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WATER CURRENT

UNL Water Center — Part of the School of Natural Resources

Vol. 36, No. 3 Summer 2004

Summer Tour Looks at Platte River Wildlife and Urbanization Issues

By Steve Ress

Those attending the Nebraska Water Conference Council's summer water and natural resources tour were exposed to a wide variety of topics related to wildlife habitat and emerging urban issues in the Platte River valley.

More than 40 participated in the June 7-9 tour that traveled the Platte River from Lexington to Omaha on a route that began in Lincoln and ended in Kearney.

UNL School of Natural Resources geologist Matt Joeckel uses soil core samples to help explain the geology of the Platte River basin to those on the Nebraska Water Conference Council's annual Water and Natural Resources Tour in June. For more photos from the annual tour, see pages eight and nine (photo: Rodney Verhoeff).

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Second Annual Water Law, Policy and Science Conference

The University of Nebraska-Lincoln's Second Annual Water Law, Policy and Science Conference has initiallly been set for April 7-8, 2005, at the UNL City Campus Union in downtown Lincoln.

Co-organizer Kyle Hoagland, director of the UNL Water Center, said the general theme of the conference is *"Water Management Under Stress: Climate Change, Drought and Water Quantity."* Nationally known keynote speakers will be part of the conference venue as will a host of UNL experts in drought monitoring and management, climatology, water science and water policy.

More details will be in the Fall *Water Current*. For now, mark your calendars and plan to attend.

The conference is co-sponsored by UNL's Institute of Agriculture and Natural Resources, School of Natural Resources, College of Law, Water Center and Water Resources Research Initiative.

Inside

Algal Blooms Dominate This Summer

from the DIRECTOR

Kyle D. Hoagland

This has been a very busy summer for algae in Nebraska. As the article in this issue describes (page 12), there has been an unusually high number of reported "blooms" or population explosions of nuisance algae in the state this spring and summer, which has prompted an even greater public interest and number of requests for information. Many sandpit lake property owners and others have contacted Tadd Barrow at UNL and the UNL Water Center, asking what's causing the problem, is their lake dangerous for swimming or fishing, and what can be done about it.

First, this is not a new problem. Algal blooms have been documented at least as far back as the Romans. But even today, it's difficult to pinpoint precisely why these blooms of microscopic blue-green algae, also know as cyanobacteria (referring to their "cyano-" or blue-green color), occur at such high densities in any particular year.

Whether these recent blooms were triggered by last year's drought, all the spring rain earlier this year, calm lakes conditions of late, or a combination of these and other factors awaits additional research. What we do know is that all lakes that exhibit blue-green blooms also contain high nutrient levels, particularly phosphorus.

These microscopic plant-like organisms take up phosphorus and nitrogen much as a corn or wheat plant does, in simple forms. Similarly, it doesn't take much additional phosphorus to dramatically stimulate growth, so non-point source phosphorus inputs to lakes from surrounding agricultural lands, lawn fertilizer and leaking septic tanks inputs to sandpit lakes, or other nutrient inputs, can set the stage for such massive growth. Thus, long-term efforts to reduce nutrient loading, as it's called, can help prevent the recurrence of future blooms.

Make no mistake, these blooms can be nasty. Blue-greens are capable of producing a variety of toxins, the most common probably being microcystin, a hepatotoxin that attacks the liver. It's a powerful substance that can kill cattle or pets that ingest it and cause contact dermatitis (skin rashes) or gastrointestinal distress in people using these lakes or that perhaps take an inadvertent gulp of lake water.

Reports of human deaths are extremely rare, simply because most people have the good sense not to drink water from green ponds.

This is the toxin the Nebraska Department of Environmental Quality has been diligently testing for in many lakes in Nebraska this year, since not all blue-greens release toxins, in fact most probably don't. Some blooming cyanobacteria produce neurotoxins that are even more lethal if ingested, resulting in more rapid deaths of animals as their respiratory circulatory systems are essentially short circuited, so it's important to know which species are present.

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WATER CURRENT

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Meet the Faculty

Gary D. Lynne, Ph.D.

Professor and past head, UNL Department of Agricultural Economics. University of Nebraskafaculty member since 1995. Formerly Assistant Professor to Professor, Food and Resour. Econ. Dept. at the University of Florida, 1974-1995. Motivations in resource conservation. Market mechanisms and incentives for environmental enhancement. Behavioral economics/social theory. Testing the null hypotheses that 1) intrinsic moral development and external social influences do *not* affect economic (profit and utility maximizing) behavior, and 2) that individuals do *not* choose completely unfettered choice, no outside-governance. Exploring the efficacy of a pluralist in contrast to a monist theory of economic motivations: Perhaps individuals pursue both a self-directed self-interest and an other-directed other-interest. Working within the interstices of disciplines as an integrator.

Gary Lynne

Education

B.S, M.S, Agricultural (Production) Economics, North Dakota State University, 1966, 1969
Ph.D., Agricultural (Resource) Economics, Oregon State University, 1974

Teaching

AECN/NREE 265 Resource and Environmental Economics
AECN 868 Advanced Resource and Environmental Economics
AECN 896 Behavioral Economics

Current Extension Programs

No formal appointment, but regularly reach out to various groups. Maintain three websites (including http://www.carbon.unl.edu, http://social.capital.unl.edu).

Current Research Programs

Conservation technology adoption behavior. Marketing of natural resources (e.g. water and carbon markets). Metaeconomics. Behavioral economics. Social capital. Chair 1-MS Committee. Active in 3-interdisciplinary research efforts both within

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Qi Steven Hu, Ph.D.

Associate Professor and climatologist, School of Natural Resources, University of Nebraska-Lincoln.

