U.S. Geological Survey New York Water Science Center – http://ny.usgs.gov

Message from Rafael W. Rodriguez, Director, New York Water Science Center

In 1996, the USGS drafted a strategic plan that established the goals of the agency for the next 10 years. The plan was based on the drivers, both internal and external and the challenges that faced our Nation at that time. The plan served its purpose well, but the drivers and challenges today are markedly different than they were ten years ago. In 2006 the USGS tasked a committee made up of scientists from our four disciplines (Biology, Geology, Water and Geography) to prepare a new strategic plan that would address evolving national and global priorities. This plan, "Facing tomorrow's challenges—U.S. Geological Survey science in the decade 2007–2017," was recently released and identifies six science directions that will guide the work of USGS for the next ten years.

- Understanding Ecosystems and Predicting Ecosystem Change: Ensuring the Nation's Economic and Environmental Future.
- Climate Variability and Change: Clarifying the Record and Assessing Consequences.
- Energy and Minerals for America's Future: Providing a Scientific Foundation for Resource Security, Environmental Health, Economic Vitality, and Land Management.
- A National Hazards, Risk, and Resilience Assessment Program: Ensuring the Long-Term Health and Wealth of the Nation.
- The Role of Environment and Wildlife in Human Health: A System that Identifies Environmental Risk to Public Health in America.
- A Water Census of the United States: Quantifying, Forecasting, and Securing Freshwater for America's Future.

In 2005, we at the USGS New York Water Science Center (NYWSC) prepared our own 5-year Strategic Plan. The plan was prepared with input from many of our cooperators and addressed the most pressing environmental and water resources issues in New York. Not surprisingly, both the NYWSC and USGS plans have several common elements and interrelated themes. The NYWSC will use both plans to guide our work for the foreseeable future.

As always, I am interested in hearing from you. Please feel free to contact me about these or any other issues or program opportunities you may wish to discuss. I can be reached at (518) 285-5659 or rrodrigu@usgs.gov.

Selected Projects – For information on all our active projects, visit our project summary web page. For more information on the specific project, please click on the project title.

Streamflow and water quality of the Onondaga Lake basin

Figure 1. – Photo of Onondaga Lake (source www.nysm.nysed.gov/batteau/onondaga.html)

Onondaga Lake has been identified as one of the Nation's most contaminated lakes as a result of discharges from industrial, sewage, and stormwater sources. Local remediation goals for the lake include: 1) improvement of water-quality to allow consumption of fish and allow human contact with lake waters; 2) restoration of the wildlife habitat to sustain the ecosystem in the tributaries and the lake; and 3) enhancement of the aesthetic quality of the surface water and shoreline. An important tool that water-resource managers can use to evaluate strategies to achieve these goals is a watershed-scale precipitation-runoff model that simulates flow and water quality in the tributaries to Onondaga Lake. With this tool, managers can evaluate such things as the effect of abating combined-sewer overflows on nitrogen loads or the effect of implementing agricultural best management practices on phosphorus loads to the lake and its tributaries.

The USGS, in cooperation with the Onondaga Lake Partnership, has developed a precipitation-runoff model of the Onondaga Lake watershed. This model simulates flow; water temperature; and sediment, orthophosphate, total phosphorus, nitrate, ammonia, and organic nitrogen loads in the four major tributaries to Onondaga Lake—Onondaga Creek, Harbor Brook, Ley Creek, and Ninemile Creek. Development of the model highlighted the hydrologic complexity of the basin, and necessitated the simulation of many factors that influence water quality in the basin, including the sediment loads from the Tully mudboils and streams subject to aggravated channel erosion, discharges from carbonate-bedrock springs, the diversion and treatment of runoff from the impervious and sewered areas of Syracuse, and the presumed mitigative effects of the Onondaga Creek flood-control dam and Otisco Lake. A report that describes this model is in press and is expected to be released during the summer of 2008. Contact: William Coon, (607) 266-0217 ext 3019, wcoon@usgs.gov.

Fractures, Faults, & Ground-Water Flow

A new water tunnel is being constructed in the Bronx, N.Y., which when completed will bring New York City water from the Croton watershed into a newly constructed filtration plant and deliver the filtered water back into the existing distribution tunnel system. The tunnel is proposed to cross the Mosholu Fault, which underlies the northern part of the Mosholu Parkway. Older water tunnels constructed in the area have reported extremely dangerous rock conditions and extensive ground-water inflows into these excavations. The USGS in cooperation with the New York City Department of Environmental Protection (NYCDEP) is using advanced surface and borehole geophysical methods to delineate the fractured-rock ground-water flow system and the location of the Mosholu Fault.

