Ray Joins Nebraska Water Center as Director

Chittaranjan Ray joined the leadership team of the Robert B. Daugherty Water for Food Institute (DWFI) as permanent director of the Nebraska Water Center on Aug. 1.

Ray was a Professor of Civil Engineering at the University of Hawaii at Manoa (UH), where he also was interim director of the Water Resources Research Center at UH, which like the Nebraska Water Center (NWC) is part of a network of more than 54 water centers.

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UNL “Raising Our H₂O IQ” at Husker Harvest Days

By Steve Ress

Those attending Husker Harvest Days Sept. 10-12 can immerse themselves in all things water with University of Nebraska research and extension experts.

“Raising Our H₂O IQ” is the theme for University of Nebraska–Lincoln (UNL) Institute of Agriculture and Natural Resources (IANR) exhibits at this year’s show near Grand Island, where UNL’s commitment to annually changing exhibit themes keyed toward bringing the public the latest relevant IANR research and extension programming continues.

“We are focusing on groundbreaking research and initiatives that are rapidly earning IANR a national and global reputation as a leader in agriculture and natural resources.”

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October Water Symposium and Water Conference At Lincoln’s Cornhusker Hotel

By Steve Ress

The University of Nebraska’s one-day water science and policy symposium and water law conference will be Oct. 15 and 16 at Lincoln’s Cornhusker Hotel.

Tuesday, Oct. 15’s symposium will focus on “Changes: Climate, Water and Life on the Great Plains,” while the following day’s Water Law Conference aims primarily at the latest in Nebraska water law for practicing attorneys and water professionals.

The events are cosponsored by NU’s Nebraska Water Center (NWC), part of the Robert B. Daugherty Water for Food Institute; NU’s College of Law and the Natural Resources and Environmental Law Section of the Nebraska State Bar Association.

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A Journey from the University of Hawaii to the University of Nebraska

About the time that you are picking this up to read it, or pulling it up online, I will have been in my new office as director of the University of Nebraska’s Nebraska Water Center for about three weeks.

I am very excited to be here and am energized by the opportunities that lie ahead, both for the water center and for the Robert B. Daugherty Water for Food Institute, of which we are an integral part.

I am also sure that many of you are curious about me, my professional background and what some of my early plans may be for the water center.

Coming from a rural area in the eastern state of Odisha, India, I am very much familiar with floods, droughts, and cyclones. At the same time, I know what rural poverty can be and the struggle that marginal farmers often have just to feed their families during the transition from one season to another — toughest being when the food grains of the past season have depleted much before the new crop is harvested.

After receiving a bachelor’s degree in agricultural engineering from Orissa University of Agriculture and Technology in India, I received a scholarship to study for a Master of Science degree in agricultural engineering from the University of Manitoba in Winnipeg, Canada to study the impact of sewage effluent irrigation for crop production.

From there, in order to broaden my engineering background, I moved to Texas Tech University in Lubbock, Texas where I received a Master’s degree in Environmental Engineering with focus on electroosmosis for removing heavy metals in wastewater during land application for irrigation.

I then went to work for the groundwater consulting firm Geraghty and Miller, Inc (now Arcadis Geraghty and Miller) dealing with hazardous waste remediation as well as providing drinking water supply to small communities.

After three and half-year’s as a staff engineer, I next went to the University of Illinois to obtain a Ph.D. in Civil Engineering. While pursuing my Ph.D., I started working at the Illinois State Water Survey, which is also located at UI.

I was able to secure my own funding to develop a doctoral dissertation on modeling pesticide transport in macroporous agricultural soils. After a couple of years of research at the Illinois State Water Survey, I accepted an assistant professorship at the University of Hawaii.

There, my research focus has been in evaluating mobility of pathogens and chemicals (pesticides and explosive chemicals) in Hawaii’s tropical, island soils, use of riverbank filtration as a low-cost water treatment/pre-treatment technology, and uptake of pharmaceutical compounds by edible plants under wastewater irrigation.

I developed international collaboration projects where we developed water supply technologies for humanitarian assistance and disaster relief missions and worked in a USAID project aimed at sustainable...
Irrigation Water Management:

Water Optimizer, Crop Residue Management, Deficit Irrigation and Soil Water Management Tools

By Gary Stone, UNL Extension Educator
Jessica Johnson, UNL Ag Economist Asst. Extension Educator
Dr. Gary Hergert, UNL Soil and Nutrient Management Specialist

The 2013 water outlook for parts of Nebraska, especially the west, has not been good. Much of the state is still in a drought; surface-water irrigation supplies are limited; and groundwater users continue to be under allocations.

With all of this uncertainty, what can producers do? There are a number of tools available for producers and urban home owners to help manage water resources. One such tool is Water Optimizer, a Microsoft Excel-based program that can estimate a profit-maximizing cropping mix based on a limited amount of water.

The Water Optimizer program has four “models” to calculate a cropping mix: single-field, single-year; single-year, multi-field; multi-year, multi-field; and an independent budget calculator to estimate production costs. Each model seeks to maximize the average net return based on the producer’s estimated water supply and crop production preferences.

Drought and Groundwater Supplies

By David Ostdiek, Communications Associate, UNL Panhandle Research and Extension Center

During times of drought people often ask University of Nebraska–Lincoln water scientist Steve Sibray the same question: Will the groundwater aquifer dry up?

The answer isn’t simple and also varies from one location to the next, said Sibray, a hydrogeologist with the UNL Conservation and Survey Division who is stationed at the Panhandle Research and Extension Center.

“It’s a lot more complicated than that,” Sibray said. Which wells might go dry “depends on the geology of the system.”

The effects of groundwater level declines vary according to which part of the water-bearing formation a well was drilled into. For users on the aquifer’s edge, with less saturated thickness, pumping will become too expensive at some point.

Cities and irrigators with wells in deeper areas aquifers (often closer to the middle of the formation) might need to deepen their wells, but usually will not run completely out of water, according to Sibray.

