences, 2008.

UNL Water Center Becomes Groundwater Guardian

The Lincoln-based Groundwater Foundation has named the University of Nebraska–Lincoln’s Water Center a 2010 Groundwater Guardian Affiliate.

The recognition acknowledges the Water Center’s efforts to support communities working to protect local groundwater supplies. It is among 35 Affiliates in 15 states, as well as 131 Communities in 34 states and one Canadian province, to earn Groundwater Guardian (GG) designation.

2010 is the Water Center’s first year of designation as a GG Affiliate.

The program recognizes and encourages local groundwater protection and education activities. GG Communities form teams of local stakeholders that implement activities to address local groundwater concerns and issues, ranging

Water Tour Will Visit North Central Nebraska July 12-14

By Steve Ress

July 12-14 are the dates for this year’s annual water and natural resources tour, which will focus on ground and surface water issues in the Niobrara and Loup River basins.

Members of the tour’s planning committee made preliminary visits to a variety of locations in the central and north-central Nebraska tour area in early December 2010 and are now beginning to sort-out a long list of possible tour stops, speakers and feeding and lodging arrangements.
I am delighted to be back in Lincoln serving a second term as the interim Director of the Water Center. I am excited about the full slate of activities for the year, detailed near the end of my column, that the Water Center is sponsoring.

I had a very productive and positive initial meeting with our new IANR Vice Chancellor and NU Vice President Ronnie Green earlier this month. Though Ronnie has been on campus since July, my Fulbright trip to the Czech Republic over the past several months precluded us getting together until now.

As many of you already know, Ronnie is energetic, strategic and thoroughly committed to moving IANR’s support for Nebraska agriculture and natural resources into the 21st Century. His drive and commitment to these goals is very contagious and it’s reassuring to know that he views the Water Center as a valuable, key player in doing what’s best for Nebraska in all areas of water conservation, use, water quality, etc. It is envisioned that the Water Center will be under the big tent umbrella of water programs associated with the new global Water for Food Institute, but with the specific mission and role of focusing on Nebraska water needs and issues.

I think it’s safe to say he sees the Water Center as being extremely important in NU’s rapidly evolving and emerging status as a national leader in water research, programming and education. Thus, as the Water for Food Institute hires a permanent director and comes more into its own over the next year, or so, there will be many opportunities for the Water Center to partner with it, to the mutual good and for the benefit of our constituents.

These collaborations are fully consistent with the history and traditions of the Water Center, in adapting to new needs in the state and at the University. The bottom line is that the Water Center has been serving Nebraska since 1964 and it will continue to fulfill its mission to serve the state, faculty and stakeholders.

I recently returned from Prague, Czech Republic where I was on a visiting Fulbright Scholar at the Environmental Technology faculty of the Vysoká Škola Chemicko-Technologická v Praze (Institute of Chemical Technology).

I was engaged in lecturing (in English), developing research collaborations, and interacting with the broader Czech water supply community. This was a once in a lifetime experience for myself and my young family.

I found it interesting to learn how the Czech higher education system worked in terms of degree programs, research funding, and faculty evaluation. Although their educational system is different than ours, they face many of the same pressures and challenges, and often have similar responses.

In terms of the larger water industry, under socialism (which was in place from just after World War II to 1989) there was massive misuse of water as a natural resource with significant pollution of groundwaters (e.g., nitrates) and surface waters (e.g., nutrients and metals) and few water use constraints on industry. Since the revolution of 1989 (heralded here as the fall of the Soviet Union), the Czech drinking water and wastewater industry has undergone a painful transition.

Adjustments to market pricing have cut water use dramatically; in some sectors water use is half of 1985 levels. Privatization of
MEET THE FACULTY

Stephen L. Young, Ph.D.

Steve Young is an assistant professor and weed ecologist in the University of Nebraska–Lincoln’s Department of Agronomy and Horticulture/West Central Research and Extension Center, North Platte. Young came to UNL just over a year ago. He is interested in the application of integrated pest management techniques, including new technology leading to sustainability in crop and non-crop systems, as well as the dynamics of plant competition, particularly the impact of life history and resource acquisition in sustainable systems. Additional interests are in ecosystem processes involving plant-soil interactions, which significantly affect soil hydrology and biology in crop and non-crop systems.

Education:
M.S., Plant Science, University of Idaho, Moscow, 2000.

Examples of Current Research/Extension Programs:

Research:
1) Monitoring and risk map development to manage invasive plant species (IPS),
2) Field-scale analysis to determine IPS spread rates,
3) Applied and experimental methods to control IPS and understand invasion dynamics, 4) Ecological implications for the use of IPS as a bioenergy source,
5) Implementing the science of adaptive management and ecosystem services valuation into policy.

Extension:

1) Noxious and Invasive Plant Species Ecology and Management Short Course. Young has organized an annual course at UNL WCREC, which will begin in 2011, to provide training for land managers (public and private), land owners, policy makers and graduate students, who are interested in the basics of noxious and invasive plant ecology and management.
2) Precision Ag Practicum. Young is teaching participants on the topic of variable rate technology. Continued advancements in sensor technology and precision application equipment could someday allow growers to manage crops at the individual plant scale. His interest is automation and vision systems for weed control in agronomic crops.

Examples of Past Research/Extension Programs:

Research:
While a post doc at Washington State University’s Center for Precision Agricultural Systems (CPAS), Young conducted research with a team of university and USDA-ARS scientists on biofuel production in the inland Pacific Northwest. His involvement was related to the quantification of the impacts of production of biofuel crops (i.e., corn, wheat, switchgrass) on soil biology and chemistry, biomass productivity, and C and N translocations in the plant and their transformation in the soil.
Prior to joining WSU, Young earned a Ph.D. in Soils and Biogeochemistry from the University of California, Davis, 2007. His research focused on the effects of species diversity and soil water dynamics on the carbon cycles at the watershed scale, include:
1.) Effects of Topographic Network Complexity and spatially variable soil moisture on the Watershed-Scale Carbon Dynamics.
2.) Variability of Carbon Exchange between the land and the atmosphere as a response to changing environmental conditions.
3.) Hierarchical process modeling to predict the covariance between water and soil-respired CO2 across heterogeneous landscapes.
4.) Coupled climatic and topographic effects on ecosystem carbon losses to streams and to the atmosphere.

