

Improving Water Quality In Monroe County



Issue 6

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IRONDEQUOIT CREEK WATERSHED GETS A MODEL

Have you ever wondered what future urbanization and development might do to flooding and the chemical quality of water in Irondequoit Creek and its tributaries? Monroe County and several municipalities within the Irondequoit Creek basin have begun a new project in cooperation with the U.S. Geological Survey (USGS) to construct a computerized hydrologic model that will simulate the effects of urbanization on flow patterns of Irondequoit Creek and its tributaries (fig. 1) and their chemical quality, particularly the concentrations of nutrients such as nitrate and phosphorus. The project was started in November 1999 and is to be completed in September 2002.

WHAT IS A MODEL?

A physical model is a representation of something, typically at a greatly reduced scale. A computerized model simulates a physical system, such as a river basin, by digitally representing its major characteristics, such as stream discharge, precipitation rate, volume of snowmelt, degree of soil saturation, and types of land use. For instance, soil composition determines the rate at which water from precipitation can infiltrate into the ground and, therefore, is a factor to be represented in simulations to predict how much water will flow

overland into streams or soak into the ground-water system.

Program-Fortran (HSPF) model of Bricknell and others (1997) will be used to simulate streamflow and sediment and nutrient transport in the

The Hydrological Simulation

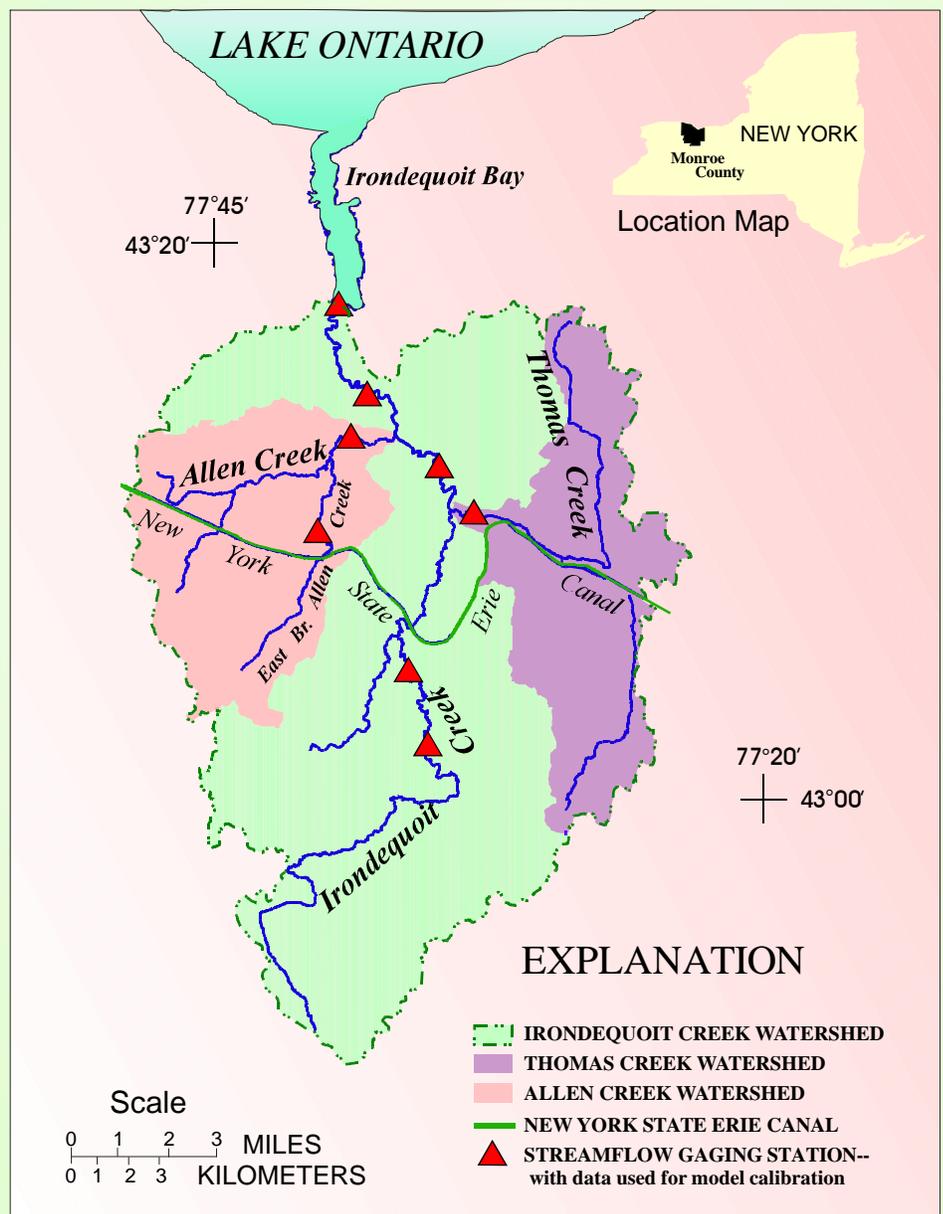


Figure 1. Location of Irondequoit Creek watershed, the Allen Creek and Thomas Creek watersheds, and eight streamflow-gaging stations used for calibration of the watershed model.

Also Inside this Issue:
USGS on the "Web"2

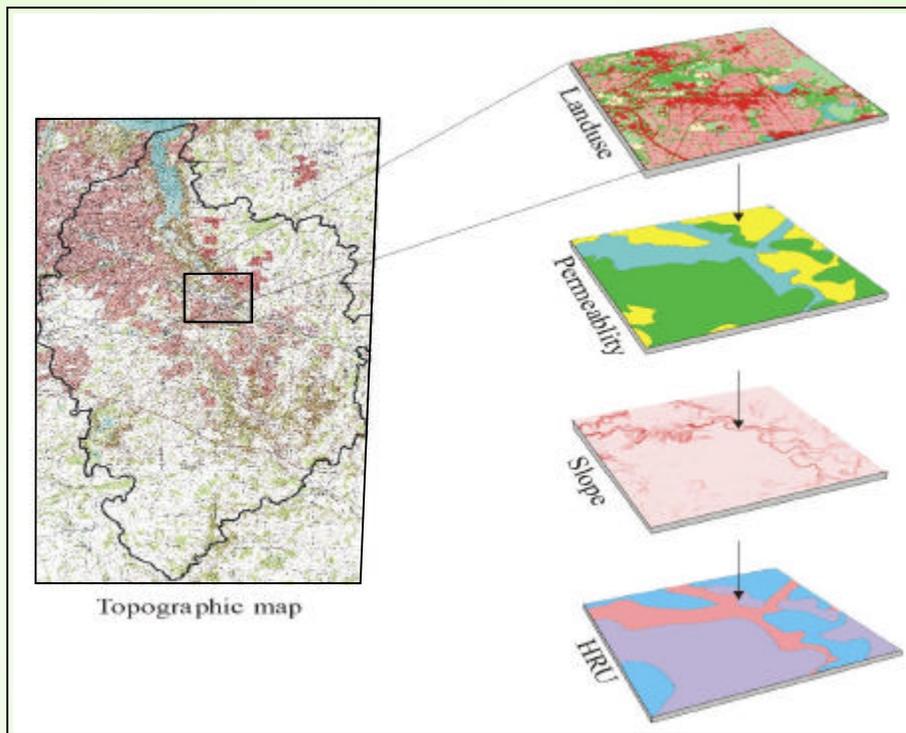


Figure 2. Superposition of Geographic Information System (GIS) Coverages representing selected physical factors (land use, soils, and Slope) that together describe a Hydrologic Response Unit (HRU) in a watershed model.

Continued from page 1

Irondequoit Creek basin. HSPF, which is designed to use available meteorologic (precipitation) and hydrologic data, can simulate watershed hydrology and nonpoint-source contaminant loads derived from urban and rural lands. The program takes into account several hydrologic processes that affect runoff from pervious and impervious land surfaces, from individual stream reaches, and from impoundments. The basin will be divided into a series of hydrologic response units (fig. 2) in the model on the basis of land-use and hydrologic characteristics.