Nebraska groundwater users, both in towns and on farms and ranches, have been concerned about water supplies for many months. Despite several snowstorms this spring, precipitation is below normal in western Nebraska, and as of mid-May the entire Panhandle was designated as being in either “extreme” or “severe” drought, on the Nebraska Drought Monitor map posted at droughtmonitor.unl.edu by the National Drought Mitigation Center at UNL.

In Nebraska, groundwater is closely monitored because it provides the vast majority of water used both by irrigation and municipalities.

One place where the past year’s severe drought has had serious impacts is native rangeland, according to Sibray. At least one local well driller has told him that springs have dried up in some areas, and landowners have needed replacement wells drilled to provide water in pasture land.

A well’s location in the aquifer is one of several factors that affect its security. Another factor is recharge, the process by which aquifers gain water from precipitation or other sources.
Select Groundwater Level Change Report

The University of Nebraska–Lincoln’s Conservation and Survey Division (CSD) recently released a special report regarding groundwater level changes at selected locations in Nebraska.

The report, entitled “Preliminary Groundwater Level Changes at Selected Sites in Nebraska Following the Drought of 2012,” is a snapshot of water level changes at selected sites in areas of Nebraska with high densities of irrigation wells.

While the annual reports assess data from approximately 5,500 wells, only five wells were selected for this special report. CSD, part of UNL’s School of Natural Resources, chose these wells due to their proximity to high densities of irrigation wells and their historically significant water-level changes.

The special report shows many consistent findings with historical trends, but is not intended to be a comprehensive study of the impacts of the 2012 drought.

All five of the selected sites discussed in the special report saw a water-level decline. The amount of decline ranged from 1.85 to 5.5 feet, depending upon their location in Nebraska.

CSD publishes the annual Nebraska Statewide Groundwater-Level Monitoring Reports annually in the fall after the spring water level measurements have been taken and analyzed. However, due to the intensity of the drought last year, many individuals and organizations requested early information about groundwater levels to prepare for the coming agricultural season.

The annual groundwater-level reports measure the change in Nebraska’s water levels on different time scales. The reports study the trends of groundwater rises and declines measured in the observation wells throughout Nebraska, and give a general depiction of the current status of groundwater levels on a year-by-year basis.

The annual reports also compare historical trends of regional water levels over extended time periods.


Annual Nebraska Statewide Groundwater-Level Monitoring Reports are available online at go.unl.edu/groundwater. Print copies of both reports are also available for purchase through the Nebraska Maps and More Store at UNL’s East Campus in Lincoln at 101 Hardin Hall, N. 33rd and St. Those interested in print copies of annual reports or the special report should contact the Maps and More store at 402 472-3471 or email snrsales@unl.edu.

Modifications, Elevated Levels of Nutrients and Pesticides Degrade Streamflow, USGS Says

A new U.S. Geological Survey (USGS) report says the health of U.S. streams is being degraded by streamflow modifications and elevated levels of nutrients and pesticides.

The national assessment of stream health was unprecedented in the breadth of the measurements — including assessments of multiple biological communities as well as streamflow modifications and measurements of over 100 chemical constituents in water and streambed sediments.

“Healthy streams are an essential part of our natural heritage. They are important to everyone — not only for recreation and for public water supply and public health, but also for economic growth,” said USGS acting Director Suzette Kimball.

“A broad understanding of the complex factors that affect stream health across the nation will aid us in making efficient, long term decisions that support healthy streams.”

USGS scientists examined the relationship of the condition of three biological communities (algae, macroinvertebrates, and fish) to man-made changes in streamflow characteristics and water quality. The ability of a stream to support these biological communities is a direct measure of stream health.

Stream health was reduced at the vast majority of streams assessed in agricultural and urban areas. In these areas, at least one of the three aquatic communities was altered at 83 percent of the streams assessed.

In contrast, nearly one in five streams in agricultural and urban areas was in relatively good health, signaling that it is possible to maintain stream health in watersheds with substantial land and water-use development.

“Understanding the interacting factors that impact multiple aquatic communities is essential to developing effective stream restoration strategies,” said Daren Carlisle, USGS ecologist and lead scientist of this study.

Streamflow modification is a critical factor in stream health because the life cycles of many native fish species are synchronized with — and therefore dependent upon — the timing and variation in natural streamflow patterns.

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The Kearney Area Chamber of Commerce (KACC) is a membership-based organization of businesses that work together to improve the business community and further their collective interests.

Our mission is to “Promote the success and profitability of members through involvement, education, advocacy and marketing of the Kearney area business community.”

KACC unites business and professional individuals and firms and creates a central agency, which lends itself to improving business and building a better community.

The chamber’s governing body is its board of directors. From small business owners to doctors, the 13-member board represents a cross-section of chamber membership. They determine organizational policy and are responsible for KACC’s finances and consider and approve the budget and determine the appropriate membership investment schedule.

In addition, the chamber has as ex-officio members of the board representatives from Buffalo County, City of Kearney, Economic Development Council of Buffalo County, Kearney Visitors Bureau, University of Nebraska-Kearney, and Kearney Public Schools.

KACC has a full time staff of six that manages the day-to-day functions of the organization including planning and hosting special events, publishing the chamber’s newsletter and web site and fostering community development in the region.

The chamber performs many functions to foster growth of the business community. For existing businesses, the chamber organizes dozens of special events each year, which facilitate networking amongst the area’s diverse business community.

Many business relationships have been established at the chamber’s Business After Hours events, ribbon cuttings and annual banquet.

KACC also supports its members by referring them to potential customers. Many visitors and newcomers to the area contact the chamber to find out where to get their oil changed, where to bank, where to eat, and where to shop. The chamber only refers its members. Every year, the organization publishes a membership directory and community guide, which is distributed to KACC members and area visitors.

Local, state and federal laws and regulations can have a huge impact on the ability of a business to succeed.

The chamber lobbies for pro-business legislation on behalf of its members. Committees, such as the government affairs committee, offer members an opportunity to voice their concerns to the chamber’s leadership and potentially shape the organization’s position on a key issue.

