

# Water Resources Science *of the* U.S. Geological Survey *in New York*

General Information Product 185

U.S. Department of the Interior  
U.S. Geological Survey



*New York is a beautiful State. We are incredibly fortunate that we can have access to the history of the Hudson River, bathe along Long Island's beautiful beaches, hike the pristine watersheds of the Adirondack and Catskill Mountains, sail the Great Lakes, tour the Finger Lakes region, be inspired by the majesty of Niagara Falls, and take in the culture and energy of New York City. New York is where we live and work. As New Yorkers and stewards of the environment, it is our duty to help protect the natural resources and people of our State. The New York Water Science Center of the U.S. Geological Survey is made up of more than 100 New Yorkers who work day-in and day-out to describe and help us understand the water resources of our State. We provide water-resource managers with the information they need to make informed decisions. We partner with about a hundred Federal and State agencies as well as local municipalities, universities, nongovernmental organizations, and Tribal Nations.*

*"The data we provide are timely and unbiased. We help protect the lives and property of our families, friends, and neighbors by providing the National Weather Service with the data they need to make accurate predictions about flooding. When others are moving themselves and their families to higher ground during such storms as Tropical Storm Irene and Hurricane Sandy, we can be found heading toward high water to ensure that accurate streamflow and storm-tide data continue to be collected and delivered to the public. It is this dedication that makes me proud to be a part of the U.S. Geological Survey family. I hope that this general information product offers you a taste of all the great work being done by the staff of the New York Water Science Center."*

Robert F. Breault  
New York Water Science Center Director  
U.S. Geological Survey







# Water Resources Science *of the* U.S. Geological Survey *in New York*





## USGS hydrographer collects streamflow information

The U.S. Geological Survey (USGS) uses accurate, defensible, and nationally consistent methods to collect streamflow data that allow for decision making across local, State, and international borders. Streamflow data are permanently archived and can be accessed from the [National Water Information System \(NWIS\)](#), the portal for all USGS surface-water and groundwater data for the Nation.





# Water Resources Science in New York

The USGS studies the effects of weather, climate, and man-made influences on groundwater levels, streamflow, and reservoir, lake, and ocean levels, as well as on the ecological health of rivers, lakes, reservoirs, watersheds, estuaries, and wildlife. From these studies, the USGS produces high-quality, timely, and unbiased scientific research and data that are widely accessible and relevant to all levels of government, Tribal Nations, academic institutions, nongovernmental organizations, the private sector, and the general public.





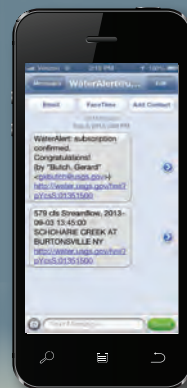
# Surface-Water and Groundwater Information

Flooding caused by storms, hurricanes, snowmelt, and ice jams in New York can cause loss of life and costly damage to property and natural resources. The frequency of extreme events, such as floods and droughts, changes over time, and the collection of real-time and long-term data provides critical insights.

The USGS collects surface-water and groundwater data to protect the lives and property of New Yorkers. The data are used to determine water availability, to understand the potential effects of water use on ecosystems, and to help design roads, bridges, and water-treatment facilities that are resilient to flooding and to changes in climate and weather.

