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WATER CURRENT

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Physical Model Could Change Flows, Future of Nebraska's Lake Ogallala

by Steve Ress
UNL Water Center

Experiments now being conducted on a scale, physical model of Lake Ogallala as part of an interdisciplinary study of the lake, could help ensure future success for the popular trout fishing lake.

The scale model, built in the hydraulics basin of the University of Nebraska-Lincoln's Walter Scott engineering building, is being used as part of an interdisciplinary study aimed at determining how the lake's physical characteristics influence the transport of water, chemicals and dissolved oxygen.

"This is the first lake modeling study based on water flow and dissolved oxygen that I am aware of in Nebraska on such a large scale," said UNL lake ecologist Kyle Hoagland, one of several UNL researchers that have been studying the lake over the past year.

Their study was commissioned by the Nebraska Game and Parks Commission with help from the Nebraska Department of Environmental Quality, Central Nebraska Public Power and Irrigation District, and Nebraska Public Power District, who want to determine what causes periodic low levels of dissolved oxygen in lake that contributes to fish kills and threatens the lake's rainbow trout population.

"This is particularly important since the lake has been Nebraska's premier public rainbow trout fishery since the 1940's," said UNL hydraulic engineer David Admiraal. Admiraal built the physical model of the lake with help from research assistant Cory Haberman and the University of Nebraska engineering shop.

Admiraal noted that the lake operated successfully as a trout habitat and recreational fishery from 1944 until 1984, when a hydropower plant was installed in Kingsley Dam, which separates Lake Ogallala from adjoining Lake McConaughy.

In an attempt to increase dissolved oxygen in Lake Ogallala, hydropower plant operators at Kingsley Dam began bypassing water from the turbine to a Howell-Bunger valve, to help oxygenate water entering the lake, but the valve has proven to be only marginally effective.

"Much of the lake continues to suffer with dissolved oxygen levels that may maintain the trout population, but aren't ideal for trout growth," Admiraal said.

His physical model duplicates the flow of water entering and leaving the lake on a scale level, which allows researchers to test theories on what can be done to alter flows, aeration strategies or even change bottom contours and features of the 650-acre lake to help ensure that adequate levels of dissolved oxygen are available for the fish.

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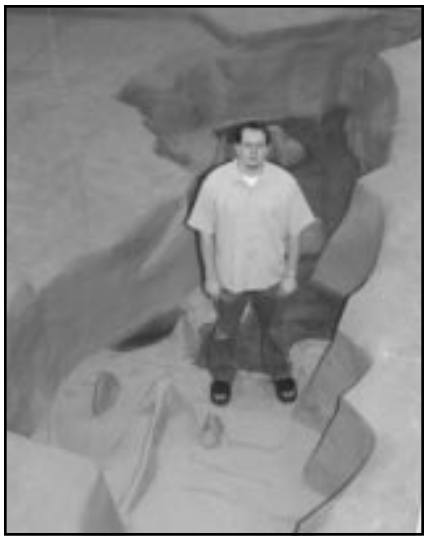

Civil Engineering graduate student Cory Haberman stands in the model of Lake Ogallala that researchers are using to simulate flows in the popular, public trout fishery (photo: Steve Ress).

INSIDE

Miscellanea

from the DIRECTOR

Kyle D. Hoagland

I have several items I want to discuss, hopefully one or more of which will be of interest.

I want to begin with an organization that is forming and which will be of direct importance to water resources in Nebraska. The Missouri River Basin Consortium (MRBC) is a group of colleges and universities located on the river or within its basin. MRBC will facilitate basin-wide interdisciplinary research, education and outreach service programs. Its goal is to advance the understanding of cultural, ecological, economic, geophysical, historical, and social issues in the Missouri River Basin through closer collaboration among its institutes.

Its initial objectives are to develop a directory of faculty expertise within the basin, to compile a list of prior work on the river and its tributaries, and to stimulate large-scale, multi-state projects on the river. This idea was first discussed by Tony Prato at the University of Missouri) and our own Mike Jess more than a year ago. Since then, the University of South Dakota established a Missouri River Institute and begun incorporating river themes into its undergraduate curriculum, as well as strengthen its research and outreach efforts in this area.

A meeting to further discussions on forming a basin-wide consortium was held at the University of South Dakota-Vermillion May 22-23. Representatives from Montana, North Dakota, Wyoming, Colorado, South Dakota, Nebraska, Iowa, Kansas, and Missouri all agreed this was a viable and timely concept, particularly in light of renewed interest in the river surrounding upcoming bicentennial observances of the Lewis and Clarke expedition that will take place over the next two years. The primary thrust at this point is research, however education efforts in numerous formats will also occur. We will update you as the MRBC evolves.

Another relatively recent development of importance to water resources in Nebraska is establishment of the Great Plains Cooperative Ecosystem Studies Unit (GP-CESU). CESUs are formed through a cooperative agreement between universities and federal agencies with mutual interest in ecosystem issues in a particular region. NU is the host university for the Great Plains region and is partnering with the University of North Dakota, Colorado State University, Little Priest Tribal College, University of Minnesota, University of Oklahoma, Langston University, and Texas A&M University. Involved federal agencies are the U.S. Geological Survey, Bureau of Land Management, USDA-Forest Service, and the National Park Service.