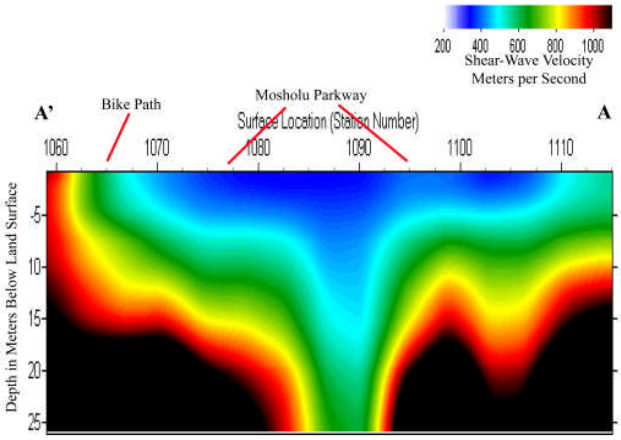

Figure 2. – Shear-wave velocity profile along cross section A-A' (see fig. 3), Mosholu Parkway, Bronx N.Y.

The USGS is utilizing a new surface geophysical technique called multichannel analysis of surface waves or MASW, to produce a two-dimensional (surface and depth) shear wave velocity map for the tunnel path. MASW takes advantage of the inherent properties of surface waves, which have the highest energy among all types of seismic waves. This allows for the use of MASW in urbanized or noisy settings. The seismic data can be collected on top of asphalt, concrete, and soil. The location of this study area included open grassy areas and significant amounts of paved areas. The addition of large volumes of automobile traffic along the primary area of interest required careful planning. The USGS New York Water Science Center along with the USGS Office of Ground Water—Branch of Geophysics, conducted several surface-wave seismic surveys along and across the Mosholu Parkway. The area has a thin (1- to 5-meter thick) sediment overburden underlain by fractured-rock consisting of gneiss and granite.

After processing, the resulting section is a color-contoured cross section showing the shear wave velocity of underlying materials. A low-velocity anomaly was detected in the various seismic sections across the parkway (fig. 2). Further analysis suggests the low-velocity zone is the Mosholu Fault which continues to the northwest. A shear wave velocity contour map also was constructed to help the NYCDEP plan a grouting program (fig. 3).

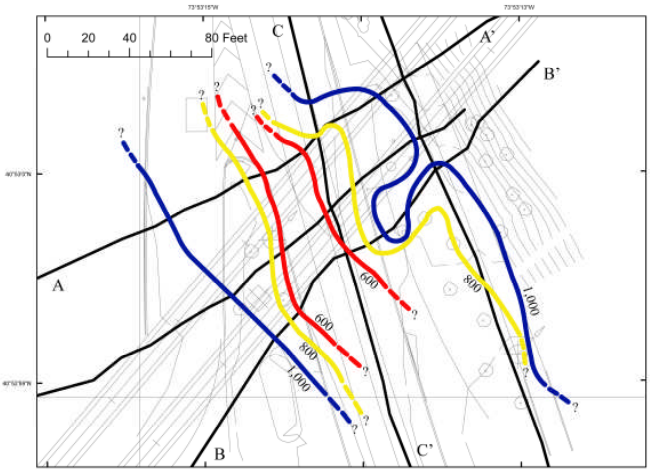

Figure 3. – Shear-wave velocity contours (in meter per second) at 15 meters (49 feet) depth below land surface along the Mosholu Parkway, Bronx N.Y.

The USGS effort will hopefully reduce the uncertainty and enhance safety for workers excavating through this fault zone. The surface-wave technique shows great promise, and its wider application to this and other hydrogeologic settings is actively being researched. Contact: Frederick Stumm, (631) 736-0783 ext. 107, fstumm@usgs.gov.

Pharmaceuticals and Personal Care Products: State of the Science conference

The USGS was pleased to cosponsor a recent conference on pharmaceuticals and personal care products (PPCPs) in the environment. The conference was organized by the New England Interstate Water Pollution Control Commission (NEIWPCC) and was held in Portland Maine. The conference brought together experts to discuss occurrence, fate, and transport of these constituents; aquatic and human health effects that may occur from exposure to these constituents including those that act as endocrine disruptors; and removal treatment methods to remove these constituents. While in many areas it was clear that the science is in its infancy, the conference was extremely timely and brought together a wide range of interest and expertise. Please see the NEIWPCC conference website for more information.

A recent study by the USGS looked at the efficiencies of conventional treatment processes at removing PPCPs from drinking water. Figure 4 shows the detection frequency in finished drinking water and provides the reference link for one of the three articles produced from this study.

