

Water Resources Update

Illinois Water Science Center Newsletter

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Illinois Water Science Center
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Compiled by D.M. Ayers

MESSAGE FROM THE DIRECTOR

The U.S. Geological Survey (USGS) and the University of Illinois dedicated the Ben Chie Yen Memorial Streamflow-Gaging Station, Boneyard Creek at Urbana, Illinois, on the morning of April 28, 2004. The station is on Boneyard Creek immediately north of Engineering Hall on the university campus. The station, operated by the USGS in cooperation with the University of Illinois and the Cities of Champaign and Urbana, is part of a network of more than 7,000 stations operated by the USGS across the Nation (approximately 180 stations in Illinois in 2003). The station is used to monitor river elevation (stage) and streamflow (discharge), with state-of-the art equipment, including acoustical instruments and real-time telemetry. This information can be used for issuing flood forecasts and warnings, day-to-day operations of water-resources projects (water-supply reservoirs, irrigation, water-quality enhancement, and navigation), recreation, and many other activities. The systematic records also are used in water-resources planning and analyses for the beneficial uses of natural resources and protection of the urban environment.

The streamflow-gaging station is dedicated for the late Professor Ben Chie Yen of the Hydrosystems Laboratory of the Civil and Environmental Engineering Department at the University of Illinois at Urbana-Champaign for his contributions to the science and engineering advancements in water resources. One of the oldest urban streamflow-gaging stations in the country, Boneyard Creek at Urbana, Illi-

nois, would not have been installed and kept operational without the pioneering work in watershed hydrology at the University of Illinois, starting in the 1880's by Professor Arthur N. Talbot and continuing with many others in subsequent years. Dr. Ven Te Chow was instrumental in establishing the original USGS gaging station near this location in 1948 and using the information for educational and research purposes. Starting in the 1960's, Dr. Yen and colleagues energetically supported the continued operation of the station at the university, using the streamflow data for illustrating hydraulic and hydrologic theories to generations of water-resources professionals coming from the United States and throughout the world. Today, students from the University of Illinois and other institutions use the information collected at this station in their studies and research in the fields of hydraulics and hydrology, as hundreds of students in the past have done.

About 60 persons attended the dedication and unveiling of the commemorative plaque, including members of Dr. Yen's family and representatives from various government, community, and private organizations interested in water resources. Fittingly, the start of the dedication was delayed for a few moments because of a brief rain shower. Speakers for the event included Dr. David E. Daniel, Dean of the College of Engineering at the University of Illinois; Mr. Stephen F. Blanchard, USGS Office of Surface Water; Dr. Marcelo H. Garcia,

Professor of Civil Engineering; and myself. Dr. Yen's dedication to his work and the many contributions Dr. Yen made to water-resources science and engineering were fondly remembered by all present.

I invite all of you to visit the Boneyard Creek at Urbana, Illinois streamflow-gaging station on the university campus, or a virtual visit at <http://il.water.usgs.gov/boneyard.html>.

Robert R. Holmes, Jr., PhD, P.E.
 U.S. Geological Survey
 Director, Illinois Water Science Center

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THE IMPORTANCE OF HYDROLOGY IN THE ECOLOGIC RESTORATION OF THE MIDEWIN NATIONAL TALLGRASS PRAIRIE, WILL COUNTY, ILLINOIS

BY
PATRICK C. MILLS, HYDROLOGIST

In 1996, the Midewin National Tallgrass Prairie, near Joliet, Illinois (fig. 1), was established as the Nation's first Federally designated tallgrass prairie. The legislation that created Midewin designated the transfer of over 19,000 acres from the U.S. Army to the U.S. Department of Agriculture Forest Service. Two primary objectives mandated by the enabling legislation include:

- to conserve, restore, and enhance the native populations and habitats of fish, wildlife, and plants.

- to provide opportunities for scientific, environmental, and land-use education and research.