A FOUR-PHASED APPROACH

The watershed model will be developed during four main phases of the project.

Phase 1--Hydrologic Data collection and model development.

This phase will include collection of precipitation, stream-discharge, and water-quality data, and compilation of pertinent GIS (Geographical Information System) coverages for the hydrologic and land-use characterization of the basin.

Phase 2--Development of Runoff Component of Model

Data from at least eight streamflow-monitoring stations on Irondequoit Creek, two on Allen Creek, and one on Thomas Creek (fig.1), whose periods of record range from 1.5 to 41 years, are available for calibration of the streamflow and water-quality components of the model and calibration of the runoff component.

Phase 3--Development of Water-Quality Component of Model

Monroe County has collected water-quality data at each of the eight streamflow monitoring stations (fig. 1) since the early 1980's; these data are available for calibration of the water-quality component of the model. This phase of model development will simulate the effects of changes in land use on the quality of water in Irondequoit Creek.

Phase 4--Analysis of Urbanization Scenarios

Changes in stream discharge and in sediment and nutrient loads that result from projected development and the attendant land-use changes will be assessed, as will the effects of hypothetical stormwater-detention basins. Results of several previous studies in Monroe County of the effects of stormwater detention in large man-made impoundments have been shown to help mitigate flooding and improve water quality downstream. ●

USGS on the "WEB"

The USGS collects and analyzes hydrologic data and conducts investigations and research on the quantity, occurrence, quality, distribution, and movement of surface water

and ground waters throughout the United States and its territories. These data are made available to the public, State and local governments, public and private utilities, and other Federal agencies involved with the

management of our water resources.

The data collected generally are grouped into the broad categories of surface water and ground water. Surface-water data, such as stream depth (stage) and discharge (rate of flow) are collected regularly on

Continued on page 3

Continued from page 2

many streams and rivers, lakes, and reservoirs. Ground-water data, such as water-table altitude, are collected at wells and springs.

Chemical and physical data on surface water and ground water also are collected routinely. Water-quality categories include temperature, specific conductance, pH, and concentrations of common ions, nutrients, pesticides, volatile organic compounds, and suspended sediment.

Nearly all of the current and historical data collected by the USGS and cooperating agencies are available on the World Wide Web, as are USGS publications in several series, including Water Resource Investigations Reports, Open-file reports, USGS Fact Sheets, and other series.

The USGS and Monroe County have had a cooperative program since 1980 to collect and analyze data on the water resources of the County and to publish the results. The studies carried out under this program have produced a vast amount of data and several interpretive reports on water-resource issues within the County.

One goal of the cooperative program in recent years has been to make these data easily accessible to the public. Many of the data are published in the annual USGS Water Resources Data Report for New York. Making these data available on the web provides convenient access to these data, and a large amount of additional data, in formats that are easy to retrieve and use.

The USGS national water-resources website (<http://water.usgs.gov>) contains information on national water conditions, recent publications, and news on USGS national programs. The web pages for New York can be accessed through the USGS national water-resources web page or at the New York District's web site at <http://ny.usgs.gov> (fig. 3). These pages (fig. 3) contain near real-time streamflow data for four sites in Monroe County (Honeoye Creek at Honeoye Falls, Oatka Creek at Garbutt, Genesee River at Ballantyne Bridge, and Black Creek at Churchville). Two more sites are to be added soon Irondequoit Creek at Blossom Road and Allen Creek at Rochester.

Several new web pages (fig. 4) are expected to become available to the public in the fall of 2000. These pages will provide access to a large volume of surface-water, ground-water, and water-quality data for other sites in the Irondequoit Creek and Genesee River basins, as well as elsewhere in Monroe County. Surface-water data will include current streamflow data and daily, monthly, and annual statistics of streamflow data. Ground-water data will include site information such as