Education

Ph.D. Atmospheric Science, Department of Atmospheric Science, Colorado State University, 1992
M.S. Atmospheric Science, Department of Atmospheric Science, Colorado State University, 1986
B.S. Meteorology, Department of Meteorology, Lanzhou University, China, 1982

Current Research/Extension Programs

Research: Understanding precipitation variations in the central United States and variability of the summer monsoon rainfall in the southwestern United States; Identifying physical mechanisms causing the interannual and multidecadal scale variations of the precipitation; Understanding climate change effects on water resources, crop production, and animal behavior in the central United States; Studying the decision behavior of Nebraska farmers related to use of climate prediction and information and identifying ways to improve both the decision-making and climate predictions so that they can be effectively used in decision-making to benefit the farmers and the society.

Extension: Developing education programs to improve societies' understanding of climate predictions and use of climate prediction and information in decision-making. Connecting climate prediction makers and users and identifying ways to improve predictions for their better use by the society.

Past Research/Extension Programs

Research: Studied interactions of atmospheric convection and radiation and their role in global climate variations; analyzed the effects of regional climate change on streamflows in watersheds and local water resources.

Extension: Served as a source of climate predictions and climate information for the general public and assisted in making

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Steve Hu

State, University Help Restore and Improve Sutton's Clarks Pond

Clarks Pond, originally known as Glen Lake, is located in Sutton, Nebraska. Glen Lake existed when the area was settled in 1870. In 1948 the lake was granted to the city by Mayme W. Clark and renamed Clarks Pond. The one-acre pond and associated park have provided ice skating in the winter and fishing in the summer.

Problems

Maximum depth in the pond was only three feet, and because of that shallow depth, it was extremely turbid, high in nutrients, and a fishery was nonexistent. Problems with sediment and nutrients stemmed from the 187-acre drainage area above the pond.

Solutions

The City of Sutton initiated a restoration and protection project on the pond in 2001. The project's first phase was to address sediment and nutrient loads from the watershed. Part of the solution was for city officials to work with upstream landowners on construction of a sediment basin. The basin could reduce sediment by as much as 75 percent. To further reduce sediment and nutrient inputs to the pond, a wetland area was developed between the sediment basin and the upper end of the pond. The one-quarter-acre wetland area will be maintained through a water level control structure. The primary components of the pond restoration project were to remove 63,000 cubic yards of sediment and stabilize eroding shorelines.

Project partners include the City of Sutton, Upper Big Blue Natural Resources District, University of Nebraska-Lincoln, Nebraska Game and Parks Commission, Nebraska Environmental Trust, Nebraska Department of Environmental Quality, U.S. Environmental Protection Agency, and Olsson Associates. Cost of this two-year project was approximately $428,000.

Table 1. Water Quality Improvements Measured in Clarks Pond

Parameter	*Pre-project (2001)*	*Post Project (2003)*	*% Improvement*
Lake Turbidity (NTU)	788	24	97
Total Phosphorus (_g/l)	1,992	149	93
Total Nitrogen (_g/l)	6,037	1,940	68
Chlorophyll *a* (mg/l)	600	97	84
Water Clarity (inches)	2	17	633

Results

Significant water quality improvements resulted from this project (Table 1). The largest improvement was in lake clarity, which increased by 633 percent. In addition to increasing water clarity, total phosphorus decreased by 93 percent; total nitrogen decreased by 68 percent; and chlorophyll, which is a measure of algae density, decreased by 84 percent. The pond has been restocked with largemouth bass, bluegill, and channel catfish.

For More Information Contact:

Overall Project Information
Pete Olson
City of Sutton
(402) 773-4225

Water Quality
Paul Brakhage
NE Dept. of Environmental Quality
(402) 471-4224

Engineering and Design
Jeff Palik
Olsson Associates
(308) 384-8750

Fisheries
Rick Eades
NE Game and Parks Commission
(402) 472-5445

Education
Tadd Barrow
University of Nebraska-Lincoln
(402) 472-7783

Instrumentation and Research Allow Lower Detection of Tetracycline Antibiotics

By Steve Ress

State of the art equipment and dedicated research has allowed the UNL Water Sciences Laboratory (WSL) to find traces of tetracycline antibiotics as low as 0.5 parts per billion (ppb) in soil and as low as 0.01 ppb in groundwater.

"The new equipment has enabled us to develop a new method for analysis of tetracyclines and some of their metabolites in water that is five to 20 times more sensitive than our previous method," said research chemist Dan Snow, who manages the WSL.

Tetracyclines are a group of antibiotics used for treating infection and disease in both humans and animals. Discovered in the 1940's and 50's, they were later found to have a profound effect on livestock growth rates. By the 1990's estimates are that more than 10,000 tons of antibiotics were administered to animals annually in the U.S., with tetracyclines comprising roughly one-fifth of that total.

After given to an animal in feed, water, or by injection, they eventually are excreted either unchanged or in a metabolized, or modified, form.

"Tetracyclines and other antibiotics given to livestock can be excreted in manure and then, depending on how that waste is handled, can end up in feedlots, lagoons, fields, and run-off to streams and lakes." Snow said.

Because of their widespread use in medicine, it is believed that many bacteria have become resistant to their effects, rendering these drugs ineffective in treating illness or infections. Since the same drugs are administered to animals, this is a way antibiotics can get into the environment and another avenue for proliferation of antibiotic resistance. Because of the concerns for antibiotic resistance, it is very important to have accurate information regarding the occurrence of these compounds in the environment.

Improved detection of tetracyclines at low levels in water and soil is necessary to understand their occurrence and assess whether there is a problem.

"The levels of tetracycline found in the environment are not normally toxic to humans or animals, but their presence at low levels in water and soils could contribute to the increase in antibiotic-resistant bacteria," Snow said.

"Because we are only now beginning to study tetracyclines in the environment, we don't really know whether they can get into groundwater. Initial tests suggest they largely remain bound to soil particles," he said. That makes the new, lower detection limits the WSL can test to even more important.

"The new equipment has enabled us to develop a new method for analysis of tetracyclines and some of their metabolites in water that is five to 20 times more sensitive than our previous method."