Substantial financial and human resources will be required to satisfy these objectives, with restoration efforts expected to require several decades. During 1940-77, most of the Midewin property was altered by construction of over 600 buildings, 392 bunkers, 118 miles of road, and 116 miles of rail bed to support the Joliet Army Ammunition Plant. Adjacent lands were drained for agriculture with a system of field tiles,

ditches, and channelization of area streams (Jackson, Prairie, and Grant Creeks). Non-native species of plants and wildlife have become a substantial part of the ecological system. Presently (2004), less than 3 percent of Midewin remains as upland prairie. Remnants of wetlands and a rare dolomite prairie also remain.

“Midewin” is the Potawatomi Indian name for the healing society. As envisioned, a substantial part of this prairie landscape will be healed of the presently degraded conditions and even-

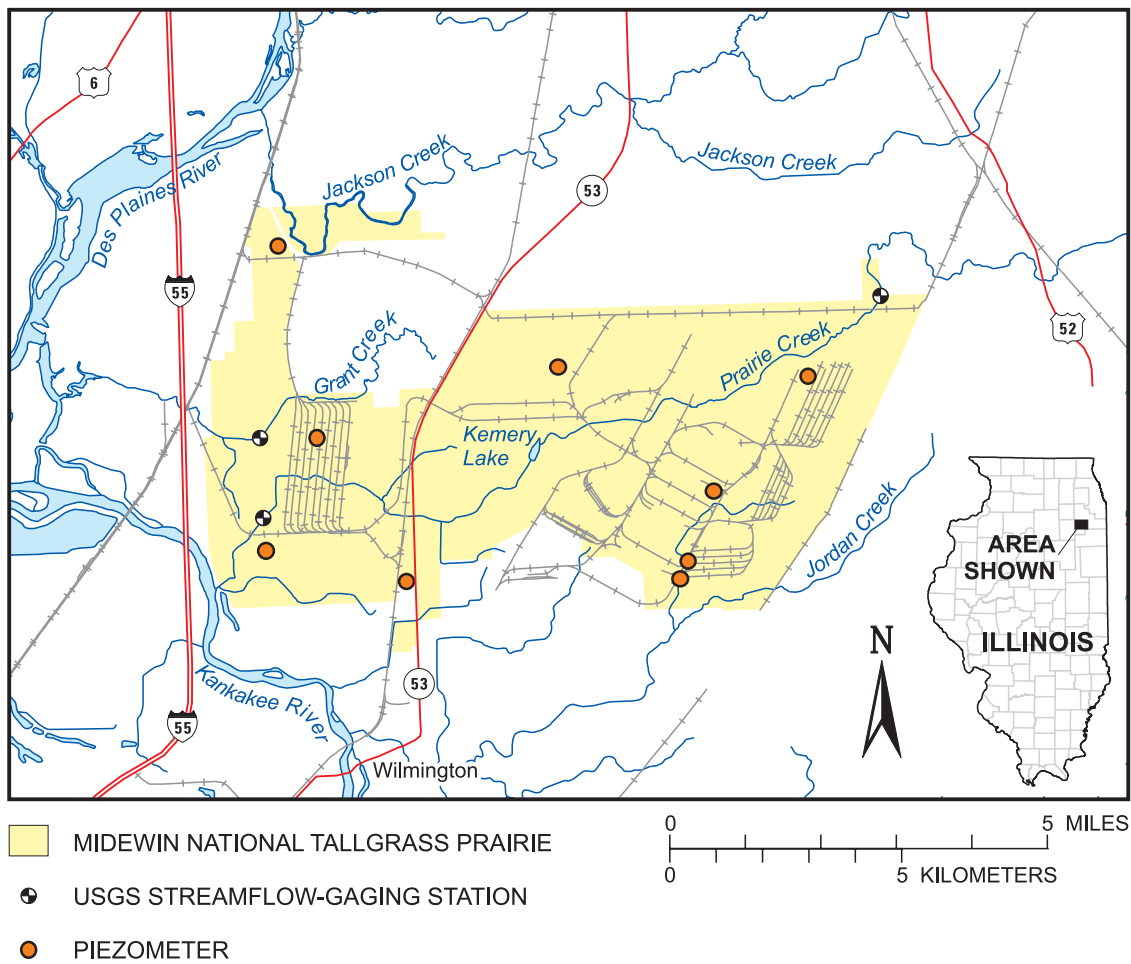


Figure 1. Location of the U.S. Forest Service's Midewin National Tallgrass Prairie near Joliet, Illinois and piezometers and streamgages installed at the site by the USGS.

tually restored to conditions resembling those present prior to Euro-American Settlement.

As part of the effort to restore Midewin to its pre-settlement conditions, raised rail beds and ditches are being leveled to grade and paved roadways, culverts, agricultural-drainage tiles, water-distribution piping, industrial sites, and stands of non-native trees are being removed. In future years, channelized