United States Geological Survey
Programs in New York

Fact Sheet

The USGS provides maps, reports, and information to help others meet their needs to manage, develop, and protect America's water, energy, mineral, and land resources. We help find natural resources needed to build tomorrow, and supply scientific understanding needed to help minimize or mitigate the effects of natural hazards and environmental damage caused by human activities. The results of our efforts touch the daily lives of almost every American.

Water Quality of Streams in the Catskill Mountains

U.S. Geological Survey (USGS) water-quality studies in basins in the Catskill Mountains provide information that is useful for identifying hydrologic processes and trends in the water quality of mountain streams. New York City, which does not use filtration in the treatment of its drinking water, obtains its water supply from these basins. With adequate data and understanding of hydrologic processes in the Catskills, the city can consider alternative water-treatment strategies.

The USGS is cooperating with New York City to describe processes that control the chemical quality of streams and rivers in the Catskill Mountains that are tributary to the New York City reservoir system (fig. 1). One study focuses on defining water-quality relations between the lower Neversink River and its headwaters by assessing chemical changes along streams throughout the basin; developing quantitative relations among stream chemistry, discharge, and basin characteristics; and developing methods to integrate water-quality data from different-sized basins. The assessment focuses on natural processes and the effects of acidic deposition—two factors that influence the chemistry of streams in undeveloped areas.

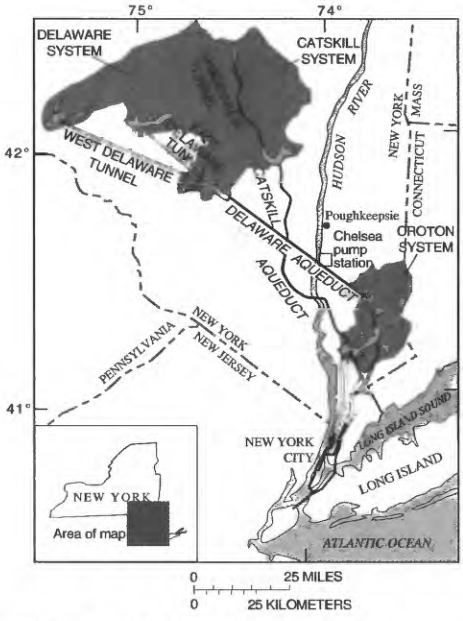

Figure 1. New York City reservoir system.

A second study focuses on the mechanisms by which nitrate in soil and water is transported to reservoirs in the Catskill Mountains and on assessing the effects of different logging practices on nitrogen uptake and release in soil. Atmospheric deposition of nitrate is greater in the Catskill region than anywhere else in the Northeast. Nitric acid from precipitation increases the nitrate concentration in streams during storms and snowmelt, causes acidification, and increases inorganic aluminum concentrations to levels that are toxic to fish. Nitrate is expensive to remove from water. High nitrate concentrations in streams could cause New York City water-resources managers to consider stricter discharge requirements on farms, sewage-treatment plants, and other sources of nitrogen within Catskill basins. Information on nitrogen processes and movement in forest soils will help to define the flowpaths of water and the transport of aluminum; it also will provide information on how management of forests in reservoir basins can be used to control nitrate concentrations in surface water.

National Water-Quality Assessment Program

Information on water-quality conditions, as well as the natural and human factors that affect those conditions, are lacking at local and national scales. In 1991, the USGS implemented the National Water-Quality Assessment (NAWQA) Program to address this problem. The long-term goals of this Program are to describe the status and trends in the quality of a large part of the Nation's surface- and ground-water resources and to identify the natural and human factors that affect their quality.

Five NAWQA Program studies are partly within New York State. Two of these studies—the Hudson River and the Connecticut River Basins—began in 1991. The Long Island/New Jersey Coastal Plain and the Allegheny/Monongahela studies began in 1994, and the Delaware River Basin study is scheduled to begin in 1997.

