

Water Resources Update

USGS Illinois Water Science Center Newsletter

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Message from the Director **Robert R. Holmes, Jr., PhD, P.E.**

As you drive along in your car, you don't think much about the oil that lubricates your engine. After all, it does nothing to enhance the appearance of the car; however, it is vital to the operation. If you are conscientious, you will spend the money and have the oil changed at regular intervals as the manufacturer recommends. If you are short on funds, it is tempting to stretch the mileage between oil changes or maybe you forgo the oil change all together. As some people find out, this is penny-wise and pound-foolish.

In a way, streamflow-gaging stations are analogous to the oil in your car. Without an adequate streamflow-gaging network, society can get into serious trouble as we try to predict floods, detect drought, determine water availability, design bridges and water supplies, monitor water quality, maintain channels for navigation, or operate reservoirs, however streamflow gages add no aesthetic value to either the natural or built environment, but just like engine oil protects your cars engine, streamgages are vital to properly protecting our health and safety. It is all too easy to discontinue funding gages when things are going along well and floods or droughts are distant memories. Consider the following quote from the National Research Council's Report 'Envisioning the Agenda for Water Resources Research in the Twenty-First Century'—*"Intensifying water scarcity cannot be successfully addressed in the absence of reliable data about the quantity and quality of water over time and at different locations. The end-of-century trend of investing fewer and fewer dollars in data-gathering efforts—the declining number of stream gages is but one example—will need to be reversed if availability is to be adequately characterized."*

Most water resources professionals know the value of streamflow-gaging stations, and over time, I have seen an increasing awareness of their value to policy and decision makers. This awareness was recently demonstrated by the emergency funding provided by the State of Illinois to keep 10 U.S. Geological Survey (USGS) streamgages operational in the Illinois River Basin for Federal Fiscal Year (FY) 2006 after one of our Federal funding partners had a serious budget shortfall. Another demonstration of this awareness is the President's budget, which for FY 2007 contains a proposed increase in the USGS National Streamflow Information Program (NSIP) line item. If passed, additional Federal funds will go toward the USGS streamgaging program in FY 2007. Let's hope it happens.

As we continue to face budget uncertainties for data collection, I am especially concerned over the decades-long decrease in small rural watershed streamflow gages. Small watershed streamflow data is crucial for periodic assessments of streamflow characteristics, such as flood frequency and low-flow frequency studies. Small watershed streamflow data also provides important data for regionalization of watershed modeling parameters. These assessments and studies are used by many water resources professionals ranging from consultants to highway engineers. We must look for ways to increase the number of rural streamflow gages in this State to address water issues of the future. Loss of streamflow-gaging stations could well be penny-wise and pound-foolish.

Lastly, I want to thank all of you, our friends, who have supported our streamgaging program through the years. With your help, the USGS provides needed and valuable data that serves the State wisely.

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Where's The Data? You Can Find It in the Annual Water-Data Report by John K. LaTour, Hydrologist

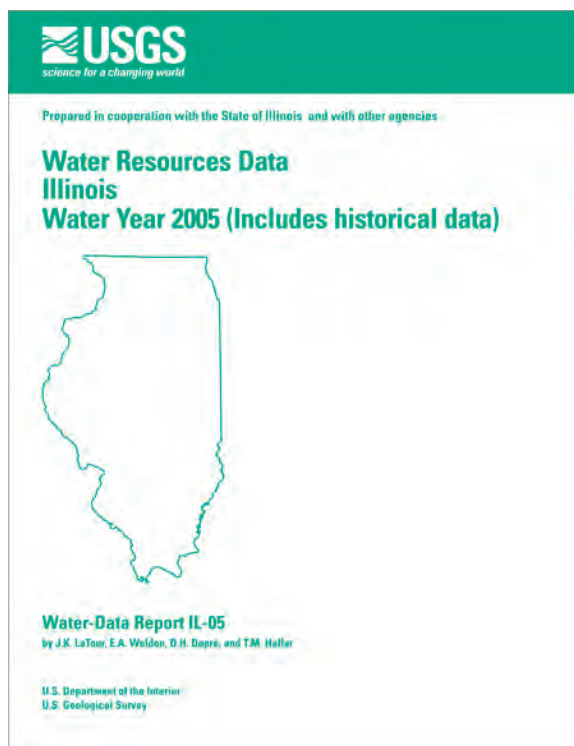
The Water Resources Discipline of the U.S. Geological Survey (USGS), in cooperation with Federal, State, and other local governmental agencies, collects a large amount of data pertaining to the water resources of Illinois. These data, accumulated during many years, constitute a valuable data base for developing an improved understanding of the water resources of the State. To make these data readily available to interested parties outside the USGS, they are published each year in Water-Data Reports.

