

Water Resources Update

Illinois District Newsletter

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Compiled by D.M. Ayers

THE IMPORTANCE OF STREAM RESTORATION

The 3.5 million miles of streams and rivers in the United States and their associated floodplains and riparian areas near these streams often contain features of great economic, social, and environmental importance, with many of these streams in urban parts of the country. These streams and rivers often are changing with respect to watershed hydrology and climate. Erosion and degradation of riverbanks and channels is a natural process that often has been accelerated by human activities. Extensive land-use conversions to agriculture, urban development, and surface mining have been documented as major causes of stream instability at the watershed scale. This instability should be remediated through a process termed stream restoration. Stream restoration is a process to reestablish the structure and function of the stream system. This process involves a large number of actions including but not limited to installation of grade-control structures, bendway weirs, land-conservation treatments, wetland construction, and installation of bank protection. These actions either separately or in combination are termed Best Management practices (BMPs). Adequate assessment of the proper actions for stream restoration requires expertise in geology, geomorphology, ecology, biology, stream hydraulics, and hydrology. Assessment and determination of proper BMPs require a watershed scale approach. In other words, examining the stream as a whole instead of in parts and basing the BMPs on its effect on the entire stream system and not a specific stream segment.

Attempts at stream restoration are proceeding at a rapid pace, with millions of dollars spent each year in the United States including efforts in Illinois. In most streams, the physical, chemical, and biological improvements resulting from the implementation of selected BMPs have not been adequate at the watershed scale despite large funding levels for watershed-conservation practices. Part of this inadequacy is the lack of understanding of the stream processes and dynamics along with a lack of systematic post-BMP implementation monitoring, which would facilitate better understanding of how and where certain BMPs will work. Stream function and behavior remains an area ripe for active research. This understanding has many facets involving theory, field observation, and design of the proper field parameters needed for long-term monitoring.

In an effort to further the technical exchange of information between those working in the stream restoration area, the U.S. Geological Survey sponsored a stream restoration workshop in Champaign-Urbana in February 2002. This workshop provided a forum for the information exchange of data — collection techniques, application of geomorphic analysis, and stream classification studies, as they pertain to stream restoration. The workshop was highly successful with well over 100 people in attendance from various agencies of Federal, State, and local government.

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LONG-TERM DOCUMENTATION OF STREAM RESTORATION

BY

DON ROSEBOOM, HYDROLOGIST, AND TIM STRAUB, HYDROLOGIST

Initial watershed assessment should include the development of a database that directs more intensive data gathering for the design of best management practices (BMPs), implementation and monitoring at selected subwatersheds and stream reaches. Stream channel alterations are among the most poorly documented watershed monitoring efforts during the technical assessments of BMPs at a watershed scale. The common approach is an analysis of older high altitude photography from the U.S. Department of Agriculture with scales of 1 inch to 660 feet. More detailed and rapid approaches are needed to determine the response of the stream as illustrated in the channel evolution models.

A program of low level-aerial videography provides the initial information, which is required to select stream degradation regions, BMP site selection, and monitoring locations within multiple watersheds. The data needs for BMP selection and siting will provide the basis of longer and more intensive monitoring of selected watersheds with sufficient monitoring funds.

Increased runoff rates of storm-water and sediment from watershed activities create both degrading and aggrading segments in tributaries to the Illinois River. The degrading streambed will lead to channel widening by bank erosion with loss of riparian trees. The channel will incise into glacial deposits containing large diameter bedload materials. This process increases the percentage of gravel and cobble in these Midwestern-prairie streams. The increased size of introduced bedload materials will increase point bar and

mid-channel bar development with rapid channel widening.

The increased erosion rates will lead to rapid accumulations of sediment and woody debris in downstream reaches of the watershed stream, where stream bed slope and, thus, stream velocity is reduced. The resulting debris logjams and large bedload depositions are major indications of both watershed and stream instability. Watershed instability usually is reflected in channel instability from both degradation and aggradation.