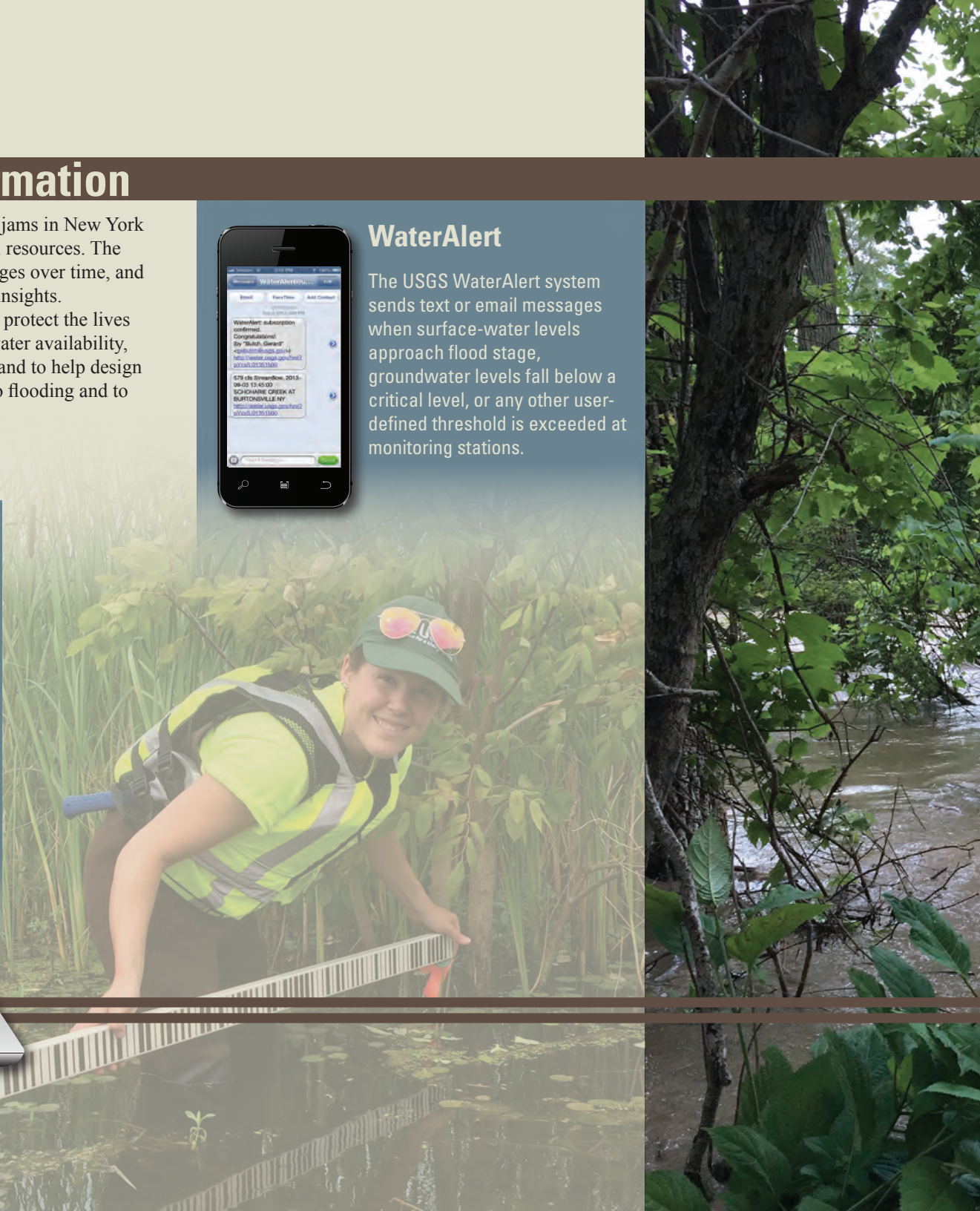
## Flood Inundation Mapper

The USGS produces flood-inundation maps that show where it may flood in a community as a local stream or river rises to specific water levels.