The USGS began publishing water-resources data starting with the "Tenth Annual Report of the U.S. Geological Survey to the Secretary of the Interior, Part 2: 1888-1889." From 1896 to 1970, water-resources data were published by river basin in USGS Water-Supply Papers. From 1961 to current, water-resources data were published by State in USGS Annual Water-Data Reports.

To address increases in the volumes of data collected and data requests, Illinois Water Science Center became the first Water Science Center to produce an interactive Annual Water-Data Report. Beginning with water year 1998, Illinois' Annual Water-Data Report has been published in electronic version on the Web at http://il.water.usgs.gov/annual_report/start.htm and on compact disc (CD).

Illinois' electronic report contains the most comprehensive coverage of data types in the country. The report includes USGS

approved current and historical data of discharge, stage, water quality, sediment and biology of streams; stage of lakes and reservoirs; levels and quality of ground water; and records of precipitation, air temperature, dew point, solar radiation, and wind speed. Over 1,300 stations are presented with information dating back as far as 1861. Also included are miscellaneous data collected at various stations not in the continuous data-collection network. Since data published in previous years' reports are included in each year's report, the most recent report



supersedes previous reports. The Introductory text, however, would differ each year.

The electronic report offers more information and features than traditional printed Water-Data Reports. The following is a list of the general features available in the report:

1. Data are arranged by data type and station.
2. Traditional annual data tables are provided for water years 1998 to current.

3. Daily values are available in text files for the period of record.
4. Gage values are available in text files for water years 1994 to current.
5. Real-time data are available through an Internet connection.
6. Peak flows are available for the period of record.
7. Station descriptions are provided separately from data tables.
8. Stations can be sorted by station number or name.
9. Map is interactive and includes many capabilities.
10. The current year's data can be printed as a traditional Annual Water-Data Report.

Data are arranged in the electronic report by data type and station. When the report is accessed, the general data types listed in the first selection window include "Surface Water", "Ground Water", "Meteorological", and "Biological". If interested in surface-water data, for example, "Surface-Water Data" would be selected. Additional data types within "Surface-Water Data" can be selected to show stations where data were collected. Stations can also be identified and selected by using the interactive map.

Traditional annual data tables are those presented in the "Annual Tables" section of the report. This section includes data tables that appear similar to those in previously printed Annual Water-Data Reports. Tables are available for water years 1998 to current.

"Daily Values" include mean-daily values for each station that has

approved data available from the USGS Illinois Water Science Center's computer system. These daily values cover the period of record and are provided as text files.

"Gage Values" include those recorded, transmitted, and/or computed from a gaging station and typically are 5-, 15-, or 30-minute data. These data are provided as compressed text files by an Internet connection, and are generally available for water years 1994 to current.

"Real-time" is a link to real-time gage values of surface-water, ground-water, and meteorological data on the National Water Information System (NWIS) real-time data Web site, if an Internet connection is available from your computer. Depending on the link chosen, accessing the Web site will either display a list of stations with real-time data or display 7-day hydrographs of current gage values for all data types collected at the selected station. Many other forms of data retrievals and options for displaying the data are available on this National Web site.

"Peak flow" contains text files of annual maximum peak discharge and their associated stage values for the period of record. Also, secondary instantaneous peak discharges and their associated stage values above a selected base discharge are available if the flow above the gage is not appreciably regulated.

The section "Station Descriptions" provides information about each station, such as station location, period of record, extremes for period of record, and other remarks pertinent to the station. This section provides station descriptions separate from annual data tables.

Selecting "Annual Tables," "Daily Values," or "Gage Values" from the report will provide a list of stations with available data. The list of stations includes the period of record

in years. Stations can be sorted by station number or name.

