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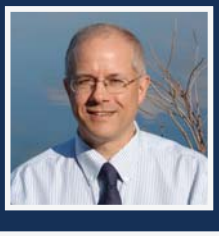


U.S. Geological Survey, New York Water Science Center Newsletter

Trends in Fish Assemblages | Status of American Eel Populations | Flood Inundation Mapping Prattsville | Ice Jam Monitoring | Hydrologic Conditions

Spatiotemporal Trends in Fish Assemblages of the Mohawk River

The mainstem of the Mohawk River extends from Lake Delta Dam near Rome, NY downstream to its confluence with the Hudson River near Cohoes, NY. It supports a diverse fishery that is used extensively by recreational anglers. Smallmouth bass (*Micropterus dolomieu*) and walleye (*Sander vitreus*) are among the most popular game species with anglers but past biological surveys have documented at least 56 fish species that inhabit the river. An extensive fish survey of the Lower Mohawk River was last conducted by the New York State Department of Environmental Conservation (NYSDEC) from 1979-1983. Some key findings of this research included: (1) The river supported an abundant and fast growing smallmouth bass population, (2) Anadromous blueback herring (*Alosa aestivalis*) were a critical forage species for the ecosystem, (3) Fish communities were notably different in permanent versus seasonally impounded reaches, and (4) The river received heavy angling pressure.

The river has apparently undergone many changes in the 30 years since this survey. The nonnative and invasive zebra mussel (*Dreissena polymorpha*), which was first observed in 1991, spread throughout the lower river by 1993. Freshwater drum (*Aplodinotus grunniens*) became established around 1990 and northern pike (*Esox lucius*) have increased in abundance as well. Meanwhile, the runs of anadromous blueback herring are becoming weaker and preliminary data suggest smallmouth bass are becoming less abundant. Finally, upgrades of the flashboards at several of the seasonal dams may allow for the repeated raising and lowering of these devices during the warm weather season to mitigate flood impacts. The extensive changes that have occurred in this ecosystem over the past 30 years warrant a comprehensive fish-community inventory to assess the current status of fish assemblages in the mainstem of the Mohawk River.

Photos showing (A) a native Pumpkinseed (*Lepomis gibbosus*) and (B) USGS Scientists electroshocking fish in the Mohawk River.

The U. S. Geological Survey (USGS) and the NYSDEC will conduct fish community surveys at a minimum of 24 locations during 2014 and 2015. The surveys will be completed using boat electrofishing of near-shore habitats. The resulting data will be analyzed to a) assess the condition of current fish assemblages, b) identify the relative abundance of common species, c) identify spatial differences associated with seasonal or permanent impoundments, and d) assess temporal changes in the fish community over the past 30 years. Field efforts will also focus on collections of American eel, blueback herring, and smallmouth bass where practical in order to obtain data and tissues needed to support collaborative research and monitoring efforts.

A Message From the Director

"We are now past the halfway point in Fiscal Year 2015 and, I know I may be jinxing us but, while funding allocations were slow to arrive this year, it has been a fairly quiet year in terms of funding challenges. Similarly, it has also been fairly quiet in terms of weather challenges. To make us better able to face the challenges should our current weather pattern change, we have flood hardened, to a much higher level, a number of streamgages throughout the State and implemented several network operational enhancements. As I mentioned in the last newsletter, in cooperation with New York State Canals, the USGS has added 18 new streamgages and reactivated or enhanced operations at 4 others. These 22 sites are part of the Governor's upstate New York flood warning system and are all now in and operational. Several of these new streamgages are in the Mohawk basin. Which is appropriate since the Mohawk basin is the primary focus of this issue of the newsletter. In this issue, you will learn about several programs including how fish populations in the Mohawk have changed over the last 30 years; ice-jam monitoring in the Mohawk near Schenectady; and flood inundation mapping for the Schoharie Creek at Prattsville NY. I am also happy to announce that new detailed elevation data (LiDAR Quality level 2) will be available for all of Schoharie County and part of Montgomery County in May, 2015, providing complete LiDAR coverage for the Schoharie Creek basin. These data will provide information needed to develop additional flood-inundation maps for other communities in the Schoharie basin. We hope to identify funding partners to help make these new flood-inundation maps a reality.