Examples of Past Research/Extension Programs:

The fate of biogenic methane across the surface water – groundwater interface.

Teaching:
Watershed Hydrology
Eco-hydrology

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Diego Riveros-Iregui, Ph.D.

Riveros-Iregui is interested in research themes focused on: 1) hydrological and geochemical transport in the soil and the stream; 2) plant and microbial activities and resulting land-atmosphere exchange of gases such as CO2 and CH4 in forests and wetlands; and 3) hydrologic controls in space and time over land-atmosphere interactions. He has a field-based research program which he complements with tools such as geographic information systems, quantitative terrain analysis, stable isotope analysis for carbon and water, process modeling, and model-data assimilation techniques. Some examples of his current research projects, which focus broadly on the links between the hydrologic and physical sciences, are: 1) Effects of Topographic Network Complexity and spatially variable soil moisture on the Watershed-Scale Carbon Dynamics, 2) Coupled climatic and topographic effects on ecosystem carbon losses to streams and to the atmosphere.

Examples of Current Research/Extension Programs:

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The University of Nebraska–Lincoln Water Center’s free water and natural resources seminars continue through April.

This year’s lectures focus largely on urban stormwater runoff and global climate change, along with other topics. The 14-lecture run began Jan. 19 and continue weekly through April 27.

“Our goal is to give students and the public opportunities to hear top local and national speakers address timely water and environmental topics,” said UNL Water Center assistant director and seminar organizer Lorrie Benson. “One of the very best things about this series is always free and people can pick and choose which lectures they want to attend.

The lectures are each Wednesday through April 27, except March 23, which is during UNL spring break. 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.

Stormwater runoff experts from across the country will give several of the lectures. Their talks are co-sponsored by UNL Extension’s Stormwater Management Team.

Some of the lectures explore topics related to climate change and concepts of global warming. Other topics are being presented, as well.

A change in the lecture line-up takes place March 2 when South Dakota’s John H. Davidson steps-in for University of Nebraska College of Law professor Sandi Zellmer, who will be traveling overseas with a group headed by NU President J.B. Milliken.

Zellmer was scheduled to speak on “More Mud in the Missouri: CWA vs. ESA.” The Missouri River theme of that talk will be taken up by Davidson with “Recent Developments in the Missouri River Basin: Conflict, stabilization, and the law.”

The course is three days of intense instruction and learning for those interested in the basics of invasive plant ecology and management and includes presentations, hands-on workshops, site visits and instructor-led discussion sessions on the latest in invasive plant ecology and management,” said course moderator and UNL weed ecologist Steve Young.

“West Central Nebraska hosts many of the same invasive plant species found throughout North America, so it is an ideal location for the course,” Young said.

Registration is $650 and registration deadline is May 1. The course is limited to the first 40 participants. The course is primarily for land managers, public and private landowners, researchers, policymakers and students.

In addition to UNL experts, instructors will come from U.S. Department of Agriculture – Agricultural Research Service, Oregon Department of Agriculture, Kansas State University, Montana State University, University of Wyoming, and other locales.

Continuing education unit (CEU) and graduate student credit is available from several sponsoring organizations. Scholarships to help offset costs are available for the first 10 graduate students registering. The course brochure, which includes daily course activities and registration details, is online at http://ipscourse.unl.edu. For additional questions, phone (308) 696-6740 or email llehmann1@unl.edu

Course cosponsors include Weed Science Society of America, Society for Range Management, Natural Resources Conservation Service, Nebraska Invasive Species Project, North Central IPM Center, Center for Invasive Plant Management and the Soil and Water Conservation Society.
Geothermal: Nebraska’s Abundant, Renewable, and Clean Energy

By Wayne E. Woldt, Ph.D., P.E., Environmental Engineer
UNL Department of Biological Systems Engineering and School of Natural Resources

Nebraska has abundant geothermal energy, renewable and easily tapped, that remains one of the most well kept secrets in the state. I would like to see this change, increasing opportunities for its deployment and use statewide.

Most people don’t realize Nebraska has tremendous potential for geothermal energy development, due to our abundant groundwater reservoirs. In this case geothermal energy can be described as “low temperature”, and the technology used to extract it from the subsurface is termed Ground Source Heat Pump (GSHP).

GSHPs can be used to meet heating and cooling demands for residential, commercial and industrial applications. One of the fastest growing segments of energy consumption in the U.S. is related to the ever increasing demand for heating and cooling, which is precisely the application that Nebraska, with its plentiful groundwater, is well positioned to provide. In a certain sense, our plentiful Nebraska groundwater represents a strategic clean energy reserve that can be harvested to help meet national energy needs. In addition, GSHP technology is considered a renewable energy, since it relies on the sun to heat the earth and shallow subsurface water.

Use of GSHP involves the transfer, or “pumping”, of energy from one location to another. The technology uses well-known mechanical systems to move the energy, which is much more efficient, and environmentally friendly, than generating energy from coal for other sources. The technology emerged in the mid-1950’s, and the GSHP industry has been growing and evolving ever since, even during challenging economic times.

Just what is the geothermal potential for Nebraska? Rough calculations, and estimates indicate that if one percent of the groundwater under Nebraska were to change temperature by one degree centigrade, the equivalent of 50 billion kilowatt-hours of energy would be exchanged, which is more than twice the annual amount of electricity sold by Nebraska Public Power District. This is a huge amount of energy, and still only represents one percent of the groundwater and one-degree change in temperature.

How do GSHP systems work to provide clean and renewable energy to Nebraskans? Ground source heat pumps work by moving heat from one location to another. In the winter, they move heat from the ground, and groundwater, into a building where it can be used for heating or industrial processes. Even though groundwater may seem cool at 55 °F, it actually contains significant energy. In the summer, the process is reversed, and the heat from a building or industrial process is removed from the source and transferred into the ground, and groundwater. GSHPs generally require three main components: 1.) Heat exchanger or ground loop, 2.) Heat pump and 3.) Heat transfer system such as air ducts (Figure 1). The heat exchanger, or loop, is simply a length of tubing placed underground and used to transfer heat from the ground to the heat pump. The loop can be placed in a vertical or horizontal orientation (Figure 1).