In the late 1990's, staff at the lab developed a method to concentrate and analyze tetracyclines in water with an instrument called an ion trap mass spectrometer. The results of these early tests indicated that groundwater samples impacted by livestock wastewater lagoons in Nebraska did not have detectable levels of tetracyclines (greater than 2 ppb), despite the fact that 85 percent of the lagoons studied showed levels of the antibiotic ranging from 10 to 10,000 pbb. This methodology was published in the *Journal of Chromatography* in 2001.

These results led Snow and fellow UNL researchers Jose Payero and David Tarkalson at UNL's West Central Research and Extension Center in North Platte to begin investigating whether tetracyclines in cattle manure applied to irrigated corn might end up in ground water or be held in the soil.

"The results from the ion trap showed low levels of tetracycline in manure-treated soil, but the concentrations were highly variable even from similar samples. We needed an instrument that could provide more accurate results in environmental samples," Snow said.

The need for improved detection of these and other pharmaceutical compounds lead to the acquisition of a triple quadrupole mass spectrometer last year.

While the ion trap is a highly sensitive and versatile instrument for analysis of pharmaceutical compounds like antibiotics, the "triple quad" provides superior sensitivity and greatly improved detection mainly because of the way the chemicals are separated and detected.

The availability of both the ion trap and triple quad systems provides nearly unlimited capabilities for study of new types of contaminants like pharmaceuticals in the environment.

Using the new equipment and methodologies, the lab can detect tetracyclines to about 0.01 ppb in water and as low as 0.5 ppb in soil. This combination of equipment and methodology allows the three UNL researchers to hone their initial study of where the tetracycline in manure used on cornfields may wind-up and whether it could pose a potential health risk to humans and animals.

"Researchers in Nebraska are extremely fortunate to have this type of instrumentation available. There are only a handful of universities in the world with this capability dedicated to water research."

The UNL Water Sciences Laboratory is part of the UNL Water Center and School of Natural Resources. The U.S. Environmental Protection Agency helps fund this research.

Water Center Completes Five-Year USGS Review

By Steve Ress

The UNL Water Center recently completed a comprehensive review of its U.S. Geological Survey (USGS) funded research activities from 1998 through 2002.

Allocation of federal grant and matching funds to the UNL Water Center during that period went 74 percent to research, 10 percent to information transfer, four percent to education and 12 percent toward administration.

Base funding for the center is received via the Nebraska Research Initiative and the University of Nebraska's Agricultural Research Division, Cooperative Extension Division and College of Agriculture and Natural Resources. The center also generated more than $1.68 million in extramural funding during the period reported. Much of this was obtained through the activities of the center's associated Water Sciences Laboratory, Water Center director Kyle Hoagland said.

"A recent survey of our University of Nebraska water faculty also indicates they currently have $12 million in grant funding in hand," he said.

During the reported period, the Water Center had 11 seed grants awarded, which resulted in 26 peer-reviewed publications, 10 graduate theses and dissertations and nearly $2 million in follow-on extramural funding from federal and state sources.

Research categories included biological sciences, climate and hydrologic processes, engineering, groundwater flow and transport, social sciences and water quality, among others.

The UNL Water Center was lead or co-sponsor for annual water conferences, summer water and natural resources tours, Platte Watershed symposiums, Fall Festival of Color, the Earth Wellness Festival, Children's Groundwater Festival, UNL School of Natural Resources research colloquiums and Husker Harvest Days trade show.

The Water Center also established or participated in posting and maintaining eight water and natural resources web sites, along with publishing a quarterly newsletter, numerous brochures and educational materials and the writing of magazine articles and news releases.

During the period reported to the USGS, the center also supported four undergraduate students, 13 Masters students, four Ph.D. candidates and eight post-doctoral students.

Significant research programs funded at least in part by USGS funds during the reporting period include the following:

A Test of Permeable Zero-Valent Iron Barriers for In-Situ Containment and Remediation of Pesticide Contamination in Unsaturated Soils, Patrick J. Shea and Steven D. Comfort.

Determination of Aquifer and Aquitard Hydraulic Properties and Their Role in Sreamflow Depletion, Xun-Hong Chen, James Goeke and Robert Diffendal.

Evaluating the Effects of Pesticide Mixtures to Freshwater Algae, Kyle Hoagland and Blair Siegfried.

Hydraulic Characterization of the Stream-Aquifer Interface: Theory, Field Implementation, and Practical Ramifications - A Multi-State Proposal, Vitaly Zlotnik, Chen, Goeke, James Butler, Marios Sophocleous and Carl Elwee.

An Assessment of Factors Indicating Well Vulnerability in Nebraska, Bruce Dvorak and Wayne Woldt.

Evaluation of Conductive Properties of the Surficial Aquifer in the Nebraska Sand Hills, Zlotnik, David Loope and Joseph Mason.

Investigation of Microbially-Influenced Copper Corrosion in Nebraska Drinking Water Systems, Matthew Morley and Dvorak.

Assessment of Source of Variation in Copper Concentration in Nebraska Drinking Water Systems, Dvorak and Morley.

Assessment of Thermal-Infrared Imaging as a Tool For Evaluation of Groundwater-Lake Interactions in the Nebraska Sand Hills, Zlotnik, David Gosselin, Geoffrey Henebry and Donald Rundquist.

Investigation of Directional Hydraulic Conductivities of Streambeds and Evaluation of Their Roles in Stream-Aquifer Interactions, Chen and Goeke.

Relating Landscape Scale Characteristics With Phosphorus Loss Potential to Surface Waters, Martha Mamo, Dennis McCallister, Daniel Ginting and William Zanner.

For more information on any of these research programs, contact the UNL Water Center at (402) 472-3305 or email sress1@unl.edu.

U.S. Water Use Virtually Unchanged Since 1985, USGS Says

A recent U.S. Geological Survey (USGS) report says that in 2000 Americans were using about the same amount of water they did 15 years earlier, despite a growing population and increasing demands for electricity.

The report, released in March, said water use in the U.S. has remained fairly stable since 1985 at around 408 billion gallons of water per day. It is a sign that conservation is working, the agency said.

