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Water Resources Update

USGS Illinois Water Science Center Newsletter

Spring/Summer 2007

U.S. Department of Interior
U.S. Geological Survey
Illinois Water Science Center
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Message from the Director
Robert R. Holmes, Jr., PhD, P.E.

I write this article while on a plane returning from an international meeting at St. Anthony Falls Lab in Minneapolis, Minnesota, on the measurement of bedload sediment transport. My invitation to the meeting stems from my own long time research interest in sediment transport and river hydraulics. The measurement of bedload, defined as those sediments that move in a river in near-constant contact with the bed, is important for a number of scientific and engineering purposes. The increasing interest in stream restoration in the past 20 years has only heightened the need to be able to reliably measure and predict bedload transport. The meeting was convened to examine the state of the science of bedload transport measurement and how to improve it. We discussed everything from the traditional trap samplers, which are physically lowered to the bed to capture the bedload in transport, to various acoustic techniques, including the use of acoustic Doppler current profilers (ADCP) and hydrophones. The U.S. Geological Survey (USGS) has long played a crucial role in the development of bedload samplers (as well as many other types of samplers, related equipment, and procedures).

One of the topics that I did not expect to be discussed at the meeting was the management of the data itself and how important it is to properly document and store these data and the associated metadata so that they will be available to scientists and engineers for various purposes. I wholeheartedly agree with that overriding premise because I feel that to maximize the public good, data collected by any public agency or publicly financed research endeavor needs proper and permanent storage and access. The USGS has long expended much time and effort in the management and dissemination of not only sediment data but all of the hydrologic, geologic, geospatial, and biologic data we collect.

This newsletter contains articles discussing some of the data storage and dissemination efforts of the USGS. The first article highlights the new version of the Illinois Water Science Center annual data report, while another article discusses the efforts by USGS to store and disseminate ecological data collected as part of the ongoing National Water-Quality Assessment Program. Several members of the USGS Illinois Water Science Center staff have played unique and crucial roles in the development of these two data dissemination efforts over the years. I hope you enjoy these articles.

New Annual Report Improves Data Consistency

by
John K. LaTour, Hydrologist

Each year, the USGS publishes annual reports to provide water-resources data to the public. Data have been published over the years in various formats and media. 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 1960, water resources data were published by river basin in USGS Water-Supply Papers. From 1961 to 2005, water-resources data were published by each State in paper USGS Water-Data Reports. To improve data accessibility, the USGS Illinois Water Science Center began around 1998 publishing interactive Water-Data Reports in digital format. The most recent interactive Water-Data Report for Illinois is available on compact disc (CD) and on the Web at *http://pubs.usgs.gov/wdr/2005/wdr-il-05/start.htm*. USGS headquarters recently decided to provide data from all States in a consistent format. Starting with the 2006 water year, a National Water-Data Report is available on the Web at *http://pubs.water.usgs.gov/wdr2006* (fig. 1). This report provides data in a consistent format for all data-collection sites in the United States.

The homepage of the National Water-Data Report provides a way to search for data across the country by State, county, river basin, or data collections. To select a data site, for example, choose the radio button "Search by Site Number" and enter the site number. If data are available, the site number and name will appear below the search window. Selecting the site number will provide a description, a data table, and a graph of the data (fig. 2). The homepage also provides a map link (Mapper), a link to documentation for the report (Documentation), and a link to additional sources of information (Related Information).

Data can be obtained by using the link "Mapper" (fig. 3) from the homepage, which is an interactive map showing the location of data sites. The map includes features such as counties, municipalities, roads, and streams. Some of the navigation functions of the map include zooming, panning, and selecting. To obtain data, choose the "Identify Sites" icon and select a site from the map. Then choose, "Download data for this Site in PDF Format" to obtain the data.

Documentation for the National Report is available as a link on the homepage. It consists of introductory text similar to that provided in previous Water-Data Reports. General topics described in this section include (1) downstream order and station number, (2) numbering system for wells and miscellaneous records, (3) explanation of stage and water-discharge records,

Figure 1. National Water-Data Report.