But most important, the chamber is people...people just like you. It is people who realize that through the chamber they can accomplish collectively what no one of them can do individually. The chamber’s strength lies in attracting the greatest number of members, creating a pool of resources from which can be drawn ideas, energy, and finances.

Also, the chamber is:

- Business and professional firms working together to make the Kearney area a better place to live.
- A voice for the business and professional community on critical issues.
- A clearinghouse for plans and proposals affecting the area’s future.
- Setting and achieving goals that will assure the Kearney area of reaching its full potential as a community.
- Working to increase prosperity by encouraging growth of existing businesses and fostering new ones.
- Committees that work for the organizational objectives in small groups of the membership and are engaged in a common effort.
- Legislative action— we work on our member’s behalf on legislative issues important to our area.
- Publicity and exposure — We have many avenues to assist you in getting the recognition you need for your business.
- Small business development — The Chamber offers assistance and training to help small businesses in the area grow.
- Web site — As a Chamber member, your business is included in the member directory on our web site.
- Training and education opportunities — The Chamber can help member businesses of all sizes in developing leaders within their companies through training and education opportunities.
- Buffalo Bucks Gift Certificate Program — This Chamber program aims to assist participating businesses by keeping the shopping dollars in this area.
- Ambassador Calls — The Chamber can be a presence for your grand openings, groundbreakings, new locations, and/or new management.

Not renewing your Chamber membership to save money is like stopping your watch to save time!

(Editor’s Note: KACC is a longtime co-sponsor and partner of the Nebraska Water Center’s annual Water and Natural Resources tour, held in the summer).
Water for Food Speaker: ‘Time is Running Out; Time for Action’

By Dan Moser, IANR News

Dilip Kulkarni remembers the first global Water for Food Conference in Lincoln in 2009. “Another water conference” was his initial dismissive reaction.

On Wednesday, May 8, as the fifth annual conference was coming to a close, Kulkarni, of India’s Jain Irrigation Systems, praised the gatherings of experts from around the world for playing an important role in surfacing challenges and solutions to the problem of feeding a world expected to grow from 7 billion to 9 billion by 2050.

But “time is running out,” Kulkarni said. “It is now the time for action, we must take our research, our knowledge to the people. The solutions are within our reach.”

The conference was hosted by the University of Nebraska’s Robert B. Daugherty Water for Food Institute and the Bill and Melinda Gates Foundation and sponsored by Monsanto.

Kulkarni and others on a closing panel led by Water for Food Institute Executive Director Roberto Lenton said the problems are complex and differ around the world. Much of the challenge lies in convincing government leaders to take research seriously in crafting new laws and policies to help address the issue.

“Too often our policymakers are taking the issue of climate change and kicking it down the road,” said Mace Hack, state director of The Nature Conservancy in Nebraska.

Another wrinkle, cited by Sandy Zellmer, Robert B. Daugherty professor of law at UNL’s College of Law, is that scientific and producer knowledge of water issues is outpacing the legal system’s grasp of them.

Earlier that same day, livestock experts addressed livestock’s often-misunderstood role in sustainable agriculture.

“Beef does use a heck of a lot of water and I’m not here to say it doesn’t,” said Jude Capper, a livestock sustainability consultant from Bozeman, Mont.

However, she said, anti-meat activists have painted an unfair picture using distorted statistics and scare tactics.

“We are bombarded every day with the message, ‘if you care about the planet you shouldn’t eat meat,” she said.

Here in the U.S., Capper said, improved beef production reduced the sector’s water footprint 88 percent from 1977 to 2007. Further improvements can yield more progress, she said.

Bradley Ridoutt, of the Commonwealth Scientific and Industrial Research Organization in Australia, said any discussion of livestock’s role has to consider its location and context. Livestock production in different parts of the world has different environmental impacts.

“Agriculture is not homogenous. It is very dangerous to make generalizations about the water footprint of broad production categories or regions,” he said.

“What is the shape, the size, the form of a livestock sector in a sustainable food system?”

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WRAP Meets in Early May

By Rachael Herpel

Thanks to all who joined the Water Resources Advisory Panel (WRAP) on May 7 at the Cornhusker Hotel in Lincoln.

In less than an hour we covered numerous topics and following is a brief synopsis:

The Robert B. Daugherty Water for Food Institute (DWFI) welcomes its leadership team Chittaranjan Ray as director of the Nebraska Water Center and Christopher Neale as DWFI Research Director. Ray was expected to join the water center in August, with Neale slated to arrive in October.

Regarding the water faculty cluster hire — strong candidates for the hydrogeophysicist and cropping systems agronomist have been identified. Interviews with all three hydrogeophysicist candidates have been completed. Interviews for the cropping systems agronomist were to be held in June.

UNL’s Institute of Agriculture and Natural Resources is hiring 36 new faculty, part of IANR’s “Growing IANR” initiative.

• The new director of UNL’s School of Natural Resources is John P. Carroll.

• A little history about the WRAP — it originally grew out of the need to bridge the gap between university research and practice throughout the state. Today there is much more conversation and collaboration between the two. Reference was made to how this would be illustrated in talks during the Water for Food Conference.
agriculture and natural resource management in two tribal regions — one in India and the other in Nepal.

After promotion to full professor I later served as interim director for the Water Resources Research Center as well as the UH’s Environmental Center for about three and one-half years. UH’s WRRC is that state’s “water center” just as Nebraska’s Water Center was originally named a WRRC when it formed as part of a Congressional mandate in the mid-1960’s.

I am a professional civil engineer and work closely with several large water utilities in the country and am active in several committees of the American Society of Civil Engineers and a fellow of ASCE.

What prompted me to apply for the water center director’s position here in Nebraska?

After the Daugherty Water for Food Institute (WFI) was formed here, I saw the position advertisement for permanent director of the NWC. The position description caught my attention as NWC was trying to find an individual who is versed with domestic water issues, including drought and irrigation and at the same time aware of global issues.

I was very excited to know that this position will provide me an opportunity to work directly under founding WFI Executive Director Roberto Lenton, who has tremendous amounts of international experiences on water.