In the report, *Estimated Use of Water in the United States in 2000*, USGS researchers found that the chief users of the nation's water are electrical power generation, agriculture and public water supply. The report also said that personal use of water is rising, but not faster than population change.

Hydropower generation makes up 48 percent of water usage; irrigation is second at 34 percent and public supply is third at 11 percent of daily water usage. Public supply includes water delivered to homes, businesses and industry.

Self-supplied industrial users, the livestock industry, mining, aquaculture and domestic wells, taken together, account for about seven percent of usage.

The full report is available online at http://pubs.water.usgs.gov/circ1268/.

Drought Persisting at Nebraska's Largest Reservoir

Lake McConaughy reached its peak elevation for the spring in late April, several weeks earlier than normal, as inflows sometimes dropped below 100 cubic feet per second (cfs).

A fifth year of drought pulled the state's largest reservoir down to 36 percent of capacity by the end of May with levels continuing to decline.

Inflows to the lake during May, which typically are among the highest of year, amounted to around 21 percent of normal, or about 15,000 acre-feet. An acre-foot of water is the amount of water it takes to cover one acre of land with a foot of water, or about 326,000 gallons.

By the end of May, the lake was about 12 miles long and about 80 feet deep near Kingsley Dam.

With most predictions being for the drought to continue through the summer, McConaughy is likely to end the 2004 irrigation season at a record low of less than 200,000 acre-feet of water in storage, or only about 11 percent of its 1.74 million acre-feet capacity, according to Central Nebraska Public Power and Irrigation District (CNPPID) in Holdrege.

CNPPID told its irrigation customers that a full supply of water would be available to them this summer, but that the supply outlook for 2005 is uncertain.

Conservation measures in response to the ongoing drought have reduced annual releases of water from the lake by more than half, from 1.4 million acre-feet in 2000 to 612,000 acre-feet in 2003, CNPPID said. This year's releases are expected to be about the same as last year.

Historic low inflows are compounding the lake's troubles. Snowmelt and runoff from the Rocky Mountains, that help feed the lake, were only 16 percent of normal in 2002, 69 percent of normal last year and are projected at 37 percent of normal this year, CNPPID said.

Reduced irrigation above the lake, which the lake then receives in the form of return flows, along with increased groundwater development above the lake that intercepts return flows to the North Platte River, also have not helped McConaughy, CNPPID said.

(Editor's Note: Taken in part from The Communicator, CNPPID, Vol. 19, No. 2, May/June 2004).

A fifth year of drought pulled Lake McConaughy down to 36 percent of capacity by the end of May and levels are continuing to decline. By the end of May, the lake was about 12 miles long and about 80 feet deep near Kingsley Dam. Many houses that formerly lined the lake's shoreline now appear as islands surrounded by sand (UNL School of Natural Resources photo).

What's a "Dead Zone?"

A dead zone is an area of water with an oxygen deficiency, often caused by excess nutrients.

Nutrients are vital for plant growth, but excess nutrients, particularly nitrogen and phosphorus, can cause serious problems when they enter water systems, where they can stimulate algae growth. As algae grows and spreads, they cover the water's surface forming what is called an algae bloom.

These blooms block sunlight from reaching underwater aquatic plants that support a diversity of aquatic life. Without the necessary amount of sunlight, the underwater plants die.

Decomposition of these plants, as well as of the algae, removes oxygen from the water.

As this continues, the oxygen level of the water becomes very low, turning the waterway into an area of "hypoxia," also known as a dead zone. Few plants or animals can survive in such an area.

(Editor's note: From *Virginia Water Central*, Virginia Water Resources Research Center, Blacksburg, VA, January 2004 (No. 29)).

Nebraska Water Conference Council's
Annual Water & Natural Resources Tour

Focusing Upon Wildlife Habitat & Emerging Urban Issues In the Platte River Valley

June 7 - 9, 2004

The tour was co-sponsored by:

Central Nebraska Public Power & Irrigation District, Gateway Farm Expo, Kearney Area Chamber of Commerce, Nebraska Association of Resources Districts, Nebraska Water Conference Council, Nebraska Public Power District and the University of Nebraska's School of Natural Resources, Conservation & Survey Division and Water Center.

Photographs by:

Tim Anderson, Central Nebraska Public Power and Irrigation District; Steve Ress, UNL Water Center; and Rodney Verhoeff, Lower Platte River Corridor Alliance.

Bill Scharf of Northwestern Michigan University (right) shows Mike Jess of the UNL Water Center how he bands and releases birds gathered at Jeffrey Island near Overton.

Rowe Sanctuary manager Paul Tebbel talks to the summer tour about the new Lian Nicholson Audubon Center near Gibbon.

Nebraska Public Power District biologist Jim Jenniges talks about nesting habitat for Interior Least Terns and Piping Plovers at an NPPD sandpit near Lexington.

Media representatives and tour participants get a close look at some of the small animals being caught and released for wildlife census information being gathered by Central Nebraska Public Power and Irrigation at Jeffrey Island, near Overton.

Summer Tour Looks at Platte River Wildlife and Urbanization Issues (continued from page 1)

With the Platte River basin one of the most contentious in Nebraska in terms of competing demands for water and protection of threatened and endangered Interior Least Terns, Piping Plover, Pallid Sturgeon and Whooping Cranes, much of the tour's first day stops focused on those issues. On the second and third days, speakers focused more on urbanization of the river and its associated sand pit lakes between Columbus and Omaha.

Initial stops had tour goers observing wildlife habitat and inventorying activities by Central Nebraska Public Power and Irrigation District at Jeffrey Island near Overton and at sandpit islands on the Platte River near Lexington by Nebraska Public Power District.

At Jeffrey Island, tour goers got a chance to see the wide variety of both feathered and furred, not to mention amphibian, wildlife using the island, while near Lexington, they used high-powered spotting scopes to view nesting Terns and Plovers and their offspring.

Later, Paul Tebbel, manager of Audubon Nebraska's Rowe Sanctuary near Gibbon, give an update on habitat issues in the basin and Audubon's role in helping to preserve and restore it.