sections of selected streams may be restored to natural configurations and (or) their banks stabilized. All of these changes subsequently will affect various components of the hydrologic system, including overland runoff, evapotranspiration, and subsurface infiltration. Hydrologic consequences that could complement the restoration of natural wetland, prairie, and stream ecosystems include elevated (above present) ground-water levels, increased base flow to streams, and reduced storm-related discharge. Monitoring and documenting these hydrologic components, through the full extent of site restoration, are key

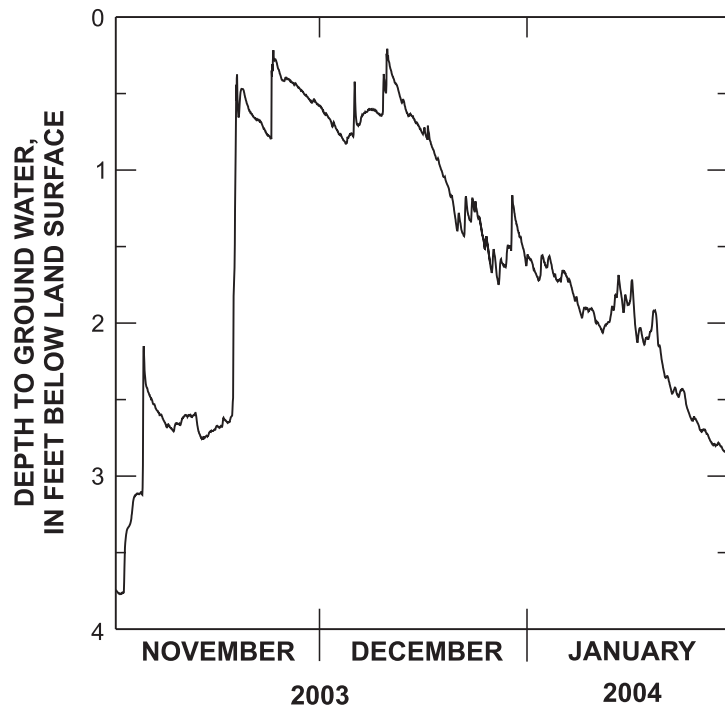


Figure 2. Hydrograph of ground-water levels in glacial-outwash deposits at Midewin.



Figure 3. Piezometer installed in an outwash-plain wetland adjacent to a munitions bunker field at Midewin. Photograph by Patrick C. Mills.

to ensuring expected hydrologic and ecosystem responses, and effective management of site restoration.

Industrial redevelopment of parts of the former Army property also potentially affects the ongoing efforts of Midewin prairie restoration. Runoff from the industrial properties locally can increase streamflow and streambank erosion, and degrade stream- and ground-water quality. Hydrologic monitoring can aid assessment of the effects of area industrialization on site-restoration efforts and provide necessary data to site managers for engineered solutions to the industrial-related stresses on the natural hydrologic system being restored at Midewin.

