THE U.S. GEOLOGICAL SURVEY'S WATER RESOURCES PROGRAM IN NEW YORK

Compiled by Denise A. Wiltshire

U.S. GEOLOGICAL SURVEY

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ILLUSTRATION

TABLES

ADDITIONAL READING

Clark, P. F., Hodgson, H. E., and North, G. W., A guide to obtaining information from the USGS: U.S. Geological Survey Circular 777 (updated annually).

Cobb, E. D., and Biesecker, J. E., 1971, The national hydrologic bench-mark network: U.S. Geological Survey Circular 460-D, 38 p.

Ficke, J. F., and Hawkinson, R. O., 1975, The national stream quality accounting network (NASQAN)--some questions and answers: U.S. Geological Survey Circular 719, 23 p.

Finch, A. J., Water resources investigations in New York: U.S. Geological Survey Open-file report (updated annually).

Gilbert, B. K., and Buchanan, T. J., 1982, Water-data program of the U.S. Geological Survey: U.S. Geological Survey Circular 863, 16 p.

Solley, W. B., Chase, E. B., and Mann, W. B., IV., 1982, Estimated use of water in the United States in 1980: U.S. Geological Survey Circular 1001, 56 p. (updated every 5 years).

U.S. Geological Survey, 1982, A guide to the water data sources directory of the National Water Data Exchange: Reston, Va., U.S. Geological Survey, 40 p.

_____ Water resources data--New York: U.S. Geological Survey Water-Data Reports, 3 volumes, (published annually).

_____ Water-resources investigations in New York: Albany, N.Y., U.S. Geological Survey, 1 sheet (updated every 5 years).

_____ Yearbook: Reston, Va., U.S. Geological Survey, (published annually).

Maps are distributed by region, according to their geographical locations. Maps of areas east of the Mississippi River, including Minnesota, Puerto Rico, and the Virgin Islands, can be purchased from:

Eastern Distribution Branch
U.S. Geological Survey
1200 South Eads Street
Arlington, VA 22202

Maps of areas west of the Mississippi River, including Alaska, Hawaii, Louisiana, Guam, and American Samoa, can be purchased from:

Western Distribution Branch
U.S. Geological Survey
Box 25286, Federal Center
Denver, CO 80225

Map, benchmark, and areal-photograph information is available from:

National Cartographic Information Center
U.S. Geological Survey
507 National Center
Reston, VA 22092

Requests for miscellaneous water information and information on water-resources programs in other States may be referred to:

U.S. Geological Survey
Hydrologic Information Unit
420 National Center
Reston, VA 22092

The Geological Survey maintains extensive earth-science libraries at the National Center in Reston, Va., and at the regional centers in Denver, Colo. and Menlo Park, Calif. Local libraries may obtain books, periodicals, and maps through interlibrary loan by writing to:

Library
U.S. Geological Survey
950 National Center
Reston, VA 22092

Library
U.S. Geological Survey
Box 25046, Federal Center
Mail Stop 914
Denver, CO 80225

Library
U.S. Geological Survey
Mail Stop 55
345 Middlefield Road
Menlo Park, CA 94025

Refer to "A Guide to Obtaining Information from the USGS," (Clark and others) for additional information on obtaining published reports and unpublished data.

U.S. GEOLOGICAL SURVEY ADDRESSES AND PHONE NUMBERS

District Office	(518) 472-3107	U.S. Geological Survey Water Resources Division 343 U.S. Post Office & Courthouse P.O. Box 1350 Albany, N.Y. 12201
Albany Subdistrict Office	(518) 472-3108	U.S. Post Office & Courthouse P.O. Box 744 Albany, N.Y. 12201
Ithaca Subdistrict Office	(607) 272-8722	521 West Seneca Street Ithaca, N.Y. 14850
Long Island Subdistrict Office	(516) 938-8830	5 Aerial Way Syosset, N.Y. 11791
Potsdam Field Headquarters	(315) 265-4410	Route 2 Sanfordville, N.Y. 13676

Figure 1.--Chart of U.S. Geological Survey offices in New York.