Afternoon presentations by Grand Island Utilities Director Gary Mader and Ginny McGuire of the U.S. Geological Survey shifted the tour's focus to dealing with groundwater contamination that threatens Grand Island's well field and to overall conditions of the Ogallala Aquifer.

The following morning, tour co-organizer and Lower Platte River Corridor Alliance coordinator Rodney Verhoeff began with a rundown on the alliance's role in helping to mold development of one of the most used stretches of the Platte River, between Lincoln and Omaha. Later that morning, Arturo Spindola, assistant director of the East-Central District Health Department in Columbus spoke on opportunities and challenges presented by immigration and increasing ethnic diversity in Platte, Colfax, Boone and Nance Counties. The well-received talk was delivered at Schuyler's historic Oak

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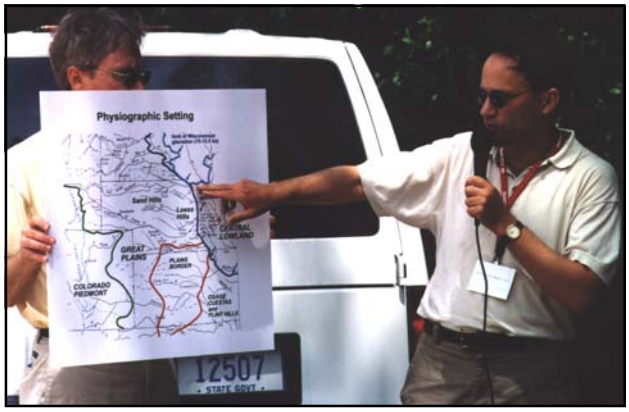
Lori Potter of the Kearney Hub and Barb Batie of the Lexington Clipper-Harold gather notes for future newspaper articles on the annual summer water and natural resources tour.

With help from NPPD's Frank Kwapnioski (right) flood plain engineer Brian Dunnigan of the Nebraska Department of Natural Resources (left) details flood plain plans for the Platte River near Fremont.

Central Nebraska Public Power and Irrigation District senior biologist Mark Peyton talks to the summer water tour at Jeffrey Island.

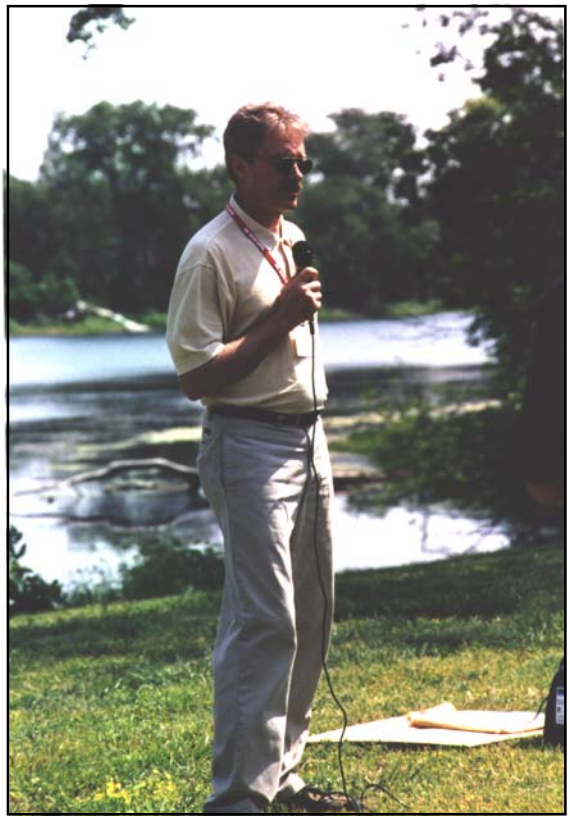


UNL School of Natural Resources geologist Matt Joeckel (right) discusses water budgeting and some of the unique geological features of the Platte River and its bluffs near Fremont State Lakes.

Summer Tour Looks at Platte River Wildlife and Urbanization Issues (continued from page 9)

UNL School of Natural Resources emeritus professor and Ron Svoboda listen to a presentation by Arturo Spindola of the East-Central District Health Department on recent immigration and demographic patterns in the Central Platte River Basin at Schuyler's historic Oak Ballroom.

Cecil Steward, Dean Emeritus of the UNL College of Architecture, talks to the summer water tour about his visions for sustainable communities and development of the Platte River Basin between Lincoln and Omaha.



UNL Water Center director and lake ecologist Kyle Hoagland explains recent research efforts to stem algal contamination of groundwater-fed lakes at Fremont State Lakes recreational area.

Listening intently to another presentation on the June water and natural resources tour.

UNL Water Center associate director Mike Jess pauses for a few moments with Fremont State lakes park superintendent Roger Stine.

Summer Tour Looks at Platte River Wildlife and Urbanization Issues (continued from page 9)

Ballroom, largely built by depression-era immigrants in the mid-1930's.

Later, UNL Water Center director and lake ecologist Kyle Hoagland and School of Natural Resources geologist Matt Joeckel respectively spoke on research to control algae blooms in sand pit lakes near Fremont and the geology of the basin.

"The discussion of algal contamination abatement was particularly poignant in that several lakes and ponds in Nebraska, including at least one in Fremont, have been closed this summer due to blue-green algae blooms," said tour co-organizer Michael Jess, associate director of the UNL Water Center and water policy specialist in UNL's School of Natural Resources.

The second day's final stop gave UNL College of Architecture Dean Emeritus Cecil Steward a chance to discuss his vision of the Platte's development and urbanization in the historic setting of Omaha's Joslyn Castle, where Steward's Joslyn Castle Institute for Sustainable Communities is located.

On the final day, Greg MacLean and Randy Stahmer of HDR Inc. gave additional insight on water and wastewater planning in the Lower Platte River corridor at the Papio-Missouri River NRD before at a stop at Schramm State Park and a return to endangered species issues by UNL School of Natural Resources fisheries biologist Ed Peters on tracking movement and spawning activities of Pallid Sturgeon.