The Bureau of Reclamation, U.S. Environmental Protection Agency (Region VII), University of South Dakota, and the University of Wyoming have also expressed interest. CESUs have been formed in several other major regions across the U.S. The goal of the CESU is to facilitate cooperation and collaboration among these agencies and universities in research and monitoring throughout the region. The CESU is modeled after well established U.S. Fish and Wildlife Service Cooperative Fisheries Units, but on a multi-state and multi-agency scale. By establishing these formal ties, the federal agencies gain more immediate access to university expertise, closer direct working relationships with the major universities in the region (in part by placing federal scientists on campus as semi-permanent faculty members), and a flat 15% overhead rate on all projects associated with the CESU.

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WATER CURRENT

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Meet the Faculty

Dr. Xun-Hong Chen

Research Hydrogeologist and Associate Professor, UNL Conservation & Survey Division and School of Natural Resource Sciences (courtesy appointments with Department of Geosciences and Department of Biological Systems Engineering). UNL faculty member since 1994. Certified Professional Geologist, State of Wyoming.

Education:
- Ph.D. in hydrogeology, University of Wyoming, 1994.
- M.S. in geology, California State University-Northridge, 1988.
- B.S. in Geology, Zhejiang University, China, 1982.

Examples of Current Research:
- Using integrated modeling techniques to investigate the hydrological cycle in the Nebraska Sand Hills with Clinton Rowe, Qi Hu, and Mark Anderson. Funded by NOAA.
- Determination of aquifer and aquitard hydraulic properties and their role in streamflow depletion, Platte River valley, Nebraska with James Goeke and Robert Diffendal, Jr. Funded by U. S. Geological Survey.
- Investigation of directional hydraulic conductivities of streambeds and evaluation of their roles in stream-aquifer interactions. Funded by U. S. Geological Survey.
- Modeling of streamflow depletion due to nearby groundwater withdrawals. Conservation & Survey Division Research Project.
- Modeling of biodegradable contaminant transport in heterogeneous porous media. Conservation & Survey Division Research Project.

Xun-Hong Chen

Other Recent Research:
- Pumping test analysis and evaluation of the impact of irrigation well pumpage on the stream-aquifer systems along the Republican Valley, Nebraska with James Goeke. Funded by Nebraska Department of Water Resources.

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Dr. Darryll T. Pederson

Hydrogeologist and Professor, Department of Geosciences, University of Nebraska-Lincoln since 1999. Formerly a faculty member in the School of Natural Resource Sciences and Department of Geosciences and Conservation and Survey Division since 1975.

Darryll T. Pederson

Education:
- Ph.D. in Geology, University of North Dakota, Grand Forks, ND.
- M.S.T in Chemistry and Physics, University of North Dakota, Grand Forks, ND.
- B.S. in Mathematics, Chemistry and Physics, Valley City State College, Valley City, ND.

Current Research/Extension:
- Characteristics of developed aquifers, including patterns of groundwater level changes. Declines usually start in the groundwater divide areas. Distribution of wells has limited effect on overall pattern of decline.
- Interpretation of water levels in monitoring well networks. What is being measured? Where does the water for a 20-foot rise of water levels in a monitoring well come from?
- Interaction of surface water and groundwater. What is the source of groundwater in a municipal well field along a river?
- Role of groundwater sapping processes in river channel development migration. Was groundwater responsible for the meander cutoff on the South Fork of the Nemaha River by DuBois, NE during the summer of 1993? Does the drainage pattern of the Nebraska Sandhills reflect a balance of aquifer thickness and amount of recharge?

Other Recent Research:
- Groundwater and the Dismal River. Origin of boiling sand springs and their locations and properties. Qucksand development along the Dismal River. Origin of the Dismal River Valley.

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The WRRI Yesterday, WRC Tomorrow

by Warren "Bud" Viessman Jr.
Associate Dean of Engineering, University of Florida

I offer some reflections on the time that the Nebraska Water Resources Research Institute (WRRI) was new (the mid 1960's through the mid 1970's) and on what may be in store for its successor, the UNL Water Center, as we follow the water currents into the 21st Century.

The early years were exciting and challenging ones for water research, and so they remain today. Many of the dominant issues facing Nebraska and the nation in those years have not changed, but there are new global ones to be reckoned with. Furthermore, the role of stakeholders in influencing water management decisionmaking has changed markedly, and this impacts water research, as well.

Several major events occurred between 1964 and 1975 that had a profound effect on water resources planning, management and research. First, there was the Federal Water Resources Research Act of 1964 which established the WRRI and similar centers in other states. This was followed by the Water Resources Planning Act of 1965 which established the U.S. Water Resources Council and River Basin Commissions. One of these was the Missouri River Basin Commission, in Omaha. The act provided water resources planning funds for the states.

In 1969, the landmark National Environmental Policy Act passed, requiring environmental impact statements for federal water projects. This same year, the Nebraska Legislature established 24 Natural Resource Districts with broad authority to manage water and other natural resources in a coordinated regional context.