Since September 2003, the USGS, in cooperation with the U.S. Forest Service, has undertaken monitoring of surface- and ground-water components of the hydrologic system at Midewin. Piezometers have been installed in glacial-

drift deposits at nine locations across the site (fig. 1). Ground-water levels are recorded hourly (fig. 2) in the 5 to 21-foot-deep piezometers located in the eastern upland till deposits, the western outwash and wetland deposits, and the northwestern dolomite prairie deposits (fig 3). Streamgages, for continuous measurement of streamflow, have been installed at sites on the westernmost (lower) reaches of Prairie and Grant Creeks within Midewin (fig. 1). Stream stage is monitored periodically at a northeastern (upper) reach of Grant Creek. Cooperative hydrologic monitoring and analysis efforts at Midewin are anticipated to expand in future years.

The water-level and streamflow data, along with available hydrologic data collected by the U.S. Forest Service, U.S. Army, and others are expected to provide the basis for various hydrologic analyses, including water-level and streamflow trend analysis, ground-water-

level and flow-direction mapping, water-budget analysis, and simulation of ground-water flow for delineation of possible natural and pumping-induced contaminant distributions. Other possible hydrologic analyses at Midewin that could allow better understanding of conditions that might affect restoration of stream ecology could include temporal analyses of stream sediment and distributions and stream- and ground-water quality and characterization of ground- and surface-water interaction.

Presently, it is important that essential baseline hydrologic data are being collected at Midewin. These data and subsequent analyses will be extremely useful for the multi-decadal site-restoration efforts at Midewin.

ENGINEER FROM THE UNITED ARAB EMIRATES/NATIONAL DRILLING COMPANY VISITS ILLINOIS WATER SCIENCE CENTER

Rashid Saud Al-Shali from the National Drilling Company, United Arab Emirates (UAE), visited the Illinois Water Science Center during the week of May 3, 2004. Rashid worked with Angel Martin and other Center personnel on technical report issues and other topics. Rashid also visited the Arizona District Office in Tucson for training in performing gravity surveys. Rashid works as part of the Ground-Water Resources Program of the National Drilling Program and U.S. Geological Survey headquartered in Al Ain, UAE.



Pictured above from left to right: Bob Holmes, Illinois Water Science Center Director; Rashid Saud Al-Shali, National Drilling Company; and Angel Martin, Illinois Water Science Center Reports Improvement Advisor.

EMPLOYEE SPOTLIGHT

OWEN PEOPLES, IT SPECIALIST

Before beginning his career with the USGS, Illinois Water Science Center in 2001 as an Information Technology (IT) Specialist, Owen Peoples worked as the South Illinois District's Communications Editor for United Parcel Service, a Computer Literacy Instructor at the Lincoln's Challenge Academy, and as a Computer Education Specialist at Carle Clinic all in the Champaign-Urbana area

Owen received a B.A. in Photojournalism from Southern Illinois University at Carbondale in 1992. While pursuing this degree, he also received a commission in the U.S. Army Signal Corps as a 2nd Lieutenant. After 22 years of Guard and Reserve service, Owen maintains the rank of Major and is the Signal Augmentation Branch Chief of the Battle

Projection Group, 1st Brigade, 85th Division based in Arlington Heights, Illinois. During the Great Flood of 1993, Owen commanded the Illinois Army National Guard unit in Carbondale. His unit was activated to provide emergency support and humanitarian assistance to levy districts from Quincy to Prairie Du Rocher.

Currently, Owen serves in the Illinois Water Science Center's computer unit and enjoys the challenges and rewards of providing computer and automation support to Center scientists, administrators, support staff, and cooperators. His duties involve system administration, real-time data support, assisting with database management, and Web-related information and dissemination.

Owen, his wife, Pamela, and five sons — Josiah, Jacob, Jordan, Jonah, and Jeremiah — live in Savoy, just south of Champaign. Owen enjoys hiking, biking, and spending time with his family.

