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Water Resources Update
Illinois District Newsletter

U.S. Department of Interior
U.S. Geological Survey
District Web Site: http://il.water.usgs.gov/

May 2004

Compiled by D.M. Ayers

MESSAGE FROM THE DISTRICT CHIEF

The U.S. Geological Survey's (USGS) National Water-Quality Assessment (NAWQA) Program began in the late 1980's with the goal of answering the question, "Is the quality of the Nation's waters getting better or worse?" The process began in 1987 with six pilot studies (as a proof of concept) and began on a nationwide basis in 1991 with the beginnings of Cycle 1 of NAWQA. The Illinois District has worked on two NAWQA studies: Upper Illinois River Basin (UIRB) and the Lower Illinois River Basin (LIRB), with Ottawa, Illinois, being the boundary between the two study areas. The LIRB study began in 1994, culminating with the summary report of this study issued in 2001. The UIRB study began as one of the pilot studies in 1987 (examining only surface water-quality issues) and was restarted in 1997 as part of the last group of the Cycle 1 studies and examined both surface and ground water.

In 2001, while the last group of Cycle 1 studies was completing the data-collection phase, Cycle 2 of NAWQA restarted those studies that begin in 1991. Cycle 1 of NAWQA had the goal of assessing the occurrence and distribution of water quality in the Nation's water resources. Cycle 2 maintains the data collection that has been the foundation of the NAWQA Program, however, the goal switches from solely assessing occurrence and distribution of water quality, to studying various water-quality topics of interest (topical studies) in some detail. There are five topical study issues being conducted as part of Cycle 2: Transport of Natural and Anthropogenic Contaminants, Effects of Urban Land Use, Mercury, Agricultural Chemical Transport, and Nutrient Effects on Ecosystems. Each Cycle 2 project study basin is evaluated for its suitability and adequacy in meeting the national goals of each topical study. In this current Fiscal Year (2004), the Lower Illinois River Basin (LIRB) NAWQA study begins the restart for Cycle 2. Illinois District Staff have prepared proposals for consideration by the National Leadership Team of NAWQA for the Transport of Natural and Anthropogenic Contaminants, Agricultural Chemical Transport, and Nutrient Effects on Ecosystems study topics. The Illinois District should be notified of the topical studies to be conducted as part of the LIRB by early summer.

The summary report for the UIRB study (Cycle 1) has just been released this spring (along with the summary reports from the other Cycle 1 1997 studies), with the highlights from this study given in this issue of the Water Resources Update. I encourage you to read this article and read the summary report, which is available online and printed from the Illinois District (while copies last). NAWQA is the type of study that provides relevant scientific information to those who have the difficult task of making public policy dealing with water-resources issues.

Robert R. Holmes, Jr., PhD, P.E.
Illinois District Chief

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Application of Extreme Flood Events in Model Verification and Flow Estimation in Ungaged Areas — A Case Study in Blackberry Creek Watershed, Kane County

by

David Soong and Timothy Straub, Hydrologists

Introduction

Calibration and verification are essential procedures in practical application of computerized mathematical models. For hydrologic models used for simulating the rainfall-runoff process of a targeted watershed, two important issues are (1) verifying the capacity of the calibrated model in simulating extreme flood events, and (2) determining the reasonableness of estimated flows in ungaged areas.

The USGS, in cooperation with Kane County Department of Environmental Management (KCDEM), is conducting a flood-hazard study for Blackberry Creek in Kane County. The Blackberry Creek watershed (71.4 square miles [mi^2] at the confluence with the Fox River) largely is an agricultural watershed located about 40 miles west of metropolitan Chicago. The watershed has undergone rapid urban development in recent decades. Both the population and proportion of urbanized land area for Kane County portion of the Blackberry Creek watershed are expected to double by 2020 from 1990 levels.