In some cases the loop can be placed in a pond or lake (Figure 1), and in other cases groundwater is used in an open loop system (Figure 2). In all cases, the better the contact between the ground loop and groundwater, the better the system efficiency.

To explore this topic further and begin the geothermal energy discussion in Nebraska, I organized a workshop involving state agencies, industry, non-profit organizations, and others. The workshop helped illuminate some of the opportunities and challenges for geothermal energy in Nebraska.

For example, it was pointed out that energy demands for buildings provide one of the best opportunities to economically reduce energy consumption and limit greenhouse gas emissions. If this is accomplished in the commercial sector, then business and industry will be able to claim a “green” component to their enterprise.

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WRAP Gets January Updates

By Rachael Herpel, NU Water for Food Institute and UNL Water Center

The Water Resources Advisory Panel (WRAP) met with NU Vice President and IANR Harlan Vice Chancellor Ronnie Green and NU Vice Chancellor for Research and Economic Development Prem Paul in early January. Green told the group efforts are underway to identify key positions to help faculty build bridges to achieve Nebraska’s water research goals. Since the Jan. 4 meeting Green has proposed “Innovating Agriculture and Natural Resources to 2025: Food, Energy, and Water Security – for Healthy People in Vibrant Communities.”

Proposed goals serve as the starting point for 11 innovation teams to develop recommendations and implementation plans. Goals specific to water include increasing production efficiency of Nebraska agriculture by 25 percent and increasing water utilization efficiency for agriculture by 15 percent. See http://ianrhome.unl.edu/Home for more information on this program and a video of Green’s presentation.

Paul provided the latest on NU’s Water for Food Institute, including how NU, Harvard University, and Massachusetts Institute of Technology have formed a consortium to work together on water for food research programs.

WRAP members viewed the Water for Food Institute’s new website at waterforfood.nebraska.edu.

Jess Gets 2010 Kremer Groundwater Award

Retired University of Nebraska–Lincoln lecturer J. Michael Jess received The Groundwater Foundation’s 2010 Maurice Kremer Groundwater Achievement Award.

The award was presented in November 2010 at the Nebraska Water Resources/Nebraska State Irrigation Association Conference in Kearney.

The prestigious award was established 25 years ago to recognize Nebraskans who have made a substantive contribution to the conservation and protection of Nebraska’s groundwater.

Selection committee member and Central Nebraska Public Power and Irrigation District general manager Don Kraus said, “few can match the depth of Mike’s knowledge of and experience with Nebraska’s water resources. His efforts over the years to improve the management, regulation and sustainability of the state’s water resources, to promote a better understanding of the interrelationship between groundwater and surface water, and to protect the quality and quantity of groundwater make him a very deserving recipient of this award.”

Jess’ long career in water includes having been an assistant hydrologist for UNL’s Conservation & Survey Division (CSD); a first lieutenant in the U.S. Army Corps of Engineers; and staff hydrologist at the Illinois State Water Survey.

In 1975 he was named deputy director of the Nebraska Department of Water Resources, then director in 1981. He served as Nebraska’s Commissioner for the U.S. Supreme Court decree in Neb v Wyo and for four interstate Compacts charged with apportioning river flows between Nebraska and adjoining states. While serving as Chairman of the Nebraska Boundary Commission, he successfully negotiated boundary Compacts with South Dakota and Missouri.

Jess came to UNL in 1999 with appointments to CSD and the Water Center. He taught several undergraduate and graduate classes in the School of Natural Resources and at the NU College of Law. His research interests included investigation of Nebraska’s rivers and aquifer systems and the formulation and execution of policies that govern uses of water.

Jess retired from UNL in 2009 and currently works as a consulting engineer specializing in an array of water resources matters such as identification and mapping of groundwater deposits and disputes over irrigation, drainage and property boundaries. He has published numerous articles about Nebraska water issues.

Kremer Award selection committee members are: Jim Goike, UNL; Jane Griffin, president, The Groundwater Foundation; Kraus; Bob Kuzelka, UNL; and Susan Seacrest, founder and former president, The Groundwater Foundation.

Words associated with energy are often nuanced.
Flow, force and resistance all define physical processes, but they also have more subtle meanings as related to popular lexicon. Expressions like “Go with the flow,” “May the force be with you,” or “Resistance is futile” illustrate the breadth of meaning that these energy words are able to convey.

Power is another energy word that has shouldered the burden of multiple meanings. Within the field of environmental science it can be used in a variety of contexts. This variety is informative as it relates to the field of environmental science and is worth considering in more detail.

One definition of power is related to the exertion of great force or strength. In science, strength is proportional to resolution and environmental scientists certainly revel in swinging this hammer!

Using the latest analytical tools, we can now measure chemicals in water at levels in the parts per trillion, and we can now discern, in amazing detail, the fate and transport of these chemicals in the environment. Furthermore, with our capacity to explore harsh environments, we can now employ these measurements on water samples taken from virtually any place on the planet. Even water circulating at the polar ice caps beneath tens of meters of ice isn’t so remote that it can’t be effectively sampled.

A second definition of power involves increasing the social strength of individuals and communities, with the form of the word most often employed being ‘empowerment’.

Empowerment is life fulfilling and educational empowerment of students is a commitment many academic environmental scientists take very seriously and hold dear. Furthermore, development of an empowered populace is pragmatic as empowered individuals are more likely to be civic-minded and vote.

After all, an educated and empowered populace can make the most informed political decisions, through judicious use of the ballot box. It can be argued that the Clean Water Act, Clean Air Act, and the U.S. Environmental Protection Agency were spawned from actions of an empowered, environmentally minded, voting citizenry.

Very often the two different types of environmental power, high-resolution research and an empowered citizenry are viewed as being so different that neither informs the other. Is there a way that environmental science can capitalize on both these sources of power? I would argue that yes, a third source of power that incorporates both resolution and empowerment can exist. To define this source of power necessitates another definition of the word.

Statistically, power is the ability to determine the probability of detecting a change in the environment given that a change has truly occurred. If one event (for example point source pollution into a local waterway) is closely associated with a second (fish die-offs) then the probability of the fish die-off occurring randomly is extremely low.