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ABSTRACT

The U.S. Geological Survey performs hydrologic investigations throughout the United States to appraise the Nation's water resources. The Geological Survey began its water-resources investigations in New York in 1895. To meet the objectives of assessing New York's water resources, the Geological Survey (1) monitors the quantity and quality of surface and ground water, (2) conducts investigations of the occurrence, availability, and chemical quality of water in specific areas of the State, (3) develops methods and techniques of data-collection and interpretation, (4) provides scientific guidance to the research community, to Federal, State, and local governments, and to the public, and (5) disseminates data and results of research through reports, maps, news releases, conferences, and workshops.

Many of the joint hydrologic investigations are performed by the Geological Survey in cooperation with State, county, and nonprofit organizations. The data collection network in New York includes nearly 200 gaging stations and 250 observation wells; chemical quality of water is measured at 260 sites. Data collected at these sites are published annually and are filed in the WATSTORE computer system. Some of the interpretive studies performed by the Geological Survey in New York include (1) determining the suitability of ground-water reservoirs for public-water supply in urban areas, (2) assessing geohydrologic impacts of leachate from hazardous waste sites on stream and ground-water quality, (3) evaluating the effects of precipitation quality and basin characteristics on streams and lakes, and (4) developing digital models of the hydrology of aquifers to simulate ground-water flow and the interaction between ground water and streams.

INTRODUCTION

For many decades the U.S. Geological Survey has performed scientific investigations in every State to appraise the quantity and quality of the Nation's water resources. The Geological Survey provides a wide range of information and services to State and local officials, scientists, students, and the public.

The Geological Survey staff in New York numbers about 140; about 60 percent are hydrologists, 20 percent are technicians, and 20 percent are support staff. Background of the professional staff includes hydrology, geology, engineering, chemistry, limnology, biology, physics, computer and library sciences, and mathematics.

This guide describes the programs performed by the Geological Survey in New York and the services and information products available.

Purpose of Studies

One of the Geological Survey's main purposes is to assess the water resources of the Nation by performing scientific investigations promptly and making the results available to the public.

To meet this objective in New York, the Geological Survey:

- monitors the quantity and quality of surface water and ground water;
- conducts analytical and interpretive investigations of the occurrence, availability, or chemical quality of water in specific areas of the state;
- develops methods and techniques of data-collection and interpretation;
- provides scientific and technical guidance to Federal, State, and local agencies, to researchers, and to the public;
- disseminates data and results of research through reports, maps, and news releases;
- maintains computerized information files; and conducts workshops and seminars.

History

In 1895, the U.S. Geological Survey began its water-resources investigations in New York by establishing a number of stream-gaging stations at dams on the Hudson River. By 1898, twenty stations were established to form a state-wide stream-gaging network. In 1900, the Survey entered its first cooperative program in New York with the Office of the State Engineer. Since 1910, the Survey has maintained a District office in Albany to direct its water-resources investigations within New York. A subdistrict office was established on Long Island in 1932, and in 1942 in Ithaca, to coordinate studies centered on Long Island and in western New York, respectively. These offices have been maintained to the present.

FUNDING

Cooperative Program

The Cooperative Program is a system whereby the U.S. Geological Survey enters into partnership with State and local agencies, nonprofit tax-based organizations, and State water-resources research centers by providing matching funds for projects. Projects funded by the Cooperative Program are the main source of hydrologic information used for managing the State's water resources. Some of the current projects funded by the Cooperative Program include appraisals of hydrogeologic conditions and evaluation of quality of water on Long Island, studies of the aquatic effects of acid precipitation in the Adirondack Mountains, and floodflow-frequency studies in urban areas.

Federal Program

The Federal Program is designed to provide a basic level of water-resources data for planning and management and to improve techniques for hydrologic investigations. Funds for the Federal Program are appropriated by Congress to:

- maintain a national water-data collection network;
- conduct investigations of water bodies in the public domain, river basins and aquifers that cross State boundaries, and international waters;
- support hydrologic research, the Survey's Central Laboratory System, and publication of reports and maps.