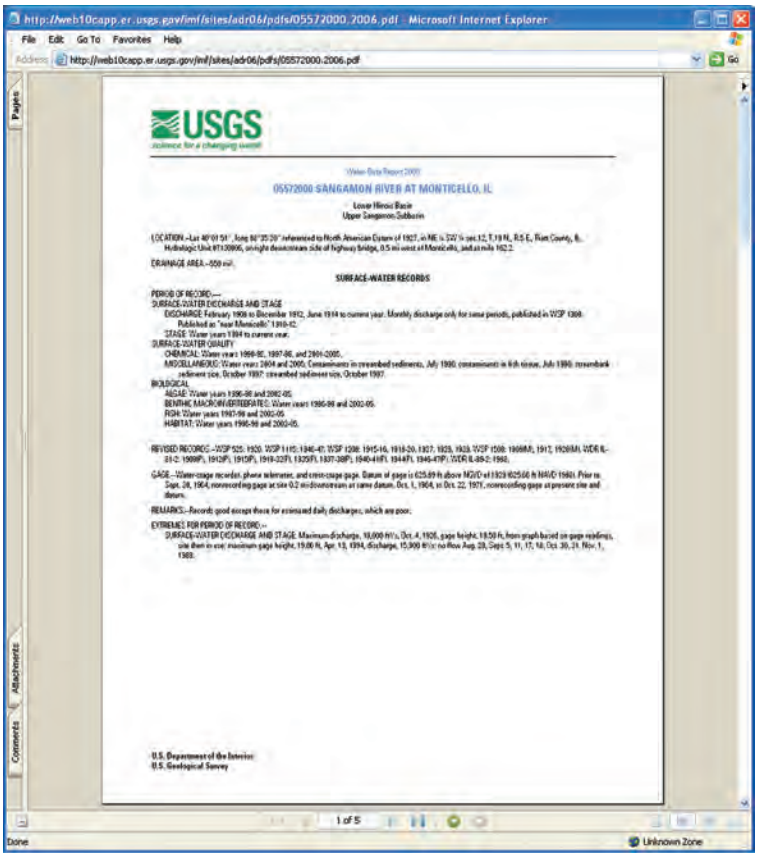


Figure 2. Result of a search based on site number.

(4) explanation of precipitation records, (5) explanation of water-quality records, (6) surface-water-quality records, (7) explanation of ground-water-level records, (8) ground-water-quality data, (9) definition of terms, and (10) hydrologic conditions.

A "Related Information" link is available from the homepage that provides additional sources of information related to USGS data and publications. From this link, you can access an extensive source of historical and real-time data through the National Water Information System Web site: *http://waterdata.usgs.gov/nwis*, or look at past Annual Water-Data Reports. You can contact a Water Science Center, view a summary of science activities in your State, do a search of publications through the USGS publications warehouse, or view the Techniques for Water-Resources Investigations (TWRI) reports. The TWRI's describe the methods used to collect water-resources data. Information is also available about special data networks and programs, such as the Hydrologic Benchmark Program, the National Stream Quality Accounting Network, the National Trends Network for Monitoring Atmospheric Deposition, the National Water-Quality Assessment Program, and the National Streamflow Information Program.

Additional information about data presented in the National Water-Data Report and other USGS reports can be obtained by contacting the USGS Illinois Water Science Center by mail at 1201 West University Avenue, Suite 100, Urbana, Illinois 61801-2347, by telephone at (217) 344-0037, or by visiting our Web site at *http://il.water.usgs.gov*.

Figure 3. Interactive Mapper.

EMPLOYEE SPOTLIGHT

Gary P. Johnson
(Chief, Hydrologic Data Collection and Analysis Section)

Gary Johnson serves as the Chief of the Hydrologic Data Collection and Analysis Section of the USGS, Illinois Water Science Center. As "Data Chief," his current duties include oversight and administration of the entire streamgage network throughout the State of Illinois, with an annual budget of over $2.4 million.