The tour's last stop at Linoma Beach, near Ashland, gave participants a rare look at sand and gravel mining operations and sand pit reclamation efforts by Lyman-Richey Corp. real estate broker Carl Roberts. Renae Held and Chris Thody of the Tern and Plover Partnership also talked about enhancing and preserving habitat for Least Terns and Piping Plovers.

Tour co-organizer Frank Kwapnioski also spoke on NPPD well field development at the Gerald Gentlemen power station near Sutherland.

Tour co-sponsors were Central Nebraska Public Power and Irrigation District, Gateway Farm Show, Kearney Area Chamber of Commerce, Nebraska Water Conference Council, Nebraska Association of Resources Districts, Nebraska Public Power District, U.S. Geological Survey - Nebraska District, Farm Credit Services and UNL's Water Center and School of Natural Resources.

Tricia Liedle of the UNL Water Center and Randy Strahmer of HDR (center) help serve ice cream to hot tour-goers at Omaha's Joslyn Castle.

Tour participants look-over soil core samples taken from near the Platte River.

Getting a view of Omaha's impressive Joslyn Castle, built not long after the turn of the last century.

Lower Platte South NRD general manager Glenn Johnson and Steve Ress of the UNL Water Center enjoy a cold drink at Linoma Beach near Ashland.

More Than 40 Toxic Algae Blooms on Lakes Statewide; Test Kits Available

Toxic blue-green algae blooms have been reported on more than 40 public and private Nebraska lakes and ponds since May.

"That's an unusually high number of complaints," said Tadd Barrow, a University of Nebraska-Lincoln water resources specialist. From May through June, the Nebraska Department of Environmental Quality and the university have responded to complaints on approximately 42 lakes.

"These blooms have not yet resulted in any reported cases of human illness, but several dogs have died from exposure to blue-green toxins," said John Holz, a university water quality specialist.

Elsewhere in the past, livestock as well as pets have died after drinking lake water during an algae bloom, Barrow said.

Skin irritations and gastrointestinal problems are the main risks to people from these toxins. In rare cases, extremely high toxin levels can be fatal to people.

Nebraska Cooperative Extension's water quality program has developed a volunteer monitoring program to check lakes for blue-green algae. Free test kits are available from Barrow's office so lake owners, users and managers can check their lake for potential toxin-producing algae, Barrow said.

State and University experts have responded to reports of blue-green algae blooms in more than 40 Nebraska lakes and ponds this summer. Free kits to test your lake or pond water are available from UNL's School of Natural Resources. Pictured is a fish kill from a past algae bloom at Pawnee Lake, near Lincoln (photo: Kyle Hoagland).

Kits contain instructions on proper sample collection, a sheet for recording measurements, a questionnaire about the lake and sample bottles for water and algae. Samples are returned to Barrow for processing and those who submit samples are notified of results.

For more information or a test kit, call Hilary Hansen at (402) 472-8190.

Knowing what algae blooms look like and avoiding water contact during blooms are the best bets, the UNL School of Natural Resources experts said.

Holz recommends people avoid activities such as swimming, water skiing, riding personal watercraft or similar activities involving physical contact or swallowing water from lakes with blue-green algae blooms.

During a bloom, lake water becomes cloudy with a green or blue-green cast and blue-green streaks may be visible on the water's surface, said Kyle Hoagland, a lake ecologist who heads UNL's Water Center.

"At this stage, the lake looks like pea soup or as if someone dumped a light-colored green paint in the water. It often develops a strong musty or fishy odor as the algae accumulate and begin to decompose," he said.

Winds can increase the danger of a toxic bloom by blowing algae to the leeward side of a lake where they concentrate in coves or along shorelines.

Blue-green algae, which are cyanobacteria, are microscopic organisms commonly found in lakes and ponds worldwide. Special characteristics of blue-green algae often allow them to multiply faster than other types of algae, Holz said.

This rapid algal growth is called an algae bloom. Blooms can appear and linger anywhere from days to weeks. They are most common in the warmer months from May to September, Hoagland said.

Some types of blue-green algae produce chemical toxins that harm people and animals, he said. "These colorless and odorless toxins may linger in the water for as long as two weeks after the bloom has disappeared."

Numerous environmental factors can trigger a bloom. Lakes with higher concentrations of nutrients, or fertilizers, especially phosphorus, generally tend to be more susceptible to blue-green blooms, he added.

A list of Nebraska lakes with known problems and health advisories is available online at http://www.deq.state.ne.us.

Cooperative Extension is part of the university's Institute of Agriculture and Natural Resources.

Meet the Faculty

Gary D. Lynne (continued from page 3)

Nebraska and with collaborators at other universities.

Publications, papers, book chapters and book reviews (last 5-years)

Lynne, G. D. and C. F. Casey. *Regulatory Control of Technology Adoption by Individuals Pursuing Multiple Utility*. J. Socio-Economics 27, 6 (1998): 701-719.

Casey, F. and G. D. Lynne. *Adoption of Water Conserving Technologies in Agriculture: The Role of Expected Profits and the Public Interest*. In F. Casey, A. Schmitz, S. Swinton and D. Zilberman (Editors). *Flexible Incentives for the Adoption of Environmental Technologies in Agriculture*. Norwell, MA: Kluwer Academic Publishers, 1999.

Lynne, G. D. *Divided Self Models of the Socioeconomic Person: The Metaeconomics Approach*. J. Socio-Economics 28, 3 (1999): 267-288.

Siles, M., L. Robison, B. Johnson, G. Lynne, and D. Beveridge. *Farmland* Exchanges: Selection of Trading Partners, Terms of Trade, and Social Capital. J. Amer. Soc. Farm Managers and Rur. Appraisers (2000): 127-140.

Cutforth, L.B., C.A. Francis, G.D. Lynne, D.A. Mortensen, and K.M. Eskridge. *Factors Affecting Farmers' Diversity Approach*. Amer. J. Altern. Agri. 16, 4 (2001): 168-176.