An example of a NAWQA Program investigation that is useful to State water-resource managers is the Hudson Basin study. Polychlorinated biphenyls (PCB's) are some of the more common compounds detected in fish tissues in this study. Concentrations detected in carp from the Mohawk River are as high as 33 micrograms per gram (parts per million). After discussion of the study results between USGS and State scientists, the State issued health advisories for the affected reach of the Mohawk River and is planning a followup survey.

Water Resources

Excessive withdrawals of ground water during the 1930's and 1940's resulted in large declines in the water table, which, in turn, caused saltwater intrusion and the depletion of freshwater

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in the aquifer system beneath Kings and Queens Counties in western Long Island. Recent reductions in pumpage, however, have allowed ground-water levels to rise and recover to the point where some basements and subways are being flooded. In an effort to determine the potential for developing this newly available resource and to provide information that is useful to alleviate basement and subway tunnel flooding, the USGS is cooperating with New York City to determine the extent and quality of the aquifer system. As part of the study, a ground-water-flow model of the aquifer system of Long Island is being developed to estimate how much water can be withdrawn from the aquifer system without causing excessive lowering of the water table and, thus, avoiding a recurrence of saltwater intrusion.

Studies have indicated that New York City's water-supply system may not meet current demands during a drought. Another potential source of water that New York City may be able to use during periods of drought and high demand is the Hudson River. The location and movement of the tidally affected saltwater front in the Hudson River Estuary would have to be known to manage water withdrawals to prevent intrusion of saltwater into municipal supplies. The USGS is collecting and compiling data on the position of the saltwater front in the estuary and is developing models to predict the location of the saltwater front on the basis of conditions at three indicator stations, to predict how various withdrawals of river water will affect the saltwater front position, and to estimate how much water can be safely withdrawn before excessive salinity affects other water suppliers that withdraw water from the Hudson River. The study is jointly funded under the USGS Cooperative Program with New York City, New York State, and six counties in the Hudson Valley.

The USGS, in cooperation with the New York State Department of Environmental Conservation, has mapped and published reports that describe 26 valley-fill aquifers in Upstate New York during the past 15 years. These maps provide the first detailed descriptions of water resources in some areas, and the reports produced under the project have become a fundamental part of the New York State Wellhead Protection Program.

Floods

Flood-induced scouring of the stream channel undermined the New York State Thruway bridge footings at Schoharie Creek on April 5, 1987; this resulted in the collapse of the bridge and the loss of 10 lives (fig. 2). Since that time, the USGS, has been evaluating data-collection methods and equations for estimating scour at bridges and monitoring scour at 77 bridges in New York State. The USGS in cooperation with the New York State Department of Transportation (NYSDOT) and the Federal Highway Administration, is evaluating instrumentation that local agencies can use to provide warnings of excessive stream channel and bank scour beneath bridges in New York.

The USGS, in cooperation with the National Weather Service and the U.S. Army Corps of Engineers (COE), operates the Susquehanna River Basin flood-warning network for the Susquehanna and the Chemung River Basins. Transmission of data from 16 precipitation and 35 streamflow-measurement sites by satellite allows the National Weather Service and the COE to warn the public of impending floods. The USGS, in cooperation with NYSDOT, operates a crest-stage-gage network of 56 sites, documents notable floods, and analyzes stream-stage data to develop flood-magnitude and flood-frequency relations useful in the design of bridges and culverts.

Landslides

Stream flooding is not the only effect of excess water from precipitation. Unusually high precipitation and recharge in spring 1993 combined with geologic structure of the walls and floor of the Tully Valley in the Finger Lakes region to produce a landslide on April 27, 1993. The landslide was the largest in New York in 75 years; it destroyed three homes and forced the evacuation of four others. Investigation by the USGS revealed that similar landslides had occurred in this area in the past. In response to the concern of local officials and citizens about the possibility of additional landslides in the area, the USGS, working with the New York State Geological Survey and other local, State, and Federal officials, prepared a map to identify areas most susceptible to landslides. The map has been used by the cities of Tully and LaFayette and agencies of Onondaga County. Results of investigations for landslide potential, followed by mitigation efforts before land-use development, help prevent or reduce most adverse economic consequences of landslides.