The position also offers opportunities to develop new research and education opportunities at UNL, work with diverse stakeholders, and to be part of a larger research community where water is an important topic.

While working at the Illinois State Water Survey, I had some preliminary ideas about the climate and drought research in Nebraska as well as the functions of UNL’s Conservation and Survey Division. The presence of the National Soil Survey in Lincoln and the potential to collaborate with neighboring states (where I already have collaborators) were some of the other reasons to look at this opportunity.

I also am hoping to have more opportunity to work on riverbank filtration research and at the same time, be close to other family members on our U.S. mainland.

Initial goals:

First, I want to acquaint myself with our stakeholders. This includes all those with interests in water within state, federal, and local agencies as well as NU faculty and extension faculty and staff.

Besides UNL, I plan on reaching out to faculty colleagues at the Omaha and Kearney campuses as well as colleagues at the College of Public Health at the University of Nebraska Medical Center.

Next, I want to educate myself about the history of water development for irrigation in Nebraska, development of water supplies for riparian communities, legal and social aspects of water, and understanding the legislative mandates and citizens’ views on use and protection of the state’s water resources.

I will use every possible opportunity to meet stakeholders and learn from them. On the research front, I and the faculty and staff at our associated Water Sciences Laboratory will look for collaborative research opportunities that will bring together expertise in various campuses within the NU system to compete for federal, foundation, as well as state grants and contracts.

For regional or national scale competitive grants, I will explore the possibility of collaboration with other centers in neighboring states as well with others with ongoing collaboration.

I also plan to work very closely with the WFI executive director so that the activities of the Nebraska Water Center also meet the missions of WFI.

Final notes:

Please read elsewhere in this issue about our upcoming fall water symposium on October 15 and water law conference on October 16, both at Lincoln’s Cornhusker Hotel. As in the past, you can register for either of these events alone, or for both at a discounted rate.

By the time the next issue of the Water Current publishes, we hope to be able to tell you where the 2014 water and natural resources tour will be going and what topics we will be looking at. This event’s organizing partnership will be meeting in the coming weeks to come-up with a plan, which we will duly let you know about. This year’s tour group to central Nebraska was a small one, but we had very positive comments about the topics we discussed and the places we stopped at.

The water center sincerely thanks Bruce Dvorak, past chair of the UNL Department of Civil Engineering; Suat Irmak, H. W. Eberhard Distinguished Professor in UNL’s Department of Biological Systems Engineering; and Conservation and Survey Division director and state geologist Mark Kuzila for their selfless work as interim and acting interim directors of the Nebraska Water Center over the last four years. We applaud and congratulate these three fellow professionals on their willingness to add this responsibility to their already busy and demanding schedules.
Annual Water and Natural Resources Tour
East Central Nebraska
June 25 and 26

Cosponsored by:
Central Nebraska Public Power and Irrigation District, Kearney Area Chamber of Commerce, Monsanto Co., Nebraska Public Power District, Nebraska Water Center — part of the Daugherty Water for Food Institute

Data gathering equipment stands ready in a field at the University of Nebraska–Lincoln’s South Central Ag Lab — near Clay Center.

Water tour participants take a look at research equipment in the field at UNL’s South Central Ag Lab near Clay Center.

Galvanized irrigation pipe nears completion at Reinke Manufacturing Co. near Deshler.

Lameck Odhiambo describes field irrigation research being done at UNL’s South Central Ag Lab near Clay Center.

Marion Langan and Kristofer Johnson at Spring Creek Prairie Audubon Center near Denton.

(photos by Steve Ress and Craig Eiting)
Tour host Mike Jess on the bus between tour stops.

Tour participants deep inside the Loup Public Power District’s Monroe hydro plant, that was originally constructed as part of rural electrification programs in the 1930’s.

Preferred Sands of Genoa, billed as one of the largest sand piles in the world. Much of the sand is used in the fracking industry.

Lincoln’s Antelope Valley project was the tour’s first stop after leaving UNL’s East Campus. The $238 million project is Lincoln’s largest public works project ever.

Tim Goldhammer explains manufacturing operations at Reinke Manufacturing Co. near Deshler.

Scott Opbroek takes tour participants on a tour of the USDA Meat Animal Research Center near Clay Center, one of the largest and most comprehensive meat animal research facilities in the world.
Rod DeBuhr talks about subsurface drip irrigation research at the UperBib Blue NRD’s CROP-TIP demonstration site in York.

Brad Morton discusses operations of the Loup Public Power District at the district’s Monroe hydro plant. The plant was built as part of rural electrification projects in the 1930’s.

One of many spectacular views at Spring Creek Prairie Audubon Center.

On the trail at Spring Creek Prairie near Denton.

USDA Meat Animal Research Center near Clay Center.
Drought and GW continued from page 3

When it comes to recharge, Sibray said most of the municipalities in the North Platte Valley are lucky. Their major source of recharge is not precipitation, but surface water from the North Platte River that seeps from the canals of the large irrigation project constructed more than 100 years ago.

Surface water recharge accounts for a significant volume of water and moves into and through the aquifer relatively quickly. By contrast, very little precipitation usually makes it to the saturated zone of an aquifer. Most of the rain or snow runs off, is used by plants, or evaporates before it can infiltrate the soil and trickle downward. The water that does trickle through might take years or decades to reach the saturated zone.

Because of annual recharge from irrigation canals, groundwater levels in the North Platte Valley are much higher than before the irrigation project was constructed, and usually don’t fluctuate much from one year to the next, Sibray said.

This effect has been documented by research, he said. Studies conducted years ago at University Lake north of Scottsbluff, conducted in conjunction with the North Platte Natural Resources District, demonstrated a distinct difference in water chemistry between river water and native groundwater. “We can see that most of the groundwater in the North Platte Valley is derived from irrigation.”

“There are cities like Scottsbluff and Gering that shouldn’t have water quantity problems as long as you have the North Platte River and the system of irrigation canals,” Sibray said.