Finally, in 1973, the National Water Commission published *Water Policies for the Future*, a document with broad recommendations for actions to be taken to deal with the identified water management problems of the time. Many of these recommendations are still valid today.

During its early years, the WRRI confronted a host of issues in need of further research and / or analysis. These included: water and energy; irrigation technology and policy; economics of water supply and development; urban water supply and storm water management; transbasin diversions; regionalization of water resources planning and management; groundwater development and management; water quality; nonpoint source pollution; regulatory policies; water reuse; data bases and monitoring; environmental protection and restoration; coordination of water resources planning, development and management activities; soil and water conservation practices; small watershed hydrology; rural water supply; institutional constraints; and development of analytical tools to support water resources planning and management.

Moving into the 21st Century, most of these issues are still as new ones have emerged to be dealt with. Many of these new issues have global dimensions, increasing their complexity.

In the coming years, the UNL Water Center will face changing public attitudes about water and environmental management; global population increases; food shortages; impacts of economic development on natural resources and ecosystems; restoration of natural systems; climate change; and transference of water across international boundaries. To deal with these issues, changes will have to be made in the way we manage water and other natural resources.

Research will need to support new policies and modernize technology. We will have to acknowledge the fact that air, water and land resources and their management tare inextricably linked.

We citizens of Earth must recognize that many of the actions we take in the U.S. have worldwide implications. The same goes for everywhere else. We must embrace a holistic concept of water management and recognize that most of the troublesome problems we face can only be solved if they are addressed in their full dimensions.

The tools to tackle many of the identified problems are available, but we must find ways to lift the constraints imposed by boundaries on agency missions, entrenched "turf-oriented" attitudes and a host of single-purpose rules and regulations that have evolved over the years.

In the final analysis, political and social acceptability will determine the actions to be supported and plans for new water projects and programs must be developed accordingly. In my view, water policies for the future must focus on the right "problemshed," be flexible and holistic, support sustainable development, embrace public views, encourage partnership approaches and be the driver for regulatory programs.

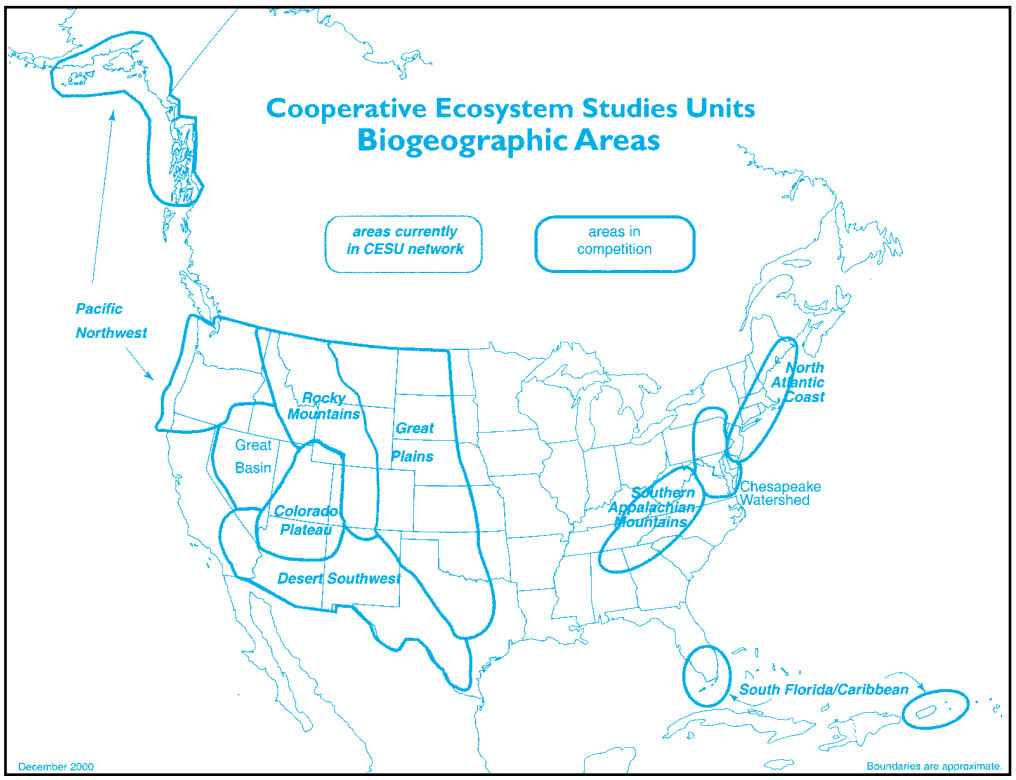
(Editor's Note: Warren Viessman was Director of the UNL Water Resources Research Institute, now the UNL Water Center, from 1968 to 1975).

Former UNL Water Center Director Bud Viessman (left) addressed sessions of water and environmental studies seminars earlier this year. Viessman directed the Water Center from 1968 to 1975. Current Water Center Director, Kyle Hoagland, is at right (photo: Steve Ress)

UNL To Host One of Eight Cooperative Ecosystem Studies Units

The University of Nebraska-Lincoln has been named to host one of eight Cooperative Ecosystem Studies Units (CESU) that will help in providing education, research, technical assistance and education to federal agencies and their partners on a variety of environmental issues and concerns.