As a first step in assessing watershed instability and developing selection of BMPs at specific watershed locations, a low-level aerial survey will identify stable and unstable reaches of stream. Once the extent and severity of unstable reaches is quantified, an intensive ground survey by an interagency watershed assessment team will determine causes of the instability. The resulting analysis will lead to more intensive surveying of the selected subwatersheds for the siting and implementation of BMPs. With monitoring data, the accuracy of the watershed analysis and the efficiency of BMPs can be determined in those sections of the watershed and stream with the greatest sediment contribution. This approach to rapid assessment builds the database to intensive and extensive monitoring of BMPs at a watershed scale in selected watersheds where monitoring funds are available.

EMPLOYEE SPOTLIGHT

**DAVID P. MORGAN,
HYDROLOGIC TECHNICIAN**

David Morgan has been with the U.S. Geological Survey (USGS), Illinois District since 1974. David started his USGS career in the former Oak Park Subdistrict office primarily streamgaging in northern Illinois. He moved to DeKalb in 1976 when the Oak Park office was relocated. David transferred to the Champaign/Urbana Subdistrict office during the same year. He continued streamgaging activities and also performed water-quality sampling duties in central Illinois. From 1979 to 1984, he managed the District warehouse. His duties included warehouse maintenance, ordering field vehicles, property inventory, and checking equipment orders for the District.

David returned to streamgaging and water-quality duties in 1985. He operated and maintained the acoustic velocity meter gage at the Chicago Sanitary and Ship Canal at Romeoville — one of the first acoustic gages in the Illinois District. He also developed and modified computer programs to automatically retrieve field data to USGS databases.

David is a graduate of Parkland College in Champaign with an associates degree in Applied Sciences—Electronics Engineering Technology. His hobbies include computer applications and collecting movies on VHS and DVD. David also enjoys NASCAR stock car racing.

JUDY'S BRANCH SEDIMENT AND GEOMORPHIC STUDY UPDATE

BY

PERRY DRAPER, HYDROLOGIC TECHNICIAN

The Judy's Branch sediment and geomorphic study began data collection in June 2002 at Glen Carbon, Illinois. Three continuous gaging stations were established to monitor the precipitation, stage, discharge, and sediment transport of Judy's Branch (drainage area of 8.3 square miles). Core samples also were collected in the stream network to determine the geomorphic makeup of the basin. Twenty-nine bank rods were established at the beginning of the study to determine bank stability over time and lateral recession rates.

The rate of lateral recession of stream banks in Judy's Branch is shown in figure 1. The bank rods are categorized according to the Natural Resource Conservation Service (NRCS) lateral recession rates for streams. Soil corings have been collected at six locations throughout the stream network. Geotechnical analysis of the corings was completed by NRCS. The values from the geotechnical analysis then were used to determine

stable bank heights for differing bank types and factors of safety (fig. 2 see page 4).

Since the beginning of the study more than 600 sediment samples have been collected at the 3 gaging stations. These samples were obtained over a wide range of stages to determine sediment loads during storm events as well as at base flow throughout the watershed. The importance of gathering data on the rapid rise, crest, and fall of stream discharge during storm events is highlighted in figure 3 (see page 4). Sediment concentration is related closely to discharge. Cross-section samples also have been taken for correlation of the point samples to the cross sections.

Developing the stage/discharge relation (ratings) at each gaging station has been ongoing throughout the study. Eighty-seven conventional (measured directly with meters) discharge measurements have been made by USGS personnel over a wide range of stages.

Indirect discharge measurements (measured without meters) also were calculated at each site for the storm event on August 24, 2001. Indirect measurements were calculated using the Slope Area Computation (SAC) and Culvert Analyses Program (CAP). Stage/discharge relations have been developed for each station.

Judy's Branch was one of the watersheds chosen for a Public Broadcasting System (PBS) special on sedimentation and nutrient runoff from agricultural fields and eutrophication of streams. The special produced by a Louisiana PBS affiliate included an interview with Robert R. Holmes, Jr., Illinois District Chief. The special, "Hypoxia in the Gulf," will air sometime in the fall of 2002.