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) 285-5658 or dc_ny@usgs.gov."

PROPOSAL -- Status of American Eel populations in the Mohawk River Basin

The waters of the Mohawk River basin are inhabited by one of the richest fish communities on the East Coast. The American Eel, Anguilla rostrata, is a unique member of this community, exhibiting a catadramous (maturing in fresh water and spawning in salt water) life history. Like many migratory fish, the American Eel has suffered a general decline across the East Coast largely attributed to barriers to migration, habitat degradation, and other anthropogenic disturbances. A recent study by Machut et al. (2007) and the implementation of a NYSDEC-initiated citizen science juvenile Eel monitoring program (Bowser and others, 2012) have greatly improved our understanding of Eel distribution and behavior in the Hudson River and tributaries. However, little work has addressed the distribution of American Eel in the Mohawk River basin or the factors that drive this distribution. The presence of Eels in this basin has been confirmed only by a handful of DEC fish surveys (aimed at sampling other species) over the past 30 years and their densities and distributions in this watershed are largely unknown.

The 2012-2016 Mohawk River Basin Action Agenda has identified conserving fish, wildlife, and their habitats as a top priority. A Fisheries Management Plan for the Lower Mohawk River (McBride, 1994) is the most comprehensive document concerning the status of and challenges facing the Mohawk River fishery. One of McBride's management recommendations is to "initiate fish studies based on specific needs as they may arise." Machut's recent Hudson River Eel study and the 2009 installation of a downstream fish passage at the School Street Hydroelectric Project around Cohoes Falls now provide a pressing need to extend our understanding of American Eel distributions in the Mohawk River. Additionally, the recent success of the citizen science juvenile Eel monitoring program on Hudson River tributaries suggests that this program could be utilized in the Mohawk basin if tributaries supporting robust Eel populations could be identified.

The primary objective of this proposal is to determine if American Eel are present or absent in waters near the mouths of tributaries to the Mohawk River. Related goals are to qualify their relative abundance and potential distribution throughout the watershed.

The objectives of this proposal will be met by conducting surveys for American Eels at 15 or more sites on Mohawk River tributaries (multiple sites may be located on some large tributaries) during the summer of 2015. Field crews of 3-4 researchers or volunteers will conduct single pass electrofishing surveys (using a backpack electrofisher). Best efforts will be made to sample during low flow periods to maximize capture efficiency. The tributaries and exact study reaches will be selected to maximize the probably of encountering Eels based on habitat assessments and locations of past Eel captures.

The specific tasks for this effort and approximate timeline are:

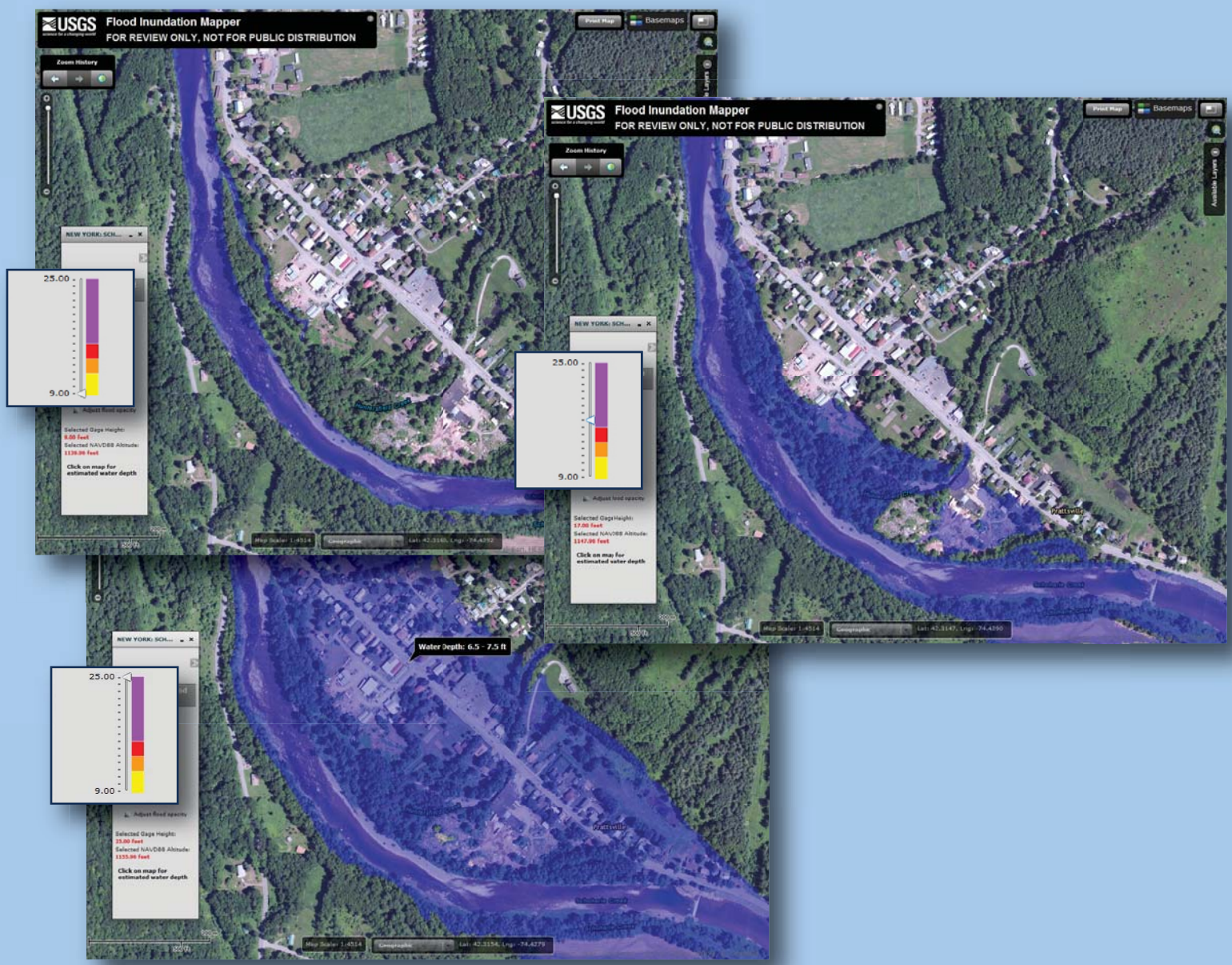
- Select sites using map resources and reconnaissance surveys as needed (April-May, 2015)
- Conduct electrofishing surveys at 15 or more sites (June-September, 2015)
- Compile and analyze data (October-December, 2015)
- Provide draft report (January, 2016)
- Publish report (February-March, 2017)

The USGS will publish a report with site locations and presence/absence and relative abundance (catch per unit effort) data summarized in tabular form. This publication will have little or no interpretation but will be citable.

Photos showing (A) American Eel, shown here, have experienced populations declines across the East Coast, (B) It is unclear if the system of impoundments on the Mohawk River (dam at Lock 7 shown here) has limited the abundance of American Eel in this watershed, (C) One of many tributaries to the Mohawk River that will be screened for the presence of American Eel.