Effects of Underground Mine Collapse

The USGS, in cooperation with the Livingston County Department of Health, is assessing the effects of mine flooding on the regional aquifer system in the Genesee River Valley and is providing expertise in the assessment of haz-

Figure 2. Bridge collapse on Schoharie Creek, April 5, 1987. Courtesy of Sid Brown, *Schenectady Gazette.*

ards associated with land subsidence that result from underground mine collapse. A salt mine, which has been in operation for 109 years and is about 1,100 feet below land surface, supplies road salt to 14 States in the Northeast. An underground room near the southern end of the mine near Cuylerville collapsed on March 12, 1994, and an adjacent room collapsed on April 18. Two large, circular collapse features several hundred feet apart have developed at land surface above the two collapsed mine rooms. Fractures that have developed in the rocks above the mine establish hydraulic connection to overlying aquifers and transmit ground water that has been flooding the mine at rates of 5,500 to 20,000 gallons per minute. As a result, several unconsolidated and bedrock aquifers above and adjacent to the mine are being drained or dewatered. Consequently, some local water-supply wells that are completed in dewatered zones of the aquifers now yield inadequate supplies or are dry.

The USGS has provided technical expertise in the assessment of land subsidence in the area and has established a regional ground-water-level-monitoring network to record the rate, magnitude, and extent of aquifer dewatering. The USGS also is developing a ground-water-flow model to aid water-resources managers in dealing with the issues of aquifer dewatering, surface subsidence, and public safety. The model is useful for estimating the length of time required to flood the mine completely and for the water levels in overlying aquifers to reach equilibrium conditions, as well as for determining the rate, extent, and magnitude of aquifer dewatering over time. The model also provides a framework for the development of future models to assess land subsidence caused by dewatering of the aquifer and upward migration of brine from the flooded mine into overlying aquifers that now are in hydraulic connection with the mine.

Contaminants

The USGS is cooperating with Brookhaven National Laboratory (BNL) to map the extent and continuity of clay deposits of Pleistocene age near BNL, one of the few remaining areas of Long Island where the USGS has not mapped these clays. Contaminants from several hazardous-waste-disposal sites at BNL have entered a shallow underlying aquifer. This is of concern to local water-resource managers because water in the shallow aquifer is used for water supply in downgradient areas. Clay deposits in near-shore areas and in the eastern end of Long Island are known to limit the hydraulic connection between shallow and deep aquifers. The extent and continuity of the clays and the hydraulic connection among aquifers in the vicinity of BNL are unknown. The results of the USGS study will be useful for assessing the potential for contaminant migration to water-supply wells (fig. 3).

Marine Environment of the New York–New Jersey Harbor Estuary

The New York/New Jersey metropolitan area is the most populated coastal region in the United States. The harbor estuary and offshore areas are used for waste disposal, transportation, recreation, and commercial fishing. As a result of these activities, bottom sediments in some areas are contaminated. A USGS Marine and Coastal Geology Program investigation is a long-term multidisciplinary study designed to map the distribution of contaminated sediments and to develop a capability for predicting the transport and long-term fate of sediments and contaminants. Sewage sludge from the New York metropolitan region was disposed of offshore from 1923 to 1987. The USGS program is designed to map the distribution of the sludge deposits and to understand the transport and long-term fate of these deposits. This regional understanding of the sea-floor geology is needed by Federal, State, and