The Judy's Branch study continues to provide hydraulic, sediment, and geomorphic data to assess the effects of urbanization on stream discharge and sediment concentrations in small watersheds.

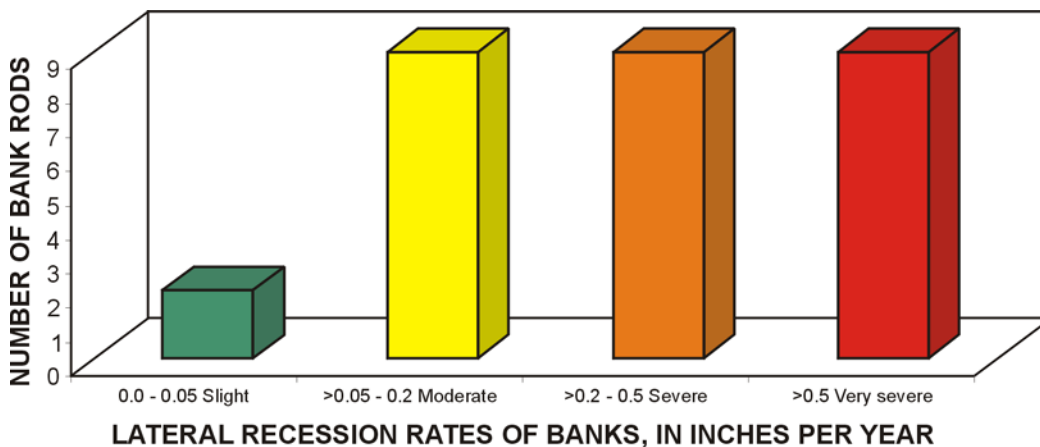


Figure 1. Lateral recession rates (using NRCS categories) at bank-rod locations throughout Judy's Branch.

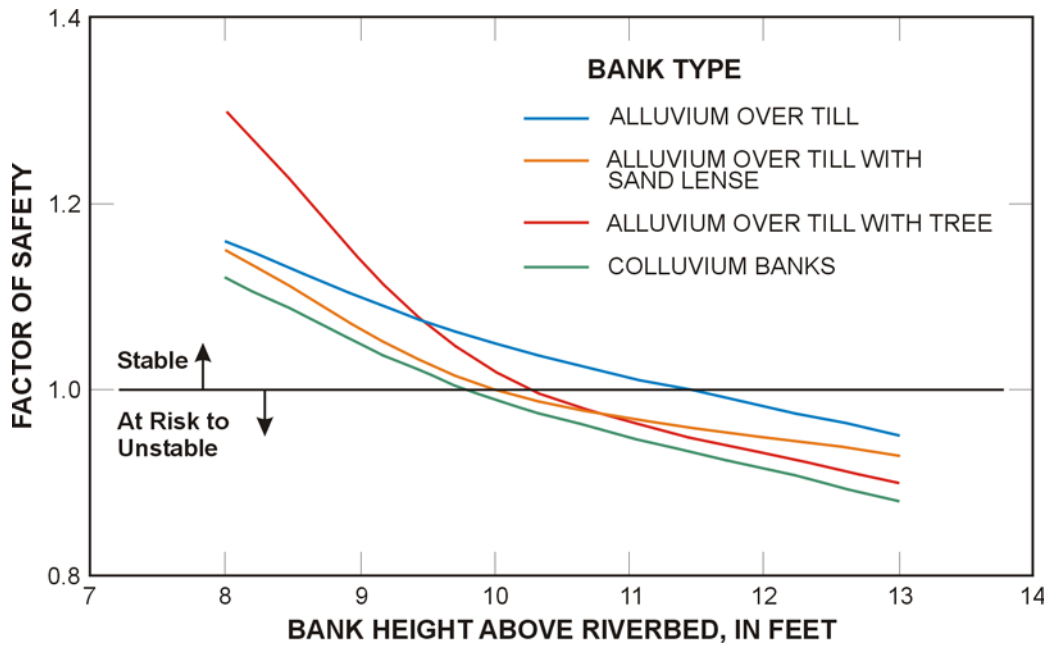


Figure 2. Factor of safety with respect to bank height for a saturated bank and 1.5 feet river level and 70 degrees bank angle for riverbank scenarios in the Judy's Branch.