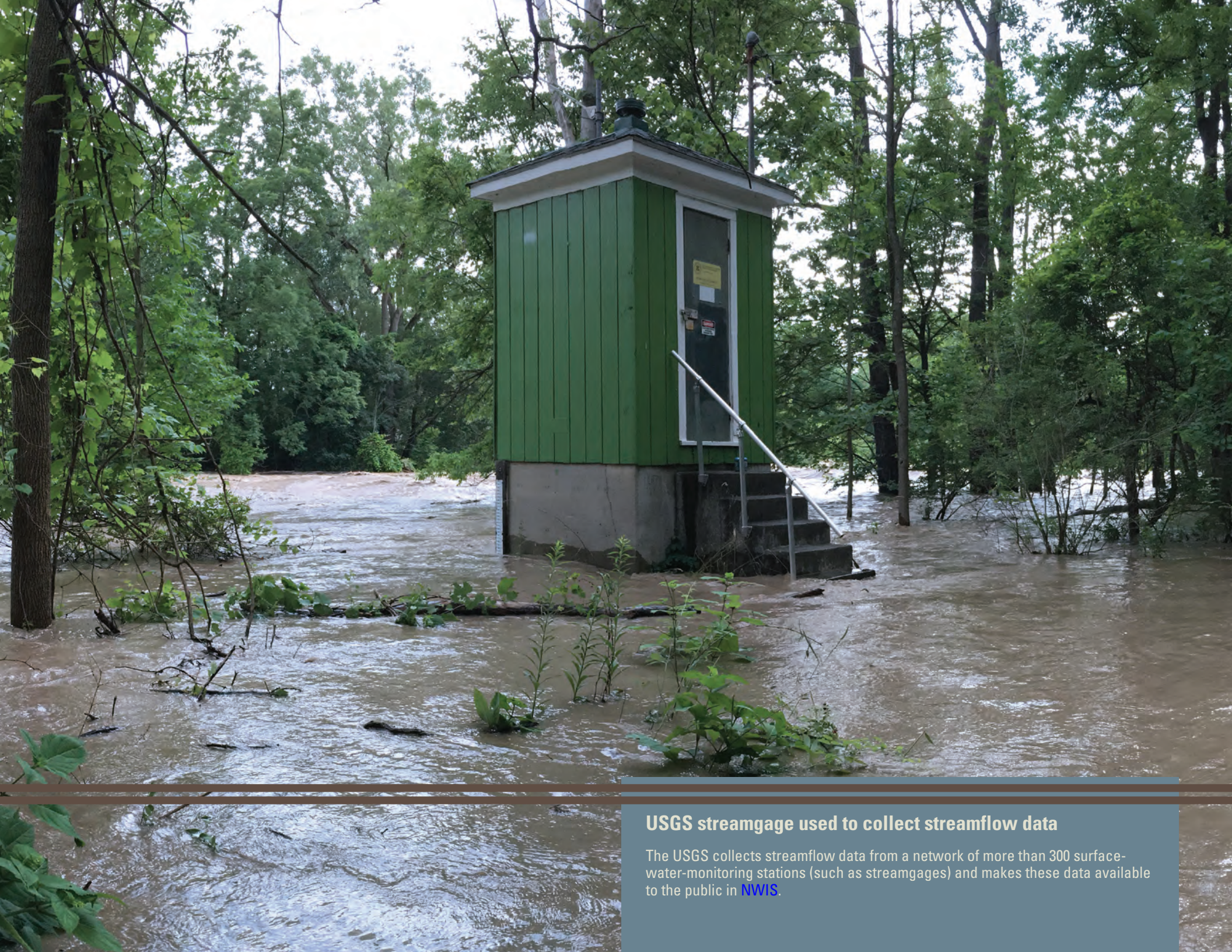


## WaterAlert

The USGS WaterAlert system sends text or email messages when surface-water levels approach flood stage, groundwater levels fall below a critical level, or any other user-defined threshold is exceeded at monitoring stations.







### USGS streamgage used to collect streamflow data

The USGS collects streamflow data from a network of more than 300 surface-water-monitoring stations (such as streamgages) and makes these data available to the public in [NWIS](#).





## USGS hydrographer collects groundwater information

The USGS collects groundwater data from a network of more than 650 groundwater-monitoring stations and makes these data available to the public in [NWIS](#).