UPDATE -- Flood-Inundation Maps for the Schoharie Creek at Prattsville, New York

Digital flood-inundation maps for a 2.6 mile reach of the Schoharie Creek at Prattsville, New York, have been created by the U.S. Geological Survey (USGS) in cooperation with the New York State Department of Environmental Conservation. Flood profiles were computed for the stream reach by means of a one-dimensional step-backwater model; this model is based on existing models, and updated to reflect current ground conditions following the August 2011 flood. This hydraulic model was used to compute 17 water-surface profiles for flood stages at 1-foot intervals referenced to the USGS streamgage Schoharie Creek at Prattsville, N.Y. (station number 01350000) for stages 9 to 25 feet. The 9-ft stage reflects near-bankfull flow and the 29-ft stage is associated with a flow that exceeds the estimated 0.2-percent annual-exceedance-probability flood (500-year recurrence interval flood). Maps for stages 9, 17, and 25 feet are shown. These flood-inundation maps will be available on the USGS Flood Inundation Mapper website, which displays current (USGS) and predicted (from the National Weather Service Advanced Hydrologic Prediction Service) stages, has a variety of basemaps, and allows users to interact with the model results and inundation scenarios.

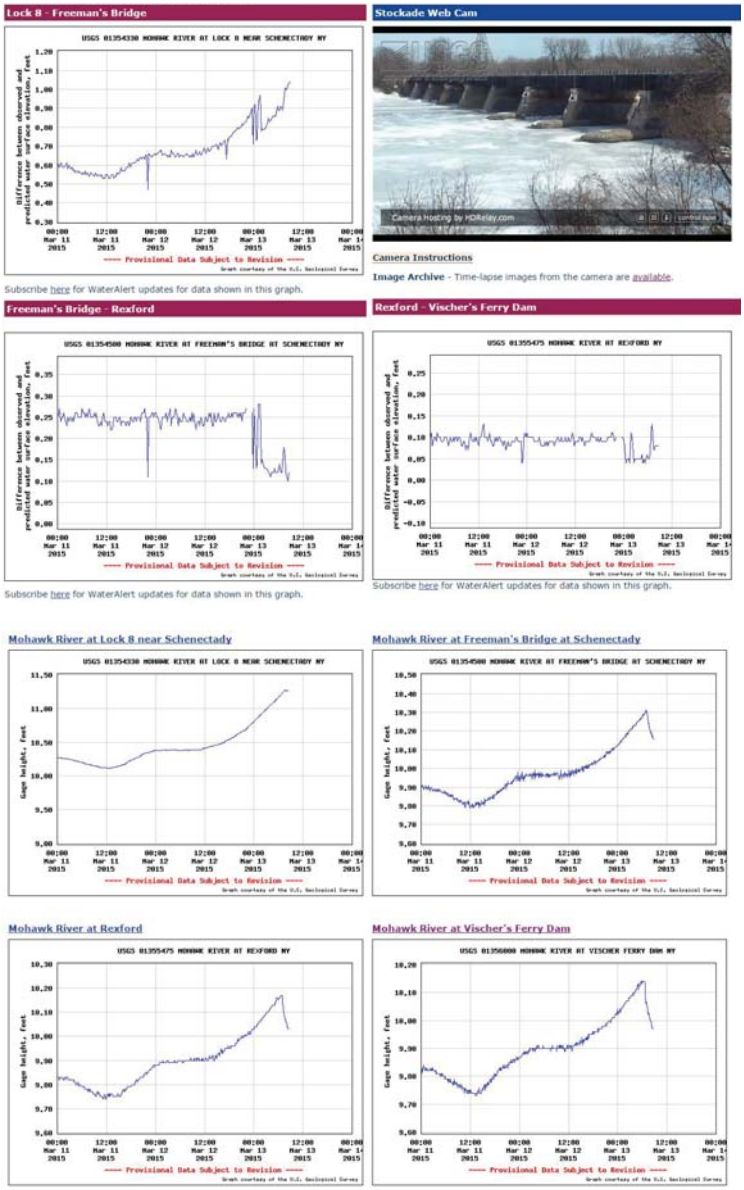


Mohawk River Ice Jam Monitoring

The Mohawk River between New York State Barge Canal Locks 7 and 8 near Schenectady, NY is susceptible to ice jams during periods of river-ice break-up. Ice jams in this reach typically form at channel constrictions, bridge piers, lock and dam structures, and sections with a reduced floodplain (Foster and others, 2011). Ice jam related flooding can result from backwater associated with the jam or from water released downstream when a jam fails. Schenectady is particularly vulnerable to ice jam related flooding; Lederer and Garver (2001) estimated that 80% of historic Mohawk River floods in Schenectady have been associated with winter snowmelt and associated ice floes.