"The CESUs are a new concept in university and inter-agency cooperation," said Kyle Hoagland, director of the UNL Water Center. They are structured as what her termed "Working collaborations" among universities and federal agencies dealing with land management, environmental and research issues.



UNL now hosts the Great Plains Cooperative Ecosystems Studies Unit, one eight such CESUs recently formed. More of the units are expected to be organized in the coming years.

Eight biogeographic areas have been established so far, with others scheduled to follow. The eight CESUs have been titled Pacific Northwest, Rocky Mountains, Colorado Plateau, Desert Southwest, Great Plains, North Atlantic Coast, Southern Appalachian Mountains and South Florida / Caribbean areas.

The Great Plains CESU, which will be headquartered at UNL's School of Natural Resource Sciences, is an expansive area that includes parts of Montana, North Dakota, South Dakota, Wyoming, Nebraska, Colorado, Kansas, Oklahoma, New Mexico and Texas.

UNL was chosen to host the CESU through a competitive grant program. Current partners in the Great Plains CESU include the University of North Dakota, Colorado State University, Little Priest Tribal College, University of Minnesota, University of Oklahoma, Langston University and Texas A&M University. Partnering federal agencies include the National Park Service, U.S. Geological Survey, Bureau of Land Management and USDA Forest Service.

"Host universities provide space, administrative support and access to university resources such as libraries. Additional universities in the region with special expertise or facilities also participate as partners." said Hoagland.

The Great Plains CESU consortium will make available an outstanding group of scientists in grasslands, ecosystems studies and natural resources management for collaborative research and teaching interactions, he added.

"This level of cooperation among universities and federal agencies is unprecedented and represents an outstanding opportunity to address complex natural resource issues in new and effective ways," Hoagland said.

Water News Briefs

Free Tabloids

Copies of *Wetlands-Understanding a Resource (1997)* and *Drinking Water-Understanding a Resource (1999)* are available free from the UNL Water Center. These publications are ideal for use with spring and summer youth activities focusing on water, the environment, pollution issues, etc.

Organizations wanting copies for educational use or general distribution can have up to several hundred copies of each publication, free of charge, providing that you make arrangements to pick them up from our UNL East Campus offices. If you need copies shipped to you, we will only ask that you pay the actual cost of shipping / mailing.

If you want copies of either or both tabloid, call the Water Center at (402)472-3305 or email sress1@unl.edu. For a list of other free publications available through the Water Center, access us online at http: / / watercenter.unl.edu.

Ogallala Aquifer Book

University of Nebraska Press has published the second edition of *Ogallala-Water for a Dry Land*. The book was written by John Opie, a historian at the New Jersey Institute of Technology.

The book provides an environmental history of the Ogallala aquifer and farming in the Great Plains region. It addresses the impact of the 1996 Farm Bill (Federal Agricultural Improvement and Reform Act) on agriculture and water use and examines the recent movement of industrial hog farming into the region.

The book also covers such issues as early exploration of water in the region, impact of the Dust Bowl on groundwater supplies and farming activity and the impact of center pivot irrigation on the region. Case studies of five water districts are presented.

For more details, visit the University of Nebraska press web site at http: / / www.nebraskapress.unl.edu.

North American Ecosystems Disappearing

Recent figures compiled by the World Wildlife Fund show that most of North America's original ecosystems are gone

Original North American tallgrass prairie - more than 99 percent transformed.

Original primary forest in the 48 contiguous U.S. - more than 95 percent lost.

Midwest oak savanna - more than 98 percent altered.

Old growth forest in the Pacific Northwest - about 90 percent cleared.

Wild or scenic rivers in the U.S. - between 90 to 98 percent degraded.

Coastal sage scrub in the U.S. - between 70 to 90 percent disturbed.

Original wetlands in the U.S. - more than 50 percent drained and filled.

Extinct and Endangered Species

Hundreds of species in the U.S. have been lost to extinction and thousands more are threatened or endangered. Here are a few of the more commonly known ones:

Extinct: Labrador Duck, Passenger Pigeon, Carolina Parakeet, Great Auk, Silver Trout, Harelip Sucker Fish, Palo Alto Thistle, Xerces Blue Butterfly, Wabash Riffleshell and West Indian Monk Seal.

Endangered: California Condor, Florida Panther, Gray Wolf, West Indian Manatee, Black-footed ferret, Golden-cheeked warbler, Indiana Bat, Stellar Sea Lion, Atlantic and Chinook Salmon and Green Sea Turtle.

(Source: Smithsonian Institution Monitoring and Assessment of Biodiversity Program, www.si.edu/simab).

Call For Papers: Great Plains Migrations 2002

UNL's Center for Great Plains Studies is soliciting papers for their 26th annual interdisciplinary symposium, "Great Plains Migrations," that will be held March 7-9, 2002.

Interested contributors should submit proposals / abstracts of 150-200 words with a cover letter and brief resume by Aug. 1. final papers will be due by Jan. 11, 2002.