Gary holds a BS degree in General Engineering from the University of Illinois (U of I) at Urbana-Champaign. While in school at the U of I, he worked as a Hydrologic Aid at the USGS and was hired full-time in 1990 after graduation. Before becoming Data Chief in 2004, Gary was involved in a variety of surface-water quantity, bathymetric, and surface-water quality projects. Gary has been the project chief of the Illinois Sediment Project since 1993, with the responsibility of monitoring sediment loads at several strategic locations in Illinois. He also was project chief of numerous other water-resources projects with an emphasis on sediment, nutrient, and pesticide transport in waterways and lakes. Gary recently was involved in extensive research of water-mixing patterns and water-quality effects from aeration and mixing of lakes. During his 18-year career, Gary has authored or co-authored 24 USGS scientific reports.

Gary feels strongly that basic hydrologic data is the foundation for water resources endeavors. He also feels that those data are often taken for granted by many in research, consulting, and water resources. In his current position, he sees first hand the diversity of users and applications of USGS streamflow data. Whether its an emergency manager using USGS data to decide whether to evacuate during a flood, a highway engineer using USGS data to design a bridge, a community planner using USGS data to determine the boundaries of a development, or a local fisherman using USGS data to determine when and where to fish, Gary knows that USGS data has a profound impact on people's lives, but few fully appreciate it. Thus, one of his goals as Data Chief is to spread the word about USGS streamgaging data, and to develop broad and diverse appreciation and support.

Gary grew up around Peoria, Illinois. His family owned and operated a trucking business that hauled U.S. Mail, heavy equipment, and agricultural products, in addition to operating a family farming operation. In his spare time, Gary loves the outdoors (hunting, fishing, and camping), is an avid Illini sports fan, and has continued to be involved in agriculture. He still independently farms some of his family's acreage in DeWitt County. He and his wife, Renee Monfort, raise Standardbred harness racing horses at his home in rural Mahomet, Illinois. They also enjoy pleasure horses and other outdoor activities along with their two daughters, Kathryn (9) and Meredith (7).

Serving and Storing NAWQA Ecological Data
by
Mitchell A. Harris, Ecologist

The USGS's National Water-Quality Assessment (NAWQA) Program collects biological community samples (fish, invertebrates, and algae) in streams as part of ecological studies. Information from these ecological studies, together with chemical and physical data, provide an integrated assessment of water quality at local, regional, and national scales.

The NAWQA Program follows the standard business practice of having two types of data management systems (warehouse and transactional) to collect, manage, and distribute ecological data. The NAWQA data warehouse stores data in order to generate information to make decisions and to serve data to the public. The Biological Transactional Database, known as BioTDB, the transactional or production data system, is designed to support day-to-day operations of the organization, like handling the data input processes.

NAWQA Data Warehouse: The Public Face of Ecological Data

The NAWQA data warehouse contains data for environmental samples collected by the NAWQA program. Overall, the warehouse contains data for about 7,600 surface-water sites and 8,100 wells across the country. Collectively, these data represent about 14 million records in the data warehouse. Biological community data for nearly 16,000 fish, algae, and invertebrate samples are available in the warehouse. Sampling approaches for these samples vary depending on the biological community that is targeted (such as fish) and the sampling objectives (for instance, generating a list of taxa that are present or estimating the proportional abundance of each taxon). A USGS publication, "Data Delivery and Mapping Over the Web: National Water-Quality Assessment Data Warehouse," showcasing the features and capabilities of the NAWQA Data Warehouse Web site is available at: *http://pubs.usgs.gov/fs/2006/3101*. The data warehouse Web page at *http://water.usgs.gov/nawqa/data* has additional information about the variety and complexity of the data that are available.

Data warehouse users can access the information contained in the data warehouse using a series of selection windows. To retrieve a biological dataset from the data warehouse and copy the resulting table to a local computer, users select Bio Community link from the "RETRIEVE DATA" section of the data warehouse home page. A new viewer window appears that allows the user to choose output options and fill in search-criteria parameters (fig. 1). The retrieval types for fish, invertebrate, and algal communities include sample count, taxonomic list, and sample abundance (fig.2).