Modern environmental science is based upon determining whether events have occurred by chance alone or whether the changes were brought about by specific actions or environmental alterations.

Enhanced statistical power can be derived from enhanced resolution and this has, in part, driven the analytic chemist to quantify chemical contaminants in water at lower and lower concentrations.

What may be overlooked however is that an increased number of observations, or sample size, can also increase statistical power. Given that enhanced resolution is often expensive and time consuming, it generally comes at the expense of sample size. An entire field of statistics has developed to inform scientists of the minimum number of samples that they need to collect to maintain overall statistical power.

Citizens that have been empowered through education, represent a workforce that environmental scientists can use to generate statistically powerful datasets.

Imagine if all of the empowered “Citizen scientists” in Nebraska could collect and analyze a single surface water sample from a specific watershed all on the same day. This workforce could canvas a very large geographical area, and could synchronously collect hundreds of samples.

The statistical power from such a large data set would allow the environmental scientist to approach scientific inquiry in ways that have never been possible before.

But how can citizen scientists possibly collect data of sufficient quality that it could be of use to professional environmental scientists? They already do. Home pregnancy tests, lead testing kits, and chlorine testers for swimming pools or home aquariums all test for chemical concentrations at low levels.

Data collected are generally presence or absence results (known as ordinal data), and of course, resolution is not as great as that which could be generated by a professional laboratory. Still, the technology is available so that empowered citizen scientists can collect chemical data that are consistent, reliable and scientifically powerful.

There are many different ‘powers’ that are being brought to bear upon current environmental issues. It is important for environmental scientists to put all these powers to work on vexing environmental issues of our time.

My next Water Current article will elaborate this topic and discuss in more detail how citizen scientists, as a workforce, can pragmatically be mobilized into a serious, data-collecting force.
Edward F. Vitzthum, past interim director of the UNL Water Center and longtime director of its once associated Environmental Programs office, passed away in Lincoln just before the holidays.

Vitzthum, 74, died peacefully at his Lincoln home on December 17, 2010.

The Pontiac, Ill. native was a graduate of Judge Memorial High School in Salt Lake City, Utah and attended Creighton University in Omaha, where he was a member of the Golden Yacht Club, graduating in 1958.

Upon graduation, Vitzthum began a journalism career in Montrose, Colo., then worked for the Salt City Tribune for several years before moving to Nebraska with his wife and children.

After many years with Nebraska Educational Television, he earned a Masters Degree and Ph.D. in higher education from the University of Nebraska and began a 25-year career in the Agricultural Leadership, Education and Communication Department within UNL’s Institute of Agriculture and Natural Resources.

During this period, Vitzthum served as associate director of Environmental Programs from 1975 to 1989, then as its director until his retirement from UNL in December 2001. The office was once part of the UNL Water Center. It is now the Pesticide Education Office within UNL’s Department of Agronomy and Horticulture.

Vitzthum also served as interim director of the Water Center from March 1999 to June 2000 after Director Bob G. Volk left UNL to become director of the Water Resources Research Institute at the University of Kentucky.

Vitzthum also served more than 30 years as a field artillery officer in the U.S. Army Reserve, retiring as a Colonel in 1988.

Vitzthum and wife Pat were huge Huskers fans and avid fishermen, spending numerous summers fishing and boating in Minnesota. He was an avid marksman and enjoyed competitive shooting throughout his life. A farm boy at heart, he enjoyed working at the Husker Harvest Days each year and collecting John Deere memorabilia.

Church-life played a prominent role in both he and wife Pat’s lives. As members of St. Joseph’s Parish in Lincoln since it’s opening, they counseled more than 230 couples through the Marriage Preparation Program. He was also active as an acolyte, lecturer, and RCIA instructor and was a lifetime member of the Knights of Columbus.

He is survived by his wife of 51 years, Patricia; his three children, Theresa Vitzthum (Lincoln), John Vitzthum and his wife Debra (Sewell, N. J.), Barbara Melbourne and her husband Steve (Bettendorf, Iowa); four grandchildren; and four sisters.

U.S. Environmental Protection Agency (EPA) has issued guidance to water systems on how to assess the prevalence of the contaminant hexavalent chromium, also known as chromium-6, in drinking water.

Recommendations are in response to emerging scientific evidence indicating chromium-6 could pose health concerns if consumed over long periods.

“As we continue to learn more about the potential risks of exposure to chromium-6, we will work closely with states and local officials to ensure the safety of America’s drinking water supply,” said EPA administrator Lisa Jackson. “This is another step forward in understanding the problem and working towards a solution based on the best available science and the law.”

Enhanced monitoring guidance provides recommendations on where and how often systems should collect samples along with analytical methods for laboratory testing.

Systems performing the enhanced monitoring will be better able to inform consumers about any chromium-6 in their drinking water, evaluate the degree to which other forms of chromium are transformed into chromium-6, and assess which existing treatment affects levels of chromium-6 in drinking water.

EPA currently has a drinking water standard for total chromium, which includes chromium-6, and requires systems to test for it. Testing is not required to distinguish what percentage of the total chromium is chromium-6 versus other forms such as chromium-3, so EPA’s regulation assumes that the sample is 100 percent chromium-6. This means the current chromium-6 standard has been as protective and precautionary as current science allows.

EPA’s latest data show that no public water systems are in violation of the standard, but the science behind chromium-6 is evolving. The agency regularly re-evaluates drinking water standards and, based

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Earlier this year, the Central Platte Natural Resources District (NRD) was finalizing the first-ever buyout of a surface water irrigation canal in Nebraska.

The agreement would free up money for farmers to convert to more efficient groundwater irrigation and increase Platte River flows. The buyout could be a precursor to similar arrangements in other parts of the state as farmers try to switch from using labor-intensive, inefficient surface-water irrigation to groundwater irrigation and NRDs work to put more water in the state’s rivers.

“This project allows us to return water to the river which will help protect endangered species, make irrigation more efficient for farmers, put more land into crop production, and improve public safety,” said Ron Bishop, Central Platte NRD general manager. The NRD has negotiated a buyout of water rights owned by land owners who were serviced by the Six Mile Canal Company as part of its efforts to increase Platte River flows to levels required under the three-state Platte River Recovery Program and state law.