Lynne, G.D. *Agricultural Industrialization: A Metaeconomics Look at the Metaphors by Which We Live*. Rev. Agri. Econ. 24,2 (2002): 410-427.

Lynne, G.D. Book review of Cory, G.A. *The Reciprocal Modular Brain in Economics and Politics: Shaping the Rational and Moral Basis of Organization, Exchange and Choice.* J. Socio-Economics 31,5 (2002): 583-586.

Lynne, G.D. Book review of Chasek, P.S. (Ed.) *The Global Environment in the Twenty-First Century: Prospects for International Cooperation.* Shibuya-Ku, Tokyo, Japan: The United Nations University Press, 2000, 465 pp. in Amer. J. Agr. Econ. 85,1 (February, 2003): 282-283.

Cordes, S., J. Allen, R. Bishop, G. D. Lynne, L. Robison, V. D. Ryan and R. Shaeffer. *Social Capital, Attachment Value and Rural Development: A Conceptual Framework and Application of Contingent Valuation*. Amer. J. Agr. Econ. (in press).

Hayes, W.H. and G.D. Lynne. *Towards a Centerpiece for Ecological Economics*. Ecological Economics (in press).

Committee or Other Special Assignments (current)

Board Member and Secretary, Chair of the Nominating Committee, Society for the Advancement of Behavioral Economics (SABE)

Chair, Institutional and Behavioral Economics Section, Amer. Ag. Econ. Assoc. (AAEA)

Member, AAEA Nominating Committee

Editorial Board Member, Journal of Socio-Economics

Web address

http://agecon.unl.edu/lynne

Qi Steven Hu (continued from page 3)

decisions related to regulation of utility markets.

Teaching

Teaching Agricultural Climatology, a graduate level course on agricultural environment and development and change of such environment, and Global Climate Change, a senior and graduate level course focusing on evidence and mechanisms of climate variability and climate change from regional to global scales.

Publications

Hu, Q., and S. Feng, 2004: *Why has the land memory changed?* J. Climate (in press)

Hu, Q., and S. Feng, 2004: *A role of soil enthalpy in land memory*. J. Climate (in press)

Hu, Q., Y. Tawaye, and S. Feng, 2004: *Variations in the Northern Hemisphere atmospheric energetics in recent decades*. J. Climate, 17, 1975-1986.

Hu, Q., 2004: *U.S. soil temperature and its variation: A new dataset*. *Bull. Amer.* Meteor. Soc., 85, 29-31.

Hu, Q., and S. Feng, 2003: *A daily soil temperature dataset and soil temperature climatology of the contiguous United States*. J. Appl. Meteor. **42**, 1139-1156.

Hu, Q., and G. Buyanovsky, 2003: *Climate effect on corn yield in Missouri, U.S.A.* J. Appl. Meteor. **42**, 1626-1635.

Hu, Q., 2003: *A multidecadal variation in summer season diurnal rainfall in the central United States*. J. Climate, **16**, 174-178.

Hu, Q., S. Feng, and G. Shaefer, 2002: *Quality control for USDA NRCS SM/ST Network soil temperatures: A method and a database*. J. Appl. Meteor., **41**, 607-619.

Hu, Q., and S. Feng, 2002: *Interannual rainfall variations in the North American summer monsoon region: 1900-1998.* J. Climate, **15**, 1189-1202.

Hu, Q., and S. Feng, 2001: *Climatic role of the Gulf of Mexico in interannual variations of summer rainfall in the central United States.* J. Climate, **14**, 3156-3170.

Hu, Q., and S. Feng, 2001: *Variation of teleconnection of ENSO and interannual variation of summer rainfall in the central United States.* J. Climate, **14**, 2469-2480.

Hu, Q., and S. Feng, 2001: *Southward migration of centennial scale variations of drought/flood in eastern China and western United States.* J. Climate, **14**, 1323-1328.

Web/E-mail addresses

http://snr.unl.edu/climate
qhu2@unl.edu

From the Director (continued from page 2)

That's where UNL is helping by offering free test kits.

If you think that your lake may have such a toxic algal problem, refer to the article on page 12 for instructions on how to get some immediate assistance in assessing your lake. UNL's Cooperative Extension water quality team will provide you with a test kit, instructions on how to use it, and some answers, all free of charge. They'll help with some ideas for longer-term solutions to manage and treat the problem, as well.

Also in this issue, please note that planning is proceeding well on the Second Annual Water Law, Policy and Science Conference, that will be held at the UNL City Campus Union in downtown Lincoln. We have tentatively set the dates for that event for April 7 and 8, 2005 and the general theme for the conference will be "Water Management Under Stress: Climate Change, Drought and Water Quantity." More details on the conference will be published in the fall issue of this newsletter, as well as being available via direct mailings and online by a link to the Water Center's web site.

We are very proud of some new equipment acquisitions and analytical methods being developed and honed at the UNL Water Sciences Laboratory under Dr. Daniel Snow, the WSL's director of laboratory services. On page five of this issue of the *Water Current*, there is an article on tetracycline analysis methods the lab has developed with the help of new state-of-the-art equipment it recently installed. More information about this equipment and a general update on what is happening at the lab can be found on the back cover of this issue.

On pages eight through 11 there is a recap and photographs of our very successful summer water and natural resources tour of the central and lower Platte River basin. As this issue of the *Water Current* went to press we were already beginning the planning process for next summer's tour. We hope to have some initial news of that process in the next issue of this newsletter.

Enjoy the rest of the summer and if you happen to be in Grand Island anytime between Sept. 14 and 16, please visit our display in the Husker-red Institute of Agriculture and Natural Resources building at Husker Harvest Days.

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.

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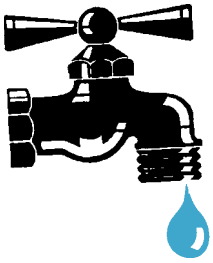

Water News Briefs

It's Easy to Reduce, Reuse, And Recycle

Bathrooms claim 75 percent of the water used in the average household. Make it a point to take shorter showers. Don't let the water run while brushing teeth, shaving or washing your face.