In cooperation with the New York State Department of Environmental Conservation's Mohawk River Basin Program, the New York State Power Authority, Brookfield Renewable Power, and Union College, USGS is monitoring river elevation at four streamgages between Locks 7 and 8. A web camera installed at a fifth location, between the gages, in the Stockade District of Schenectady, provides real-time images of the river during winter months.

Photos showing (A) Ice jam in Mowhawk River, and (B) USGS Hydrologist installing Mohawk River "Jam Cam."

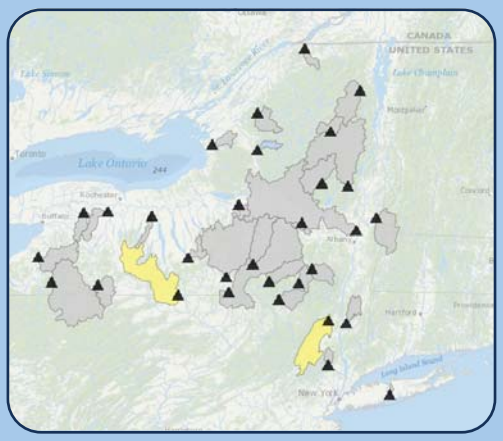


These plots depict the difference in water elevation between what is observed and what is predicted at a gage. Predictions are referenced to ice-free conditions, so when there is no ice in the river to restrict flow, the values are about zero. Increases in the prediction values between the gages indicates that streamflow is restricted and an ice jam is causing water to backup. A positive value can be thought of as extra water stored in the river due to ice. It is important to keep in mind that these plots generally reflect conditions between the gages. Ice jams occurring outside of the river-reach indicated (eg. Lock 8 or Freeman's Bridge) may not be reflected in the values shown.

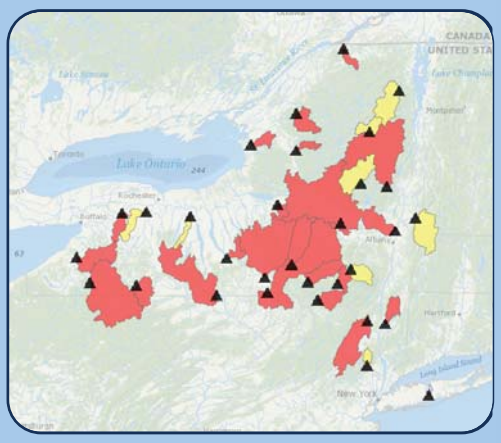
Surface-Water and Groundwater Conditions in New York

Monthly and seasonally (shown below), hydrologists at the New York Water Science Center synthesize and summarize streamflows and groundwater levels for New York. Visual representation of the streamflow and groundwater conditions are shown on the NY WSC's Hydrologic Conditions Mapper. During Autumn and winter (2015) streamflow was in the wet or normal ranges at nearly all of the index stations. Groundwater levels at the observation wells varied from wet to very dry, with the majority of the wells in the wet or normal ranges. February and March; however, streamflow was generally in the dry to very dry range at most of the index stations. Groundwater levels at the observation wells (in February and March) varied around the State from wet to very dry with the majority of the wells in the dry or very dry ranges.