Base- and 500-year floodplains and floodway are being remapped as part of the flood-hazard analysis. Peak-flood magnitudes at selected locations in the watershed are estimated by the flood-frequency analysis on synthesized flood series. The Hydrologic Simulation Program-Fortran (HSPF) is used to simulate the flows, where the annual maximum series is organized from the synthesized flow time series for flood-frequency analysis. The estimated flood quantities then are applied to the River Analysis System (HEC-RAS) model for estimating water-surface profiles. In order to gain confidence in the accuracy of flood estimates, 50 years (1949–99) of rainfall-runoff simulation is performed and the annual maximum series is organized at 49 locations inside the watershed for estimating flood frequencies. Verification of the HSPF and HEC-RAS models is crucial in the study and is discussed below.

For model calibration and verification, streamflow data from a USGS streamflow-gaging station located at Yorkville, at downstream near the watershed outlet (station number 05551700, Blackberry Creek at Yorkville). Available period of record at the Yorkville station is 1960 to the present. The drainage area above the Yorkville station is 68.2 mi^2. There is also a streamflow-gaging station at Jericho Road Crossing (station number 05551675, Blackberry Creek at Montgomery); the period of record is from 1998 to the present. By comparing data collected at Yorkville, the hydrologic model is calibrated with the HSPEXP program where users can apply judgment in determining model parameter values. With this approach, high correlation and model-fit coefficients for flood volumes, flood peaks, and flow-duration curves for the calibration period (1989–95) and verification period (1995–99) are achieved. However, there are no other data for assessing the hydrologic model and the reasonableness of estimated flood frequencies at other locations in the ungaged parts of the watershed.

The July 17-18, 1996 flood event is not included as part of the verification processes. This event is a major flood event with flood peaks observed at Yorkville exceeding the 500-year flood estimated by Curtis (1987). The Kane County Department of Transportation (KDOT) and the Illinois Department of Natural Resources-Office of Water Resources (IDNR-OWR) also collected valuable information immediately after the July 1996 event, which provided an opportunity for examining the two issues described earlier.

Application of NEXRAD rainfall

One of the main uncertainties in rainfall-runoff simulation comes from the representativeness of the precipitation data to field conditions. The gridded 48-hour (July 17-18, 1996) radar rainfall totals (NEXRAD Stage III data that are adjusted using hourly point rainfall data) are averaged to each sub-basin. In this way, the NEXRAD analysis is equivalent to having 16 rain gages over the watershed. The simulated flood hydrographs for the July 18, 1996 event completed using Thiessen rainfall and NEXRAD rainfall are compared in figure 1. Apparently, by using more spatially and temporally representative rainfall information (NEXRAD), the volume of the simulated hydrograph is larger than that of the observed hydrograph. Possible reasons for this difference are variations between estimated NEXRAD and actual rainfall model deficiencies related to routing functions and/or model resolutions.

Application of high watermarks and inundation map

With the more representative flood discharges available for the entire watershed for the July 18 flood event, high watermarks (HWMs) taken by the KDOT can be used for calibrating and verifying the hydraulic model (HEC-RAS). The IDNR-OWR and Kane County staffs conducted a fly-over the afternoon of July 18, 1996, to inspect flood damages in the watershed. Images captured with videos and still photographs taken during the fly-over were used in developing an observed inundation map. If the model estimates are reasonable, the simulated water-surface elevations corresponding to the peak discharges should be comparable to the observed HWMs; similarly, the simulated inundation map generated from the simulated river stages should be comparable to the observed inundation map. The comparison of inundation maps, in turn, is a means for evaluating the simulated discharges.

The fly-over was not intended specifically for developing the inundation map; and, therefore, did not cover the entire Blackberry Creek and tributaries. Also, determining inundation under trees and cloud shadows was difficult. Local causes of inundation, such as debris jams, also can affect the proper application of the inundation map. In the meantime, the timing of the flight, the capacity of steady-state hydraulic computation, possible changes in cross sections, as well as vegetation cover, and many other possible sources of error, should be considered in comparing the inundation.

The most complete inundation map developed during this study was at Lake Run (map provided by Paul Schuch, Kane County, 1996). Considering the timing of peak stages in actual and simulated conditions, and the information available for developing the observed inundation map, these results are considered reasonable.

