



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

Message from Ward Freeman, Director, New York Water Science Center

Since the last newsletter [Dr. Marcia McNutt has been confirmed as the new Director of the USGS](#) and she will also serve as the Science Advisor to the Secretary of the Interior. Director McNutt has hit the ground running in her new position and is moving forward on addressing key science issues facing our Nation. She recently completed her first Congressional Appropriation Committee hearing and heard from the members of Congress, among other things how important the USGS streamgaging program is. As Director McNutt moves forward, she has indicated her strong support for the USGS Science Strategy (available at: http://www.usgs.gov/science_strategy/). She plans to be guided by this strategy and will establish a Science Advisory Committee for each of the six strategic themes. The first of these, Climate Variability and Change, has been established and Director McNutt placed the leadership of the USGS climate change program under Matt Larsen (USGS Associate Director for Water). Dr. Larsen brings a strong science and leadership background to this critically important program.



The month of March brought significant precipitation to eastern and southeastern New York. Although the snowpack and warm temperatures could have resulted in much more severe flooding than we saw, several areas of Long Island are still experiencing [high groundwater levels and basement flooding](#) from the long stretch of greater than normal precipitation that area has received. USGS crews have been out in southeastern New York measuring high water levels and documenting flooding during much of March and early April; not to mention helping to document the significant flooding that the neighboring states of Connecticut, Rhode Island, and Massachusetts experienced in the recent storms.

As the above heading suggests, another change since the last newsletter is that I was offered and accepted the position of Director of the USGS New York Water Science Center. I am excited by the challenges and opportunities ahead. I appreciate the difficult challenges that the current fiscal climate is having on the collection of scientific information and research but I am also excited to come into this position at a time when there are some great water-resource science opportunities on the horizon. Opportunities for collaboration with many of you, including research on the geohydrology and water quality of areas overlying the Marcellus and Utica Shale Plays; research related to the USEPA Great Lakes Restoration Initiative; efforts to improve water-use information for the State; and research on carbon sequestration, ecological flows, and development of near real-time flood inundation maps. I've worked with many of you over the years and I look forward to working with you in my new role on these and other programs in the future.

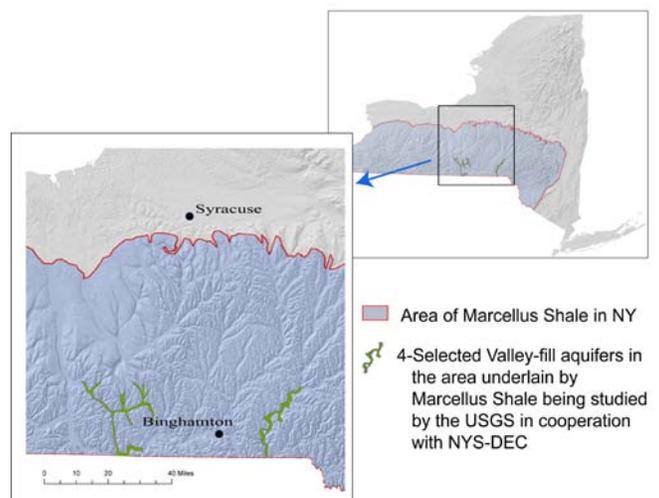
I am a phone call away and interested in hearing from you. Please feel free to contact me about these or any other issues or program opportunities you may wish to discuss. I can be reached at (518) 285-5658 or wfreeman@usgs.gov.

Selected Projects – For information on all our active projects, visit our [project summary web page](#). For more information on projects in this newsletter, please click on the links or email the contact person.

Water issues and the Marcellus Shale gas development in New York

What is the Marcellus Shale?

The Marcellus Shale is part of a thick sequence of Devonian-age, sedimentary rocks in the Appalachian Basin that lie partially in the Southern Tier of New York (see figure). To produce commercial amounts of natural gas in the Marcellus Shale, it has to be extracted by first drilling a vertical hole then slowly turning the drilled hole to penetrate a long horizontal distance in the Marcellus



Shale, sometimes over a mile. The shale is then hydraulically fractured (a stimulation technique where water, sand, and chemical additives under high pressure, forms and props open fractures in the rock, which provide high-permeability pathways for gas to move to the well – hydrofracking).

What are the concerns about developing natural gas wells in the Marcellus Shale?