Other Federal Agencies

Other Federal agencies provide funds to the Geological Survey for research in support of the missions of these agencies. Recent projects that have been performed in New York in cooperation with other Federal agencies are delineation of flood prone areas (U.S. Department of Housing and Urban Development), compilation of drainage areas and other basin characteristics of New York streams (U.S. Army, Corps of Engineers), and determination of groundwater flow regime at a hazardous-waste burial site (U.S. Department of Energy).

PROGRAMS IN NEW YORK

Data-Collection Network

The U.S. Geological Survey collects data on the flow of streams and rivers; water levels of lakes and reservoirs; water levels in wells; chemical quality and sediment load of streams; and the amount of water used for specific uses, such as public supply, industry, or agriculture. These data form the main basis of all related studies. The data are published for use in planning and managing water-supplies, hydroelectric power, flood control, bridge and culvert design, pollution abatement, and wildlife protection.

In 1982, the Survey monitored stream discharge at 200 gaging stations, measured water levels in 250 observation wells, and analyzed water-quality at 260 sites throughout the State.

Most of the data are published annually and are also filed in WATSTORE, a national computer system maintained by the U.S. Geological Survey and described on p. 6.

Water-Quality Monitoring

The chemical quality of New York's water is critical to public water supply, health, and recreation. The Geological Survey addresses water-quality issues that are of regional or national interest, such as hydrologic effects of subsurface waste disposal and storage.

The Geological Survey's water-quality monitoring program provides a basis for evaluation of the chemical, biological, and physical properties of the surface and ground waters of New York. Staff hydrologists perform research on the composition, distribution, and movement of inorganic, organic, and radiochemical constituents in water. In addition, staff hydrologists investigate the sources and fate of pollutants and the effects of pollutants on aquatic and terrestrial ecosystems. The data collected during these studies are used to investigate streams, lakes, reservoirs, estuaries, wetlands, and aquifers. Results of these studies broaden our knowledge of (1) the interaction between chemical constituents of water, rocks, and soils; (2) the chemical characteristics of hydrologic systems that are critical to resource management; and (3) methods for determining the relationship between components of the hydrologic cycle and predicting responses of the components to stress.

Quality of Precipitation

The chemical composition of atmospheric precipitation affects the quality of surface water and ground water. The contamination of rain and snow by particles and gases emitted from powerplants, smelters, and automobiles is of growing public concern in many areas. Scientists have noted trends in acidity of atmospheric precipitation in the Northeast, including New York. Elevated concentrations of lead and organic compounds in lake sediments in remote areas have also been attributed to atmospheric deposition.

Since 1965, the U.S. Geological Survey has maintained a preciptation-quality monitoring network in New York. The resulting data are being used to study temporal and areal trends in the acidity and chemical composition of precipitation and to assess the effects of precipitation quality on New York State's suface water and ground water.

Ground-Water Appraisals

Ground water supplies about 35 percent of all freshwater used in the United States for public supply. In New York State, about 30 percent of the population is served by ground water. Although New York State's ground-water supply is plentiful, its quality must be protected. Managing ground-water resources begins with collecting data on the quantity and quality of this resource. The U.S. Geological Survey has been collecting ground-water data in New York State since the early 1900's. Many studies are done in cooperation with State, County, and local agencies to assess ground-water conditions and trends.

The Geological Survey plays a major role in identifying and monitoring potential sources of ground water. Information on hydraulic properties, water-level fluctuations, saturated thickness of water-bearing materials, and ground-water flow patterns are needed to predict aquifer responses to natural or man-induced stresses such as pumping, drought, and contaminants. The information can be used to construct aquifer maps and to develop computer models that simulate ground-water properties. Data collected and compiled by the Geological Survey on ground-water levels and low-flow statistics are essential in evaluating the interaction between ground water and streams.

Hydrologic Impacts of Hazardous and Toxic Wastes

Increased public awareness of the potential hazard of buried wastes has prompted the Geological Survey to study the effects of waste storage and disposal on local ground-water systems in several areas of the State. These studies entail definition of ground-water flow patterns, migration pathways of contaminants from their containment site, and the interaction of contaminants with ground water and aquifer materials.