# Surface-Water and Groundwater Information

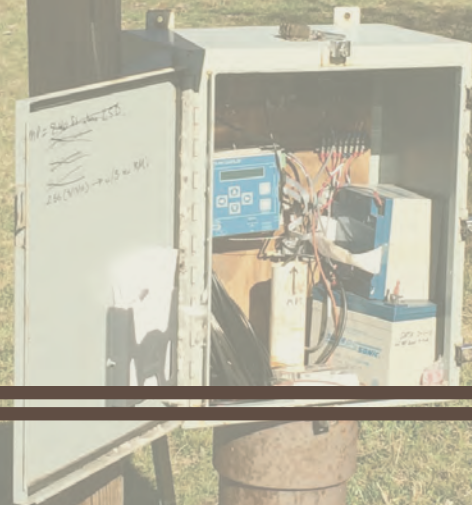
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## Hydrologic Conditions Mapper

The streamflow and groundwater data that the USGS collects each month are used to map monthly hydrologic conditions. The Hydrologic Conditions Mapper shows how wet or dry the drainage areas are for select streamgages and groundwater wells in New York.



During times of drought, quick and decisive management of water resources can ensure that human and ecological needs are met. Real-time and long-term data from streamgages and groundwater wells are used, in part, to determine the severity of drought conditions and help State and local water-resource managers determine appropriate actions for reducing the effect of droughts.



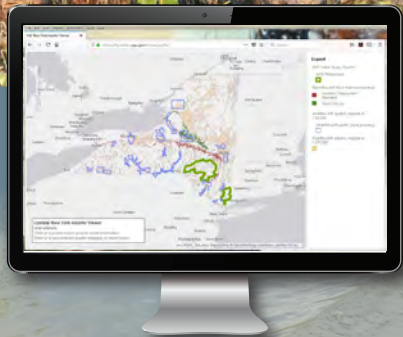


# Water Availability and Use

Groundwater and surface water are among the Nation's most important natural resources. Although the Northeast can be considered "water-rich" compared with other parts of the Nation, competition between human use and ecological needs for water is mounting. To ensure adequate water availability in the future, the USGS collects and disseminates scientific information to help quantify water-resource availability, including availability for human use. These efforts help water-resource managers understand how to meet future water demands while balancing human and ecological needs. Major topics of study include surface-water modeling, groundwater-flow modeling, hydrogeologic characterization, water-use science, flood science, and climate change.

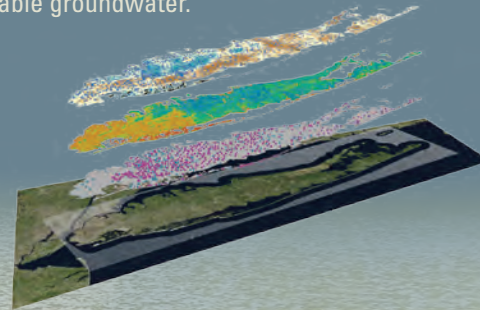
## Aquifer Interactive Maps

Since the 1980s, the USGS has mapped more than 30 aquifers. These aquifer maps are accessible from the Upstate New York Aquifer Viewer interactive mapping application.



## Groundwater-Flow Models for Long Island

In the 1970s, USGS hydrologists pioneered the use of groundwater modeling to understand groundwater flow on Long Island. Today [2018], this model uses updated geology and freshwater and saltwater boundaries to estimate the effects of aquifer withdrawals and recharge on the available groundwater.