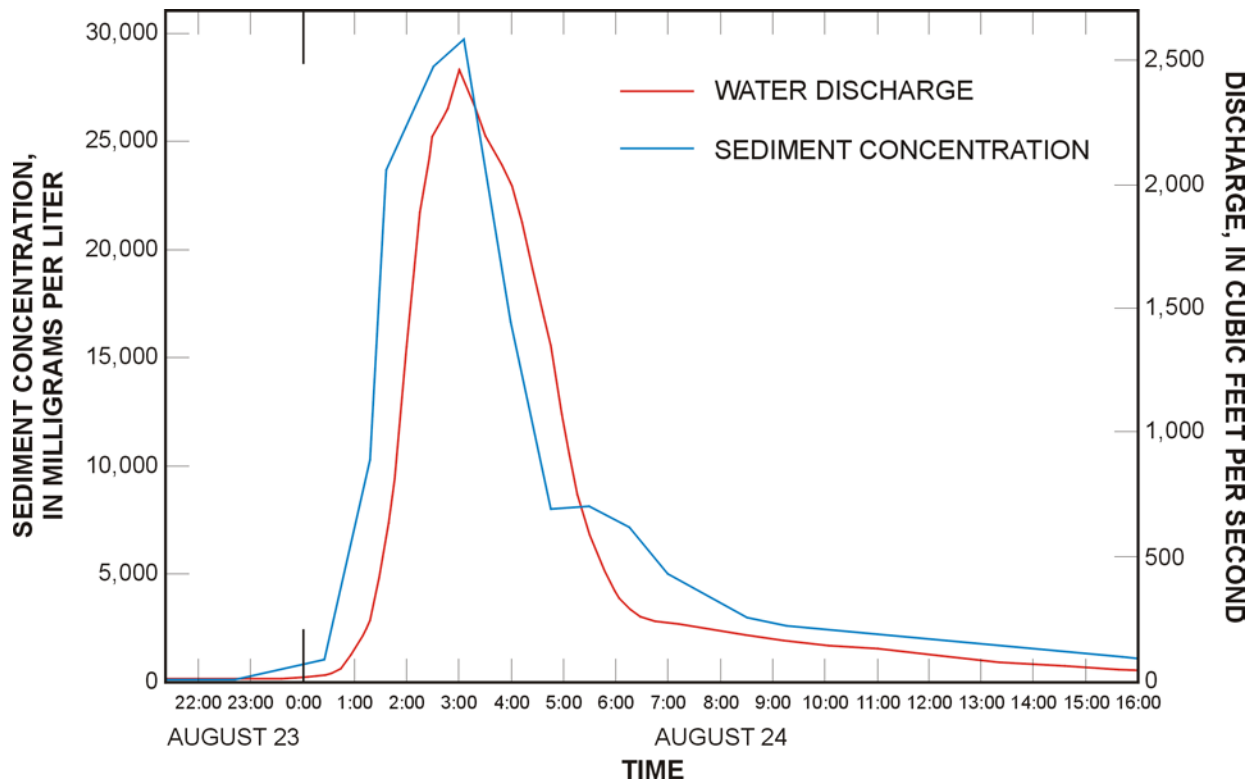


Figure 3. Time series plot of water discharge (red) and sediment concentration (blue) at Judy's Branch at Route 157 during the August 24, 2001, storm.

COOPERATOR SPOTLIGHT

KANE COUNTY DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

The mission of the Kane County Department of Environmental Management is to develop, evaluate, and implement programs to protect the health, safety, and welfare of the county's residents and the environment. Departmental programs include Countywide Stormwater Management, Solid Waste and Recycling, and other environmental activities. The Department of Environmental Management (Department), through its Stormwater Management Program, administers identification, management, and improvement projects for the county's water resources.