Flood Investigations

Data collected at the Geological Survey's stream-gaging stations in New York are used to determine the magnitude and frequency of floods as well as to maintain a long-term data base of streamflow. The Geological Survey has published many reports on the discharge and frequency of floods and provides maps defining flood-prone areas along New York's streams and rivers.

NATIONAL PROGRAMS

Water-Data Program

The Geological Survey is the principal Federal agency responsible for maintaining a nationwide network of ground-water and surface-water data collection sites. The Geological Survey's water-data program provides a general data base for water-resources investigations, environmental impact assessments, and establishing baseline conditions of the Nation's water.

Since 1888, when the Geological Survey began collecting hydrologic data, the national network has grown to include 17,000 stations for collecting river, lake, and reservoir data; 21,000 wells and springs for collecting ground-water data; and nearly 15,000 sites for collecting data on chemical quality of surface water and ground water.

In addition, the water-data program includes water-use and suspended-sediment data.

The Geological Survey operates two specialized data networks--the National Stream Quality Accounting Network (NASQAN) and the Hydrologic Benchmark Progam described below.

National Stream Quality Accounting Network (NASQAN)

The NASQAN network began operation in 1973 and consisted of 50 stations throughout the country. Today the network consists of more than 500 stations. The network is designed to (1) monitor the physical, chemical, and biological characteristics of water within the United States, and (2) determine areal and temporal variations in stream-water quality. Water samples are collected four times a year and analyzed for specific conductance, pH, bacteria indicators, inorganic compounds, biological nutrients, suspended sediment, floating algae, organic carbon, trace elements, and bottom-dwelling organisms. Results are published annually in a series titled "U.S. Geological Survey Water-Data Report," referenced on p. 12. New York at present has 15 NASQAN stations.

Data collected from these stations have been used to study the effects of atmospheric precipitation, weathering, and population density on stream-water quality.

Hydrologic Bench-Mark Program

The Hydrologic Bench-Mark Program was established in 1958 to obtain data on streamflow, water-quality, ground-water levels, atmospheric precipitation, and stream temperature in areas where land use and land cover are relatively unchanging and where water resources are minimally affected by human activities. The system consists of 57 sites in 37 states. Bench-mark data are used to define hydrologic changes due to natural phenomena rather than those resulting from man's activities. New York has one station, located on the Esopus Creek at Shandaken in Ulster County. The data from this station are published annually.

Water-Data Storage and Retrieval System (WATSTORE)

Data collected by the two networks described above are published in reports and maps and are also stored in the Geological Survey's Water-Data Storage and Retrieval System (WATSTORE). WATSTORE, established in 1971, consists of several files containing data with common characteristics and data-collection schedules. Table 1 summarizes the file names and their contents.

Data in WATSTORE are available to the public in machine-readable form or as printed tables, graphs, or digital plots. Searches and retrievals may be obtained upon request through the offices listed in figure 1.

Table 1.--Summary of WATSTORE system

File name	Content
Station Header File	Index of stations in the data-collection network containing identification, location, and physical descriptions of sites
Daily Values File	Water data (streamflow, river stages, reservoir contents, water temperatures, specific conductance, sediment concentrations, and discharges, and ground-water levels) that are collected daily or continuously
Unit Values File	Data collected more frequently than daily such as streamflow, rainfall, and stream-temperature
Peak Flow File	Annual maximum streamflow and gage-height values at surface-water sites
Water-quality File	Chemical, biological, and radiochemical data of surface and ground waters
Ground-water Site Inventory	Inventory of wells, springs, and other sources of ground-water data
Water-use File	Statistics on domestic, industrial, and agricultural water use

National Water Data Exchange Program (NAWDEX)

In 1964, Congress designated the U.S. Geological Survey as the lead agency for coordinating the water-data acquisition and dissemination activities of all Federal agencies. In response, the Survey established the Office of Water Data Coordination to administer the program. Two committees were formed--one represents Federal agencies (Interagency Advisory Committee on Water Data), the other is a non-Federal interest group (Advisory Committee on Water Data for Public Use).