For purposes of the symposium, migration is broadly defined to include prehistoric, historic and contemporary movements of flora, fauna and humans to, within and form the Great Plains. The symposium will be innovative in its interdisciplinary content and approach, bringing together scholars from the biological sciences, social sciences and humanities.

It will provide an opportunity to examine traditional Great Plains topics such as European American migration and avian migration in the Central Flyway, together with relatively unstudied topics such as Asian migration and dispersal of invasive species into the Great Plains.

For more information, contact Mary Liz Jameson or David Wishart at (402)472-3082 or email cgps@unl.edu.

Most Endangered

The Missouri River topped American Rivers list of the 10 most threatened and endangered rivers. Last year the Missouri ranked second on the list. Increasing threats to several wildlife species that are at risk of extinction is the primary reason for the river gaining the group's number one ranking.

The remaining 12 rivers on the annual list are:

2. Canning River, Arctic National Wildlife Refuge, Alaska.
3. Eel River, California.
4. Hudson River, New York.
5. Powder River, Wyoming and Montana.
6. Mississippi River, Midwest.
7. Tug Fork of the Big Sandy, West Virginia and Kentucky.
8. Snoqualmie River, Washington.
9. Animas River, Colorado and New Mexico.
10. East Fork Lewis, Washington.
11. Paine Run, Virginia.
12. Hackensack River, New York and New Jersey.
13. Catawba River, North Carolina and South Carolina.

June

21-26: Symposium on Marine Conservation Biology, San Francisco, CA. Forum on the nascent science of marine conservation biology. Contact Julie Morrison at (877)712-3777 or e-mail jmevents@bigsky.net.

26-29: First International Conference on Oxidtion and Reduction Technologies for In-Situ Treatment of Soil and Groundwater, Niagara Falls, Ontario. For information, contact Hussain Al-Ekabi at (519)858-5055 or email hussain@alekabi.com.

27-30: Decision Support Sustems for Water Resources Maagement, Snowbird, UT. Sponsored by the American Water Resources Association and Universities Council on Water Resources. Contact AWRA at (540)687-8390 or email info@awra.org.

28-July 3: National Environmental Health Associations' Annual Education Conference and Exhibition, Atlanta, GA. Phone (303)756-9090 or email staff@meja/prg.

July

2-4: International Interdisciplinary Conference on the Environment, San Francisco, CA. Contact Kevin L. Hickey at (508)767-7296, emial khickey@assumption.edu or online at http://www.desu.edu/mreiter/iea.htm.

8-11: 2001: A Collections Systems Odyssey: Integrating O&M and Wet Weather Solutions," Bellevue, WA. Sponsored by the Water Environment Federation. To register, phone (800)666-0206 or email confinfo@wef.org. For information email egonzalez@wef.org.

8-13: International Congress of Toxicology, Brisbane, Australia. Phone (61)7-3858-5496 or e-mail ictix2001@im.com.au.

10-13: Global Change Open Science Conference, amsterdam, Holland. For information, contact Open Science Conference secretariat at (31)20-5040208, email igbp@congrex.nl or online at http://www.sciconf.igbp.kva.se.

29-Aug. 1: An Engineering Odyssey, Sacramento, CA. Annual international meeting of the American Society of Agricultural Engineers. Contact ASAE, 2950 Niles Rd., St. Joseph, MI 49085-9659, phone (616)429-0300 or email hq@asae.org.

30-Aug. 2: Managing River Flows for Biodiversity, Ft. Collins, CO. Conflicts between meeting ecosystem needs and human demands. Contact Nicole Silk at nsilk@tnc.org.

August

4-9: Ecological Society of America annual meeting, Madison, WI: "Keeping all the parts: Preserving, Restoring and Sustaining Complex Ecosystems." Contact Nadine Lymn, 1707 H St., NW, Suite 400, Washington, D.C. 20006, phone (202)833-8773 or email nadine@esa.org.

6-8: Globalization and Water Management: The Changing Value of Water, Dundee, Scotland. For information, contact David W. Moody at (603)835-7900, email dwmoody@beaverwood.com or online at http://www.awra.org.

September

12-15: 2001 Arizona Hydrological Society Symposium, Presidio Plaza Hotel, Tucson, AZ. For information, contact Steve Brooks at (520)888-8818, email sbrooks@golder.com or online at www.AzHydroSoc.org.

October

9-11: Pharmaceuticals and Endocrine Disrupting Chemicals in Water, Minneapolis, MN. Sponsored by the National Ground Water Association. Contact Bob Masters, NGWA, 601 Dempsey Rd., Westerville, OH 43081, phone (800)551-7379 or email rmaste@ngwa.org.

14-18: Optimizing Nitrogen Management in Food and Energy Production and Environmental Protection, Potomac, MD. Contact Rhonda Kranz, Ecological Society of America, 1707 H St., NW, Suite 400, Washington, D.C. 20006, phone (202)833-8773 or email N2001@esa.org.

16-19: Stream Repair and Restoration: A Focus on the Urban Environment, Jane S. McKimmon Center, NC State University, Raleigh, NC. Case study presentations of urban stream restoration projects completed within the last five years. Presenters being solicited until May 15. For information on the conference or presentation topics/formats, contact

22-25: International Conference on Contaminated Soils, Sediments and Water, Amherst, MA. Contact Denise Leonard, Environmental Health Sciences, N344 Morrill, University of Massachusetts, Amherst, MA 01003, phone (413)545-1239 or email dleonard@schoolph.umass.edu.