U.S. GEOLOGICAL SURVEY MARKS 125TH ANNIVERSARY

BY

ANGEL MARTIN, JR., HYDROLOGIST

For 125 years, the USGS has provided the Department of the Interior, the Nation, and the world with the science needed to make important decisions and safeguard society concerning earth-science issues. In 2004, the USGS celebrates 125 years of science for America — the mission that has guided the USGS, the people and traditions that have shaped it, the science that has made the USGS one of the leading earth-science organizations in the world, and the partnerships that will continue to help USGS achieve important goals for the next 125 years.

As an unbiased science organization, USGS scientists are dedicated to the timely, relevant, and impartial study of the landscape, natural resources, and the natural hazards that threaten us. According to Dr. Chip Groat, USGS Director, "the USGS is proud of its work and grateful to those who have supported us in the past and continue to support our efforts. Together, we have made a difference in the quality of life in America and abroad, and we are excited to have this opportunity to commemorate our accomplishments." The USGS has many products and events planned in celebration of its 125th anniversary in various States and at the National Headquarters in Reston, Virginia. For more information, including a listing of USGS activities commemorating the anniversary, please go to the Web site listed below.

<http://www.usgs.gov/125/>

USGS HELPING TO ANSWER QUESTIONS REGARDING NUTRIENTS

BY

PAUL J. TERRIO AND GEORGE GROSCHEM, HYDROLOGISTS

The occurrence and distribution of nutrients (principally nitrogen and phosphorus) in the Nation's waters is an issue that has received a great deal of attention and effort during the past decade. The presence of hypoxic conditions (depletion of oxygen) in the Gulf of Mexico has been attributed to input of nutrients from the Mississippi River Basin and has been a primary driver of the concerns regarding nutrient levels. In 2002, the U.S. Environmental Protection Agency (USEPA) published ecoregion-based numeric criteria for total nitrogen, total phosphorus, chlorophyll-*a*, and turbidity concentrations in surface-water bodies based upon statistical assessments of available data. Most States have chosen to develop State-specific water-quality standards for nutrients and nutrient related constituents using cause-effect relations instead of promulgation of the national criteria.

Illinois is usually depicted within the area of the Upper Mississippi River Basin (UMRB) having some of the highest concentrations and contributing some of the largest quantities of nitrogen and phosphorus in the basin. Numerous characteristics contribute to this distinction including agricultural land-use practices, commercial and residential fertilization, wastewater effluent, climate, topography, and soil characteristics. For more than 30 years, the Illinois Water Science Center and other USGS centers have collected data and conducted research in the UMRB through a variety of programs including, the National Stream Quality Accounting Network (NASQAN), National Water-Quality Assessment (NAWQA) Program, Toxic Substances Hydrology (TOX-ICs) Program, and programs at the Upper Midwest Environmental Sciences Center (UMESC). USGS Fact Sheet 105-03 describes some of these programs and findings. Long-term monitoring data focused on major biological, physical, and chemical components of the UMRB ecosystem provide a body of data that allow focused modeling and research studies to more cost effectively explain regional and national impacts. The USGS also has conducted research studies in the UMRB to delineate

nitrogen and oxygen isotope ratios, providing useful information about nutrient sources, land uses, and nitrogen recycling processes that contribute nitrogen to the river. USGS laboratory and field experiments have shown that introduction of water from the UMRB main stem to backwater areas results in increased rates of sediment denitrification and nitrate uptake and removal.

Recently, a common understanding of the ongoing science activities and capabilities of USGS relating nutrients in the UMRB was outlined in USGS Circular 1270. The goal of this effort was to develop a systematic interagency research approach that helps to explain the effects of land use, urban and water-management systems, and natural features such as hydrology, geology, and biogeochemical and biological processes, on the fate and transport of nutrients and sediments. An integrated approach that incorporates monitoring of concentrations and loads, process research to determine controlling mechanisms, and development of predictive models will provide the best scientific understanding of watershed characteristics and responses to management practices.