“Using the best scientific hydrologic analysis available (COHYST – Cooperative Hydrology Study), the closure of the ditch and elimination of direct river diversions will result in an annual savings of 130 acre-feet of water to the river, even if these same irrigated acres of farmland are irrigated with groundwater.

“To put this in perspective, annually that is more than 42 million gallons returned back to the river. In looking at surface water projects in our district and talking with other NRD managers it appears that more than 60 percent of surface water irrigated areas are using groundwater,” said Bishop.

The Six Mile irrigation ditch has been in place and diverting Platte River water since 1894, withdrawing an average of 2,377 acre-feet of water annually. After 116 years of use, the more than 30 land owners and farmers along the Six Mile Canal are eager to convert their land to groundwater use which will be more efficient and reliable than surface water and help protect river flows and endangered species. The vote by landowners to close the canal was unanimous.

For farmers along Six Mile, agreeing to the deal was a matter of dollars and sense.

“With the surface water system, we had to be at the fields several times each day, which increased fuel and labor cost,” said Roger Wahlgren, a Six Mile Canal Board Member. “I can now irrigate with a touch of a button on my cell phone which can turn my pivot on or off and saves me time and labor. By doing this project, it has eliminated short crop rows and probably increased the value of land where the canal used to be by $500 an acre. Now we can leave the water in the river for future uses and save $15 an acre per year in fees for canal operations and maintenance.

“More than 80 percent of acres served by the canal were using groundwater anyway, and under the new agreement the remaining acres can be covered by groundwater irrigation.”

More than a century ago, farming with a team of horses and irrigating from canals was considered “new” technology. Today farmers use tractors with GPS systems to replace horses, and more efficient groundwater irrigation systems to replace surface water irrigation. But much of the farmland was legally bound to the canal irrigation system. Buyouts like the one negotiated between the Central Platte NRD and several farmers in Dawson County whose land was bound to the Six Mile Canal allow farmers to detach themselves from irrigation systems that increasingly don’t make financial or environmental sense.

Benefits of the project include:

1. Protects water supplies, future users, and endangered species by increasing flows to the river.
2. Saves farmers fuel and labor costs, improving their bottom line.
3. Farms can use new technology that makes irrigation more efficient and helps protect groundwater.
4. Allows farmers to efficiently apply nutrients to crops through chemigation systems using center-pivot irrigation.
5. Protects lives, saves the county dollars, and improves roads through reduced maintenance costs while removing bridges and other hazards to drivers within the road right-of-way.
6. Increases productivity and efficiency of the farm. By filling in the canal farmers have added land to grow crops and gains longer, more efficient rows on their property.
7. Eliminating the canal increases flow to the river and irrigates the same amount of acres.

At its peak the canal served irrigation water to approximately 1,700 acres and multiple landowners. Land previously served by the canal will now be served by more efficient groundwater irrigation and the water is being purchased by CPNRD through the NRD’s Water Banking Program. Central Platte NRD started their Water Bank as a solution to balance water that is available with current water uses. There were two major programs that required the NRD to find a solution, including the Platte River Recovery Program (PRRIP) and Legislative Bill 962.

The Six Mile Canal service area was ineligible to participate in the Water Bank because the surface water right could not be transferred. With the closure of the Six Mile Canal, the associated state water right to divert natural flow from the Platte River will be relinquished, making the irrigated acres in the service area eligible for the CPNRD Water Banking Program.

The Platte River Recovery Program is a federal agreement between Nebraska, Wyoming, Colorado and the Department of Interior; with the goal to protect endangered species. LB 962 is a law passed in Nebraska in 2004 that gives the Nebraska Department of Natural Resources the authority to assess water basins on an annual basis. Both of these programs require the NRD to return stream flows back to 1997 levels as part of first increment schedules.

That level has been determined to be 3,400 acre-feet that Central Platte NRD must return back to the river. The CPNRD is purchasing the water to increase stream flow in the Platte River. Currently, the district has acquired nearly 3,000 acre-feet with the purchase of the Six Mile Canal.
“At this point, the organizing committee has a very long list of possibilities that is overly-ambitious for a three-day tour, which is a very good position to be in. Now the sorting of the list and hard decision-making process begins, which is always the difficult part of organizing the tour,” said tour co-organizer and host Michael Jess. “Time, distance and logistical constraints now require an exercise in careful picking and choosing.”

Committee members are focused on having a final tour itinerary and registration fee schedule completed by early April.

Lodging stops will likely be in Ainsworth on July 12 and in Valentine the following night. Arrangements for an outdoor cookout in the Valentine area, as well as a tour of locally produced wine grapes and gourmet vinegars are being investigated.

“During the course of the tour, I expect participants will be exposed to project features and activities supported by three Irrigation Districts and two Natural Resources Districts.

“Some additional features in the tour area could include the Niobrara Valley Preserve, Sargent Irrigation Co., The University of Nebraska–Lincoln’s Barta Brothers Ranch, Merritt Reservoir, Seven Springs Bottled Water Co. in Long Pine, Sandhills Implement Co., The Prairie Club, Fort Niobrara National Wildlife Refuge and Snake River Falls Ranch,” Jess said. “We also are discussing the possibility of a half-day float trip down the Niobrara River.”

Issues related to the Ogallala (or High Plains) Aquifer will be key to the tour. The aquifer is one of the largest in the world, covering an area of about 174,000 square miles in parts of eight states, and is relied upon heavily for irrigated agriculture, drinking water and other uses.

It is key to many conservation, recreation and agriculture issues in central and north-central Nebraska.

Tour cosponsors are Central Nebraska Public Power and Irrigation District, Kearney Area Chamber of Commerce, Gateway Farm Expo, UNL’s Water Center and Institute of Agriculture and Natural Resources and others.

For updates on tour planning, agenda and dates, keep an online eye on watercenter.unl.edu online.
Stephen L. Young, Ph.D.  continued from page 3

establishment of yellow starthistle in restored Central Valley plant communities of California. Among his findings, he identified light and soil water as primary mechanisms for yellow starthistle invasion into native plant communities. Additionally, he quantified plant rooting patterns and activity in situ, to identify prominent peaks in below ground resource acquisition for yellow starthistle and two native perennial plant species.