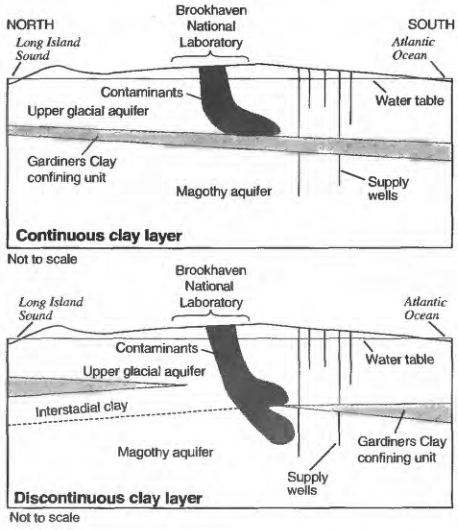

Figure 3. Diagramatic geologic sections showing how geology affects movement of contaminants at Brookhaven National Laboratory.

local agencies for wise management and use of coastal waters and by scientists to plan and conduct research and monitoring. The ongoing research and mapping study is in cooperation with the Woods Hole Oceanographic Institution, the Rutgers Institute for Coastal and Marine Science, and the National Marine Fisheries Service.

National Mapping Program

Among the most popular and versatile products of the USGS are its 1:24,000-scale topographic maps (1 inch on the map represents 2,000 feet on the ground). These maps depict basic natural and cultural features of the landscape, such as lakes and streams, highways and railroads, boundaries, and geographic names. Contour lines are used to depict the elevation and shape of terrain. New York is covered by 1,018 maps at this scale, which is useful for civil engineering, land-use planning, natural-resource monitoring, and other technical applications. These maps have long been favorites with the general public for outdoor uses, including hiking, camping, exploring, and back-country fishing expeditions.

The New York State Department of Environmental Conservation (NYSDEC), in cooperation with the U.S. Environmental Protection Agency, Region II (USEPA II), has embarked on a program of computerized geographic data collection. The NYSDEC is converting 928 hydrographic map layers into computer-readable format from 1:24,000-scale topographic maps supplied by the USGS. The program is expected to expand to include development of about 900 digital elevation models and about 950 landscape-contour files. The USGS also provides quality assurance of State-generated data and archives the finished products. These data are useful to the NYSDEC, Division of Water, for monitoring and estimating precipitation runoff and as a basis for administering wetlands.

The USGS, as the lead agency for the National Aerial Photography Program, is cooperating with USEPA II to obtain infrared coverage for New York State. The photography, which started in spring 1994, is useful for investigating the salt mine collapse near Genesee and for generating computer-readable photographs

useful for analysis and application in other environmental investigations.

Hydrologic Data-Collection Network

Major river basins within New York include the Hudson, the Mohawk, the Saint Lawrence, the Delaware, the Susquehanna, the Oswego, the Genesee, and the Allegheny. The rivers in these basins supply water not only to users within New York, but also to users downstream in Canada and in States through which the rivers flow. The USGS, in cooperation with more than 25 local, State, and Federal agencies, collects streamflow, water-quality, and ground-water data at more than 1,200 sites throughout the State (fig. 4). These data are critical for the day-to-day administering and managing of water resources, determining the extent and severity of droughts, characterizing and predicting conditions during floods, and monitoring the effects of human activities on streamflow and water quality. The data also are essential to interpretive studies that provide information for making decisions about water issues that affect millions of people.

Cooperative Programs

The USGS works in partnership with many State and local agencies. A few examples not referenced above are the Clifton Park Water Authority, the Cortland County Planning Department, the Hudson River–Black River Regulating District, the Nassau County Department of Public Works, the Onondaga County Department of Public Works, the Suffolk County Department of Health Services, and the Suffolk County Water Authority.

The USGS provides support to the New York State Water Resources Institute, which conducts a program of research, education, and information and technology transfer.

Figure 4. Data-collection sites in New York

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Additional earth science information can be found by accessing the USGS "Home Page" on the World Wide Web at "http://www.usgs.gov".

For more information on all USGS reports and products (including maps, images, and computerized data), call 1-800-USA-MAPS.

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