The similarities to the observed flood hydrograph at Yorkville, HWMs along the main stem, and inundation maps at ungaged parts of the watershed gave confidence to users in applying the computerized mathematical model to represent the hydrologic processes of the targeted watershed, especially at locations where no data are available. After the HWMs and inundation analysis, long-term simulation (1949–99) is conducted with precipitation records at Argonne (a National Weather Service station, record length: 1948–present). Annual maximum flood series are organized and peak-flood magnitudes have been estimated at 49 sub-basins in the watershed. Other procedures to evaluate the reasonableness of estimated flood frequencies in ungaged areas have been conducted.

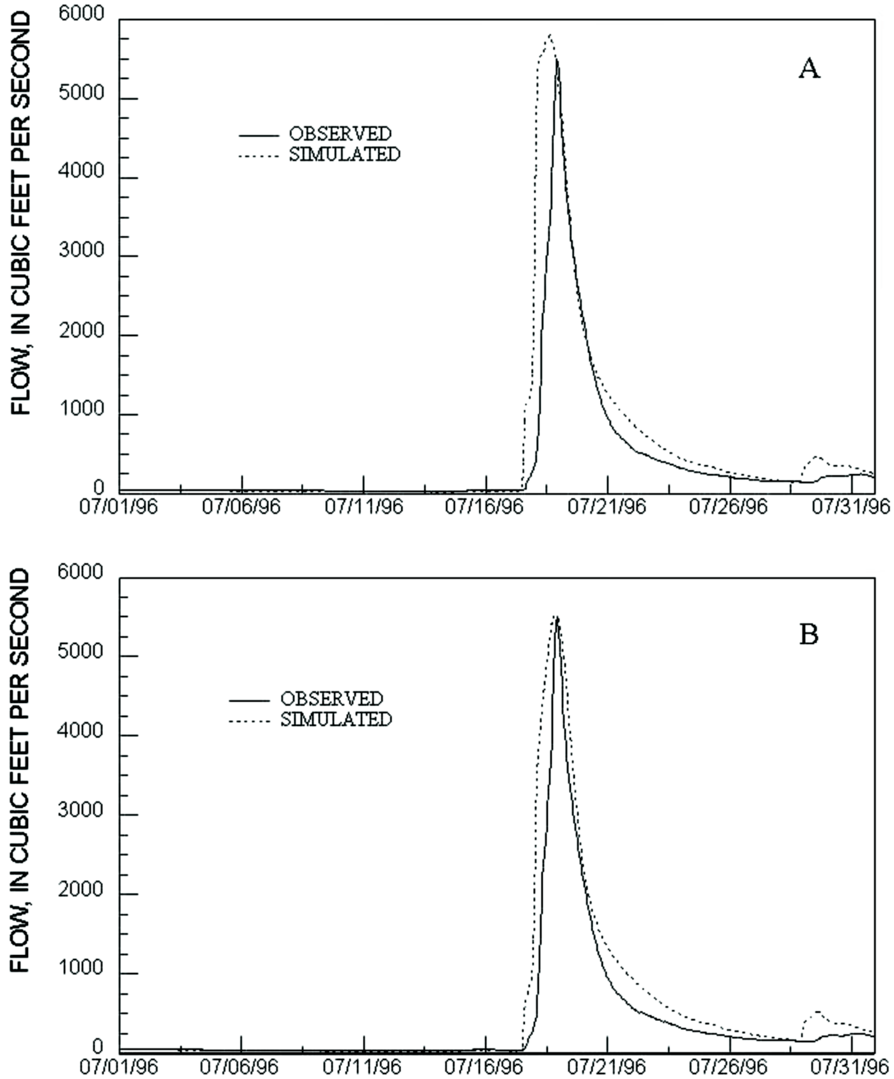

Figure 1. Observed and simulated flow hydrograph at Yorkville in the Blackberry Creek watershed, for the July 17-18, 1996 event. Simulated hydrograph presented in (A) is obtained using Thiessen rainfall, simulated hydrograph presented in (B) is obtained using NEXRAD rainfall.