Examples of Outreach Programs:

1) 2010 Weed Science Society of America Symposium: Advancements in Automation and Machine Guided Technologies for Precision Weed Control. Young organized this symposium with invited speakers to address the issue of robotic weed control systems for site-specific crop production. Machine vision and RTK GPS guidance systems are the latest technologies being researched for use in weed detection and identification in combination with currently available guidance, precision in-row weed control and mapping technologies.

2) 2010 Soil and Water Conservation Society Symposium: Ecosystem Services - The Significance of Contributions by Invasive Plant Species. Young’s goal was to provide a greater understanding of the contribution that invasive plant species are making to terrestrial and aquatic ecosystems. While invasive species continue to threaten many natural and man-made environments and most efforts are in their control or removal, they do provide services to these ecosystems, which have yet to be quantified on a range of scales. Steve invited experts from across the country to help address this fundamental topic, which, to date, has received limited attention.

Diego Riveros-Iregui, Ph.D.  continued from page 3

Selected Publications:


Selected Publications:

Young, SL. 2010. What contributions are invasive plant species making to ecosystem services? Journal of Soil and Water Conservation 65(2):31A-32A; doi:10.2489/jswc.65.2.31A
Young, SL. 2009. Automated weed control in organic cropping systems. Weed Science 57:449-450

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Free Water and Natural Resources Lectures  continued from page 4

Cooperation and Paradox” wherein he will speak about how after the salvo of court decisions involving endangered species and water quality in the Basin, the perception may be that things have settled-down, with the Corps of Engineers carrying-on its many studies, and each state keeping a self-serving eye on reservoir levels.

Below the surface, however, a long and challenging list of developments is underway in the basin, from Canada to Missouri, including new uses, new constituencies and new controversies.

Davidson has been a Missouri River advocate for nearly 35 years and has authored numerous books and articles dealing with water, agriculture and environmental law. He continues to write and teach from time-to-time as a retired professor of law at the University of South Dakota School of Law.

John Gulliver, University of Minnesota, speaking on innovations in stormwater treatment, and Chris Spence of Environment Canada, speaking on lake hydroclimatology in water management, are the series’ two Williams Memorial lecturers.

Williams lectures honor the memory of the late Alan G. and Irene Williams, both of whom were graduates of the University of Nebraska. A fund in their name, in cooperation with the NU Foundation, supports activities associated with the UNL Water Center.

David Breshears of the University of Arizona will deliver the series' Maurice Kremer Memorial lecture. Breshears will speak on rapid and widespread landscape transformations brought on by dust, drought and tree death.

The Kremer lecture acknowledges the water and natural resources legacy of former State Senator Maurice Kremer of Aurora, whose foresight, vision and leadership in the Unicameral on water issues initiated the water planning process in Nebraska.

Most lectures will be videotaped and most speaker materials will be available for viewing online at watercenter.unl.edu after they are presented.

For more information, contact the UNL Water Center at (402) 472-3305. Additional cosponsors are UNL’s Institute of Agriculture and Natural Resources, School of Natural Resources, and Nebraska Center for Energy Science Research.

Remaining Lectures:

March 2: Recent Developments in the Missouri River Basin: Conflict, Cooperation and Paradox, John H. Davidson, University of South Dakota
March 16: Porous Pavements in North America, Bruce Ferguson, University of Georgia (co-sponsored by UNL Extension Stormwater Management Team)
March 23: No Seminar (UNL Spring Break)
April 6: Maurice Kremer Memorial Lecture: Drought, Dust and Tree Death: Rapid and Widespread Landscape Transformations, David Breshears, University of Arizona (co-sponsored by UNL School of Natural Resources)
April 13: Research and Design of Green Stormwater Management Practices, Bill Hunt, North Carolina State University (co-sponsored by UNL Extension Stormwater Management Team)
April 27: Integrating Water and Vegetation to Transform Our Cities: Experiences from Portland, Oregon, Tom Liptan, City of Portland, (co-sponsored by UNL Extension Stormwater Management Team)

Groundwater Guardian  continued from page 1

from water festivals and pharmaceutical take back programs to rain garden installations and wellhead protection activities. These efforts are often supported by affiliate organizations like the UNL Water Center.

“Organizations like the UNL Water Center live up to their designation of a ‘Groundwater Guardian,’” says Groundwater Guardian Director Jennifer Wemhoff. “We say at The Groundwater Foundation that ‘It is because of people that groundwater must be protected, but it is only through the efforts of people that it can be accomplished.”

The Groundwater Foundation is a nonprofit organization with a mission to educate people and inspire action to ensure sustainable, clean groundwater for future generations. Since 1985 it has developed programs, projects, and resources that have educated youth and adults about the importance of groundwater and ways they can help protect it.

For more information about Groundwater Guardian or the foundation go to www.groundwater.org, phone (800) 858-4844, or email guardian@groundwater.org.

GG is supported by the U.S. Geological Survey.
It was also noted that GSHPs provide benefits to electrical energy producers by shaving peak loads and improving load factor. However, for a provider to claim renewable energy credits, there needs to be some method to “meter” the geothermal energy, which is not currently available.

The workshop also noted that geothermal has an increased “up front cost”, and there is a need for enhanced consumer and public policy knowledge and awareness of the benefits of GSHP that compensate for the initial cost. Finally, it was determined that Nebraska is an excellent location for geothermal energy development and can present a compelling case for business and industry to consider locating here to take advantage of the clean energy opportunities that we have to offer.

The broad-based group I am currently working with, as part of my Extension appointment, intends to do more work with representatives from industry, agencies and organizations to advance geothermal energy in Nebraska. We envision a large-scale geothermal energy research and demonstration facility, where different types of ground source heat pump systems are implemented and available for research, teaching and viewing.