Water tables have declined over the years in some areas, such as Box Butte County. But Sibray said Alliance is situated above the aquifer’s deep point, so even if declines continue, the city should not run out of water.

Over the long term, Sibray said he’s optimistic about the continued availability of water in towns in most areas. One reason is that municipal water use generally has a higher value than other uses. So as water supplies get scarcer, high-end uses such as towns and municipalities will still be drawing water down past the point where irrigators can afford to.
leader in critically important water research,” said Ronnie Green, NU Vice President and IANR Harlan Vice Chancellor.

The University of Nebraska and IANR are focused on many areas of research and programming that have water use, quantity and quality at their core. No single issue is more important to Nebraskans and globally than water.

“Our commitment in this field is evidenced most strongly by establishing the Robert B. Daugherty Water for Food Institute at the University of Nebraska a few years ago,” Green said.

“In a state where the vast majority of our annual water use supports our agricultural economy and which is the number one state for irrigated agriculture in the nation, IANR’s focus will continue to be on helping Nebraska, the nation and the world understand more about how to improve efficiency, quality and availability of this precious resource,” Green said.

This is the sixth year IANR’s teaching, research and extension exhibits are focused on a specific area of importance that is relevant to all Nebraskans and visitors to the red Husker exhibit building on the south side of the showground at Lot 321. There, and in the next-door white tent, show goers will see many of the ways IANR and UNL Extension are working to raise our H2O IQ.

Key exhibit areas focus on hydrology; how tillage and residue removal affect water balance in crop fields; variable rate irrigation as the next evolution in precision agriculture technology for center pivot irrigation systems; transpiration as the key to maximizing yield per gallon on water applied to crops; water efficient residential landscapes; the Nebraska Agricultural Water Management Network that works hand-in-hand with hundreds of Nebraska irrigators; UNL’s respected and often-referenced drought planning experts from the National Drought Mitigation Center; and helping to meet global food security needs via the Robert B. Daugherty Water for Food Institute.

Outreach education will also be prominent within each of the individual exhibits.

UNL staff at a central information booth will provide assistance in answering questions on a variety of extension and research-related topics, provide copies of helpful NebGuides, and direct those needing further help to extension experts in their local area.

The red Husker building is also the place to learn about the latest opportunities for students at UNL’s College of Agricultural Sciences and Natural Resources, and the Nebraska College of Technical Agriculture at Curtis. College representatives will be available throughout the run of Husker Harvest Days at Lot 321. Here, Sue Ellen Pegg walks high school students through opportunities that await them at UNL (IANR photo).
Morning sessions of the Tuesday symposium will look at the bigger picture of water issues that are of current interest to Nebraska and the Great Plains.

“We will be looking at water and planning, with climate change and variability as key drivers in planning, along with factors such as population growth, agriculture, industry and ecosystem needs,” said event organizer and NWC assistant director Lorrie Benson.

Water planning, especially, is currently a topic of increasing interest as competing uses often vie with one another for a share of a limited and often overused resource, Benson said.

“Plenary presentations, as well as several of the afternoon breakout sessions, are designed to provide information to assist in planning efforts,” she said.

The day opens with a brief history of Nebraska water planning by retired UNL lecturer and consulting water resources engineer Mike Jess, followed by a presentation on the larger view on water planning by David Yates, National Center for Atmospheric Research and Stockholm Environment Institute. Yates’ expertise is water planning, including impacts from climate change.

Following Yates, Shannon McNeeley of North Central Climate Science Center, a consortium at Colorado State University, Fort Collins, Colo., will discuss water-related climate change adaptations. McNeeley co-wrote the adaptation chapter for the recently released National Climate Assessment Report issued by the U.S. Global Change Program and is an expert in how people respond to and make decisions related to impacts from climate change.

Mike Hayes, director of UNL’s National Drought Mitigation Center, will talk about incorporating drought planning into the water planning process; and Alan Tomkins, director of the NU Public Policy Center, will discuss new research on public trust in and confidence in Nebraska’s natural resources districts and Nebraska Department of Natural Resources.

Other scheduled speakers include Karl Brooks, director of the Region VII office of the U.S. Environmental Protection Agency, Kansas City, Mo., addressing water quality as part of comprehensive water planning.

Symposium poster abstracts are still being accepted. Any water-related topic of interest in Nebraska and the Great Plains is welcome.

More information can be found at http://watercenter.unl.edu.

Wednesday, Oct. 16’s Water Law Conference opens with NU College of Law professor Anthony Schutz’s “Water Law 101,” a primer of important statutes and cases and their context to help listeners understand how and why they developed.

Other speakers include John Dernbach of Widener University School of Law, Chester, Penn. on “Creating a Legal Framework for Sustainability” and Kristin Linsley Myles of Munger, Tolles and Olson LLP, San Francisco, Calif. Myles will review “South Carolina v. North Carolina — an Original Jurisdiction Water Dispute from the Special Master’s Perspective.” She was special master for a dispute about the Catawba River.

“Certified Acres: What, Why, Who, Transfers and Records” will be delivered by Jon Schroeder of Schroeder and Schroeder PC, Curtis, Neb.

Lash Chaffin of the Nebraska League of Municipalities will speak on municipal legal options during times of drought and Don Blankenau of Blankenau Wilmuth Jarecke LLP, Lincoln, will give an update on legal issues in the contentious Republican River basin.

David Bargen of Rembolt Ludtke LLP, Lincoln, will talk about implications from a recent ruling in the Columbus sewer backup case and Nick Buda of Jacobsen, Orr, Lindstrom and Holbrook, P.C., LLO, Kearney, will present a fast-paced review of new laws, regulations and cases from Nebraska and around the U.S.

Also on the itinerary is a presentation on “Technology, Globalization & the ABA Model Rules of Professional Conduct: Ethical Issues in the Information Age, Part II — Outsourcing” by Richard Dooling of the NU College of Law.

Continuing legal education credits (CLEs) for Nebraska, Colorado and Iowa will be offered.

Though Wednesday’s conference focuses on information of interest to practicing attorneys, it is open to all.