November

14-16: 2001 Groundwater Foundation Fall Conference and Groundwater Guardian Designation, Hilton Pittsburgh and Towers Hotel, Pittsburgh, PA. Questions and registration information can be had from Cindy Kreifels at (800)858-4844, (402)434-2740 (in Lincoln) or via email to cindy@groundwater.org.

27-Dec. 1: Second National Conference on Pesticide Stewardship, Memphis (TN) Marriottsponsored by the National Pesticide Stewardship Alliance. For information contact Kathy Brooks at (877)920-6772 or email kbrooks@arrowchase.com.

We're Updating!!

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

Change my address ☐ Delete me from your list ☐ Add to our list ☐

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Foundation Accepting Nominations

The Groundwater foundation is accepting nominations for its three annual national awards honoring individuals who create a legacy of groundwater protection through local action, education and government service.

The awards are:

The Vern Haverstick Groundwater Hero Award: Created to showcase groundwater protection activities by unsung, yet heroic efforts of community residents.

The Edith Stevens Groundwater Educator Award: Established to recognize groundwater educators who understand the importance of groundwater, lead by personal example and motivate others to protect groundwater.

The E. Benjamin Nelson Government Service Award: Established to recognize an elected or appointed public official who has significantly advanced environmental and groundwater stewardship.

Award recipients will receive complimentary travel, lodging and registration for the Groundwater Foundation's annual conference at the Hilton Pittsburgh and Towers, Pittsburgh, PA, Nov. 14-16.

For a booklet containing information on the awards and nominating instructions, contact foundation awards coordinator Zoe McManaman at (800)858-4844 or email zoe@groundwater.org. Nominations must be received by July 14 to be considered.

Physical Model Could Change Flows, Future of Nebraska's Lake Ogallala (continued from page 1)

The study has carefully scrutinized water flow and dissolved oxygen levels to help understand the problems. Researchers have also determined that hydrogen sulfide and ammonia from Lake McConaughy can exacerbate Lake Ogallala's low dissolved oxygen levels, further contributing to the fish kills. The UNL researchers theorize that water low in dissolved oxygen often flows through Lake Ogallala in well-defined waves, or "slugs," as water from Lake McConaughy is released into Lake Ogallala through Kingsley Dam.

To gather the information needed to build the scale model, researchers sampled water from the lake from four testing platforms and 30 underwater sampling sites last summer. A non-toxic, traceable dye injected into the lake gave additional clues into water flow patterns.

Admiraal and fellow hydraulic engineer John Stansbury measured the lake's water flow speeds and mapped its bottom using sonar. That information aided construction of the 25- by 40- by three foot concrete model of Lake Ogallala at Walter Scott that is now being used to help recreate its flow patterns and characteristics.

In harmony with Stansbury's computer model, the physical model is being used to track circulation and dissolved oxygen transport and to predict dissolved oxygen distributions for various operations in the lake, such as hydropower plants operations, along with aeration scenarios and in the lower basin of the lake, water velocity, temperature, and depth.

"It was important to develop the physical model because of the lake's geometry, combined with the variable operation of the hydropower plant, which together represents a quite complex system," Admiraal said. The physical model is calibrated against the field data that has been collected on flow patterns and velocities under the full range of lake operational conditions.

Cameras and computers will both be used to analyze water flow into and out of the model in one, two and even three dimensions. In addition, dyes can be injected into the water to aid researchers looking for patterns.

The model itself was constructed in the summer and fall of 2000 using computer designed auto cad maps of the lake's bottom from the Nebraska Game and Parks Commission. Using the computer maps, bottom details were transferred onto more than 40 30 16-gauge steel plates, which were hand cut to the contours of the

(continued oon next page)

Cory Haberman with the collection tank and computer hardware used in connection with the model of Lake Ogallala to record flow data for researchers (photo: Steve Ress).

From the Director (continued from page 2)

The benefit to the host and partner institutions is direct funding from the agencies to conduct research in the region without the typical formal request for proposals and associated nine to 12 month waiting period and much closer linkages to the agencies and their resources. CESUs also promises to allow larger-scale projects with multiple study sites across the region, through greater cooperation among the federal land management agencies and universities.

I recently visited the UNL Panhandle Research and Extension Center in Scottsbluff as part of a meeting of the Nebraska Water Conference Council. Mike Jess provided a tour of the North Platte irrigation project, which will be an integral part of next year's water conference. The conference will center around the centennial of the U.S. Bureau of Reclamation and its role in transforming agriculture and the environment in western Nebraska. The conference will be held jointly with the annual North Platte Basin Water Policy Conference (held jointly with Wyoming) at the new Gering Civic Center. Tentative dates are March 11-14, 2002. I also learned about the water-related research and outreach efforts at the Panhandle Center, particularly work by Dean Yonts and his colleagues. I plan to visit other R&E Centers as well as colleges and universities in the coming months to gain a broader appreciation of the water science research and education in Nebraska.