As part of my Extension appointment in UNL’s School of Natural Resources, I am able to collaborate with faculty and access the repository of data and knowledge on Nebraska’s natural resources, which makes a perfect fit for efforts to promote geothermal energy research, development and demonstration. Additionally, my appointment in UNL’s Department of Biological Systems Engineering provides a base of support that can underpin the technical component of harvesting geothermal energy. The two entities fit together like hand-and-glove, much like geothermal energy itself; one significant component is tied to natural resources, and the other is tied to engineering and technology.

As we look to the future, and the ever-increasing demand for renewable sources of clean energy, I am convinced that Nebraska, with its tremendous groundwater reservoirs, is poised to rise to the challenge, and lead the nation in efficient and affordable - clean energy.

From the Director continued from page 2

portions of the water industry has lead to layoffs at utilities, and presented opportunities for corruption. During this time period large changes occurred in the economics and regulation of the industry. The way technology and operations were (and currently) are applied was interesting to compare to similar systems in Nebraska since it was clear that a few key factors drove the differences (e.g., energy and coagulants costs, land use barriers, availability of infrastructure capital). A main thread was that the recent changes resulted in very predictable changes in the technology and operations.

There are a number of very significant water-related activities coming up over the next six to eight months that we want you to be aware of. Much more information on each of these events can be found at the listed web sites.

May 1-4: Water for Food: Paths to Solutions, third annual international conference, Lincoln. Sponsored by NU’s global Water for Food Institute. This will include a CEO panel with industry perspectives on water for food, a producer’s panel, technical sessions on yield gap analysis and irrigating with limited water and many other topics. Registration and information are online at http://waterforfood nebraska.edu/wff2011.

July 12-14: Annual Water and Natural Resources Tour of North Central Nebraska (Loup, Niobrara and Snake River basins, Ogallala Aquifer, etc.). Details of the tour are being updated as they become available at watercenter.unl.edu. Registration details should be known by mid-April. As usual, we expect the tour to sell-out quickly.

Oct. 12: Water Law Conference, downtown Holiday Inn, Lincoln. This event will again focus on Nebraska water law and is designed for the practicing attorney, but will also be of interest and use to others such as state agency and Natural Resource District board and staff members, etc.

Oct. 13: Climate, Water and Ecosystems – Shaping the Great Plains, downtown Holiday Inn, Lincoln. This science symposium, the day after the water law conference, includes a poster session. It will focus on the intersection of climate change impacts and water across a wide range of disciplines including fish and wildlife, habitat, agriculture, irrigation, drinking water and wastewater, stormwater, modeling, atmospheric sciences, geology, geography, etc. The focus will be on research and programming in the physical and human sciences.

I would also remind you that our weekly, free public water lectures on Wednesday afternoon continue through April 27 in Hardin Hall on the UNL East Campus, Lincoln. A copy of the lecture series poster can viewed or downloaded at http://watercenter.unl.edu/downloads/Spring_Seminar%20Poster_2011.pdf.

Lastly, I want to add my voice to the chorus of others offering condolences to the family of Dr. Edward F. Vitzthum, past director of Environmental Programs and a former interim director of the Water Center, who passed away in December. Ed was a well-respected faculty member in the Water Center family, as well as within the Agricultural Leadership, Education and Communication Department and at Nebraska Educational Television.

A career journalist by education and profession, Ed’s affinity for hard-nosed editing will forever be seen in the quality of many, many popular publications that left the Water Center over many years… including many issues of this newsletter.
Mark Your Calendars

Upcoming UNL Water Center-sponsored activities include the following:

**July 12-14:** Annual Water and Natural Resources Tour of North Central Nebraska (Loup, Niobrara and Snake River basins, Ogallala Aquifer, etc.). More details, when available, will be online at watercenter.unl.edu. Registration details should be known by mid-April.

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Co-sponsored by the U.S. Geological Survey Nebraska Water Science Center.

Don’t forget our weekly, free public water seminar lectures on Wednesday afternoon in Hardin Hall on the UNL East Campus, Lincoln.

Go online to watercenter.unl.edu for more information on these and other UNL Water Center events and activities.

**River Flow Altered by Management**


USGS assessment provides the most geographically extensive analysis to date of streamflow alteration. Findings show that the amount of water flowing in streams and rivers has been significantly altered from land and water management in nearly 90 percent of waters that were assessed in the nationwide USGS study.

Flows are altered by a variety of land and water-management activities, including reservoirs, diversions, subsurface tile drains, groundwater withdrawals, wastewater inputs, and impervious surfaces, such as parking lots, sidewalks and roads.

The severity and type of stream flow alteration varies among regions, due to natural landscape features, land practices, degree of development, and water demand. Differences are especially large between arid and wet climates. In wet climates, watershed management is often focused on flood control, which can result in lower maximum flows and higher minimum flows.

For more information, contact: Daren Carlisle at (703) 648-6890 or dcarlisle@usgs.gov

WRAP continued from page 6

org and 2010 Water for Food Conference Proceedings, also available online. The 2011 conference, *Water for Food: Paths to Solutions*, is May 1-4 in Lincoln and features plenary addresses by Jeff Raikes, CEO of the Bill and Melinda Gates Foundation; Anil Jain, managing director, Jain Irrigation Ltd. of India; Anders Berntell, executive director, Stockholm International Water Institute; Pasquale Steduto, principal officer, United Nations/FAO Water; and others.

Technical sessions include *Quantitative Food Security: Yield Gaps, Water and Nitrogen Productivity and Maximizing Water Use Efficiency in Agriculture* and a workshop on aquifer characterization, focusing on *Water Resources for Irrigation in Sub-Saharan Africa*. A water quality caucus, led by the University of Nebraska Medical College of Public Health, will be held immediately following the conference. For the latest updates, go to http://waterforfood.nebraska.edu/wff2011.

Paul also briefed WRAP on a Food, Water, and Energy Resources Policy Retreat in December. There faculty began planning a large-scale interdisciplinary research initiative by identifying key national issues in food, water, and energy resources and critical needs for policy research. It also focused on leveraging UNL’s strengths to face these challenges.

UNL’s annual Research Fair will feature speakers and activities to further this work. The fair is April 12-14 and open to the public.

Faculty presentations began with Derrel Martin briefing WRAP on a recent meeting with the Nebraska Water Balance Alliance. The Alliance is posing questions similar to several of the research questions ranked as high priorities by WRAP.