At the recommendation of the Advisory Committee on Water Data for Public Use, the Geological Survey developed a program for cataloging and indexing water data. As a result, the National Water Data Exchange (NAWDEX), a confederation of organizations involved in water-resources investigations, was established in 1976 to provide a central clearinghouse of water-data information held by participating agencies. Water-data information collected or archived by NAWDEX members is indexed in the NAWDEX computer system. The NAWDEX system does not contain water data but provides information on data held by NAWDEX members. Table 2 summarizes file names and their contents.

The NAWDEX system consists of a Water-Data Sources Directory and a Master Water-Data Index.

Table 2.--Summary of NAWDEX

File name	Content
Water Data Sources Directory	Index of organizations that are sources of water data
Master Water Data Index	Description of sites for which data are available.

Water-Data Sources Directory.--This contains information on organizations collecting environmental data or contributing to environmental studies pertinent to water-resources investigations. The information consists of (1) location of organization and alterative sources for obtaining the organization's data, (2) type and geographic coverage of data, and (3) format of data.

The Master Water-Data Index.--This identifies sites where water data are being or have been collected and describes (1) geographic location of each site, (2) organization archiving the data, (3) types of data, for example surface water, ground water, or water quality, (4) types of measurement or chemical analyses, (5) frequency of measurement or chemical analyses, and (6) format of data.

The Geological Survey office in Albany is one of 63 NAWDEX local assistance centers and can provide direct access to the NAWDEX system. For further information about NAWDEX, write or phone the appropriate office listed in figure 1.

Regional Aquifer System Analysis

The nation's increasing dependence on ground water for public water supply has prompted the U.S. Geological Survey to organize a series of hydrologic research projects on aquifer systems in the United States. The Regional Aquifer-System Analysis program (RASA) was established in 1978 to map and evaluate interconnected aquifers or groups of aquifers that share similar characteristics within a region. Twenty-nine aquifer systems have been selected for this program. Each investigation is designed to address the problems related to a specific system and develop computerized simulations to analyze flow systems and to predict effects of future ground-water pumping, waste disposal, and other stresses on the system.

The Northeast RASA program has its headquarters at the U.S. Geological Survey office in Albany, N.Y. The principal emphasis of the northeast RASA study is to investigate the occurrence and movement of ground water in glacial aquifers in 10 states. Results of the investigation will provide background information on ground-water flow systems for local investigations relating to ground-water supply and quality.

National Water-Use Program

The U.S. Geological Survey has compiled estimates of water use in the United States, Puerto Rico, and the Virgin Islands every 5 years since 1950. These estimates are derived from many sources. In 1977, Congress, recognizing the need for uniform water-use information, directed the U.S. Geological Survey to establish a National Water-Use Information Program.

The National Water-Use Information Program is a cooperative effort between the States and the Federal Government. The objectives are to (1) collect and compile water-use data, (2) develop computerized water-use data retrieval at both the State and National levels, (3) devise new methods of data collection and analysis, and (4) make this information available to environmental managers and those involved in establishing water-resources policy.

The National Water-Use Data System, maintained at the Survey's headquarters in Reston, Va., classifies water use in 12 categories, such as domestic, agricultural, industrial and commercial, irrigation, public-water supply, and electric-power generation. The system also contains data on the return of water to a surface-water body or aquifer after use. Data in the National Water-Use Data System are listed by county and river basin. Water-use data systems, maintained by U.S. Geological Survey offices in each State, contain site-specific data on the withdrawal and return of fresh and saline surface water and ground water.

The U.S. Geological Survey initiated the New York State Water-Use Program in 1979. Since then several State agencies have joined the program. Sources of data on water use have been identified, and data compilation has begun. A computerized data base of site-specific information is near completion.