A. Streamflow

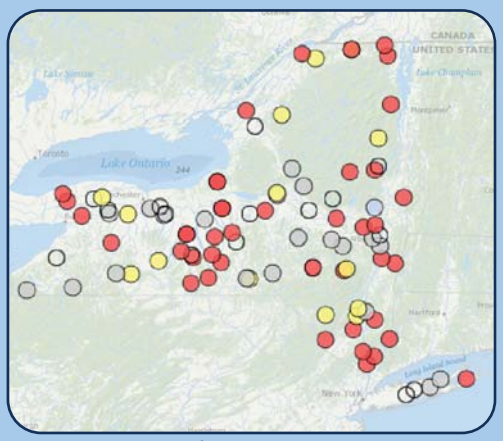


Autumn 2014

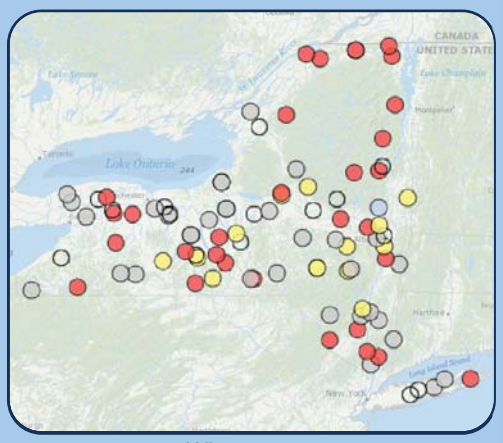


Winter 2015

B. Groundwater



Autumn 2014

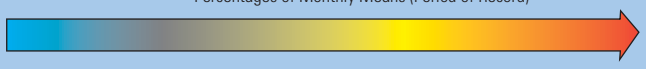


Winter 2015

EXPLANATION

Basin boundry — Streamgage ▲ — Groundwater well ●

Percentages of Monthly Means (Period of Record)



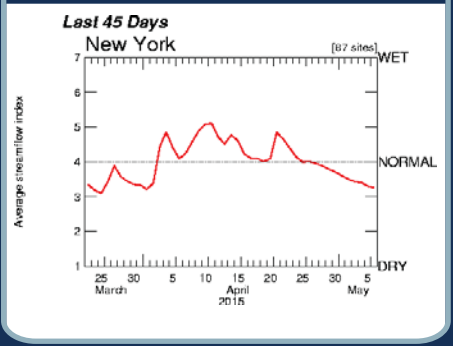
Seasonal conditions at selected (A) streamgages and (B) groundwater wells in New York. USGS maintains and operates most streamgages and groundwater wells in cooperation with various federal, state, and local agencies. Winter (January, February, March), Spring (April, May, June), Summer (July, August, September), Autumn (October, November, December).

USGS Water Watch & Groundwater Watch

WaterWatch is a USGS World Wide Web site that displays maps, graphs, and tables describing real-time, recent, and past streamflow conditions for the Nation. Real-time streamflow information (stage and flow) generally is updated on an hourly basis. WaterWatch provides maps that show the location of more than 3,000 long-term (30 years or more) USGS streamgages.

Groundwater Watch is a USGS World Wide Web site that displays maps, graphs, and tables describing groundwater level data from wells currently in a regular measurement program. Three types of water-level data are displayed, including periodic, continuous data that are periodically retrieved, and real-time data generally updated on an hourly basis. Groundwater Watch contains water levels and well information from more than 20,000 wells that have been measured by the USGS or USGS cooperators at least once within the past 365 days.

45 Day Index Plot



Among other things, WaterWatch summarizes streamflow conditions in a region (state or hydrologic unit) in terms of the long-term typical condition at streamgages in the region. For example, this plot shows that streamflow over the last 45 days was at or below normal conditions for New York.

FEATURED ARTICLE

Groundwater Quality in the Mohawk River Basin, New York, 2011

Water samples were collected from 21 production and domestic wells in the Mohawk River Basin in New York in July 2011 to characterize groundwater quality in the basin. The samples were collected and processed using standard U.S. Geological Survey procedures and were analyzed for 148 physiochemical properties and constituents, including dissolved gases, major ions, nutrients, trace elements, pesticides, volatile organic compounds (VOCs), radionuclides, and indicator bacteria.