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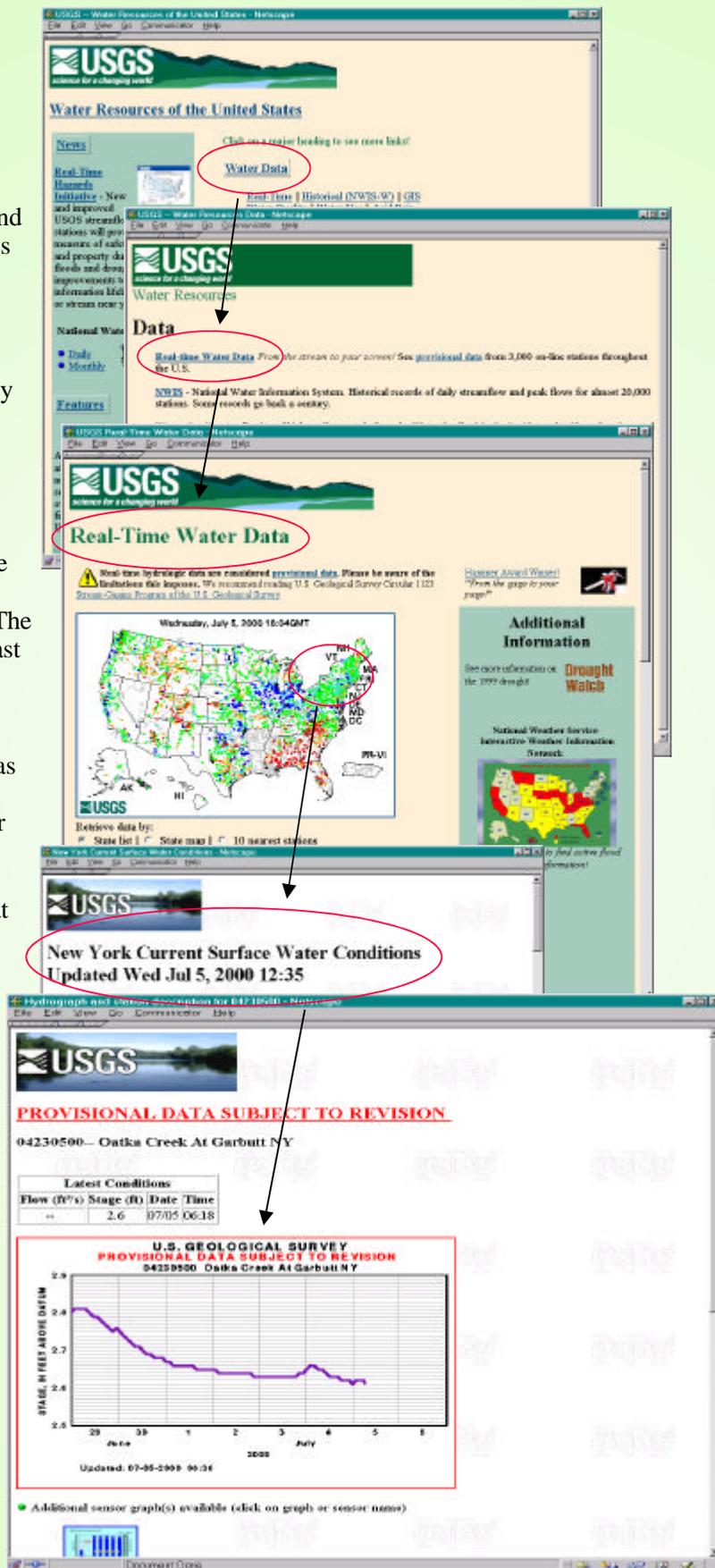
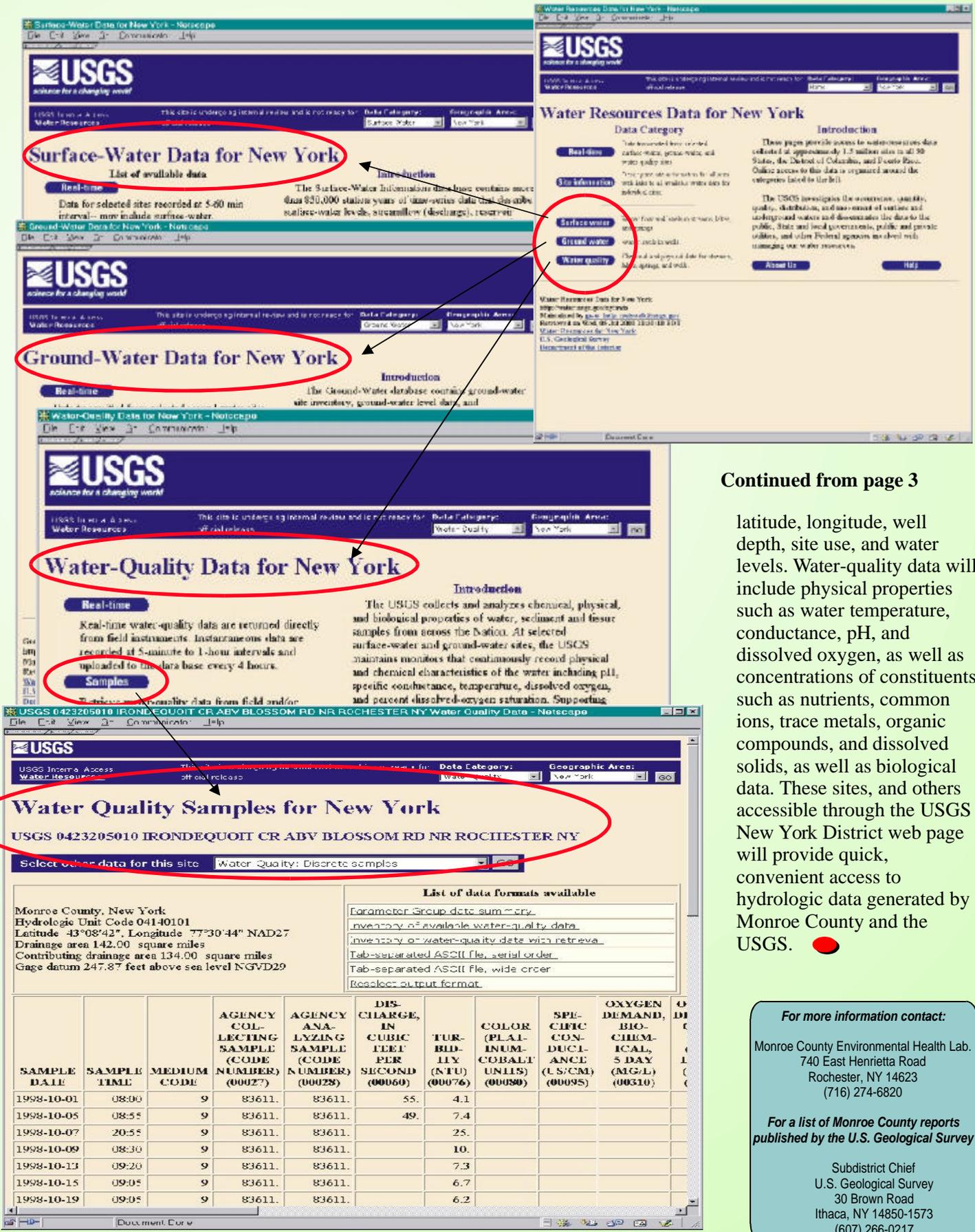


Figure 3. Sample web pages showing progression from USGS water-resources home page (<http://water.usgs.gov>) to selected topics.



Continued from page 3

latitude, longitude, well depth, site use, and water levels. Water-quality data will include physical properties such as water temperature, conductance, pH, and dissolved oxygen, as well as concentrations of constituents such as nutrients, common ions, trace metals, organic compounds, and dissolved solids, as well as biological data. These sites, and others accessible through the USGS New York District web page will provide quick, convenient access to hydrologic data generated by Monroe County and the USGS.

For more information contact:
 Monroe County Environmental Health Lab.
 740 East Henrietta Road
 Rochester, NY 14623
 (716) 274-6820

For a list of Monroe County reports published by the U.S. Geological Survey

Subdistrict Chief
 U.S. Geological Survey
 30 Brown Road
 Ithaca, NY 14850-1573
 (607) 266-0217

Figure 4. New NWIS (National Water Information Service) home web page for New York State showing prototype water-quality pages.