Tremendous amounts of water are required for the drilling and stimulation of a Marcellus Shale gas well. Fluids recovered from the well, including both the liquids used for the hydrofracking and any formation brines naturally found within the shale, must be handled, stored, treated, and disposed of properly. Three important environmental concerns related to Marcellus Shale gas production are: (1) supplying the large amounts of water needed without impacting local groundwater or surface-water resources, (2) determining the proper methods for the safe treatment and disposal of large volumes of spent and recovered fluids from the wells, and (3) avoiding degradation of small watersheds from increased erosion and sedimentation as large quantities of equipment and supplies are moved around on drill pads and unpaved rural roads.

The water-resource issues include allowing enough water for in-stream flow, especially to maintain healthy habitat within the stream during low-flow periods. Because drilling and well development could occur year-round, the timing of withdrawals from small headwater streams can be critical, especially during a relatively dry year.

What is the current status of Marcellus drilling in New York State and how is the USGS involved?

The New York State Department of Environmental Conservation – Division of Mineral Resources is developing a draft Supplemental Generic Environmental Impact Statement (dSGEIS) to address the above issues and others. This document was presented for public comment October through December, 2009, and the DEC is currently reviewing the numerous comments it received on the SGEIS and when the review is complete, they will determine the State's path forward for drilling in the Marcellus Shale.

As the Nation's primary source for impartial hydrologic information, the USGS has developed a Marcellus Shale Fact Sheet (<http://pubs.usgs.gov/fs/2009/3032/>) to provide the public with helpful information on the Marcellus Shale and its development. The USGS has also provided comments on the draft SGEIS. Additionally, the USGS, in cooperation with the NYS-DEC, Division of Water, has started aquifer characterization studies for four valley-fill aquifers in the Southern Tier (see figure above), and have proposed a number of other studies to establish base-line water-quality characteristics of groundwater and surface water to help protect and manage all of New York's natural resources in the region where Marcellus drilling will take place. The USGS is currently looking for cooperative funding opportunities with Federal, State, and local governmental agencies to help in this endeavor. Contact Bill Kappel wkappel@usgs.gov.

[USGS helps coordinate Appalachian Trail atmospheric deposition study](#)

The U.S. Geological Survey's New York Water Science Center is helping to coordinate an Appalachian Trail (AT) atmospheric deposition study. The Appalachian Trail, a 14-state footpath from Maine to Georgia, is a unit of the National Park Service that is managed cooperatively by the National Park Service (NPS), the Appalachian Trail

Conservancy, AT Club volunteers, the USDA Forest Service, and other public land-management agencies. Upper elevation and ridge-top ecosystems, which comprise much of the trail corridor, have been impacted by, and remain extremely sensitive to, acidic deposition. Ridgetop soils that are often low in calcium make the ecosystems of the AT more sensitive to acidic deposition than other ecosystems. Acidic deposition has been identified as a primary environmental threat.



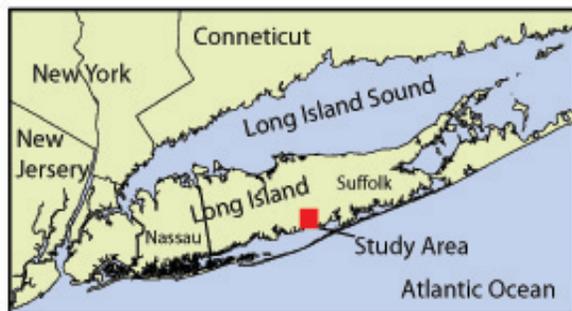
acid-sensitivity classes and to other land-use or land-form characteristics. The information collected will be integrated using modeling and geographic information system (GIS) tools that will enable extrapolation of acidification status over the entire AT. A series of maps of the acidification status for the AT corridor will be developed which reflect changes that have resulted from historical deposition, as well as sensitivity to future changes and critical loads. The products of this study will provide land managers the tools they need to help protect these sensitive ridge-top ecosystems from atmospheric deposition, climate change, and other stressors. Contact: Greg Lawrence glawrenc@usgs.gov.

Questions that will be addressed by this study include:

- 1) What are the current deposition loads across the AT?
- 2) What is the status of soil chemistry associated with atmospheric deposition, geologic weathering, and vegetation communities across the AT?
- 3) What is the base-cation surplus in streams across the AT?
- 4) Are trees of common species along the AT showing signs of stress related to calcium depletion?
- 5) Is there an indication of a change in tree growth rates along the AT that can be associated with measured stressors?
- 6) Are vegetation communities being affected along the AT?
- 7) What deposition levels will allow ecosystems to recover if research indicates damage has occurred?