According to this study, of the 21 compounds detected in finished drinking water, only tetrachloroethene (detected once) is currently regulated in drinking-water supplies. Concentrations of individual compounds in finished water were low and mostly less than 0.5 µg/L (microgram per liter). Tetrachloroethene was detected at 0.03 µg/L; more than 160 times less than its USEPA MCL of 5 µg/L. Only the detergent–degradate compound p-nonylphenol (NP) was detected at concentrations exceeding 1 µg/L. The majority of the total measured concentration of constituents in finished water was represented by five compounds (NP, DEET, HHCB, carbamazepine, and bisphenol A). For more information contact Paul Stackelberg (518) 285-5652, pestack@usgs.gov.

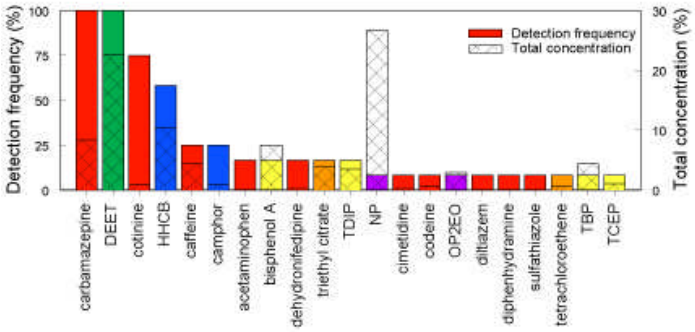

Fig. 4 – From Stackelberg and others 2007 "Efficiency of conventional drinking water treatment processes in removal of pharmaceuticals and other organic compounds" showing the concentration and detection frequency in finished drinking water. The hatched bars show total concentration as percent of total concentration of all compounds. Colored bars: Green = pesticide/repellant; Red = pharmaceutical; Blue = fragrance; Yellow = flame retardant or plasticizer; Purple = detergent degradate; and Orange= other miscellaneous compounds.

The USGS in cooperation with the New York State Department of Environmental Conservation and in collaboration with the USGS Toxic substances Hydrology Program, the New York City Department of Environmental Protection, and the New York State Department of Health are conducting two related research programs. One is a study of organic wastewater constituents in the New York City (NYC) watersheds. This study began in 2003 after the results from an earlier synoptic sampling effort showed several PPCPs were detected in streams within the Croton watershed that were downstream from wastewater treatment plant (WWTP) outfalls. The study samples key NYC water supply reservoir locations as well as several WWTP effluents and their receiving streams within the NYC watersheds. Thus far the study has shown that activated sludge treatment is more efficient at removing PPCPs from wastewater than trickling filter and that most of the removal can be attributed to biologic processes within the wastewater treatment process. For more information on this study, contact Patrick Phillips (518) 285-5667, pjphilli@usgs.gov.

The second study, just getting underway, builds on the previous study by looking at potential endocrine disruption in stream waters and fish of the New York City watersheds. Many of the organic wastewater constituents can act as endocrine disrupting compounds and can cause feminization of fish and other species. This study will look at the estrogenicity of waters and WWTP effluents as well as look at reproductive biomarkers in game-fish species. For more information on this study, contact Barry Baldigo (518) 285-5605, bbaldigo@usgs.gov.

Hydrologic Conditions

Surface Water in New York, February to July 2007

Streamflow conditions at all hydrologic condition monitoring sites in New York over the last 6 months have varied a great deal from dry in February to wet in March and April back to dry again in June. July is still below the median but precipitation is again shifting things back into the normal range. Figure 5 shows that over a 45 day period ending in mid-August, the index of streamflow was slightly below normal. For more information, our web page displays real time and historic data; visit the surface-water-watch page for hydrologic conditions across the country; and the Center's monthly summary of hydrologic conditions in New York.

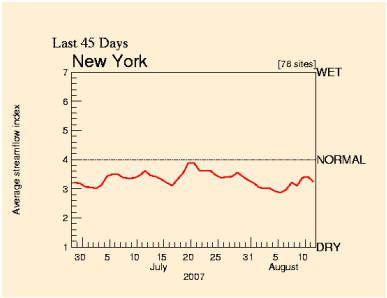

Figure 5. – Graph of index streamflow for NY, July to August 2007, from 78 sites with more than 30-years of record.