The Illinois Water Science Center is helping to investigate and address the concerns and questions regarding nutrients in the aquatic environment through various efforts including participating on regional and State working groups and performing investigative studies. Through the Federal-State cooperative program, Paul Terrio (Illinois Water Science Center Water-Quality Specialist) is serving on an assignment to the Illinois Environmental Protection Agency to assist with the development of numeric standards for nutrients in Illinois surface-water bodies. The numeric standards will be based on cause-effect relations among nutrients and related instream biological and water-quality conditions. This effort involves focused field research, data analysis, literature review, science and

implementation workgroups, and public outreach. The *Illinois Plan for Adoption of Nutrient Water Quality Standards* calls for nutrient standards to be approved by USEPA and adopted by the Illinois Pollution Control Board by the end of 2008.

The Illinois Water Science Center, in cooperation with the Illinois Department of Agriculture and the Natural Resources Conservation Service, has been investigating the potential water-quality and crop-production benefits of controlling subsurface tile drainage at an experimental site in Ford County since 2001. A paired-field site with one conventionally tile-drained field and one field with controlled tile drainage has been instrumented to monitor tile flow, nitrate-nitrogen and dissolved phosphorus concentrations, weather conditions, and water-table levels. Restricting the flow of water through the tile-drain system during the fallow season and managing the tile-drain flow during the growing season is anticipated to result in (1) a reduction in the amount of nitrate-nitrogen transported through the tile line and (2) a potential crop-production benefit resulting from increased availability of soil moisture during the summer months. Preliminary results show that concentrations of nitrate-nitrogen and dissolved phosphorus are similar between the two fields, whereas the amounts of these constituents transported through the tile lines, and subsequently discharged to the receiving stream, is directly dependent upon the amount of water allowed through the tile line. Data collection is continuing for this project and the results will be published in a report following the completion of the investigation.

For further information:

- USGS Upper Midwest Environmental Science Center:
<http://www.umesc.usgs.gov/>
- USGS Toxic Substances Hydrology Program: <http://toxics.usgs.gov>
- U.S. Geological Survey, 2003, Nutrients in the Upper Mississippi River: Scientific Information to Support Management Decisions; U.S. Geological Survey Fact Sheet 105-03, 6 p.
- U.S. Geological Survey, 2004, A Science Strategy to Support Management Decisions Related to Hypoxia in the Northern Gulf of Mexico and Excess Nutrients in the Mississippi River Basin; U.S. Geological Survey Circular 1270, 50 p.



Excessive algal growth can result when nitrogen and phosphorus are present in sufficient amounts in streams and rivers. Photograph by Paul J. Terrio.

COOPERATOR SPOTLIGHT

KENDALL COUNTY SOIL AND WATER CONSERVATION DISTRICT

The Kendall County Soil and Water Conservation District is one of 98 Soil and Water Conservation Districts (SWCD) in Illinois, and one of nearly 3,000 SWCDs nationwide. The mission of the SWCDs, including Kendall County's SWCD, is to promote the conservation and enhancement of soil, water, and other natural resources. This mission is accomplished by utilizing and coordinating the financial and educational resources available from public, private, State, local, and Federal entities to meet the needs of local land users seeking to conserve or restore the quality of our natural resources.

SWCDs were established in 1937 under the Illinois Soil and Water Conservation District Act and are local units of government. The Act gives SWCDs the responsibility to provide technical information to individuals and groups on methods of soil and water conservation, and provide natural resource inventory information on properties slated for zoning changes. The Kendall County SWCD was formed on June 3, 1947.