Registration is $155 for one day and $270 for both days, Benson said. Rates are the same as last year.

More information about both events, including detailed agendas and online registration, is at watercenter.unl.edu. Questions should be directed to the NWC at 402-472-3305.
Annual low and high streamflows were modified in 86 percent of the streams assessed. Over 70,000 dams and diversions contribute to modified streamflows across the Nation. Flood control structures in the East and groundwater withdrawals for irrigation and drinking water in the arid West also contribute to streamflow modification.

Biological alteration associated with elevated nutrient concentrations was most pronounced for algal communities. The occurrence of altered algal communities increased by as much as 40 percent above baseline in streams with elevated nitrogen and phosphorus concentrations.

Macroinvertebrate communities were altered by as much as 40 percent above baseline conditions in streams with elevated pesticide toxicity. Although concentrations of insecticide mixtures, such as chlorpyrifos, carbaryl, and diazinon, in streams are highly variable seasonally and from year to year, they can reach levels that are harmful to aquatic life, particularly in agricultural and urban streams.

Ecological Health in the Nation's Streams, 1993-2005 (USGS Circular 1391, 132 pp.) is available online.

Learn more about the ecological health of U.S. streams from related USGS reports, a fact sheet, and a video at www.usgs.gov.

USGS also continuously monitors water levels and streamflows at thousands of the nation’s streams on a real-time basis. These data are available online at USGS Current Streamflow Conditions.

Water-quality data from more than 1,300 locations, much of it in real-time, are available through USGS Water Quality Watch.
This tool has several options that allow users to customize the model to reflect their farm. Water Optimizer asks for information such as soil type, well / pump specifications, preferred nitrogen levels, production costs and anticipated market price for commodities. Through these selections producers can compare a variety of commodity mixes.

The Water Optimizer downloads can be found at: http://agecon.unl.edu/wateroptimizer/download.html

We suggest starting with the single-field single-year model first, as it is the simplest form of the program. Be sure to download the Operator Manual for the model you select.

For additional help with crop budgets or Water Optimizer use, contacts include Extension Educators Jessica Johnson or Gary Stone at the UNL Panhandle Research and Extension Center, 308-632-1230; Extension Educator Jennifer Rees in Clay County, 402-762-3644; or Extension Educator Chuck Burr in Phelps County, 308-995-4222.

In addition to cropping mix, another water-management factor for producers to consider is no-till or limited tillage operations. Every producer has their own soil and water management strategies, but consider this:

- Depending on soil type and soil moisture content, each tillage pass could potentially remove 0.5 to 0.75 inch of moisture from the profile.
- Having adequate crop residue will help trap off-season precipitation (such as snow).
- Having adequate crop residue on the soil surface can help reduce soil moisture surface evaporation by 2 to 4 inches during the growing season.
- Having adequate crop residue on the soil surface will help reduce soil erosion from wind and precipitation, and increase water infiltration into the soil instead of running off the field.
- Control weeds that germinate after harvest. Unmanaged weeds can use up stored soil moisture in a hurry.

These management practices can leave more water in the soil for the crop to utilize. In some instances a tillage operation will be necessary for seedbed preparation or weed management. Consider strip-tillage for planting operations in order to leave the crop residue in place.

For producers who have limited amounts of water, another tool to consider is deficit irrigation, a strategy where the producer utilizes stored soil moisture and in-season precipitation to get the crop established and through vegetative stages. Then the producer applies the majority of the irrigation water during the reproductive and grain fill stages of the crop.

In most cases, the producer will have to stress the crop during the vegetative stages and apply minimal amounts of irrigation water to keep the crop growing. The producer will be applying less water than is required to meet the full ET (evapotranspiration) of the crop. This strategy will have a reduction in yield when compared to full irrigation. However, deficit irrigation will encourage grain fill rather than vegetative growth.

Other water management tools are soil-water sensors and ET gauges. Soil water sensors are placed in the field of the growing crop at different depths relative to the root zone of the crop. The producer takes readings from the sensors every two to four days to determine how much soil moisture is available for the crop and how much irrigation is needed to fill the soil profile.

ET gauges, also called atmometers, are instruments that simulate the evapotranspiration of an alfalfa crop. Readings from ET gauges are taken weekly, and used to estimate the crop water use for that week based on the given crop and crop growth stage. The producer can then know how much irrigation water to apply to each field to replace the water used by the crop.

There are also a number of grass ET gauges that simulate actively growing grass so the home owner can track their lawns’ water use.

More information is available on-line from UNL Extension at droughtresources.unl.edu.
**Trends of Pesticide Use, 1992-2009**

For the first time, national maps and trend graphs show the distribution of the agricultural use of 459 pesticides for each year during 1992-2009 for the entire conterminous U.S.

The maps and supporting national database of county-level use estimates for each pesticide were developed by the U.S. Geological Survey (USGS) for use in national and regional water-quality assessments.

The national use analysis is based on methods developed by USGS to estimate annual county-level pesticide use for agricultural crops grown throughout the conterminous United States. Pesticide-use data compiled from proprietary surveys of farm operations were used in conjunction with annual harvested-crop acreage reported by the U.S. Department of Agriculture (USDA) to calculate use rates for each crop and year.

“These nationally complete and consistent, county-level use estimates are vital for USGS water-quality models that estimate pesticide concentrations in streams and rivers. In addition, long-term annual data is essential for interpreting water-quality trends,” said Wes Stone, an author of the reports.

Gail Thelin, senior author of the report on estimation methods, noted, “When evaluated statistically, USGS estimates agree with estimates from other sources for comparable years, pesticides, and states. That consistency supports the reliability of the comprehensive and long-term assessment of use patterns and trends that is now available through this study.”

Complete results of the USGS analysis of pesticide use are provided in three products:

- **Irrigation was the difference between “haves” and “have-nots” in farm income in drought-stricken 2012 Nebraska.**

“Crop farms with access to sufficient irrigation water were able to take advantage of excellent prices along with excellent yields,” said Tina Barrett, executive director for Nebraska Farm Business. “These led to record breaking net income per acre for both commercial irrigated yellow corn as well as irrigated seed corn in 2012.”