Central Laboratory System

The U.S. Geological Survey operates two Central Laboratories--one near Atlanta, Ga., the other in Denver, Colo. These laboratories analyze water, suspended sediment, and bottom material for organic, inorganic, radiochemical, and biological constituents. The Central Laboratories are capable of performing more than 400 types of tests. The analytical methods used by the Central Laboratories are developed by Survey staff and are published in a series of reports titled "Techniques of Water-Resources Investigations." See page 10 for information on where to obtain these reports.

The U.S. Geological Survey Office in Albany maintains a field service laboratory but State and contract laboratories also conduct laboratory analyses for the District's hydrologic studies.

Hydrologic Instrumentation Facility

The Hydrologic Instrumentation Facility (HIF), established in 1980 in Bay St. Louis, Miss., is responsible for developing instrumentation used in the Geological Survey's water-resources investigations. The HIF staff develop, test, evaluate, distribute, repair, and calibrate hydrologic instrumentation used by the Geological Survey.

HIF supports the instrumentation needs of the Survey's New York office and its cooperating agencies working on joint investigations. In addition to the resources of the HIF, the Geological Survey office in New York owns and maintains hydrologic instrumentation and field equipment.

INFORMATION PRODUCTS

Publications

Reports and maps are the principal product of the hydrologic investigations conducted by the Geological Survey. The Geological Survey office in New York publishes about 40 reports and maps a year that summarize results of its investigations.

Reports and maps prepared by the Geological Survey offices in New York are published in the following Geological Survey series: Water-Supply Papers, Professional Papers, Circulars, Water-Resources Investigations, Bulletins, Water-Data Reports, Techniques of Water-Resources Investigations, Open-File Reports, Hydrologic Investigations Atlases, Miscellaneous Investigations maps, and Miscellaneous Field Studies maps. In addition, results of investigations are published in technical journals, conference proceedings, and text books.

All Geological Survey reports, maps, and data prepared in New York are available for inspection in Albany, Ithaca, and Syosset. Many publications are free on request, others require prepayment. New publications are announced in news releases and in the pamphlet "New Publications of the Geological Survey," which is issued monthly. Book catalogs titled "Publications of the Geological Survey, 1879-1961", "Publications of the Geological Survey, 1962-1970", and annual updates of these catalogs are also available. Information on where to obtain publications is given on p. 10.

The Geological Survey office in Albany compiles a summary of water-resources investigations, which includes a list of completed reports for current research projects conducted in New York. Refer to the "Additional Reading" section of this report for a bibliography of general-interest publications on the data-collection programs and hydrologic investigations performed by the U.S. Geological Survey. Further information may be obtained by writing the U.S. Geological Survey, Publications Unit, 343 U.S. Post Office and Courthouse, Albany, N.Y. 12201.

Information Services

The vast amount of information published by the Survey and other earth-science agencies requires the use of computerized systems that provide rapid retrieval of digital and bibliographic data.

The Geological Survey office in Albany maintains both a library and computer applications unit that provide information-retrieval services to District researchers and staff of agencies participating in the cooperative programs.

Where to Obtain U.S. Geological Survey Publications

Current releases are described in a monthly catalog, "New Publications of the Geological Survey." To receive this free publication monthly, write:

U.S. Geological Survey
Mailing List Unit
582 National Center
Reston, VA 22092

Professional Papers, Bulletins, Water-Supply Papers, and Techniques of Water-Resources Investigations; single copies of the Earthquake Information Bulletin, and Preliminary Determination of Epicenters; and some miscellaneous reports, including those that have gone out of print at the Superintendent of Documents, U.S. Government Printing Office, can be purchased from the Eastern Distribution Branch at the address shown below). Prepayment is required for books and maps; prices are given in "New Publications of the Geological Survey." Circulars and publications of general interest such as pamphlets or leaflets, are free upon request from:

Text Products Section
Eastern Distribution Branch
U.S. Geological Survey
604 South Pickett Street
Alexandria, VA 22304

Open-File Reports and Water-Resources Investigations Reports are available for inspection at the office from which the report originated; they can be purchased from:

Open-File Services Section
Western Distribution Branch
U.S. Geological Survey
Box 25425, Federal Center
Denver, CO 80225