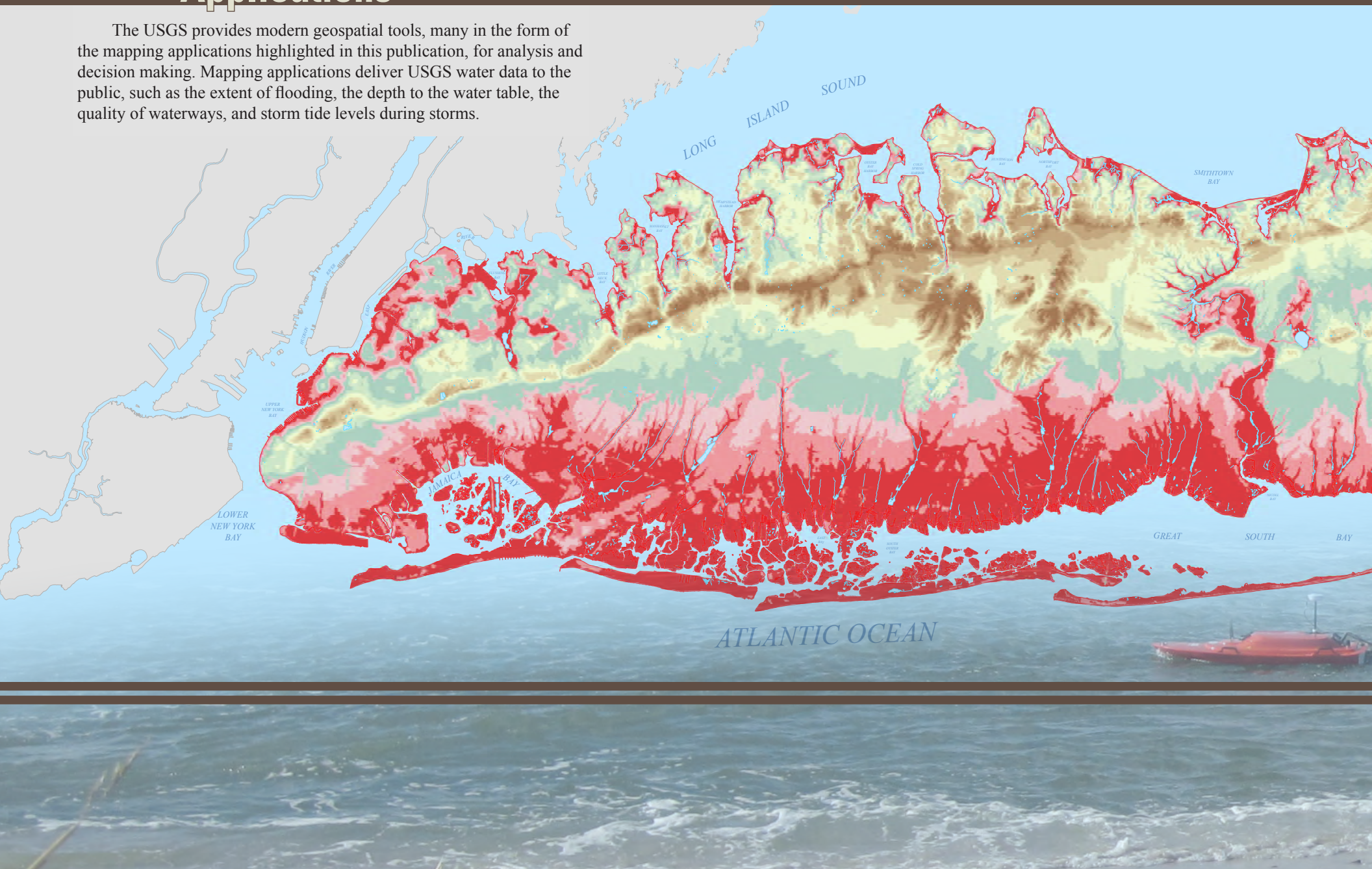
## **USGS hydrologists measure geophysical properties of the Long Island aquifer system**

Exploratory wells are being drilled on Long Island. The wells help define the aquifer system, track saltwater encroachment into the aquifer, and inform a new model of groundwater flow for the island.



# Geospatial Applications

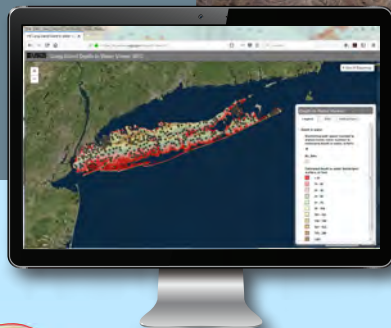
The USGS provides modern geospatial tools, many in the form of the mapping applications highlighted in this publication, for analysis and decision making. Mapping applications deliver USGS water data to the public, such as the extent of flooding, the depth to the water table, the quality of waterways, and storm tide levels during storms.