An interactive map is available that shows stations that have data. The map offers seven main options as follows:

1. display stations by data type,
2. display features such as streams,
3. find stations by station number or map feature,
4. display stations by year(s) of available data,
5. increase or decrease text or symbol sizes,
6. zooming and panning capabilities, and
7. displays the various types of data that are available for a selected station.

Stations can be displayed on the map according to data type such as discharge, stage, sediment, biology, surface-water quality, meteorology, ground-water levels, and ground-water quality. Map features, such as State boundaries, streams and county boundaries can also be displayed.

Stations can be found on the map by using the "Find" function. The red bull's eye will show the location of the first station or feature found. If interested in stations with data for a certain year or period of time, you can use the "Show Stations by Year(s)" function. Enter a year or years in the box provided to display stations with data for the desired year(s).

Text and symbols on the map can be increased or decreased in size. The "+" and "-" symbols in the "Size" function are used to increase or decrease the size of the text or symbols, respectively. Text of station numbers and map features will appear on the map when zooming for more detail.

The map offers zoom and pan capabilities. By using the "Zoom" bar, you can increase or decrease the detail of the map. By holding down any mouse button, the map can be repositioned (panning).

When a station or feature is pointed to with the cursor, the name of the station or feature appears below the map. Selecting (double clicking) a station on the map will display the various types of data that are available for that station.

The report provides a PDF print-on-demand feature that can print a paper copy very similar to the traditional printed Water-Data Report for the current water year. This printable format of the report contains the same introductory sections as the electronic report and presents the traditional annual tables of surface-water, ground-water, meteorological, and biological data collected during the current water year. To print this document, the user can select "Printable Water-Data Report."

Illinois' interactive Annual Water Data Report has greatly improved the availability of USGS data to the public and has reduced the cost of publication. Over 90% of data requests received by the Illinois Water Science Center have been addressed with the Annual Data Report.

Thousands of dollars have been saved by publishing the report on compact disc versus large paper volumes. The availability of data will continue to grow as the Illinois Water Science Center continues to expand the amounts and types of data available in the report.

Additional information about data presented in Annual Water-Data Reports can be obtained by contacting the Illinois Water Science Center by mail at 1201 W. University Ave., Suite 100, Urbana IL 61801-2347, by telephone at 217-344-0037, or by e-mail at DC_IL@usgs.gov.

EMPLOYEE SPOTLIGHT

GEORGE E. GROSCHEM (CHIEF, GROUND-WATER AND WATER-QUALITY INVESTIGATIONS SECTION)

George Groschen began work as a hydrologic field assistant in the USGS Minnesota District office, St. Paul, in September 1977. He attended the University of Minnesota where he received a B.A. in Philosophy in 1978. At Minnesota, he also received a M.Sc. in Geology. His thesis described the geochemical interaction of the lake and the contiguous ground-water system. Having grown up in Maplewood, Minnesota, he was naturally interested in lakes. In April 1980, he became a full time hydrologist in the Minnesota District to study the interaction of the ground water at a lake in Washington County, Minnesota.

He transferred to Austin, Texas in 1982 thinking he would spend a few years at most in Texas. In Austin he modeled the potential for salt-water intrusion into aquifers. In the Corpus Christi area, he demonstrated that sea-water encroachment was unlikely but that leakage of overlying saline water was going to increase. Another Texas project was a 3-D solute-transport simulation, including the effects of density contrasts, of potential intrusion of natural saline water into the Hueco Bolson aquifer at El Paso, Texas. George demonstrated that lateral migration of saline water from the river alluvium would increase. His study was one of the first to use the Heat and Solute Transport 3-D model (HST3D). He also studied the complexity of flow to a long well screen (greater than 50 ft.) including the effects of density contrasts and aquifer heterogeneity and anisotropy

especially with salinity stratification in the aquifer.

Groschen transferred to the USGS San Antonio office in October 1986 to study the Edwards aquifer – the sole source of drinking water for the City of San Antonio. During the next 3 years he developed experience with surface modeling using Interactive Surface Modeling (ISM) to characterize the geometry of the aquifer including hundreds of normal faults, many with large displacements. He used this scientific visualization technique to graphically display and to demonstrate the effectiveness of faults as barriers to ground-water flow. He also gained experience in ARC/INFO, a geographic information system. His next project was the study of the geochemistry and hydrology of the saline-water zone of the Edwards aquifer. The geochemistry study involved the sampling and analysis of both stable isotopes and radioisotopes, including chlorine-36. He developed a hydrologically consistent concept of geochemical evolution of the water in the saline-water zone.