The Kendall County SWCD is a public body made up of citizens concerned

with the protection of our natural resources. The Kendall County SWCD has three staff members — a Resource Conservationist, an Education Coordinator, and an Administrative Coordinator. The SWCD is located in a U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) field office that is staffed by a District Conservationist and Soil Conservationist. The SWCD is governed by a five-member board of directors elected by district landowners and residents. This board of directors and the district staff formulate and administer a program of work that is tailored specifically to the conservation and protection of the district's natural resources.

Districts have no taxing authority. Funding is provided in part by the Illinois Department of Agriculture (IDOA). Districts offer various programs that supplement IDOA funding. The additional funding is utilized for operation expenses and education programs.

Activities performed by the Kendall County SWCD include used oil pickup and recycling, selling trees and

fish for resource renewal, providing assistance with sealing abandoned wells, streambank stabilization and restoration, implementation of the Conservation Practices Program to reduce soil erosion, and participation in the development of Integrated Management Plans for the Fox River and Aux Sable Creek. The SWCD also has an educational program that offers presentations to traditional and non-traditional groups, as well as maintaining resource materials for county residents. Additionally, the Kendall County SWCD is an excellent source for obtaining educational material including soil surveys, topographic maps, National Wetland Inventory Maps, floodplain maps, and aerial photographs.

The Kendall County SWCD is located at 7775A Route 47 in Yorkville, Illinois; and can be reached at (630) 553-5821, extension 3.

From the Mailbag

If you have comments about our newsletter or our Web site, please use the form on the back page. Comments also can be sent to dc_il@usgs.gov.

“... I just received the Great Flood Fact Sheet. Wow, nicely done!”

“Although we are only a small community at Illinois’ NW tip, the variety of information is interesting. Just reading the articles teaches me some more acronyms. Thanks!”

“Articles on extreme flood events, MTBE, and water quality in Upper Illinois River Basin were all of extreme interest to me. Your newsletter is a valuable communication ...”

“... I think you are right in saying that USGS data is the cornerstone of most river (and stream) research conducted in the US.

That’s certainly true for me as my research on nutrient fluxes in the Ohio River Basin is entirely dependent on the discharge data collected by your agency ...”

“I just got your May newsletter, and wanted to let you know I enjoy looking over it ...”

The Illinois Water Science Center is moving to the University of Illinois campus. This move will take place November 10-12, 2004. Our new address will be 1201 West University Avenue, Suite 100, Urbana, Illinois 61801.

ILLINOIS WATER SCIENCE CENTER PUBLICATIONS

Listed below are publications that were published recently. Federal Fiscal Year (FY) covers October 1 through September 30. Our policy is to provide copies of our publications to requestors at no cost as long as the publication is in stock in the Illinois Water Science Center. To obtain copies of the following, or any other Illinois Water Science Center publication, you may contact Donna Ayers at (217) 344-0037, extension 3053 or by e-mail at dmayers@usgs.gov. Reports also can be found at: <http://il.water.usgs.gov/pubs/search.html>.

FY 2004

OFR 03-206, Hydrogeologic and Ground-Water-Quality Data for

Belvidere, Illinois, and Vicinity, 2001–02, by P.C. Mills and R.T. Kay

WRIR 03-4226, Herbicides and Their Transformation Products in Source-Water Aquifers Tapped by Public-Supply Wells in Illinois, 2001-02, by P.C. Mills and W.D. McMillan

FS 2004-3024, The Great Flood of 1993 on the Upper Mississippi River—10 Years Later, by G.P. Johnson, R.R. Holmes, Jr., and L.A. Waite

Circular 1230, Water Quality in the Upper Illinois River Basin, Illinois, Indiana, and Wisconsin, 1999-2001, by G.E. Groschen, T.L. Arnold, M.A. Harris, D.H. Dupre, F.A. Fitzpatrick, B.C. Scudder, W.S. Morrow, Jr., P.J. Terrio, K.L. Warner, and E.A. Murphy

SIR 2004-5085, Water Quality of Nippersink Creek and Wonder Lake, McHenry County, Illinois,

1994-2001, by D.H. Dupre and D.M. Robertson