## Long Island Depth to Water Table Viewer

Monitoring wells on Long Island are used to measure the depth of the water table. These measurements are incorporated into the Long Island Depth to Water Table Viewer and are updated every 5 years.







## USGS hydrologist collects a water-quality sample

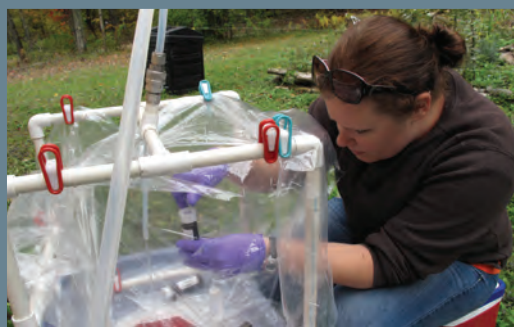
The USGS collects water-quality data from water samples and a network of continuous water-quality-monitoring stations and makes these data available to the public in [NWIS](#).



# Water Quality

## Quality of Groundwater in Aquifers

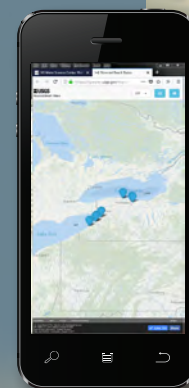
Since the early 2000s, more than 700 existing private and public-supply wells have been sampled to record the quality of ambient groundwater in bedrock and glacial-drift aquifers in upstate New York.



Weather, climate, and man-made influences affect the quality of water in New York. To assess water quality for human and ecological needs, the USGS collects data from a variety of natural resources, including streams, lakes, and reservoirs; estuaries and embayments; groundwater; wastewater; agricultural, forested, and wildland soils; forest canopy and undergrowth; fish, macroinvertebrates, and other wildlife; and the atmosphere. Water-quality data, in turn, are used to determine the health of ecosystems (including wetlands, urban landscapes, coastal environments, and watersheds) and the connection of the health of ecosystems to human water use. Major topics of study include surface-water and groundwater-quality monitoring and water-quality modeling.

## Beach Safety Notification

The USGS retrieves and makes available on a daily basis water-quality data that are used by beach managers to determine whether a local beach is open, under advisory, or closed. The data are used to update the interactive Nowcast Beach Status mapping application.