After only 12 years in Texas, Groschen transferred, in 1994, to the Illinois District Office in Urbana to become the Lower Illinois River Basin National Water-Quality Assessment study-unit chief. Here he directs a water-quality monitoring and analysis project covering most of central and west-central Illinois. In 2003 he also became the study-unit chief of the Upper Illinois River Basin and in 2004, became the Ground-Water and Water-Quality Investigations Section Chief of the Illinois Water Science Center.

George and his wife, Kate Winkler, live in Champaign and have 6 children. The oldest was

left behind in San Antonio where she is a comic book publishing magnate. Their other five children are in various stages of attending the University of Illinois or Parkland College studying biochemistry, paleontology, graphics arts, or auto mechanics. In his spare time, George prefers to collect and digitize ancient vinyl LPs, especially those that he felt would never be re-issued on compact disc, such as Ruth Welcome on concert zither, Jane Morgan and the Troubadours, or the Banjo Barons. He also plays classical and jazz guitar and occasionally his hammered dulcimer or arabic oud, when he's not listening to his vast collection of audio CDs or restoring antique zithers.

USER-FRIENDLY DVDs AND DETAILED GIS FEATURES FOR THE RAPID WATERSHED ASSESSMENT

BY

TIMOTHY D. STRAUB AND DONALD ROSEBOOM, HYDROLOGISTS

The watershed assessment tool is a user-friendly DVD that combines aerial video documentation with Geographic Information System (GIS) mapping. The DVD format allows individual stream locations within the entire watershed to be quickly located and visually evaluated by local and state agency staff, and landowner committees. The DVD operates on home or computer DVD players without the need for proprietary software. The visual image can include high-, mid-, low-, and ground-level video which is included on the top portion of the DVD screen and a map with helicopter or ground location on the bottom portion of the screen (fig. 1).



Figure 1. DVD screen captures of an urban (left) and rural (right) mid-level flight of West Branch Du Page River in Illinois. The video is shown on the top portion of the DVD screen and the map with helicopter location (cross-hair symbol) is on the bottom portion. The yellow-dotted line is the flight path of the helicopter.

Utilizing video mapping capabilities, detailed information (in GIS format) on the location and severity of stream-channel erosion and other channel and riparian features can be quickly processed (fig. 2). The Illinois Water Science Center (IWSC) expertise in stream and riparian evaluations, and video and GIS processing help streamline the process of stream and watershed assessments. Further watershed applications of this product could include evaluations of wetlands, riparian areas, urban outflows, and row crop tillage.