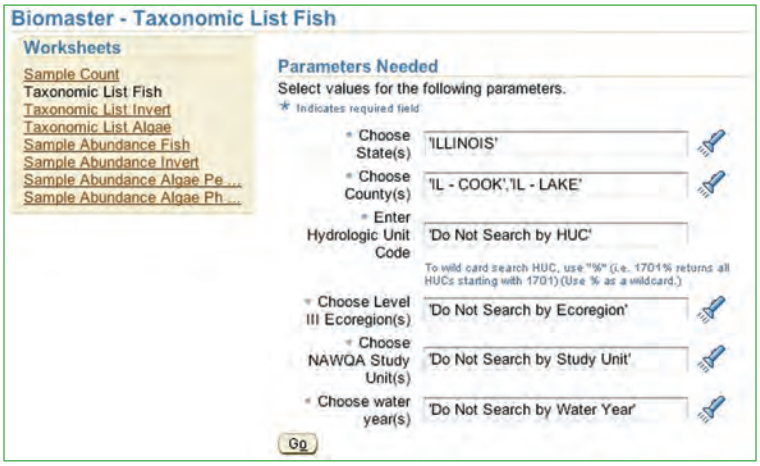


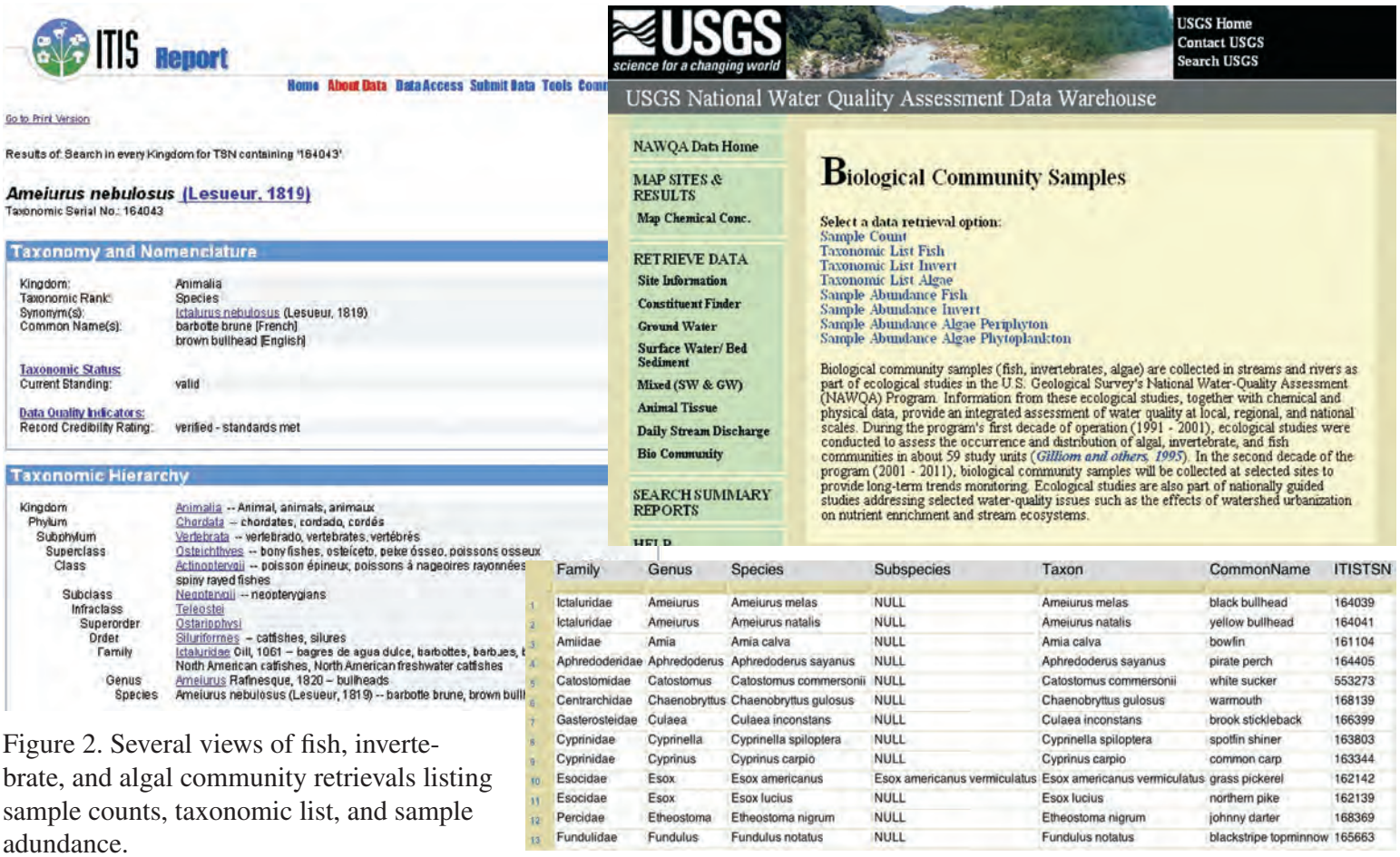
Figure 1. NAWQA Data Warehouse options for retrieving biological data.