Ground Water in New York, February to July 2007

Water levels from February through July 2007 were in the normal range except for Long Island which has seen fairly wet conditions (high water levels) throughout. May and June in upstate New York saw much drier conditions but July is again moving into the normal range at many stations (figure 6). Our web page displays real time and historic ground-water data for these and other wells, in addition to a monthly summary of hydrologic conditions. Another useful resource for hydrologic conditions in New York is the USGS ground-water watch page.

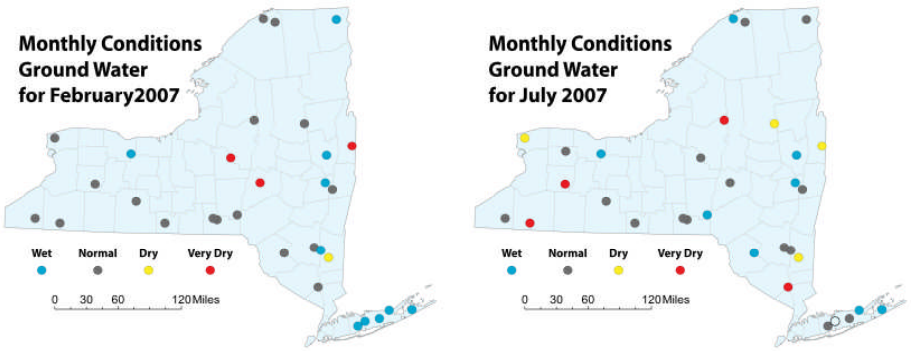

Figure 6. – Drought monitoring wells with greater than 10 years of record, showing the percent exceedance for February 2007 and July 2007. Note many additional network wells exist with less than 10 years of record. Only a small subset of the wells on Long Island is included because of long-term impacts from sewering and water supply pumping that obscures the natural climatic effects.

New Reports from the New York Water Science Center –Listed below are some of the reports and abstracts written by scientists in the USGS New York WSC that were released in recent months. A complete list of New York WSC publications can by found on our publication search page.

- Baldigo, B.P., Sloan, R.J., Smith, S.B., Denslow, N.D., Blazer, V.S., and Gross, T.S., 2006, Polychlorinated biphenyls, mercury, and potential endocrine disruption in fish from the Hudson River, New York, USA: Aquatic Sciences, v. 68, p. 206-228.
- Benotti, M.J., Fisher, S.C., and Terracciano, S.A., 2006, Occurrence of pharmaceuticals in shallow ground water of Suffolk County, New York, 2002-2005: U.S. Geological Survey Open-File Report 2006-1297, 5 p.
- Burns, D.A. and Murdoch, P.S., 2006, A threshold relation between harvest intensity and stream chemistry in a northern hardwood forest of the Northeastern US: EOS Transactions, American Geophysical Union, v. 87, no. 52, Suppl.
- Burns, D.A., Boyer, E.W., and Kendall, Carol, 2006, Sources of nitrogen to streams of varying land use as determined through dual isotope analysis of nitrate: EOS Transactions, American Geophysical Union, v. 87, no. 52, Suppl.

The USGS Water Resources Discipline (WRD) has the principal responsibility within the Federal Government to provide the hydrologic information and interpretation needed by others to achieve the best use and management of the Nation's water resources. WRD actively promotes the use of its information products by decision makers to:

- Minimize loss of life and property as a result of water-related natural hazards, such as floods, droughts, and land movement.
- Effectively manage ground-water and surface-water resources for domestic, agricultural, commercial, industrial, recreational, and ecological uses.
- Protect and enhance water resources for human health, aquatic health, and environmental quality.
- Contribute to wise physical and economic development of the Nation's resources for the benefit of present and future generations.

If you have an environmental or resource-management issue in which you would like to partner with the USGS to investigate, please contact any of our senior management staff (listed below). Projects are supported primarily through the Cooperative Water Program. This is a program through which any State, County, or local agency may work with the USGS to fund and conduct a monitoring or investigation project.

- Burns, D.A., Riva-Murray, Karen, Bode, R.W., and Passy, Sophia, 2006, Changes in stream chemistry and aquatic biota in response to the decreased acidity of atmospheric deposition in the Neversink River basin1987-2003: New York State Energy Research and Development Authority (NYSERDA) Report 06-16, various pagings.
- Burns, D.A., Klaus, Julian, and McHale, M.R., 2007, Recent climate trends and implications for water resources in the Catskill Mountain region, New York, USA: Journal of Hydrology, v. 336, p. 155-170.
- Chu, Anthony, 2006, Hydrogeology of the Lloyd aquifer on Long Island, New York--A brief summary of USGS investigations: U.S. Geological Survey Open-File Report 2006-1341, 12 p.
- Lawrence, G.B., Sutherland, J.W., Boylen, C.W., Nierzwicki-Bauer, S.W., Mome, B., Baldigo, B.P., and Simonin, H.A., 2007, Acid rain effects on aluminum mobilization clarified by inclusion of strong organic acids: Environmental Science & Technology, v. 41, no. 1, p. 93-98.