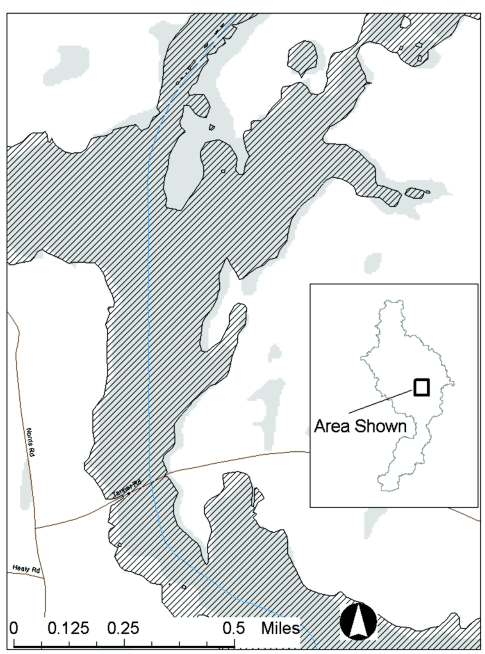

Figure 2. Comparison of observed and simulated inundation using NEXRAD rainfall at two sub-basins Lake Run tributary to Blackberry Creek, Kane County. the observed inundation image was developed from video taken in the afternoon of July 18, 1996, and presented as hatched areas. The inundation obtained from simulated peak discharges are presented in gray areas.

Methyl tert-Butyl Ether (MTBE) and Other Volatile Organic Compounds in Community Drinking-Water Supplies in the United States

by

Angel Martin, Jr., Supervisory Hydrologist

The large-scale use of the gasoline oxygenate methyl *tert*-butyl ether (MTBE) has resulted in its frequent detection in ground water and surface water in many places throughout the United States. MTBE, a water-soluble compound, may enter water resources from point sources (such as gasoline spills) and nonpoint sources (such as precipitation). MTBE is used as a fuel oxygenate and an octane booster. Studies by researchers, industry, water utilities, universities, and government agencies have discovered high concentrations (above background concentrations) of MTBE in soils and ground water at leaking underground gasoline-storage-tank sites and frequent occurrence of low to intermediate concentrations of MTBE in some reservoirs used for public-water supply and recreational boating.

The USGS, in cooperation with the Metropolitan Water District of Southern California, the Oregon Health and Science University, and the American Water Works Association Research Foundation, completed national surveys of the extent and frequency of detections of MTBE, other gasoline compounds, and other volatile organic compounds (VOCs) in water used for drinking-water supplies in the United States. Source waters of 954 community water systems (CWSs) were sampled during 1999–2000 as part of a random survey to (1) ascertain the frequency of occurrence and to compare the concentrations of MTBE and other VOCs in ground-water and surface-water sources, and (2) determine whether the detection of MTBE and other VOCs differed by size of the CWS. A second focused survey sampled 134 CWSs source waters in the country during 1999–2001. The selection of source-water sampling locations targeted locations where MTBE and other gasoline components were suspected or known to occur.

A total of 42 of 66 VOCs analyzed for during the random survey throughout the country were detected at or above the reporting level of 0.2 micrograms per liter (μg/L). Twenty-seven percent of source-water samples (257 of 954) contained at least one VOC, and 95 percent of the samples had concentrations less than 10 μg/L. Gasoline compounds collectively (as well as MTBE alone) were detected significantly more in surface-water sources (15 percent) than ground-water sources (6.6 percent). The more frequent detection of MTBE in surface water (14 percent) than in ground water (5.4 percent) likely is related to emissions, leaks, or spills from motorized watercraft. Furthermore, MTBE detections were five times more frequent in source waters from MTBE high-use areas than elsewhere. Interestingly, and in agreement with the results of the literature review completed before the surveys, MTBE detections did not appear to be related to the density of gasoline storage tanks near drinking-water sources.