BioTDB: Behind the Scenes

BioTDB is the centralized database system for storing, maintaining, and distributing NAWQA ecology data. It is the locus for long-term maintenance of data, and the master source for the NAWQA Data Warehouse and other external databases. NAWQA biologists install a client application on their computers to connect to the central database. Through a variety of screens, biologists enter their field-collected data into the system, send electronic sample processing work orders to taxonomic laboratories, and use an interactive data-check system (fig. 3) to help ensure data accuracy and completeness. NAWQA biologists can also export their data in formats designed for data analysis applications. BioTDB assists data managers in tracking samples sent to laboratories for processing and uploading the data from the labs.

USGS Illinois Water Science Center Connection

Based in the USGS Illinois Water Science Center, Mitchell Harris serves as the Assistant Data Manager for BioTDB. His management activities include planning and implementing required system maintenance and upgrades, assuring the integrity and quality of the database, and evaluating and implementing new user requirements. Mitch also provides user support, including answering user questions, designing training exercises, and updating the user guide and Web pages.



	Family	Genus	Species	Subspecies	Taxon	CommonName	ITISTSN
1	Ictaluridae	Ameiurus	Ameiurus melas	NULL	Ameiurus melas	black bullhead	164039
2	Ictaluridae	Ameiurus	Ameiurus natalis	NULL	Ameiurus natalis	yellow bullhead	164041
3	Amiidae	Amia	Amia calva	NULL	Amia calva	bowfin	161104
4	Aphredoderidae	Aphredoderus	Aphredoderus sayanus	NULL	Aphredoderus sayanus	pirate perch	164405
5	Catostomidae	Catostomus	Catostomus commersonii	NULL	Catostomus commersonii	white sucker	553273
6	Centrarchidae	Chaenobryttus	Chaenobryttus gulosus	NULL	Chaenobryttus gulosus	warmouth	168139
7	Gasterosteidae	Culaea	Culaea inconstans	NULL	Culaea inconstans	brook stickleback	166399
8	Cyprinidae	Cyprinella	Cyprinella spiloptera	NULL	Cyprinella spiloptera	spotfin shiner	163803
9	Cyprinidae	Cyprinus	Cyprinus carpio	NULL	Cyprinus carpio	common carp	163344
10	Esocidae	Esox	Esox americanus	Esox americanus vermiculatus	Esox americanus vermiculatus	grass pickerel	162142
11	Esocidae	Esox	Esox lucius	NULL	Esox lucius	northern pike	162139
12	Percidae	Etheostoma	Etheostoma nigrum	NULL	Etheostoma nigrum	johnny darter	168369
13	Fundulidae	Fundulus	Fundulus notatus	NULL	Fundulus notatus	blackstripe topminnow	165663

Figure 2. Several views of fish, invertebrate, and algal community retrievals listing sample counts, taxonomic list, and sample adundance.

Future of BioTDB

Presently, data warehouse and BioTDB personnel are engaged in several activities to ensure efficient data access and improve data quality. For example, in the future, NAWQA biologists can expect to use electronic field forms on ruggedized computers to enter data streamside. Electronic field forms will allow automated data checking in the field and batch-loading to the central database that can reduce the time required for data entry and data checking.