Dryland farms didn’t fare as well.

For the first time in 10 years, drops in net returns per acre went into negative numbers. Dryland wheat was the exception due to its earlier harvest time, though the 2013 crop may reflect last year’s drought.

Overall, net farm income in Nebraska fell eight percent, though it was still the second highest average on record.

For 15 percent of farms, accrual net income exceeded $750,000. Yet for another 15 percent of farms, net farm income was negative.

“This is the first time in several years that a significant amount of farms lost money,” Barrett said.

Many of the farms that lost money had a significant livestock operation or dryland crop operation. Some farmers lost money due to risky marketing strategies that caused significant hedge account losses.

Although net worth continues to increase, total debt also is increasing. From 2011 to 2012, the increase in debt was just over $125,000 per farmer. The biggest increase was in long-term liabilities.

“The debt increase is not necessarily a bad thing,” said Barrett, “but if profits tighten in the future, especially without a drop in family living costs, there will be a major ‘squeeze’ on the amount available to make the payments on this rapidly increasing level of debt.”

The future is uncertain.

“What we do know is that we’ve had seven years of great prosperity in Nebraska and it has improved the health of the average Nebraska farm,” Barrett said. “Hopefully it has been enough to withstand a few tough years when we’re faced with them.”

Barrett’s entire article is available at http://agecon.unl.edu/.

(From October 2012)

**UNL Circular on Rain Gardens**

For those interested in rain gardens, a new University of Nebraska–Lincoln Extension interactive online publication can provide the answers.

The publication offers information about the benefits of rain gardens and how to choose the right size and site for a garden. It has features such as instructive videos, slideshows and interactive charts, covering many aspects of rain gardens.

Steve Rodie, extension landscape horticulture specialist, was a co-author of the circular.
A rain garden is a garden positioned so that it can collect rainwater and runoff from houses, preventing that water from reaching storm drains. Rain gardens also filter out pollutants from rainwater and their ability to capture water enhances soil moisture and reduces runoff volumes.

Information is included about how to measure the slope of a hill, the area of a roof and the rate that the soil absorbs water. These factors are important to consider when building a rain garden.

“The publication will really help people understand how to design a garden successfully,” Rodie said.

The publication can be found at: http://www.ianrpubs.unl.edu/epublication/live/ec1262/build/ec1262.pdf.

**Smartphone App For Farmers and Ranchers**

A new University of Nebraska–Lincoln smartphone app helps agricultural producers track key temperatures.

The Climate App publishes maps that show recent highs, lows, and soil temperatures. The High Plains Regional Climate Center (HPRCC) in UNL’s School of Natural Resources released the app to keep producers aware of temperature ranges that could affect production timelines.

Ken Hubbard, regional research climatologist and the coordinator heading the app’s development, said that the project aims to inform producers’ decision-making.

“We already had maps online,” said Hubbard. “But we realized that producers don’t really have time to go hunting on their computers for information. So the hope is that the app will go with them on their phones and make their jobs easier.”

The Climate App’s homepage currently presents five options: “Maximum Temperature (F) yesterday,” “Minimum Temperature (F) yesterday,” “7 Day Average Soil Temperature (4”), “1 Day Soil Temperature (4”),” and “1 Day Precipitation Total.” Each option links to a map with a color scale that indicates the corresponding local information.

The current map options focus on temperature because the HPRCC wants to help farmers decide whether it is a good time to plant. In the coming months, the app will progress to showcase precipitation information and corn water-use for the previous day. The intention is that this information would help farmers know whether to irrigate.

The Climate App is the latest development in the HPRCC’s mission to provide useful information to help producers make decisions regarding their production timelines and procedures. The app automatically imports data from the HPRCC’s established system.

HPRCC partnered with representatives from other groups, including UNL’s Information Services and Department of Agronomy and Horticulture and financial sponsors at Kansas State University. Additionally, UNL extension personnel provided invaluable feedback as the team developed prototype apps.

Use your phone’s browser and enter the URL as hprcc3.unl.edu/ Ap. There is no cost for the app.

More information on other topics is available at the respective websites below:

- Crop production and pest management: http://cropwatch.unl.edu/
- Water information: http://water.unl.edu/home
- Climate: http://www.hprcc.unl.edu/

**Third Edition Handbook**

American Water Works Association has announced a thorough revision of the *Water Treatment Operator Training Handbook*, AWWA’s operator training and on-the-job reference. The updated handbook is now available in AWWA’s online store.

This third edition of the handbook incorporates operator certification knowledge requirements as defined in the Associated Boards of Certification need-to-know criteria, including regulations, safety practices and all the processes and procedures of water treatment operations.

The updated handbook also has expanded chapters on membrane technology and laboratory testing and protocol.

The handbook, originally authored by Nicholas G. Pizzi, was revised and supplemented by William C. Lauer, an internationally recognized authority on drinking water health effects and treatment methods and author or editor of 21 books and more than 70 articles on these subjects.

Taste Test Says Oklahoma City “Best of Best”

The American Water Works Association (AWWA) said Oklahoma City Water Utilities Trust, Okla. Is their annual “Best of the Best” Tap Water Taste Test winner.

The Oklahoma City Water Utilities Trust delivers tap water to more than 200,000 homes and businesses, and more than 20 nearby communities and water districts through a system of more than 3,200 miles of underground pipes. This is the second time the utility has won the title.

Second place was a tie between International Falls, Minn. and Northeast Sammamish Sewer and Water District, Sammamish, Wash. The People’s Choice award winner was Louisville Water Company, Louisville, Ky.


Judges rated each water system on its flavor characteristics.


Water for Food Speaker continued from page 6

Ridoutt asked, “There must be some limits,” he acknowledged, but he rejected calls for moving away from meat consumption. Instead, Ridoutt said, policies must be based on research.

Globally, livestock accounts for 16 percent of the calories, 33 percent of the protein and 43 percent of the fat consumed by humans, said Mats Lannerstad of the International Livestock Research Institute and Stockholm Environmental Institute. Beyond that, he noted, livestock has many nonfood uses.