The goal of this project is to establish the status and susceptibility of this publicly-managed land with respect to acidic deposition, and collect data that will enable future changes to be identified. The project will entail a three-tiered sampling approach to collect soil, water, and vegetation data that can be related to geologically-based,

Shallow groundwater quality in the Patchogue River basin,



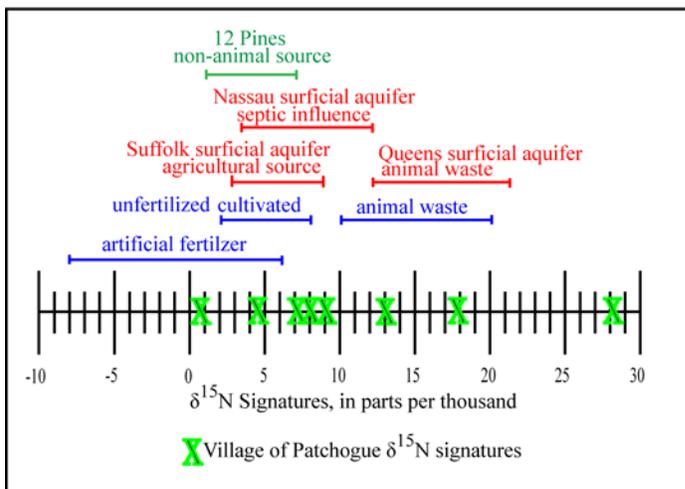
Suffolk County, New York

The U.S. Geological Survey (USGS), in cooperation with the Village of Patchogue and the New York Department of State, collected water-quality samples from 10 shallow wells within the village to document the effects of onsite wastewater disposal on groundwater discharging into the

Patchogue River. The onsite disposal of wastewater within the Patchogue River basin—a riverine estuary that discharges into Great South Bay, Suffolk County, Long Island, NY—has adversely affected water quality and aquatic habitats within both the tidal and non-tidal portions of the river. Of particular concern are increased loads of nutrients (nitrate, nitrite, ammonia, and phosphorus) to the shallow groundwater system which flows into the Patchogue River. Increased nutrient loads can lead to eutrophication in the receiving waters. Among the undesirable effects of eutrophication are an increase in plant and algae growth, which can result in increased water turbidity, odors at low tide, and a decrease in dissolved-oxygen concentration that can result in fish and shellfish mortality. In response to increased development within the approximately 14 square-mile basin, the Village of Patchogue has begun to develop a Local Waterfront Revitalization Plan that will guide efforts to improve the water quality of the Patchogue River and the adjacent Great South Bay estuary.

Groundwater samples were analyzed for physical properties, nutrients, organic carbon, major ions, trace elements, and stable isotope signatures of nitrogen ($\delta^{15}\text{N}$). Results were compared with data from previous studies completed in nearby areas to reveal possible trends in the concentrations of groundwater parameters. The chemical signature of effluent plumes from onsite wastewater-disposal systems in sandy glacial aquifers has been studied in detail and has shown that elevated concentrations of major ions, nitrate, and phosphorous (depending on the age of the septic system) are common. Total nitrogen, sulfate, and potassium concentrations from this study were similar to results from medium - high density residential land-use areas in previous groundwater studies of Long Island. Measured calcium and chloride concentrations were greater in this study than in previous studies, but this may be attributed to the Village's proximity to the saltwater Great South Bay.

The stable isotope signature of nitrogen ($\delta^{15}\text{N}$) can be used to identify potential sources of nitrate in the water-table aquifer. Previously reported nitrogen-isotope signature ranges for Long Island indicate septic waste has a typical $\delta^{15}\text{N}$ signature between 7 and 12 parts per thousand (‰) whereas nitrate from chemical fertilizer has a range between 1 and 7 ‰. Nitrate isotopes suggest that

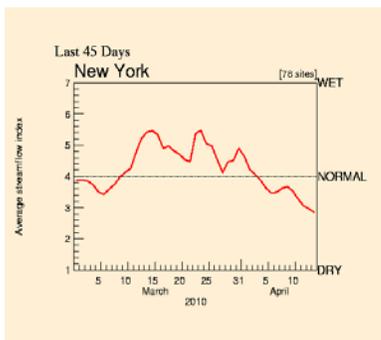


$\delta^{15}\text{N}$ signature ranges (‰) for eight samples from Patchogue (X) and those reported for Nassau and Suffolk Counties in previous studies by Kreitler (1975) blue, Kreitler and others (1978) red, and Flipse and others (1984) green.

the groundwater in this study is influenced by several sources, including fertilizer, septic waste, and pets (see above figure). A report summarizing the results of this study is currently in preparation. Contact Irene Abbene iabbene@usgs.gov.