On an unrelated note, I would like to point yet another new direction of the *Water Current*. You perhaps have noticed that many of our articles, while pertaining to water resources in Nebraska, are no longer restricted to those involving funding or direct participation from the Water Center. This is both reasonable and necessary. Reasonable because the Water Center no longer has the financial resources to fund even a moderate number of projects (the subject of an upcoming column!) and necessary because of the breadth of issues, projects, faculty, organizations, and events that we must cover in order to do justice to water resources in Nebraska. Consequently, some articles may not directly involve the Water Center (e.g., the CLEAR team article in the April issue), yet are certainly worthy of your attention. While this may occasionally lead to some confusion or even consternation, it will hopefully mean a better newsletter for our readership! As always, your comments are welcome...

We also want to wish a speedy recovery to Dr. Ted Elliott, Director of the UNL School of Natural Resource Sciences. Although Ted has been director for less than a year, he has provided strong leadership and has already been a very effective advocate for natural resources research, teaching and outreach, including the hydrologic sciences. Our thoughts are with you and we look forward to your return to the helm ...

Physical Model Could Change Flows, Future of Nebraska's Lake Ogallala (continued from page 8)

bottom. The plates were spaced from one to three feet apart and the space between the plates was filled with concrete cinder blocks and fill sand. A special blend of cement and vermiculite was then used over the top of the model to finish it and give it a smooth, water-tight surface.

Much of the model's construction and operation has been done by hydraulic engineering graduate student Haberman of Norfolk. Haberman received a B.S. in Civil Engineering from UNL in 1999.

He estimates that the model has upwards of 1,500 cinder blocks in it, along with 12 yards of fill sand and nine cubic yards of hand-mixed concrete. The finished model holds about 1,000 gallons of water, taking about 10 minutes to fill (and about half an hour to drain).

"It was built as accurately to scale as we could possibly make it within the confines of the hydraulics basin of the building," Haberman said.

Head gates, representing where water from the lake is allowed to flow into irrigation canals and into the Platte River are also reproduced in scale and are computer controlled in their opening and closing, just as the real gates are.

"The scale details of the lake, it's bottom topography, the head gates and other perimeters unique to Lake Ogallala will allow us to accurately reproduce it's water flow patterns and then work on ways to alter them to benefit the trout and other sport fish in the lake," Haberman said.

It is anticipated that the model will be used over at least the next year to help researchers gather the data they will need to make recommendations to the Nebraska Game and Parks Commission on what can be done to adjust flows in the lake and / or alter bottom contours and features to help maintain dissolved oxygen levels that will sustain the lake as a public fishery.

This project is being funded in part by the Nebraska Game and Parks Commission, the University of Nebraska-Lincoln and the UNL Water Center.

Meet the Faculty

Dr. Xun-Hong Chen (continued from page 3)

— Groundwater modeling and analysis of streamflow depletion in Franklin and Red Willow counties, Nebraska. Funded by Nebraska Department of Water Resources.

— Quantifying the interaction of surface water and groundwater, considering the hydrological components as a whole system. Funded by the University of Nebraska.

— Nebraska domestic well water quality data analysis with David Gosselin. Funded by Nebraska Department of Health.

— Determination of vadose zone permeability for air flow and evaluation of soil vapor extraction system using numerical models. Conservation & Survey Division Research Project.

Selected Publications:

— Chen, X. H., and Y. Yin, 2001. Streamflow depletion: modeling of reduced baseflow and induced stream infiltration from seasonally pumped wells. *Journal of American Water Resources Association*, (in press).

— Chen, X. H., 2000. Measurement of streambed hydraulic conductivity and its anisotropy, *Environmental Geology*, 39(12), 1317-1324.

— Chen, X.H., J. Goeke, and S. Summerside. 1999. Hydraulic properties and uncertainty analysis for an unconfined alluvial aquifer. *Ground Water*, 37(6), 845-854.

— Chen, X.H., J.F. Ayers, and D.C. Gosselin, 1998. Modeling of nitrate-nitrogen movement near high-capacity irrigation wells. *Ground Water Monitoring and Remediation*, 18(4), p. 148-156.

— Chen, X.H., and D.C. Gosselin, 1998. Numerical simulation of radial gas flow: effects of soil anisotropy, well placement and surface seal. *Journal of Hydrologic Engineering*, ASCE 3(1), p. 52-61.

— Ayers, J.F., X.H. Chen, and D.C. Gosselin, 1998. Behavior of nitrate-nitrogen movement around a pumping high-capacity well: a field example. *Ground Water*, (36)2, pp. 325-337.

— Chen, X.H., and Y. Yin. 1999. Modeling of groundwater flow and analysis of stream-aquifer interactions, Franklin County, South-central Nebraska. *Report to the Nebraska Department of Water Resources*, 140 p.

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Dr. Darryll T. Pederson (continued from page 3)

— Using atrazine and water temperature as a tracer of induced recharge from the Platte River into a municipal well field. Using the atrazine tracer to determine aquifer dispersion.

— Characteristics and behavior of the major, buried-buried paleovalley aquifer in southeastern Nebraska. Sustainability of the aquifer. Interpretation of water movement. Origin of quickgravel. Interception of baseflow by vegetation and effect of irrigation pumping on baseflow.