- Lumia, Richard, Freehafer, D.A., and Smith, M.J., 2006, Magnitude and frequency of floods in New York: U.S. Geological Survey Scientific Investigations Report 2006-5112, 152 p.
- Misut, P.E. and Voss, C.I., 2007, Freshwater-saltwater transition zone movement during aquifer storage and recovery cycles in Brooklyn and Queens, New York City, USA: Journal of Hydrology, v. 337, Issues 1-2, p. 87-103.
- Murdoch, P.S., Armstrong, T.R., Dunn, P.H., Chapin, F.S., Tieszen, L.L., Wickland, K.P., et al, 2006, Rates and effects of climate warming and permafrost thawing in the Yukon River Basin, The Yukon Climate Effects Assessment and Monitoring Network: EOS Transactions, American Geophysical Union, v. 87, no. 52, Suppl.
- Murdoch, P.S., Birdsey, Richard, Stolte, Ken, Raimann, Rachael, Riva-Murray, Karen, Jenkins, Jennifer, 2006, A multi-scale collaborative approach linking terrestrial and aquatic long-term monitoring: Lessons learned in the Delaware River basin and proposed new directions [abs.]: 5th National Monitoring Conference, Monitoring Networks: Connecting for Clean Water, San Jose, Calif, May 7-11, 2006.
- Murdoch, P.S. and Shanley, J.B., 2006, Flow-specific trends in river-water quality resulting from the effects of the Clean Air Act in three mesoscale, forested river basins in the northeastern United States through 2002: Environmental Monitoring and Assessment, v. 120, no. 1-3, p. 1-25.
- Phillips, P.J., Ator, S.W., and Nystrom, E.A., 2006, Trends in diazinon and other urban pesticides in stream samples from the northeastern United States, 1993-2004 [abs.]: 5th National Monitoring Conference, Monitoring Networks: Connecting for Clean Water, San Jose, Calif, May 7-11, 2006.
- Phillips, P.J., Furlong, E.T., Stinson, B., Zaugg, S.D., Smith, S.G., Esposito, K., and Kolpin, D., 2006, Concentrations and removal of pharmaceutical compounds at four wastewater plants in New York State, 2003-2005 [abs.]: 5th National Monitoring Conference, Monitoring Networks: Connecting for Clean Water, San Jose, Calif, May 7-11, 2006.
- Phillips, P.J., Ator, S.W., and Nystrom, E.A., 2007, Temporal changes in surface-water insecticide concentrations after the phaseout of diazinon and chlorpyrifos: Environmental Science & Technology, v. 41, no. 12, p. 4246 -4251.
- Riva-Murray, Karen, Phillips, P.J., Bode, R.W., and Munn, M.D., 2006, Pesticides in urban settings--Use of a pesticide toxicity index to evaluate potential toxicity of stream water samples to macroinvertebrates [abs.]: 5th National Monitoring Conference, Monitoring Networks: Connecting for Clean Water, San Jose, Calif, May 7-11, 2006.
- Stackelberg, P.E., Gilliom, R.J., Wolock,D.M., Hitt, K.J., and Nakagaki, Naomi, 2006, Development and application of a regression equation for estimating the occurrence of atrazine in shallow ground water underling agricultural areas of the United States [abs.]: 5th National Monitoring Conference, Monitoring Networks: Connecting for Clean Water, San Jose, Calif, May 7-11, 2006.
- Suro, T.P. and Firda, G.D., 2006, Flood of April 2-3, 2005, Neversink River Basin, New York: U.S. Geological Survey Open-File Report 2006-1319, 98 p.
- Suro, T.P. and Firda, G.D., 2007, Flood of April 2-3, 2005, Esopus Creek basin, New York: U.S. Geological Survey Open-File Report 2007-1036.
- Szabo, C.O., Grover, J.S., McInnes, S.K., 2006, Water resources data, New York, water year 2005, volume 3, western New York: U.S. Geological Survey Water-Data Report NY-05-3, 454 p.
- Wang, Xing, Burns, D.A., Yanai, R.D., Briggs, R.D., and Germain, R.H., 2006, Changes in stream chemistry and nutrient export following a partial harvest in the Catskill Mountains, New York, USA: Forest Ecology and Management, v. 223, iss. 1-3, p. 103-112.

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