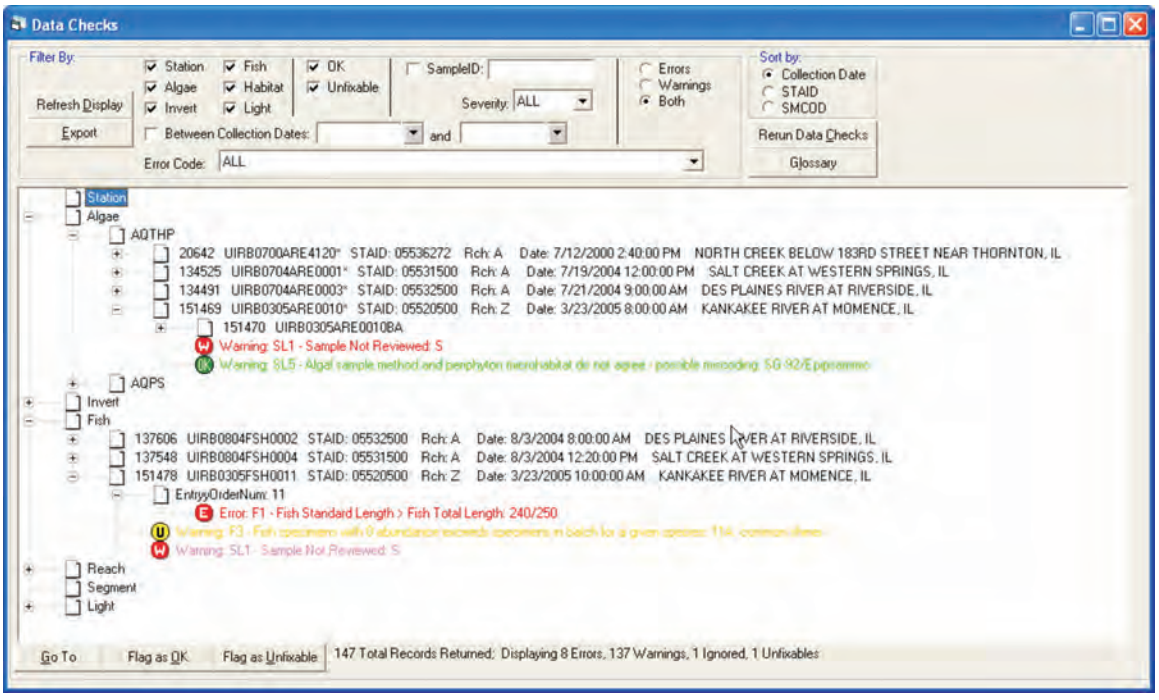
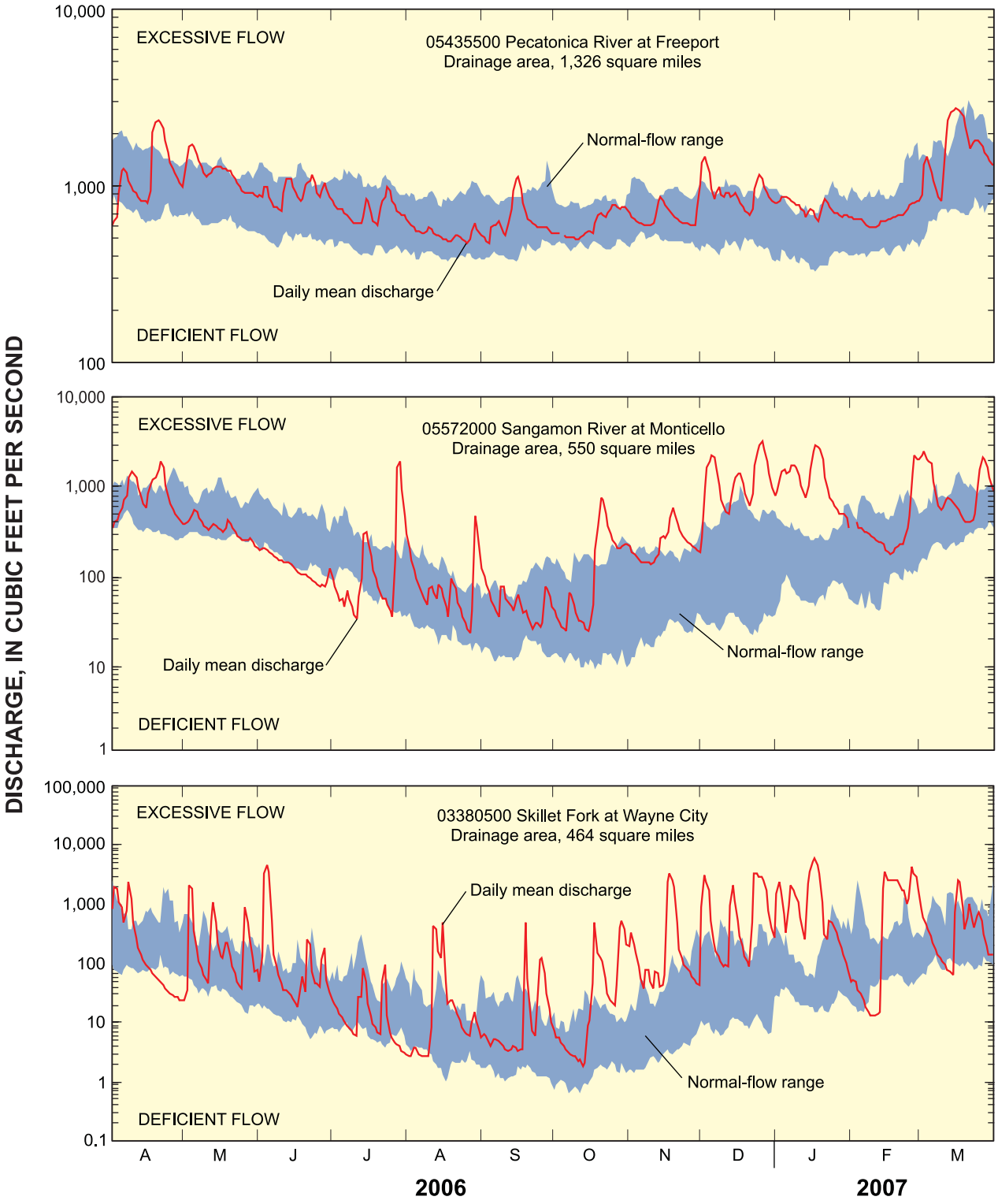