Teaching:

— Groundwater Geology 488/888, Hydrogeology 889, Hydrology Seminar 987, Geology 100 and supervision of graduate students doing thesis and dissertation research in groundwater.

Seected Publications:

— Pederson, D.T., 2000. Effect of semi-perched groundwater on monitoring of groundwater levels in a developed aquifer, *Journal of the American Water Resources Association*, (36)6.

— Pederson, D.T., 2000. Stream piracy revisited: A groundwater sapping process? Abstracts with Programs, *Geological Society of America*, (32)7, 61A.

— Pederson, D.T. 2000. Review of: Groundwater and Geologic Processes, Ingerbritsen and Sanford, *GSA Today*, (10)2, 22.

— Pederson, D.T., 1999. Groundwater sapping and drainage density, EOS Trans. *American Geophysical Union*, Fall Meeting Supplement, (80)46, F449.

— Pederson, D.T., 1999. Sustainability of the water resource for all users is not attainable in the High Plains, Abstracts with Programs, *Geological Society of America*, (31)7, 492A.

— Pederson, D.T. and Cornwall, J.F., 1999. Stream piracy: groundwater is the villain, Program and Proceedings - *The Nebraska Academy of Sciences*, page 77.

— Cornwall, J.F. and Pederson, D.T., 1999. Groundwater erosion processes in a meander near Cook, Nebraska, Program and Proceedings - *The Nebraska Academy of Sciences*, page 72.

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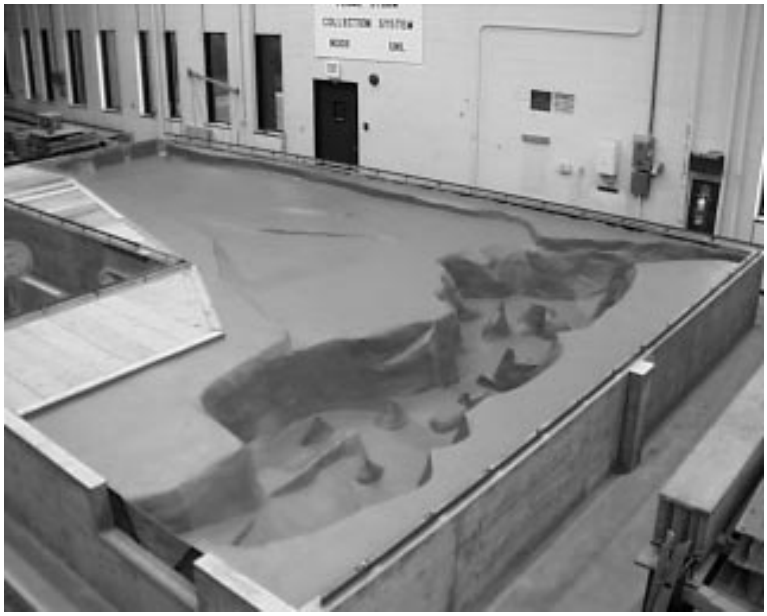

An overhead view of the Lake Ogallala model in the engineering basin of UNL's Walter Scott Engineering building (photo: Cory Haberman)

This photograph from the early construction stages of the model of Lake Ogallala clearly shows the hand-cut steel plates, concrete blocks and fill sand used in its construction (photo: Cory Haberman).

Careful construction makes the model of Lake Ogallala begin to take shape (photo: Cory Haberman).

Three Free Natural Resources Fact Sheets Available From UNL's CSD

Environmental change, water and other natural resource issues are featured in a new series of fact sheets published by the University of Nebraska-Lincoln's Conservation and Survey Division.

The free fact sheets, called Earth Science Notes, provide brief, timely information on diverse Nebraska natural resources topics. Generally 4 to 6 pages long, topics are drawn from Conservation and Survey Division and UNL School of Natural Resource Sciences research.

"Similar to what the U.S. Geological Survey does with its Fact Sheet series or what NU Cooperative Extension has done for years with NebGuides, we want to offer concise treatments of a variety of topics to a public more and more swamped with information," explained Mark Kuzila, Conservation and Survey director. "In addition, our specialists and those at the School of Natural Resource Sciences produce reams of technical data but don't always have time to turn that into general-audience publications. This way they can summarize it in terms most people can understand."

The fact sheets will list other resources if people want further information, Kuzila added.

One newly published Earth Science Notes examines the effects of environmental change on climate and water supply in the central Great Plains; another looks at test-hole drilling in Nebraska, Conservation and Survey's most basic form of data-gathering. Others will cover the sale and transfer of water in Nebraska, a subject debated in this session's Nebraska Legislature, and offer a new analysis of the groundwater supply. Future topics could include land-use, soils or geological issues.

Copies of Earth Science Notes are available from the Conservation and Survey Division, 113 Nebraska Hall, P.O. Box 830157, University of Nebraska-Lincoln, Lincoln, Neb., 68588-0517; e-mail csdsales@unl.edu or phone (402)472-7523. Conservation and Survey is part of NU's Institute of Agriculture and Natural Resources.

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