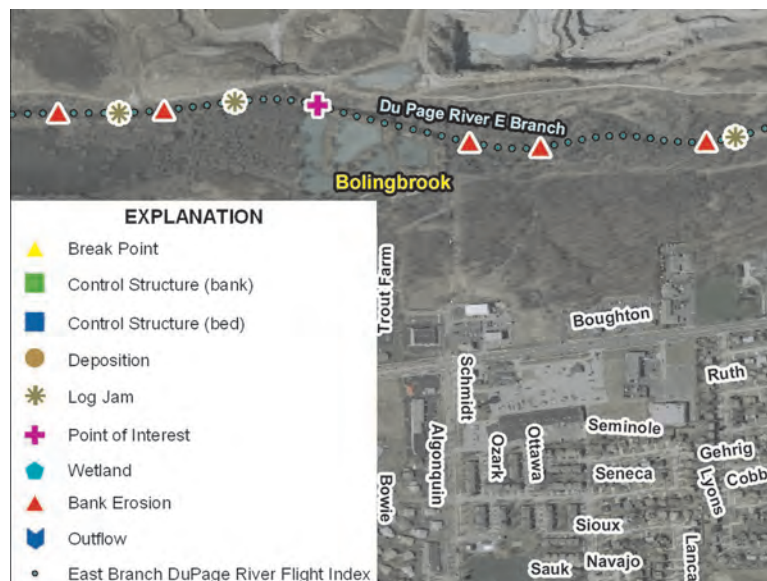
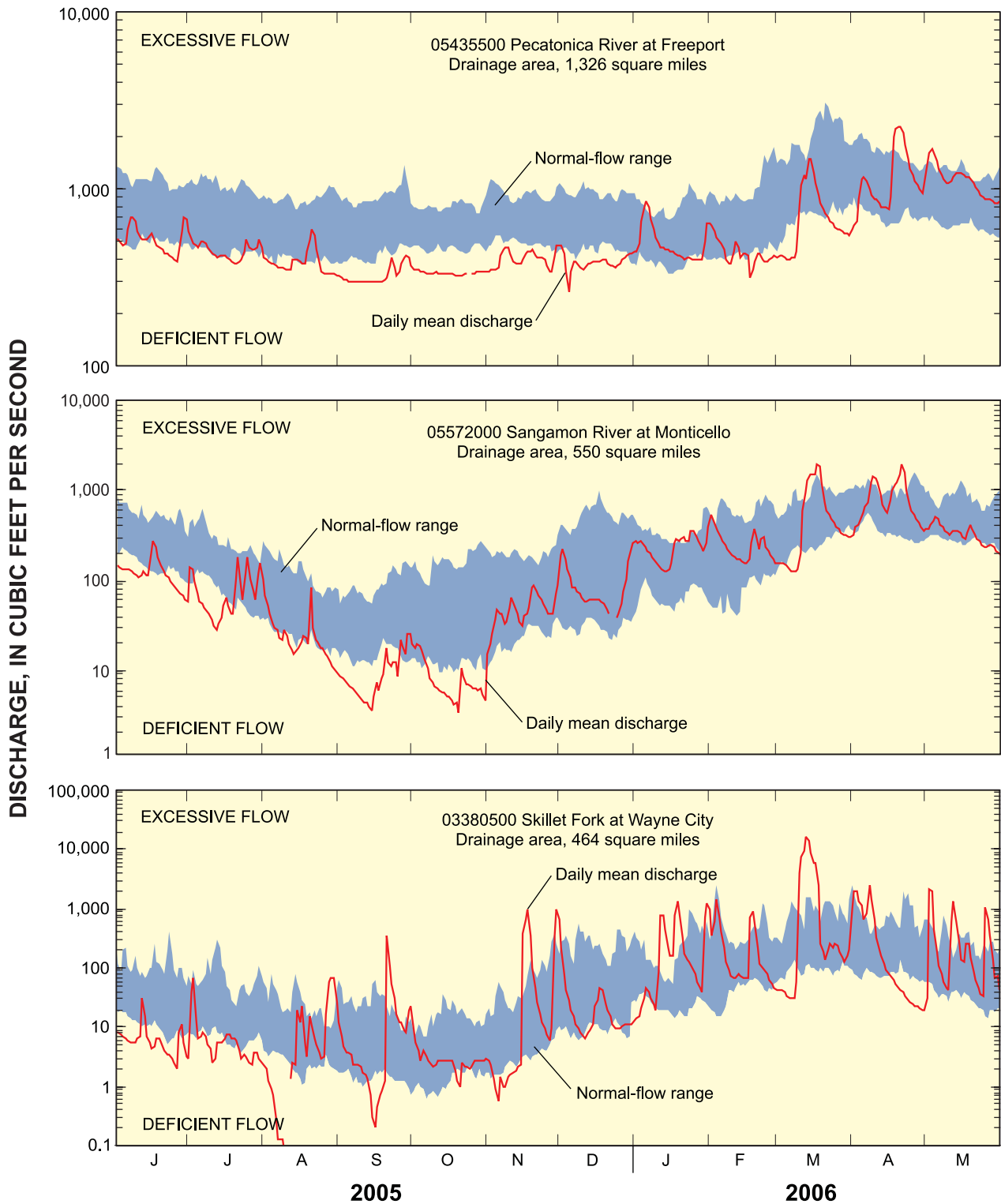


Figure 2. GIS features showing stream and riparian conditions on the East Branch Du Page River in Illinois.