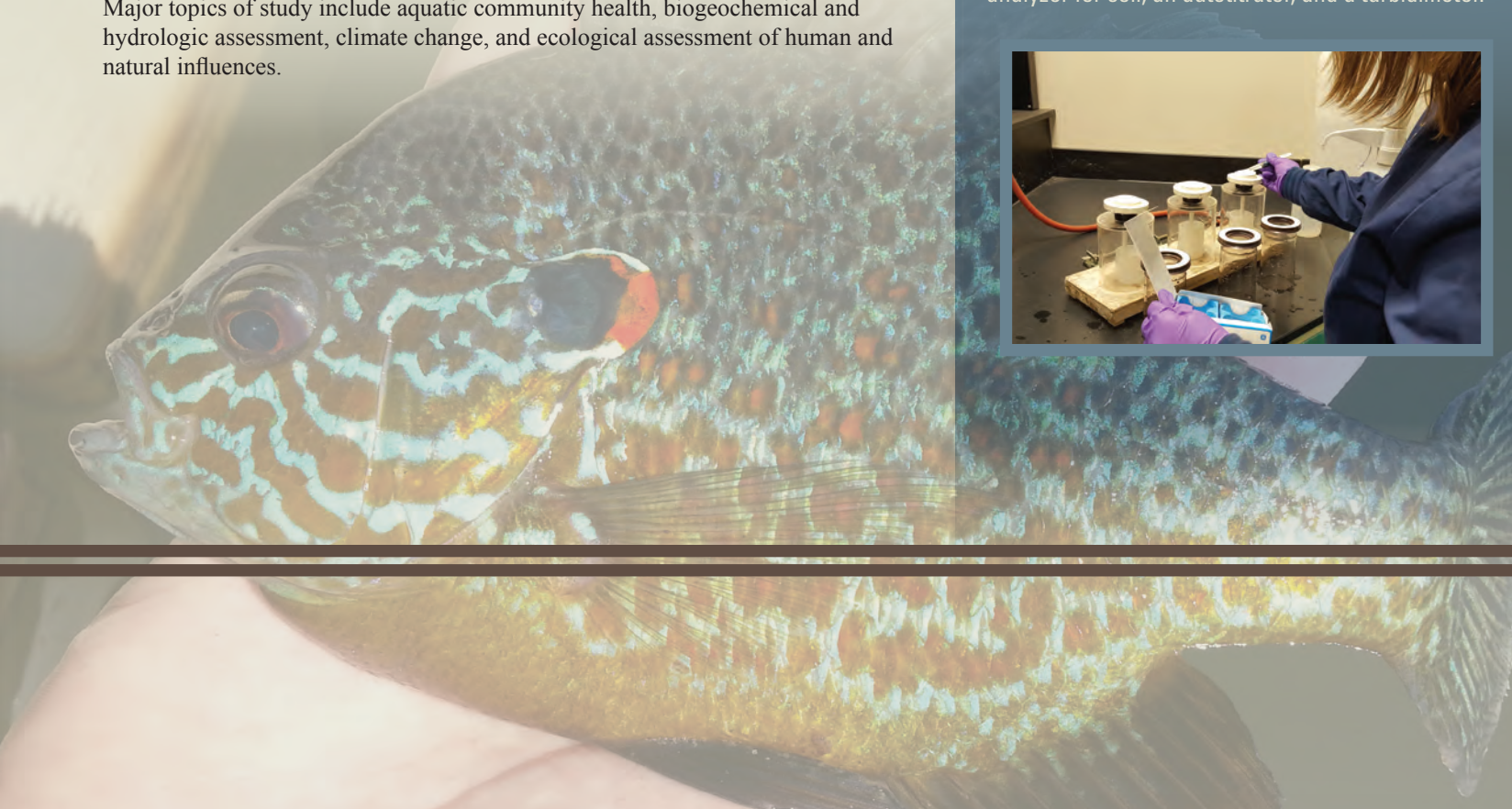


# Ecosystems Health

Ecosystem health refers to the status of an ecosystem relative to a natural or undisturbed state. A range of different stressors and disturbances such as floods, droughts, air or water pollutants, and invasive species can affect the health of an ecosystem. The USGS collects short-term and long-term physical, chemical, geological, and biological data that can help natural resource managers evaluate ecosystem health. Trend analysis and interpretive studies have proven helpful in addressing changes in ecosystem health over time. For example, since the Clean Air Act went into effect, implementation of the law has resulted in decreases in the emission of pollutants that were the cause of acid rain; the USGS has been monitoring the status of ecosystems in the Adirondacks and the Catskills as they recover from the effects of acid rain. Other studies have focused on the effects of large floods on fish and aquatic insect communities, the effects of water pollutants on aquatic biota, and the effects of climate change on streamflow. Major topics of study include aquatic community health, biogeochemical and hydrologic assessment, climate change, and ecological assessment of human and natural influences.

## Laboratory

The USGS has a laboratory in New York for the chemical analysis of soils and water samples collected by the USGS and its partners. This laboratory provides accurate measurements of soil water, nonagricultural soils, stream water, and lake water; these measurements can then be adapted and used in a variety of studies. The laboratory includes many state-of-the-art instruments, including an ion chromatograph, an inductively coupled plasma spectrophotometer, a dissolved carbon analyzer, three flow-injection analyzers, a carbon-nitrogen analyzer for soil, an autotitrator, and a turbidimeter.







### USGS hydrologist collects a soil sample

The USGS and the Northeastern Soil Monitoring Cooperative are studying how human activities are changing our soils.