Hydrologic Conditions

Surface Water in New York, August 2009 to March 2010

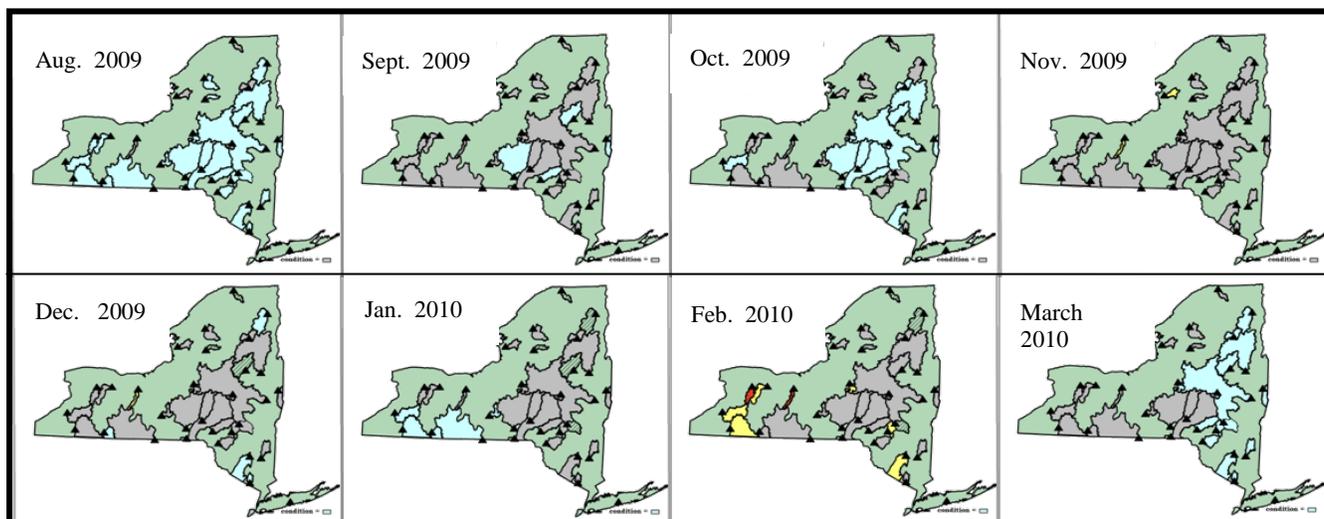


Index streamflow for NY, March to April 2010, from 78 sites with more than 30 years of record.

Average monthly streamflow conditions across New York State have been in the normal to wet range over most of the last 8 months. The month of February was the exception where some areas of western and southeastern New York had dry to very dry conditions. The [45-day index plot](#) (figure at left) shows that streamflow in March was well above normal but the trend in the beginning of April has moved to below normal conditions.

[Figures from the NOAA Regional Climate Center](#) show that accumulated precipitation over the last 6 months in New York was below normal for much of the State but areas in far eastern and southeastern New York saw accumulated precipitation well above normal. The 6-month precipitation departure for Long Island was 8 to 10 inches above normal.

The map of below normal [28-day average streamflow conditions](#) currently (April) shows dry conditions (below normal) in western and far northern New York.