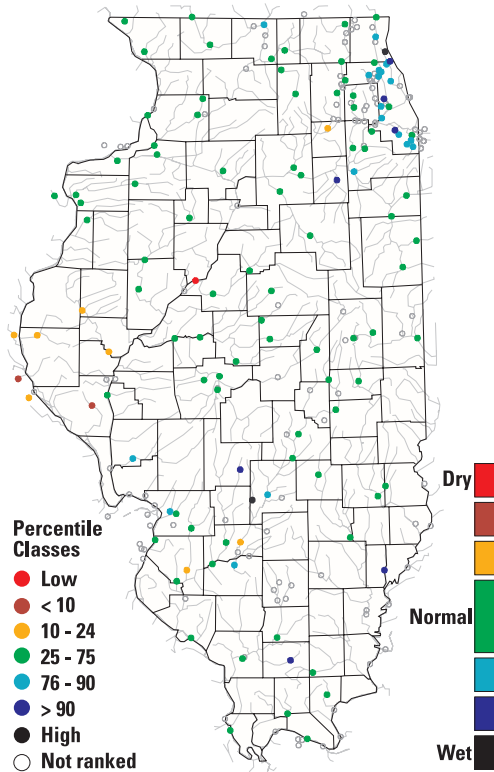
ILLINOIS STREAMFLOW CONDITIONS FOR JUNE 2005 THROUGH MAY 2006



Daily mean discharge from June 1, 2005 through May 30, 2006 compared with percentile distribution of mean daily discharged for the 30-year period, 1961-90, for 3 representative streamgaging stations. A daily mean discharge is in the deficient-flow if its value is less than or equal to the 25th percentile, in the normal-flow range if its value is between 25th and 75th percentiles, and in the excessive-flow range if its value is equal to or greater than the 75th percentile.



USGS Illinois Science Center Director Dr. Robert Holmes (left) gives USGS Acting Director Dr. Patrick Leahy (right) a tour of the USGS teaching streamflow-gaging station on the University of Illinois campus on February 9, 2006.



ILLINOIS HYDROLOGIC CONDITIONS ON MAY 25, 2006

The map at left can be found at: http://il.water.usgs.gov/hydro_conditions/index.html. This map tracks short-term changes (over several hours) in rivers and streams where USGS has a streamflow gage. The colors represent real-time streamflow compared to percentiles of historical daily streamflow for the day of the year. Only stations having at least 30 years of record are used. You can access the real-time data for each station by clicking on the dots. You may also access a similar map for the entire United States at <http://water.usgs.gov/waterwatch/>.

**USGS ILLINOIS WATER SCIENCE
CENTER PUBLICATIONS**

FY 2006

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 USGS Illinois Water Science Center. To obtain copies of the following, or any other USGS 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 2005

SIR 2005-5270, Hydrologic, Hydraulic, and Flood-Hazard Analysis of the Blackberry Creek Watershed, Kane County, Illinois, by D. Soong, T.D. Straub, and E.A. Murphy (<http://pubs.usgs.gov/sir/2005/5270/>)

SIR 2006-5016, Suspended-Sediment Yields and Stream Channel Processes on Judy's Branch Watershed in the St. Louis Metro East Region in Illinois, by T.D. Straub, G.P. Johnson, D.P. Roseboom, and C.R. Sierra (<http://pubs.usgs.gov/sir/2006/5016>)

SIR 2006-5018, Computation of Discharge and Error Analysis for the Lake Michigan Diversion Project in Illinois, by J.J. Duncker, T.M. Over, and J.A. Gonzalez (available soon as Web-only report)

SIR 2006-5076, Hydrogeology, Water Use, and Simulated Ground-Water Flow and Availability in Campton Township, Kane County, Illinois, by R.T. Kay, L.D. Arihood, T.L. Arnold, and K.K. Fowler (Web only at <http://pubs.usgs.gov/sir/2006/5076/>)

SIR 2006-5078, Concentrations, Fluxes, and Yield of Nitrogen,

Phosphorus, and Suspended Sediment in the Illinois River Basin, 1996-2000, by P.J. Terrio (not yet available)

OFR 2006-1045, Geology, Hydrology, and Water Quality in the Vicinity of a Brownfield Site near Yorkville, Illinois, by R.T. Kay (Web only at <http://pubs.usgs.gov/of/2006/1045/>)

OFR 2006-1430, Sensitivity of Potential Evapotranspiration and Simulated Flow to Varying Meteorological Inputs, Salt Creek Watershed, DuPage County, Illinois, by D. Whitbeck (<http://pubs.usgs.gov/of/2005/1430/>)

NEWSLETTER FORMAT PREFERENCE

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