The Department's resource identification projects include efforts to study and better understand floodprone areas and to identify high-quality wetlands and fens in the county for possible protection. Hydrologic and hydraulic modeling and geographic information systems (GIS) are used to develop improved floodplain maps and document locations of these wetlands and fens.

Resource management projects aim to manipulate or manage the present water resources to best meet the county's environmental and public interests. The Department regularly assesses and maintains the county's waterways to reduce flooding potential in rural, residential, and urban areas. Technical assistance also is given to planning projects that seek to improve water quality or reduce

flood risk in the county's rivers and streams.

Kane was one of only six counties in Illinois enabled by legislation in 1985 to regulate stormwater discharges from new development. The Kane County Stormwater Ordinance was adopted in 2001 and now includes additional local wetland protection provisions. The principal purpose of the ordinance is to promote effective, equitable, acceptable, and legal stormwater management measures by establishing reasonable rules and regulations for development.

Finally, the Department of Environmental Management administers water resource improvement projects involving streambank stabilization, wetland creation and enhancement, dam removal, and stream restoration. These projects enable the county to manage water resources for both water quantity and quality.

The Department currently is collaborating with the U.S. Geological Survey (USGS), Illinois District on studies aiming to better understand and manage the county's water resources. The streamflow-gaging station at Jericho Road measures the flows and floods in Kane County's portion of the Blackberry Creek watershed. A Floodplain Revision Study is developing a system of hydrologic and hydraulic models to simulate flood inundation of Blackberry Creek at 1996 and 2020 conditions. As part of this study, the base

floodplain will be updated for Blackberry Creek, and the county staff will use the model system for future analysis. This study has received appreciable assistance from the Illinois Department of Natural Resources, Office of Water Resources (IDNR OWR), and the county has become the cooperative technical partner with the Federal Emergency Management Agency. The Department, Illinois Environmental Protection Agency, IDNR OWR, and USGS also are working cooperatively on a study concerning sediment analysis on Brewster Creek near St. Charles, Illinois before and after the proposed dam removal.

OUTREACH ACTIVITIES
ILLINOIS STATE FAIR
BY MEGAN JUPIN AND STEFANIE FENIMORE

Kettle corn, teepees, trees, and lumberjacks — common sights of the Illinois State Fair. Now, however, there is a new addition to the traditional fair flavor — the USGS display. The second year of USGS outreach at the fair was not without its ups and downs but was considered successful.

This year the USGS was assimilated into the spirit of Conservation World — a diverse collection of shows, shopping, and food. Not to mention an educational hotspot for kids and parents. Tents and displays were sponsored by such groups as the Illinois Environmental Protection Agency (IEPA), the Youth Archery Program (sponsored by the Illinois Department of Natural Resources [IDNR]), just to name a few.

Set on the “Government Row”, as it was fondly referred to, the USGS was surrounded by government agencies, all meant to educate the public about their mission and services. The USGS display was a favorite with families, both for the educational and the hands-on/visual attractions.

This year brought a completely new look for the USGS display, resulting primarily because of the generous amount of space given to the USGS by Conversation World — a 20-foot by 20-foot spot provided us with a lot more room than last year.

Various exhibit items were incorporated into the display. Stream-flow-gaging equipment, consisting of a Price AA current meter, a 75-pound sounding weight, personal floatation devices, and waders, were exhibited in one area. Information on pH testing and a ground-water model was exhibited on a wall. Automatic data-sampling units, such as a pressure sensor and data logger were shown on a wall. Informational posters and Fact Sheets explaining USGS studies and programs, and some basic principles of water flow were posted throughout the tent.

The backboard also provided a brand new look. The previous year’s “Water Words of the World” look was stripped off and the board was repainted with magnetic paint, and a blue topcoat and glitter. This look enabled posters to be easily exchanged with magnetic strips as well as creating an interesting place to find USGS visual identity magnets. The addition of the USGS “Earth Science Careers” video, produced by the Illinois District, added insight to the many job possibilities with the USGS.

The main attraction of the tent was the water table. It was a hit with the younger crowd as many of the kids spent a great deal of time “making rivers” and watching erosion take place right before their eyes. A few families

even made repeat visits to the USGS tent at their kids’ request.