Patricio Grassini, a post-doctoral research associate in UNL’s Department of Agronomy and Horticulture, presented research on water productivity of irrigated corn in Nebraska, conducted in collaboration with UNL’s Ken Cassman and the Tri-Basin Natural Resources District.

Grassini said the research is a framework for producers to diagnose and identify options for higher yields with better crop management using the same water supply; to use less water but achieve the same yield with improved irrigation management; or get higher yields with less irrigation water. This research has been published in *Field Crops Research*, Volume 120 (citations below).

Karie Decker, Coordinator of the Nebraska Invasive Species Project for the Nebraska Cooperative Fish and Wildlife Research Unit within UNL’s School of Natural Resources, closed the meeting by describing Nebraska’s Aquatic Invasive Species Management Plan and efforts to contain the zebra mussel, an invasive species recently found in Lake Zorinsky in west Omaha. She said bills to create the Nebraska Invasive Species Council to help combat aquatic invasive species would be considered by the unicameral this year.


EPA Approves Nebraska’s 2010 List of Impaired Waters

The U.S. Environmental Protection Agency (EPA) has approved Nebraska’s list of impaired waters, which removes 36 waters from the previous list and adds 107 waters, bringing the total number of impaired waters in the state to 259.

EPA Region 7 Administrator Karl Brooks said, “The impaired waters list helps the Nebraska Department of Environmental Quality (NDEQ) set priorities for restoration activities and reduce sources of water pollution in the state. This is a big step toward cleaner water for all Nebraskans.”

NDEQ submitted its impaired waters list to EPA for review and approval as required by the Clean Water Act (CWA). CWA requires EPA to review the state’s list of impaired waters to determine if the state reasonably considered available water quality-related data, and identifies waters to be listed. A water body is placed on the list when monitoring finds that pollutant levels prevent the lake, river, or stream from attaining its beneficial uses. In Nebraska, those include human recreation, agricultural water supply and maintaining healthy aquatic life.

EPA’s January decision letter provides a more detailed description of their review and the basis for this action. It can be found online at http://epa.gov/region07/news_events/legal/.

For more information, contact Kris Lancaster at (913) 551-7557 or email lancaster.kris@epa.gov

EPA Monitoring continued from page 8

on new science on chromium-6, has already begun a rigorous and comprehensive review of its health effects.

In September 2010, EPA released a draft scientific review for public comment.

When the human health assessment is finalized this year, EPA will review conclusions and consider all relevant information to determine if a new standard is needed.

Bin-busting Sampling continued from page 16

spectrometer (LC-MS) systems are used almost continuously for analysis of algal toxins, antibiotics and other pharmaceuticals, as well as steroid hormones in a number of different sample types (water, wastewater, soils, manure, etc.).

LC-MS is becoming the most widely accepted and highly requested instrumental method for low-level analysis of “emerging contaminants”.

Methods for stable isotope analysis using dual inlet, elemental analyzer and continuous flow isotope ratio mass spectrometry are also in demand. In addition to the nitrogen isotope (15N) analysis of nitrate and ammonia, we now offer 18O of nitrate and phosphate. We can measure the relative amounts of the isotopes of water (2H and 18O) by a couple of different methods now. Our lab has also been developing new equilibration methods for running these tracers in plant and soil samples.

While EPA conducts this evaluation, the agency believes more information is needed on the presence of chromium-6 in drinking water. For that reason, they are providing guidance to all public water systems and encouraging them to consider how they may enhance chromium-6 monitoring.

More information on the new guidance to drinking water systems is online at: http://water.epa.gov/drink/info/chromium/guidance.cfm

The elemental analyzer systems can provide automated sample preparation for stable isotope analysis (2H, 13C, 15N, and 18O) of a wide variety of sample types including minerals, plants, and even bird feathers!

Our skilled and experienced technical staff at the WSL works diligently to ensure that samples are processed rapidly and analyzed correctly. Staff assists with training and supervising students who also work in the lab. They prepare samples, operate and maintain the equipment, document procedures, as well as help develop new methods for water research. If you ever have any questions about equipment capabilities, methods, or other items please feel free to contact me or any of our staff. We are here to provide solutions and serve the analytical needs of water and water-related research.

To contact the WSL, email me at dsnow1@unl.edu, phone (402) 472-7539 or go online to http://watercenter.unl.edu/WaterSciLab/Contact.asp
Bin-busting Sampling year at UNL Water Sciences Laboratory

By Daniel Snow, PhD
Director of Laboratory Services

Last year’s sample load was a “bin-buster” at the University of Nebraska–Lincoln Water Sciences Laboratory (WSL).

Close to 4900 samples were received, compared to 3900 in 2009 and 2800 the year before. The nature of these samples continues to evolve with new projects and research needs.

Our nutrient analyses capabilities increased with the purchase of a new semi-automated high temperature digestion system for Kjeldahl nitrogen in water and wastewater. We are working toward processing samples more quickly for total nitrogen and increasing the rate of sample analysis.

A Lachat flow injection autoanalyzer (FIA) will soon be available to complement our Seal AQ2 discrete chemistry autoanalyzer. Currently there are 11 methods run on the AQ2 autoanalyzer for water quality measurements such as nitrate-N, phosphate, and silica. The FIA is designed for high-throughput analysis of the most commonly requested methods.

We continue to see a high demand for analysis of metals and other trace elements using the Platform inductively coupled plasma mass spectrometer (ICP-MS). The ICP-MS can be interfaced with an ultrasonic nebulizer to improve ionization efficiency and method sensitivity, or with a hydride generator/cold vapor system for reducing matrix interference in the analysis of selenium, arsenic and mercury.

We are currently working on a speciation method for selectively detecting different forms of uranium using ion chromatography (IC) as the sample introduction technique. We have been successful in using the IC interface with the ICP-MS in a speciation method for inorganic and organic forms of arsenic extracted from soil samples, and I look forward to providing new speciation methods.

Our trace organics analysis includes analysis of chemicals such as chlorinate solvents by purge and trap gas chromatography mass spectrometry (GC-MS), along with several methods for pesticides by solid phase extraction coupled with GC-MS. The LCQ and Quattro liquid chromatograph mass...