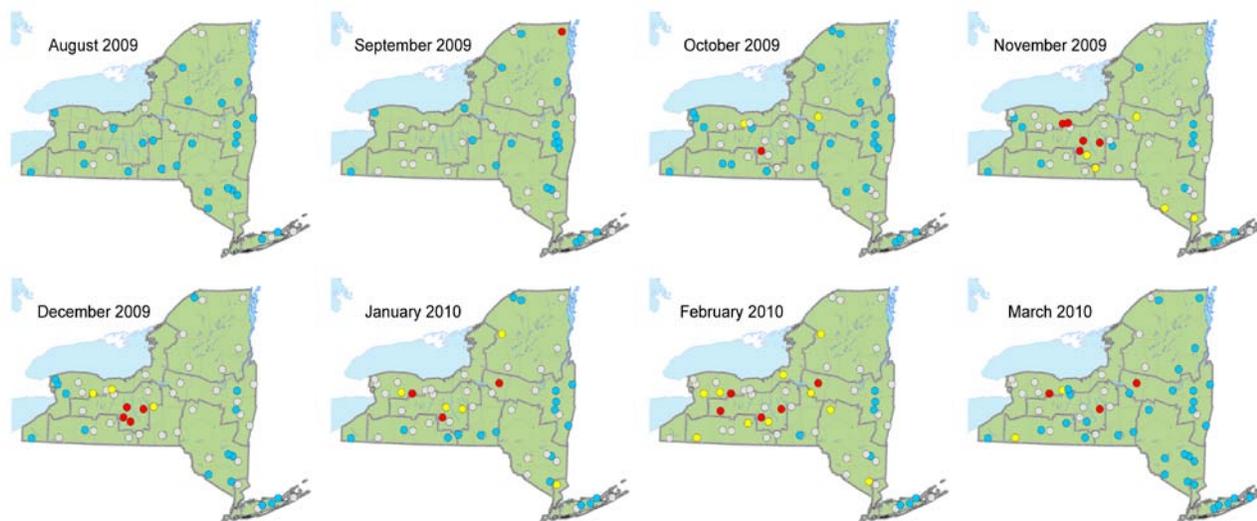
Exceedance

■ 0 to 25%
 ■ 25 to 75%
 ■ 75 to 90%
 ■ > 90%

Average monthly hydrologic conditions from August 2009 (upper left) to March 2010 (lower right) at selected surface-water sites in New York – where blue indicates wet conditions; gray indicates normal conditions; yellow indicates dry conditions; and red indicates very dry conditions. These maps are contained within the “End-of-Month Hydrologic Conditions” reports available at: <http://ny.water.usgs.gov/cgi-bin/eomreports>.

Groundwater in New York, August 2009 to March 2010

Groundwater levels varied much more than surface water over the last 8 months, with several areas showing dry to very dry conditions from November through February. Elevated precipitation over the last several months in southeastern New York has led to [high groundwater levels on Long Island resulting in basement and infrastructure flooding in several areas](#) and recent intense rainfall has led to ponding and flooding in some areas as well. The NY WSC web page displays [real-time](#) and [historic](#) groundwater 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 [groundwater watch](#).



Exceedance

● 0.00 - 24.99
 ● 25.00 - 75.00
 ● 75.01 - 89.99
 ● 90.00 - 100.00

Monthly hydrologic conditions in selected groundwater wells in New York from August 2009 (upper left) to March 2010 (lower right), showing percent exceedance based on the period of record for the well. Blue dots indicate wet conditions, gray dots indicate normal conditions, yellow dots indicate dry conditions, red dots indicate very dry conditions.

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 be found on our [publication search page](#).

Baldigo, B.P. and Ernst, A.G., 2009, [Do fish benefit from stream restoration in the Catskill Mountains?](#): Clearwaters, v. 39, p. 54-59.

Coon, W.F., Hayhurst, B.A., Kappel, W.M., Eckhardt, D.A.V., and Szabo, C.O., 2009, [Water-quality characterization of surface water in the Onondaga Lake basin, Onondaga County, New York, 2005–08](#): U.S. Geological Survey Scientific Investigations Report 2009–5246, 67 p.

Eckhardt, D.A., Reddy, J.E., and Shaw, S.B., 2009, [Groundwater quality in central New York, 2007](#): U.S. Geological Survey Open-File Report 2009-1257, 40 p.

Hackett, W.R., Gleason, G.C., and Kappel, W.M., 2009, [Land-surface subsidence and open bedrock fractures in the Tully Valley, Onondaga County, New York](#): U.S. Geological Survey Open-File Report 2009-1188, 16 p.