In Illinois, 29 ground-water and surface-water samples were collected during the random survey. On the basis of results of the random survey, samples were collected (as part of the focused survey) from four ground-water sources serving less than 10,000 people, at locations where MTBE concentrations were suspected. MTBE concentrations of these samples did not exceed U.S. Environmental Protection Agency (USEPA) drinking-water advisory concentration of 20-40 μg/L. In a separate USGS study in the lower Illinois River Basin, MTBE was detected (at a concentration below the USEPA advisory) only in one ground-water sample from the shallow glacial drift aquifer (not a source water for a CWS in the sampled area). In a study in the upper Illinois River Basin, 48 wells were sampled for MTBE in 2000 and 2001. MTBE was detected in samples from four wells. MTBE concentrations in these samples ranged from 0.2 to 4.6 μg/L.

CWSs in Illinois routinely sample for VOCs under the Safe Drinking Water Act monitoring program. Under the Illinois CWS Laboratory Fee Program, analyses for MTBE have been reported as part of standard laboratory methods since 1994. Approximately 80 percent of the 1,200 CWSs that supply water participate in the program, and most (1,100 or 1,200) use ground water as the source of drinking water. The results reported by the Illinois Environmental Protection Agency (IEPA) in 2000 indicated that MTBE was detected at 26 active systems. In addition, three CWSs have had to discontinue use of wells as a result of MTBE contamination; these CWSs were in Kankakee County, Island Lake, and East Alton, Illinois. Although concentration data were not given for the water supplies with MTBE detections, the IEPA did indicate that most of the concentrations were unlikely to cause adverse human health effects.

Additional information regarding the national surveys of MTBE and other VOCs in community drinking-water sources is available at http://sd.water.usgs.gov/nawqa/vocns/nat_survey.html.

Employee Spotlight

Jennifer Lynn Hogan, Ecologist

Jennifer Hogan was born in the northwest suburbs of Chicago. She pursued an undergraduate degree in Liberal Studies at the University of Notre Dame and L'Universite Catholique de L'Ouest in France. After graduation, Jennifer decided to move to Florida to pursue a graduate degree in Wildlife Ecology at the University of Florida. Jennifer transitioned from the arts to science by volunteering her time to alligator hatchlings, sturgeon, and sea turtles. In the midst of her graduate studies in Florida, she decided to pursue an internship at the USGS in Austin, Texas in summer 2000. One summer in Austin turned into 3 years, during which time she was involved in collecting and analyzing hydrological and biological data. She conducted her Master's research along the Texas coast on the distribution and nesting of estuarine turtles. She documented the first terrapin nest in the State of Texas and published one of the only records of a sub-population in the State. After Jennifer graduated from the University of Florida in December 2002, she decided to move closer to home and accepted a permanent position as an Ecologist with the Illinois District in early 2003. Since her move to Illinois, Jennifer has been collecting biological and hydrological data for the National Water-Quality Assessment Program. Jennifer's interests include outdoor activities, travel, biking, cave diving, scuba, rock climbing, writing, dance, art, and music.

Highlights of the Upper Illinois River Basin National Water-Quality Assessment, 1999–2001

by

George E. Groschen, Study Unit Chief

Stream and River Highlights

During 1999–2001, water quality in upper Illinois River Basin streams and rivers largely reflected the amount of agricultural or urban land in their basins. Since the mid-1850s, channel and drainage modifications, urban development in the Chicago area, agricultural runoff, and other activities have altered water quality, biological communities, and habitat for aquatic organisms. Concentrations of chemicals in stream water occasionally exceeded guidelines for the protection of aquatic life and drinking water, such as for nitrate, phosphorus, diazinon, and organic wastewater compounds. Concentrations in the Des Plaines and Kankakee Rivers were least likely to exceed standards and guidelines. Although area streams and rivers generally are not used as drinking-water sources, elevated concentrations can affect aquatic wildlife and the quality of water for downstream Illinois River water users.