The public was appreciative of the display. Many had questions concerning local water-quality issues as well as general questions about the displays and posters.

The Illinois State Fair was held this year in Springfield August 9-18, 2002, and USGS participation would not have been a success without the many volunteers from the District Office.

OUTREACH ACTIVITIES
EARTH SCIENCE CAREERS VIDEO RECEIVES SHOEMAKER AWARD
BY KELLY WARNER AND JENNIFER SHARPE

The video “Earth Science Careers” was produced and published in the Illinois District (produced by Jennifer Sharpe) in cooperation with the Prairie Production Group. This video provides an overview of Earth Science career fields within the USGS. Various types of work experiences, environments, expertise, and education of a typical USGS employee are explored in sometimes humorous, yet factual vignettes. The video is available as an educational resource from the Illinois District until stock is exhausted.

The “Earth Science Careers” video won the prestigious USGS Shoemaker Award for Communications Product Excellence. This national award is given to USGS products that demonstrate extraordinary effectiveness in communicating and translating complex science concepts and discoveries in ways that capture the interest and imagination of the American public.

The award was established in memory of the late USGS astrogeologist, Eugene Shoemaker, a pioneer in the field of planetary geology, co-discoverer of the

comet Shoemaker-Levy, and the first human to have some of his ashes interred on the moon.



Jennifer Sharpe (left) and Kelly Warner (right) accepting the Shoemaker Award from USGS Director, Charles “Chip” Groat, at the USGS John Wesley Powell Building in Reston, Virginia on June 27, 2002.

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 would like to see:

1. Monthly statements/summaries of Water Resource Conditions in Illinois, a. above normal flows, b. record flows, c. cfs; and
2. A monthly streamgage cooperator focus. I like your employee of the month, and the insight into studies."

"I just wanted to thank you for responding so quickly. This is exactly the information I was looking for. Thanks so much for your help..."

"Thank you for the super fast reply, I've been waiting for reply from other areas."

"Thanks so much for the quick reply! I plan on checking out the sites tonight!"

Comments about the USGS Web site at www.usgs.gov/.

"The USGS website is beautiful to look at, easy to navigate, fascinating and useful. Links are never broken and animations always seem to work. Thank you."

"You cannot imagine my amazement to find 'ground-water depth' information and 'water quality data' online at the USGS website, stretching back to 1934 for a selected field of more than 80 water wells ... I am stunned, to say the least."

ILLINOIS DISTRICT PUBLICATIONS

Listed below are publications that were published recently. 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.

FY 2002

OFR 01-307, Geology, Hydrology, and Water Quality in the Vicinity of a Brownfield Redevelopment Site in Canton, Illinois, by R.T. Kay

OFR 01-459, Physical, Chemical, and Biological Methods and Data from the Urban Land-Use Gradient Study, Des Plaines and Fox River Basins, Illinois,

1999-2001, by D.L. Adolphson, T.L. Arnold, F.A. Fitzpatrick, M.A. Harris, K.D. Richards, B.C. Scudder, and J.S. Stewart

WRIR 01-4056, Uranium and Radon in Ground Water in the Lower Illinois River Basin, by W.S. Morrow

WRIR 01-4068, Habitat, Biota, and Sediment Characteristics at Selected Stations in the Lower Illinois River Basin, Illinois, 1995-98, by D.L. Adolphson, D.J. Fazio, and M.A. Harris

WRIR 01-4100, Hydrogeology and Simulation of Ground-Water Flow in the Aquifers Underlying Belvidere, Illinois, by P.C. Mills, J.E. Nazimek, K.J. Halford, and D.J. Yeskis

WRIR 01-4116, Estimated Water Withdrawals, Water Use, and Water Consumption in Illinois, Indiana, Iowa, Kentucky,

Michigan, Missouri, and Wisconsin, 1950-95, by R.T. Kay
Water-Data Report IL-01, Water Resources Data Illinois Water Year 2001, by M.L. Harris, P.J. Draper, D.L. Schrader