Other sessions on the global conference’s final day covered the potential role for unmanned aerial vehicles, or drones, in agriculture and research. UNL scientists are working to make drones more reliable, safer and easier to use for researchers and producers alike. Potential uses include scouting fields for pests and disease, gathering water, air or leaf samples and monitoring other crop and environmental factors.

Moisture-sensing equipment and other information can improve water efficiency 20 percent or more, said M. Can Vuran, UNL assistant professor of computer science and engineering. However, only about eight percent of producers use these tools. Vuran’s team is developing wireless underground sensor networks to help producers manage irrigation more efficiently.

The three-day conference drew more than 400 people from around the world who are working to overcome the urgent challenge of growing more food with less water.

Additional information about the 2013 Water for Food Conference is online at: http://waterforfood.nebraska.edu/wff2013.

The Robert B. Daugherty Water for Food Institute is a research, policy analysis and education institute committed to helping the world efficiently use its limited freshwater resources, with a particular focus on ensuring the food supply for current and future generations. Established in April 2010, the institute focuses on fundamental and applied research to provide the knowledge base for effective, practical solutions. It is building the tools needed to guide decision-making about management of water quantity and quality and to inform policymaking at all levels.
resources research institutes that were established by Congressional mandate in 1964. Most of these centers are located at state Land Grant Universities.

In Hawaii, Ray also served as Director of the University’s Environmental Center and as Chief Environmental Engineer for the Applied Research Laboratory, a U.S. Navy sponsored facility at UH.

Prior to joining the UH faculty in 1997, Ray held positions in industry and at the Illinois State Water Survey. The holder of a Ph.D. in civil engineering from the University of Illinois, he has extensive experience in many facets of managing both water quantity and water quality issues.

Ray replaces NWC interim director Suat Irmak, a UNL irrigation engineer and Harold W. Eberhard Distinguished Professor of Biological Systems Engineering in UNL’s Depart of Biological Systems Engineering. Irmak had been NWC’s interim director since January 2012. Bruce I. Dvorak, an environmental engineer and past chair of UNL’s Department of Civil Engineering, preceded him as interim director, from September 2009 to November 2011.

Soil scientist Mark Kuzila, state geologist and head of UNL’s Conservation and Survey Division within UNL’s School of Natural Resources, was acting interim director of the NWC between Dvorak and Irmak’s appointments.

Ray, who also carries an academic appointment as a professor in UNL’s Department of Civil Engineering, said he was attracted to UNL “As the NWC was trying to find an individual who is versed with domestic water issues, including drought and irrigation and at the same time aware of global issues.”

He said he was also “Very excited to know that this position will provide me an opportunity to work directly under founding DWFI executive director Roberto Lenton, who has tremendous amounts of international experiences on water.”

Ray also said he is looking forward to meeting and working with the NWC’s many stakeholders, learning more about all aspects of Nebraska water issues and exploring research opportunities and collaborations.

At the same time that Ray’s hire was announced, DWFI said that it had hired Christopher Neale, who will join the DWFI in October, as its director of research. Neale is a professor in the Irrigation Engineering Division of the Civil and Environmental Engineering Department at Utah State University.

“I am delighted by the appointment of Drs. Neale and Ray,” Lenton said. “They will play critically important roles in advancing the work of the Water for Food Institute in Nebraska and other parts of the world facing critical water for food challenges.”

The Robert B. Daugherty Water for Food Institute at the University of Nebraska is a research, education and policy analysis institute committed to helping the world efficiently use its limited freshwater resources, with particular focus on ensuring the food supply for current and future generations.

many negative consequences, including land subsidence, reduced well yields, and diminished spring and stream flows.

While the rate of groundwater depletion across the country has increased markedly since about 1950, the maximum rates have occurred during the most recent period of the study (2000–2008), when the depletion rate averaged almost 25 cubic kilometers per year. For comparison, 9.2 cubic kilometers per year is the historical average calculated over the 1900–2008 timespan of the study.

One of the best known and most investigated aquifers in the U.S. is the High Plains (or Ogallala) aquifer, which underlies much of Nebraska and, in total, more than 170,000 square miles of the nation’s midsection. It represents the principal source of water for irrigation and drinking in this major agricultural area. Substantial pumping of the High Plains aquifer for irrigation since the 1940s has resulted in large water-table declines that exceed 160 feet in some places.

The study shows that, since 2000, depletion of the High Plains aquifer appears to be continuing at a high rate. The depletion during the last eight years of record (2001-2008, inclusive) is about 32 percent of the cumulative depletion in this aquifer during the entire 20th century.

The annual rate of depletion during this recent period averaged about 10.2 cubic kilometers, roughly two percent of the volume of water in Lake Erie.
A new U.S. Geological Survey report, *Groundwater Depletion in the United States (1900-2008)*, comprehensively evaluates long-term cumulative depletion volumes in 40 separate aquifers (distinct underground water storage areas) in the United States, bringing together information from previous references and from new analyses.

“Groundwater is one of the nation’s most important natural resources. It provides drinking water in both rural and urban communities. It supports irrigation and industry, sustains the flow of streams and rivers, and maintains ecosystems,” said Suzette Kimball, acting USGS Director. “Because groundwater systems typically respond slowly to human actions, a long-term perspective is vital to manage this valuable resource in sustainable ways.”

To outline the scale of groundwater depletion across the country, here are two startling facts drawn from the study’s wealth of statistics. First, from 1900 to 2008, the nation’s aquifers, the natural stocks of water found under the land, decreased (were depleted) by more than twice the volume of water found in Lake Erie. Second, groundwater depletion in the U.S. in the years 2000-2008 can explain more than two percent of the observed global sea-level rise during that period.

Since 1950, the use of groundwater resources for agricultural, industrial, and municipal purposes has greatly expanded in the U.S. When groundwater is withdrawn from subsurface storage faster than it is recharged by precipitation or other water sources, the result is groundwater depletion. The depletion of groundwater has