Heisig, P.M., 2009, [Summary of results from the U.S. Geological Survey Water-Resources Investigation of Rockland County, New York, 2005–07](#): presented at State of the Hudson River Watershed conference, 7th, Hudson River Watershed Alliance and Hudson River Environmental Society, September 29-30, 2009, FDR Presidential Library, Hyde Park, NY. [abs]

Lawrence, G.B., Roy, K.M., Baldigo, B.P., Simonin, H.A., Passy, S.I., Bode, R.W., and Capone, S.B. 2009, [Acid rain effects on Adirondack streams—Results from the 2003–05 Western Adirondack Stream Survey \(the WASS Project\)](#): U.S. Geological Survey Fact Sheet 2009–3075, 6 p.

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 groundwater 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.

Lincoln, T.A., Horan-Ross, D.A., McHale, M.R., and Lawrence, G.B., 2009, [Quality-assurance data for routine water analyses by the U.S. Geological Survey laboratory in Troy, New York—July 2001 through June 2003](#): U.S. Geological Survey Open-File Report 2009–1232, 32 p.

Lincoln, T.A., Horan-Ross, D.A., McHale, M.R., and Lawrence, G.B., 2009, [Quality-assurance data for routine water analyses by the U.S. Geological Survey laboratory in Troy, New York—July 2003 through June 2005](#): U.S. Geological Survey Open-File Report 2009–1233, 34 p.

Lincoln, T.A., Horan-Ross, D.A., McHale, M.R., and Lawrence, G.B., 2009, [Quality-assurance data for routine water analyses by the U.S. Geological Survey laboratory in Troy, New York—July 2005 through June 2007](#): U.S. Geological Survey Open-File Report 2009–1234, 33 p.

Miller, T.S., 2009, [Geohydrology and water quality of the valley-fill aquifer system in the upper Sixmile Creek and West Branch Owego Creek valleys in the Town of Caroline, Tompkins County, New York](#): U.S. Geological Survey Scientific Investigations Report 2009–5173, 56 p.

Mulvihill, C.I., Baldigo, B.P., Miller, S.J., DeKoskie, Douglas, and DuBois, Joel, 2009, [Bankfull discharge and channel characteristics of streams in New York State](#): U.S. Geological Survey Scientific Investigations Report 2009-5144, 51 p.

Nystrom, E.A., 2009, [Ground-water quality in the Upper Hudson River Basin, New York, 2007](#): U.S. Geological Survey Open-File Report 2009–1240, 37 p.

Phillips, P.J., Nowell, L.H., Gilliom, R.J., Nakagaki, Naomi, Murray, K.R., and VanAlstyne, Carolyn, 2009, [Composition, distribution, and potential toxicity of organochlorine mixtures in bed sediments of streams](#): Science of the Total Environment, doi:10.1016/j.scitotenv.2009.09.052, 13 p.

Suro, T.P., Firda, G.D. and Szabo, C.O. 2009, [Flood of June 26–29, 2006, Mohawk, Delaware, and Susquehanna River Basins, New York](#): U.S. Geological Survey Open-File Report 2009–1063, 354p.

Tamulonis, K.L., and Kappel, W.M., 2009, [Dendrogeomorphic assessment of the Rattlesnake Gulf landslide in the Tully Valley, Onondaga County, New York](#): U.S. Geological Survey Scientific Investigations Report 2009–5134, 14 p.

Tamulonis, K.L., Kappel, W.M., and Shaw, S.B., 2009, [Causes and movement of landslides at Rainbow Creek and Rattlesnake Gulf in the Tully Valley, Onondaga County, New York](#): U.S. Geological Survey Scientific Investigations Report 2009–5114, 18 p.

Yager, R.M., Misut, P.E., Langevin, C.D., and Parkhurst, D.L., 2009, [Brine migration from a flooded salt mine in the Genesee Valley, Livingston County, New York: Geochemical modeling and simulation of variable-density flow](#): U.S. Geological Survey Professional Paper 1767, 59 p.

SAVE THE DATES

The USGS New York Water Science Center
is helping cosponsor the
New York Water Environment Association's

**2010 Watershed Science &
Technical Conference**

September 15-16, 2010

Hotel Thayer, West Point, NY

This will serve as the USGS NY WSC's annual cooperator and stakeholder symposium for 2010

We hope you'll be able to attend.

USGS New York Water Science Center, Senior Staff:

[Ward O. Freeman](#), Director, (518) 285-5658

Associate Director (position is currently vacant)

[Edward Bugliosi](#), Ithaca Program Office Chief, (607) 266-0217 ext 3005

[Stephen Terracciano](#), Coram Program Office Chief, (631) 736-0783 ext 102

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