Use a bottle, other container or brick to displace water inside your toilet tank to cut down on the amount of water used for each flush.

Save used water for watering plants or cleaning around the house.

Use compact fluorescent bulbs, which use one-fourth the energy of regular bulbs.

Use fans instead of air-conditioning whenever possible.

Turn off lights, computer monitors or any other electrical appliances when not in use.

Bring your own bag to the store. Each 15-year-old tree only produces about 700 shopping bags.

Buy products that can be used over again; avoid disposable items.

Don't consume more than what you actually need.

UNL Environmental Resource Center

The University of Nebraska's Environmental Resource Center is a student-run organization that coordinates environmental information and services for students, faculty and stakeholders of the UNL community. Resources are provided in the form of books, videos, journals and human resources.

The ERC provides advising, internship and job postings and environmental, as well as campus-wide seminar listings.

The ERC houses the office of Ecology Now and provides a place for participating organizations to meet. It is open 9 a.m. to 3 p.m. Monday through Friday. For more information, phone (402) 472-8823, email unerc@unlinfo.unl.edu or go to Room 345 in the Nebraska Union, 1400 R St. on the downtown UNL campus.

Hazardous Waste Collections

The Lincoln-Lancaster County Health Department is sponsoring household hazardous waste collections on the following dates and locations:

— Friday, Sept. 10: Lancaster County Shop Salt Dome, Waverly (five blocks north of Hwy 6 on N. 141st. St.; 141st and Old Field St.), 3 to 7 p.m.
— Saturday, Sept. 11 and Saturday, Oct. 9: Lincoln-Lancaster County Health Dept., 3140 N St., south parking lot, Lincoln, 9 a.m. to 1 p.m.
— Saturday, Nov. 6: State Fair Park, Lincoln, 4-H Youth Complex, 9 a.m. to 1 p.m.

These are household collections, not for businesses. Only residents of Lincoln and Lancaster County can bring items to the collection points.

Items that will be accepted include:

Heavy metals such as wastes containing liquid mercury such as thermometers and fluorescent bulbs; Solvents such as mineral spirits, turpentine, paint strippers and thinners, oil-based paints, varnishes, stains, polishes and waxes; Pesticides such as weed killers, garden sprays, wood preservatives, roach powder, flea and tick products, rat poisons, etc.; Items containing PCBs such as ballasts from old fluorescent lamps and small capacitors from old appliances including radios, motors and televisions.

Do not bring items such as latex paint, medicine, fertilizer, batteries, antifreeze, used oil, or explosives and ammunitions.

If you have questions on what you can or cannot dispose of at these collections, call the LLCHD at (402) 441-8040.

Nebraska Water Fun Facts

About 65 percent of the High Plains Aquifer (also called the Ogallala Aquifer) lies beneath Nebraska and is estimated to contain about two billion acre-feet of water (an acre-foot being enough water to cover one acre of land with a foot of water, or about 326,000 gallons of water). This is equal to about 25 years of the state's average annual stream-flow or about 700 times the average amount of water in its surface water reservoirs.

Nebraska has nearly 2,000 natural lakes in the Sandhills.

Nebraska has more than 5,000 wetlands, including many saline sites, and over 1,000 reservoirs and sandpit lakes.

Nebraska ranks 10th nationally in number of stream miles, including its major river systems, and ranks 16th nationally in total wetland acres.

New Equipment and Methods Continue Update of WSL Analytical Capabilities

By Daniel D. Snow, Ph.D.,
Director of Laboratory Services,
UNL Water Sciences Laboratory

New equipment and methods for using them continue to update analytical capabilities of the UNL Water Sciences Laboratory (WSL).

A new robotic analyzer has been installed at the WSL this summer. It enhances the range of analytical methods the lab offers.

The Seal Analytical AQ2 is a bench-top "discrete" colorimetric analyzer that determines a wide range of parameters, such as nitrate, ammonia and phosphorous in water.

Autoanalyzers like the AQ2 permit rapid analysis of large numbers of water samples, helping reduce costs and decrease time needed for standard and widely used tests such as nitrate. In contrast to flow-injection analyzers, where samples and reagents are analyzed in a continuously flowing stream, the discrete analyzer individually prepares samples and standards in reaction "wells," which are then automatically measured at precise intervals.

A discrete analyzer allows greater control over procedures and permits rapid automated analysis of a wide variety of samples from groundwater, surface water and even digests and soil extracts.

Over 20 different methods are available for the AQ2. It is now configured for analysis of nitrate and nitrite by Cd-reduction (EPA Method 353.2), ammonia by the phenate method (EPA Method 350.1) and phosphate by molybdate chemistry (EPA Method 365.1). The AQ2 can perform multiple tests on the same set of samples simultaneously, which saves time and effort for quicker results.

The WSL is also now offering analysis of hydrogen and oxygen isotopes of water in solids such as plants and soils using a process known as azeotropic distillation to extract water for stable isotope analysis. Slight variations in the natural abundance of deuterium and oxygen-18 in water can be used to determine water sources and flow in plants, soils and ground water. The method is being used for samples to study water replenishment, utilization, recharge, and evaporation in the Nebraska Sandhills by UNL researchers.

On the WSL staff, Mark Meyer has been promoted to a research technician. Meyer has a bachelor's degree in water science from UNL and several years experience as a UNL laboratory technician. He is responsible for sample log in, preparation of water samples for pesticide analysis, as well as many of the standard tests for anions, ammonia, nitrate and dissolved carbon.

New methods are continuously developed as needed to meet research needs. In addition to the new tests offered with the AQ2 autoanalyzer and the new isotope methods, laboratory staff is working on methods for sulfonamide and fluoroquinolone antibiotics as well as androgen and estrogen hormones in environmental samples. More information and a brochure listing methods available at the WSL can be found online at http://waterscience.unl.edu

The WSL is part of the UNL Water Center and UNL School of Natural Resources.

University of Nebraska Lincoln WATER CENTER

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