### **USGS station used to continuously monitor tidal waters**

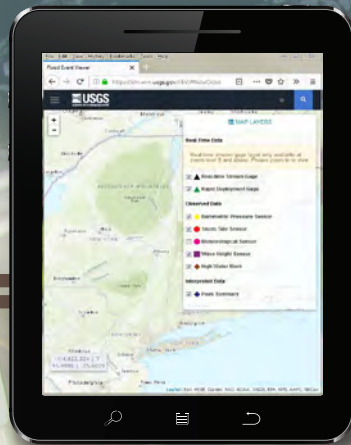
The USGS collects tidal elevation and water-quality data from a network of 18 monitoring stations along the coast of New York and makes these data available to the public in [NWIS](#).



# Coastal Science

## Surge, Wave, and Tide Hydrodynamics Network

The USGS maintains the Surge, Wave, and Tide Hydrodynamics (SWaTH) Network along the northeastern and mid-Atlantic coast to improve our understanding of how overland storm tide and waves evolve and dissipate when they move across natural and man-made landscapes. Data from the SWaTH Network are either transmitted in near real-time or uploaded within days after a storm to the USGS Flood Event Viewer.



The coastal areas of New York are highly vulnerable to tidal and storm-surge flooding. Timely evacuation of people from flood-threatened areas in advance of approaching hurricanes and nor'easters (northeast coastal storms) requires adequate flood-warning time. To address this need, the USGS operates a network of monitoring stations in the coastal areas of Long Island and New York City that collect data on weather and tidal water elevation and make them available online in near real time.

The USGS studies the State's diverse coastal waters and landscapes—areas rich in economic and environmental resources—from the Atlantic Ocean to the Great Lakes. Coastal areas are home to more than half the population of New York. Major topics of study include nearshore environmental health (for example, ecosystem health and water and sediment quality), beach and barrier island dynamics, shoreline erosion, tide and wave hydrodynamics, wetlands, climate and land-use change, and flood hazards.





# Geophysical Applications

The USGS is recognized as an expert in geophysical technology transfer and leads geophysical training courses and workshops around the world. State-of-the-art geophysical equipment such as borehole-wall imagers, sonic tools, flow meters, and electromagnetic sounders is available to characterize below-ground surficial and bedrock geology and to support groundwater-resource studies and training curricula.

## Education and Outreach

The USGS uses state-of-the-art geophysical equipment for training and demonstrations for partners, cooperators, and other groups. The USGS is part of a partnership to revitalize urban waterways for the good of underserved communities and the environment by supporting local projects, participating in community outreach events, and providing data to help decision makers improve local waterways. USGS scientists also bring science to classrooms in schools throughout the State.







## USGS geologists collect geophysical information

The USGS collects borehole and surface geophysical data and makes these data available to the public in the [GeoLog Locator](#).



A photograph of a USGS boat on a body of water. The boat is white with a grey stripe and has the USGS logo and tagline 'science for a changing world' on its side. A metal mast or boom extends from the boat, with a pulley system and rope attached. The background shows a lush green forest on a hillside overlooking the water. The sky is blue with scattered white clouds.

## Working With the Private Sector

In providing water-related data to the public, the USGS has a mandate to avoid competition with the private sector. Projects completed by or for the USGS must provide an enhancement of knowledge or hydrologic methodology. As such, USGS projects either provide services that are not readily available from the private sector or satisfy a cooperator's operational need as part of a broader mandate to advance knowledge of a regional hydrologic system, advance field or analytical methodology or understanding of hydrologic processes, or provide hydrologic data or results useful to many groups. The USGS uses private-sector contractors to carry out specific tasks in projects where it is appropriate and efficient to do so. Projects with large components appropriate for the private sector are completed in partnership with cooperators and private-sector firms. The goal of the USGS is to provide technical leadership and not simply respond to the needs of cooperators as they perceive them.



**U.S. Department of the Interior**

RYAN K. ZINKE, Secretary

**U.S. Geological Survey**

William H. Werkheiser, Deputy Director  
exercising the authority of the Director

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