- The ammonia concentration (flow-weighted mean) at the Chicago Sanitary and Ship Canal at Romeoville was 0.64 mg/L (milligrams per liter), the highest measured in the upper Illinois River Basin and the fourth highest of 109 streams and rivers measured nationwide by the National Water-Quality Assessment (NAWQA) Program during 2000–01.
- In every stream-water sample collected from urban or mixed land-use (agricultural and urban) watersheds, phosphorus concentrations exceeded the USEPA desired goal to prevent excessive growth of algae and other nuisance plants (0.10 mg/L).
- Nitrate concentrations of 12.3 mg/L (flow-weighted means of nitrate as nitrogen) at the agricultural stream sites Sugar Creek at Milford and Iroquois River near Chebanse were the highest among 109 streams sampled during 1999–2001 for the NAWQA Program nationwide.
- Natural features (including glacial geology, soils, and hydrology) and land-management practices (including artificial drainage of farmland) affect nutrients in streams, as indicated by nitrogen in runoff at the Iroquois River near Chebanse, Illinois and the Kankakee River near Momence, Illinois. The Iroquois River had some of the highest concentrations of nitrate (as nitrogen) and the Kankakee had some of the lowest concentrations for the upper Illinois River Basin.
- The insecticide diazinon was detected frequently in streams and rivers in urban and mixed land-use areas. Specifically, diazinon was detected in 93 percent of samples collected at Salt Creek at Western Springs (nearly 80 percent urban land) and concentra-

tions in 18 percent of samples exceeded the guideline for protection of aquatic life. Diazinon has been used extensively in residential areas.

- Benthic invertebrates that are sensitive to pollution and habitat disturbance, such as mayflies, stoneflies, and caddisflies, were most common in streams whose watersheds are less than 4 percent urban land. Aquatic communities were degraded where urban areas cover as little as 25 percent of the watershed.
- Diverse fish communities that include species sensitive to pollution (as indicated by high Index of Biotic Integrity scores) were found at Indian Creek, which drains less than 1 percent urban land (score of 57); Big Rock Creek, which drains less than 1 percent urban land (score of 52); and Genesee Creek, which drains about 7 percent urban land (score of 52).
- Herbicides were detected frequently in streams and rivers, particularly those draining agricultural land. For example, atrazine was detected in every sample from streams and rivers draining agricultural or mixed land-use watersheds.

Trends in Stream-Water Quality

- Ammonia concentrations decreased during 1978–97 in areas where sewage-treatment processes were enhanced, however, nitrate concentrations increased. The enhancements generally transformed ammonia to nitrate, making effluent less toxic to fish.
- Detections of alachlor and cyanazine have decreased in streams and rivers since the early 1990s because of decreased use of these herbicides.

Ground-Water Highlights

Ground water is the largest source of drinking water in the upper Illinois River Basin (15 percent of the drinking water), except for Lake Michigan (82 percent). Commonly used herbicides and nitrate were less frequently detected in well-water samples than in stream and river samples.

- Shallow ground water in the upper Illinois River Basin generally meets drinking-water standards and guidelines; standards or guidelines have not been established for many pesticides and most breakdown products detected.
- Detections of synthetic chemicals were frequent in samples collected from monitoring wells and domestic-supply wells in recently urbanized areas. For example, volatile organic compounds (VOCs) were detected in 75 percent of the well samples. At least one pesticide, pesticide breakdown product, or VOC was detected in 90 percent of the wells. However, concentrations were near the laboratory method detection limit, and none of these constituents exceeded drinking-water standards or guidelines.
- Ground-water recharge is reduced in urban areas because of widespread impervious surfaces, such as roads and parking lots. Urbanization effects on potential recharge, along with droughts, could affect ground-water supplies.
- Shallow ground water collected from monitoring wells and domestic-supply wells exceeded the drinking-water standard for nitrate in only two sampled wells.
- Breakdown products of pesticides were detected in 60 percent of the agricultural-area wells; however, no pesticide or breakdown product exceeded drinking-water standards or guidelines. Breakdown products of acetochlor, alachlor, and metolachlor were detected more frequently and at higher concentrations than were their parent compounds.