Figure 3. The BioTDB interactive data-check system.

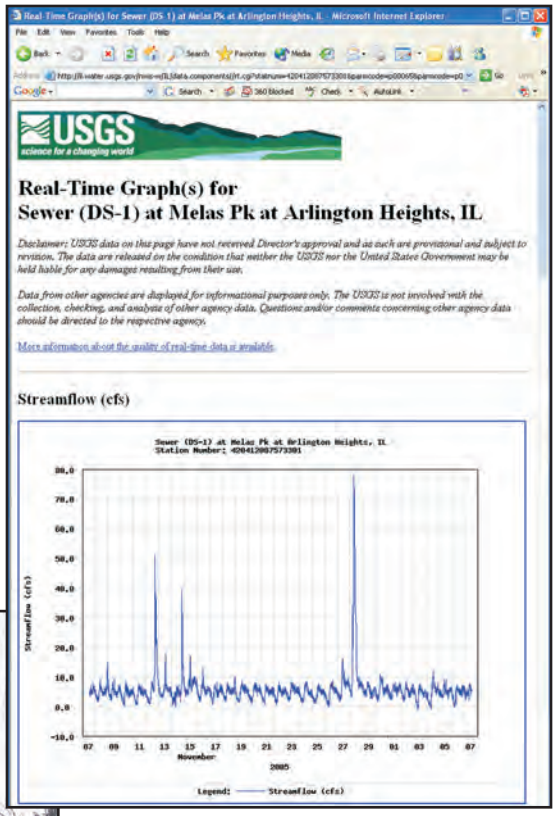


Daily mean discharge from April 1, 2006 through March 31, 2007 compared with percentile distribution of mean daily discharged for the 30-year period, 1961-90, for 3 representative streamgaging stations. A daily mean discharge is in the deficient-flow if its value is less than or equal to the 25th percentile, 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.