The Mohawk River Basin covers 3,500 square miles in New York and is underlain by shale, sandstone, carbonate, and crystalline bedrock. The bedrock is overlain by till in much of the basin, but surficial deposits of saturated sand and gravel are present in some areas. Nine of the wells sampled in the Mohawk River Basin are completed in sand and gravel deposits, and 12 are completed in bedrock. Groundwater in the Mohawk River Basin was typically neutral or slightly basic; the water typically was very hard. Bicarbonate, chloride, calcium, and sodium were the major ions with the greatest median concentrations; the dominant nutrient was nitrate. Methane was detected in 15 samples. Strontium, iron, barium, boron, and manganese were the trace elements with the highest median concentrations. Four pesticides, all herbicides or their degradates, were detected in four samples at trace levels; three VOCs, including chloroform and two solvents, were detected in four samples. The greatest radon-222 activity, 2,300 picocuries per liter, was measured in a sample from a bedrock well, but the median radon activity was higher in samples from sand and gravel wells than in samples from bedrock wells. Coliform bacteria were detected in five samples with a maximum of 92 colony-forming units per 100 milliliters.

Water quality in the Mohawk River Basin is generally good, but concentrations of some constituents equaled or exceeded current or proposed Federal or New York State drinking-water standards. The standards exceeded are color (1 sample), pH (1 sample), sodium (9 samples), chloride (1 sample), sulfate (2 samples), dissolved solids (7 samples), aluminum (3 samples), iron (8 samples), manganese (6 samples), radon-222 (10 samples), and bacteria (5 samples). Fecal coliform bacteria and Escherichia coli (E. coli) were each detected in one sample. Concentrations of fluoride, nitrate, nitrite, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, selenium, silver, thallium, zinc, and uranium, and gross alpha activities, did not exceed existing drinking-water standards in any of the samples collected. Methane concentrations in two samples were greater than 28 milligrams per liter, and the maximum measured concentration was 44.3 milligrams per liter.

SELECT NYWSC PUBLICATIONS

Coon, W.F., 2014, Development and use of a basin-scale hydrologic model for the Onondaga Lake basin: ClearWaters, New York Water Environment Associates, Inc., v. 44, no. 3, p. 31-33.

Reynolds, R.J., Anderson, J.A., and Williams, J.H., 2015, Geophysical log analysis of selected test and residential wells at the Shenandoah Road National Superfund Site, East Fishkill, Dutchess County, New York: U.S. Geological Survey Scientific Investigations Report 2014 5228, 30 p.

Heisig, P.M., 2015, Hydrogeology of the Ramapo River - Woodbury Creek valley-fill aquifer system and adjacent areas in eastern Orange County, New York: U.S. Geological Survey Scientific Investigations Report 2014-5156, 23 p., 1 pl.

Phillips, P.J., Schubert, C.E., Argue, D., Fisher, I.J., Furlong, E.T., Foreman, W.T., Gray, J.L., Chalmers, A.T., 2015, Concentrations of hormones, pharmaceuticals and other micropollutants in groundwater affected by septic systems in New England and New York: Science of The Total Environment, v. 512-513, p. 43-54, doi:10.1016/j.scitotenv.2014.12.067

Gazoorian, C.L., 2015, Estimation of unaltered daily mean streamflow at ungaged streams of New York, excluding Long Island, water years 1961-2010: U.S. Geological Survey Scientific Investigations Report 2014-5220, 29 p.

Fischer, J.M., Phillips, P.J., Reilly, T.J., Focazio, M.J., Loftin, K.A., Benzel, W.M., Jones, D.K., Smalling, K.L., Fisher, S.C., Fisher, I.J., Iwanowicz, L.R., Romanok, K.M., et al, 2015, Estuarine bed-sediment-quality data collected in New Jersey and New York after Hurricane Sandy, 2013: U.S. Geological Survey Data Series 905, 42 p., plus CD-ROM, http://dx.doi.org/10.3133/ds905.

McMullen, K.Y., Poppe, L.J., Danforth, W.W., Blackwood, D.S., Winner, W.G., and Parker, C.E., 2015, Sea-floor morphology and sedimentary environments in western Block Island Sound, offshore of Fishers Island, New York: U.S. Geological Survey Open-File Report 2014-1224, 1 DVD-ROM.

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- 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

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