NAWQA biologists Mitch Harris and Jennifer Hogan electrofishing during a yearly fish population survey in an Illinois River tributary.

Cooperator Spotlight

Metropolitan Water Reclamation District of Greater Chicago

The Metropolitan Water Reclamation District of Greater Chicago (District) is an independent government and taxing body encompassing approximately 91 percent of the land area and 98 percent of the assessed valuation of Cook County, Illinois. The District originally was organized as the Sanitary District of Chicago in 1889 under an act of the Illinois General Assembly, which has been modified from time to time to increase the District's powers and jurisdiction. The 1889 enabling act was in direct response to a public health and nuisance problem caused by sewage discharges to the Chicago River and Lake Michigan. The District eventually reversed the flow of the Chicago and Calumet River Systems to divert wastewater away from Lake Michigan to the Des Plaines River and eventually the Mississippi River. These river systems have been tributary to the Illinois River since 1900 and 1922, respectively. The District operates the 78-mile long waterway system under Federal regulations. Flow within the entire waterway system and water diverted from Lake Michigan under U.S. Supreme Court Decree and State of Illinois allocation orders are controlled by four lock and dam structures: Chicago River Controlling Works; O'Brien Lock and Dam; Lockport Powerhouse, Lock and Dam; and Wilmette Pumping Station. A major portion of the waterway system is part of the Illinois Waterway, a Federal navigation project.

The mission of the District is to keep sewage pollution out of Lake Michigan, the area's primary drinking-water supply, and to properly treat sewage to avoid contamination of the waterway system, and the Des Plaines and Illinois Rivers. One of the most important aspects of treating wastewater is monitoring the kinds of waste that are deposited into the sewer system. Whereas the District's modern treatment plants can clean normal household and industrial wastes, there are some hazardous substances, such as toxic metals and chemicals, that should not be discharged to the sewer. The District monitors the contributing industries to assure that wastes are disposed of in an environmentally responsible way and in compliance with Federal, State, and local laws.

The District is located primarily within Cook County and serves an area of 872 square miles, which include the city of Chicago and 125 suburban communities. The District's wastewater load is equivalent to a population of 10.4 million people and is derived from 5.3 million people, a commercial and industrial equivalent of 4.5 million people, and a storm runoff equivalent of 0.6 million people. The District's 554 miles of intercepting sewers and force mains range in size from 12 inches to 27 feet in diameter, and are fed from approximately 10,000 connections to local municipal sewers. The District owns and operates seven water-reclamation plants, ranging in size from 3 to 1,200 million gallons per day, and 23 pumping stations. The District treats an average of 1,500 million gallons per day of sewage. The District's total wastewater-treatment capacity is over 2,000 million gallons per day.

The District's Tunnel and Reservoir Project (TARP) is one of the country's largest public works projects for contamination and flood control and consists of 109 miles of tunnels, 9 to 33 feet in diameter and 150 to 300 feet underground, and three combined sewer overflow reservoirs, having an aggregate storage capacity of 18 billion gallons. Two of the three reservoirs presently (2004) are under construction.

The District is governed by a nine-member Board of Commissioners elected at large and each serving 6-year terms. The Board elects from its membership a President, Vice-President, and Finance Committee Chairman.

Operation and control of all facilities and the waterway system is performed by the Maintenance & Operations Department and monitoring of water and sediment quality is performed by the Research & Development Department. Both departments use extensive instrumentation systems to provide the extensive amounts of data needed to carry out their operational and monitoring responsibilities. Whereas the District provides for its own instrumentation and manages its own data, reliance is placed on the USGS for discharge and stage measurement in the waterway system. Much of the data used by the District derives from the extensive monitoring of stage and discharge by the USGS in the metropolitan Chicago area supported by other USGS cooperators. However, the District directly supports stage and discharge measurements at three location.