U.S. Geological Survey Real-Time Sewer Flow Monitoring
by
James J. Duncker, Hydrologist

The USGS has long had the mission of providing and publishing streamflow measurements for open-channel streams in Illinois and throughout the United States. Most of the data are provided on a real-time basis on the Internet (see article in this issue by J.K. LaTour). There are currently (2007) nearly 200 streamflow monitoring gages in Illinois and approximately 7,300 streamflow-monitoring gages in the United States. As part of this effort, the USGS has worked advance measurement technologies. An outgrowth of this work has been the development, testing, and application of acoustic flowmeters to sewer (both sanitary and storm) flow measurement.

Recent sewer flow monitoring work that is being done by the USGS in conjunction with the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC), includes the use of satellite telemetry to provide real-time Internet access to continuously collected water-level, velocity, and flow data in sanitary and combined-sewers that lead to the MWRDGC's Deep Tunnel drop shafts. Real-time access to the sewer flow data allows for efficient storm sampling and rapid assessment of sewer flow. The USGS is interested in conducting this and similar projects to further develop and refine the state-of-the-art monitoring of flows for activities such as water-quality or flood-hazard assessments.



Sewer DS-1 (Melas Park at Arlington Heights, Illinois) real-time flow data available on the Internet at *il.water.usgs.gov*.

MWRDGC drop shaft DS-6 and USGS instrument enclosure at Mt. Prospect, Illinois. Note the solar panel and satellite antenna located above enclosure on the pole.

USGS and MWRDGC personnel making a confined-space entry for installation of an acoustic sewer flowmeter.

If you have a need for this type of sewer monitoring and would be interested in working with the USGS or have any questions regarding this type of work, please contact Bob Holmes at (217) 344-0037, extension 3005 or e-mail bholmes@usgs.gov.

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 the USGS Publications Warehouse at: *http://infotrek.er.usgs.gov/pubs/*

FY 2006-07

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 and Error Analysis of Discharge for the Lake Michigan Diversion Project in Illinois: 1997-99 Water Years, by J.J. Duncker, T.M. Over, and J.A. Gonzalez (Web-only).
(*http://pubs.usgs.gov/sir/2006/5018/*)

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).
(*http://pubs.usgs.gov/sir/2006/5076/*)

SIR 2006-5078, Concentrations, Fluxes, and Yields of Nitrogen, Phosphorus, and Suspended Sediment in the Illinois River Basin, 1996-2000, by P.J. Terrio.
(*http://pubs.usgs.gov/sir/2006/5078/*)

OFR 2006-1045, Geology, Hydrology, and Water Quality in the Glacial Drift Aquifer in the Vicinity of the Nelson Landfill near Yorkville, Illinois, by R.T. Kay (Web only).
(*http://pubs.usgs.gov/of/2006/1045/*)

OFR 2006-1248, Watershed Data Management (WDM) Database for Salt Creek Streamflow Simulation, Du Page County, Illinois, by E.A. Murphy and A.L. Ishii.
(*http://pubs.usgs.gov/of/2006/1248/*)

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/*)

SIR 2006-5158, Sediment Coring and Sedimentation Analysis on Rasmussen Lake in Ethel's Woods Forest Preserve near Old Mill Creek, Illinois in 2005, by T.D. Straub, D.P. Roseboom, and P.G. Dennis (Web only).
(*http://pubs.usgs.gov/sir/2006/5158/*)

USGS Illinois Water Science Center Staff, Dec. 2006

Our staff is composed of hydrologists, hydrologic technicians, geologists, cartographers, geographers, support personnel, ecologists, IT and computer specialists, and students. The Illinois Water Science Center has offices in De Kalb, Urbana, and Mt. Vernon. The picture at left shows some of the staff at a recent retirement luncheon for Tom Wicker (front center in tan sweater).