USGS measurements in the Chicago River indicated the presence of density currents during the cold weather season when flows are low. The finding of these currents led the District to work with the Hydrosystems Laboratory at the University of Illinois at Urbana Champaign (UIUC) to perform a study of these currents. The study required intensive data collection by the USGS on the Chicago River to downtown Chicago and the nearby North and South Branches to obtain field measurements for UIUC model calibration. Eventually, the UIUC will investigate measures to disrupt the density currents so that lower quality water from the North Branch will not penetrate into the Chicago River.

The District worked with the Water Quality Center at Marquette University in Milwaukee to develop an unsteady-state hydraulic and water-quality model for the water system. An unsteady-state model is necessary because of short-term spatial and temporal changes in flow and because of the complex hydraulics in this artificially controlled man-made waterway system. Calibration and verification of the hydraulic portion of the model requires the use of USGS stage and discharge data for boundary conditions. This model also is being used by the Corps of Engineers for a navigation study and eventually may be used by the District for guidance or real-time decision making in waterway system operations during storm runoff periods. It also will be used as an analytical tool in a current study of water quality and use classification for the waterway system being conducted by the Illinois Environmental Protection Agency.

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.

"Read about Waterwatch in the May 2003 Water Resources Update. Have bookmarked the page as it has some fascinating information. Thanks."

"Thanks for all the information on the Rock River dams. Everything you have provided to me has been of great help. I can't wait to get on the water!"

"... By the way your website is excellent. Easy to navigate and full of useful info."

"Thank you so much for the materials. I just received them. I will share them with other teachers."

"Thanks for your call and sending out the data!! It looks like it is going to be just what we needed!!! Thanks again for your expediency on this request!!"

"I just wanted to thank you for the very informative session you had with Michael yesterday. You are obviously gifted as a teacher, as well as being an enthusiastic expositor of the value of the services rendered by the U.S. Geological Survey. Although Michael has practiced the indifferent look of the bored teenager, he is actually quite brilliant and with a definite bent toward the sciences, so I think this was a worthwhile tour in a sense that goes beyond merely completing badge requirements!"

"I think the newsletter is great!"

"Thanks for sending that mail. I have got some really, really good info on volcanoes from the USGS Web site. . ."

". . . I'm impressed with your agency/division and how quickly I have gotten what I needed. I really appreciate it!"

"Thanks a lot. I am impressed with the service. . ."

". . . I received access to the USGS/IEPA mapserver some time ago now and have been going through it -- it's one of the best I've ever seen. My compliments here are really an understatement."

Illinois District Publications

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

FY 2003

WRIR 01-4121, Monitoring and Analysis of Combined Sewer Overflows, Riverside and Evanston, Illinois, by A.M. Waite, N.J. Hornewer, and G.P. Johnson

WRIR 02-4062, Delineation of the Troy Bedrock Valley and Particle-Tracking Analysis of Ground-Water Flow Underlying Belvidere, Illinois, by P.C. Mills, K.J. Halford, and R.P. Cobb

WRIR 02-4213, Use of Isotopes to Identify Sources of Ground Water, Estimate Ground-Water-Flow Rates, and Assess Aquifer Vulnerability in the Calumet Region of Northwestern Indiana and Northeastern Illinois, by R.T. Kay, E. R. Bayless, and R.A. Solak

OFR 02-487, Flooding in Illinois, April–June 2002, by C.F. Avery and D.F. Smith

WRIR 02-4097, Pesticides in Surface Water in the Lower Illinois River Basin, 1996–98, by R.B. King

WRIR 02-4293, Anthropogenic Constituents in Shallow Ground Water in the Upper Illinois River Basin, by W.S. Morrow

Water-Data Report IL-02, Water Resources Data Illinois, by A.D. Robl, J.W. Angel, and J.R. Norris

WRIR 03-4105, Concentrations of Polynuclear Aromatic Hydrocarbons and Inorganic Constituents in Ambient Surface Soils, Chicago, Illinois: 2001-02, by R.T. Kay, T.L. Arnold, W.F. Cannon, D.Graham, E. Morton, and R. Bienert

WRIR 03-4103, Arsenic in Illinois Ground Water—Community and Private Supplies, by K.L. Warner, A. Martin, Jr., and T.L. Arnold

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