1981 - 1982

Water Resources Investigations in New York

U.S. GEOLOGICAL SURVEY
Open-File Report 81-1190

This booklet is intended to aquaint you with the U.S. Geological Survey and its water-resources investigations in New York State during 1981. Most of these studies will continue into 1982 or longer.

Other work of the Survey in New York entails programs in geology, offshore minerals exploration, and topographic mapping; those studies are directed from regional offices in Reston, Virginia. The water-resources studies are directed from the New York District Office in Albany.

Most of the Survey's water-related studies are supported through joint funding agreements with State and local agencies. Formal joint-funded programs will be considered where information is needed and when the study would be mutually advantageous to the Survey and the agency. In most cases, costs are shared equally. If you wish more information about USGS programs in New York, I would be most happy to talk with you.

Lawrence A. Martens

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U.S. Geological Survey Representative
Albany, New York

Cover drawing by Eleanor L. Kirchner, 1981

U.S. GEOLOGICAL SURVEY

Water Resources Investigations in New York · 1981 - 82

Compiled by
Anne Finch

Open-File Report 81-1190

Albany, New York
1981

UNITED STATES DEPARTMENT OF THE INTERIOR

JAMES G. WATT, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

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Albany, N.Y. 12201

FOREWORD

More than a century ago, on March 3, 1879, the U.S. Geological Survey was created by Act of Congress, as a bureau within the Department of the Interior, to classify public lands as to their suitability for mining and irrigation and to evaluate the geologic structure and mineral resources of the Nation. Since then, the Survey's authority and responsibilities have expanded to include topographic mapping, geochemical and geophysical studies, stream gaging, and water-supply assessments. More recently, supervision of mineral exploration and development on Federal and Indian lands, engineering supervision of water-power projects, and administration of a minerals-exploration program have been included.

During recent decades, the Survey has become the Nation's principal fact-finding and research agency concerned with our physical resources. Its purpose is to gather and interpret data and publish the results promptly so that governmental officials, planners, and citizens can base decisions on objective scientific information.

The work of the Survey is carried out by four divisions--Water Resources, National Mapping, Geologic, and Conservation; coordination and assistance in the application of this information for specific uses is provided by the Land Information and Analysis Office. All of these organizational units are under the general auspices of the Survey Director, who is in turn responsible to the Secretary of the Department of the Interior.

Inquiries pertaining to geology, topography, mapping, or the outer continental shelf may be directed to the addresses given on page 75; a guide to obtaining Geological Survey publications and related information is given on page 71.

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ILLUSTRATIONS

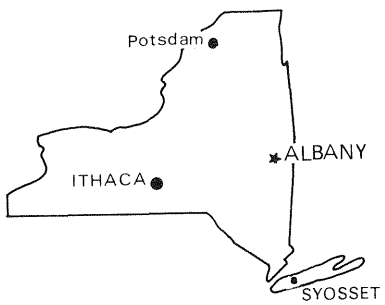
INTRODUCTION

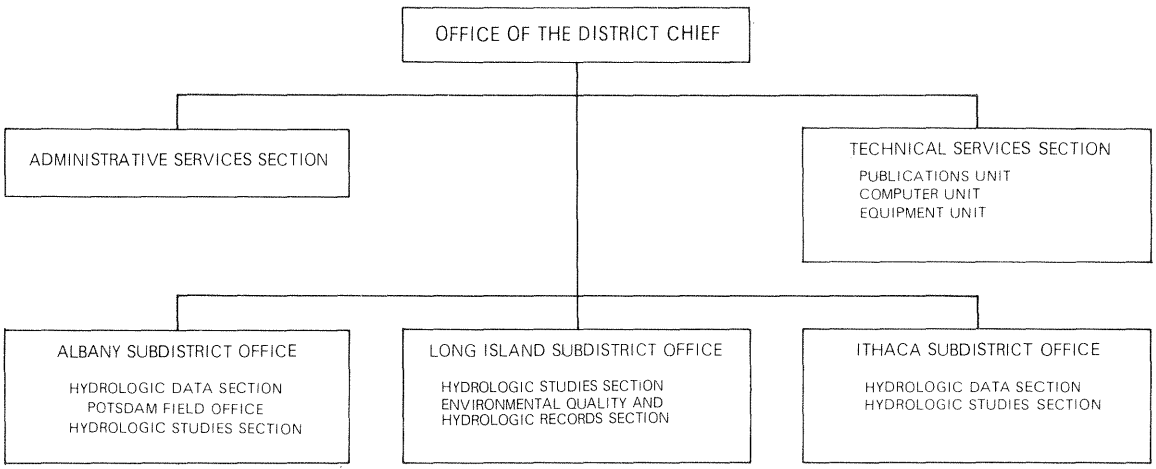
This volume describes the water-resources investigations conducted by the U.S. Geological Survey in New York in 1981; many of these studies will continue into 1982 or longer.

The Geological Survey began its water-resources studies in New York State in 1895 with a stream-gaging program in the Catskill Mountain region and entered its first cooperative program, with the Office of the State Engineer, in 1900. The Survey has maintained a District office in Albany since 1910 to direct its water investigations within the State and has maintained a sub-district office on Long Island since 1932 to study and monitor the ground-water situation in this area of increasing urbanization. The Survey alo maintains subdistrict offices in Ithaca and Albany to collect and interpret data from western and eastern New York, respectively, and maintains a field station in Potsdam to collect records in the northernmost part of the State.

The staff of the New York District numbers about 150. The professional hydrologists represent a variety of scientific and technical backgrounds that include engineering, chemistry, geology, geochemistry, mathematics, physics, biology, and soil science. The hydrologists are assisted by experienced engineering and hydrologic technicians who provide support service in the collection and analysis of field data, and by specialists in computer, publication, and administrative services.

The office addresses and organization chart are given in figure 1; the office locations are shown in the map below. A list of District staff members is given on page 74.





NEW YORK DISTRICT OFFICE ADDRESSES

Inquiries regarding projects described in this section may be directed to the District Office or Subdistrict Office in which the work originated.

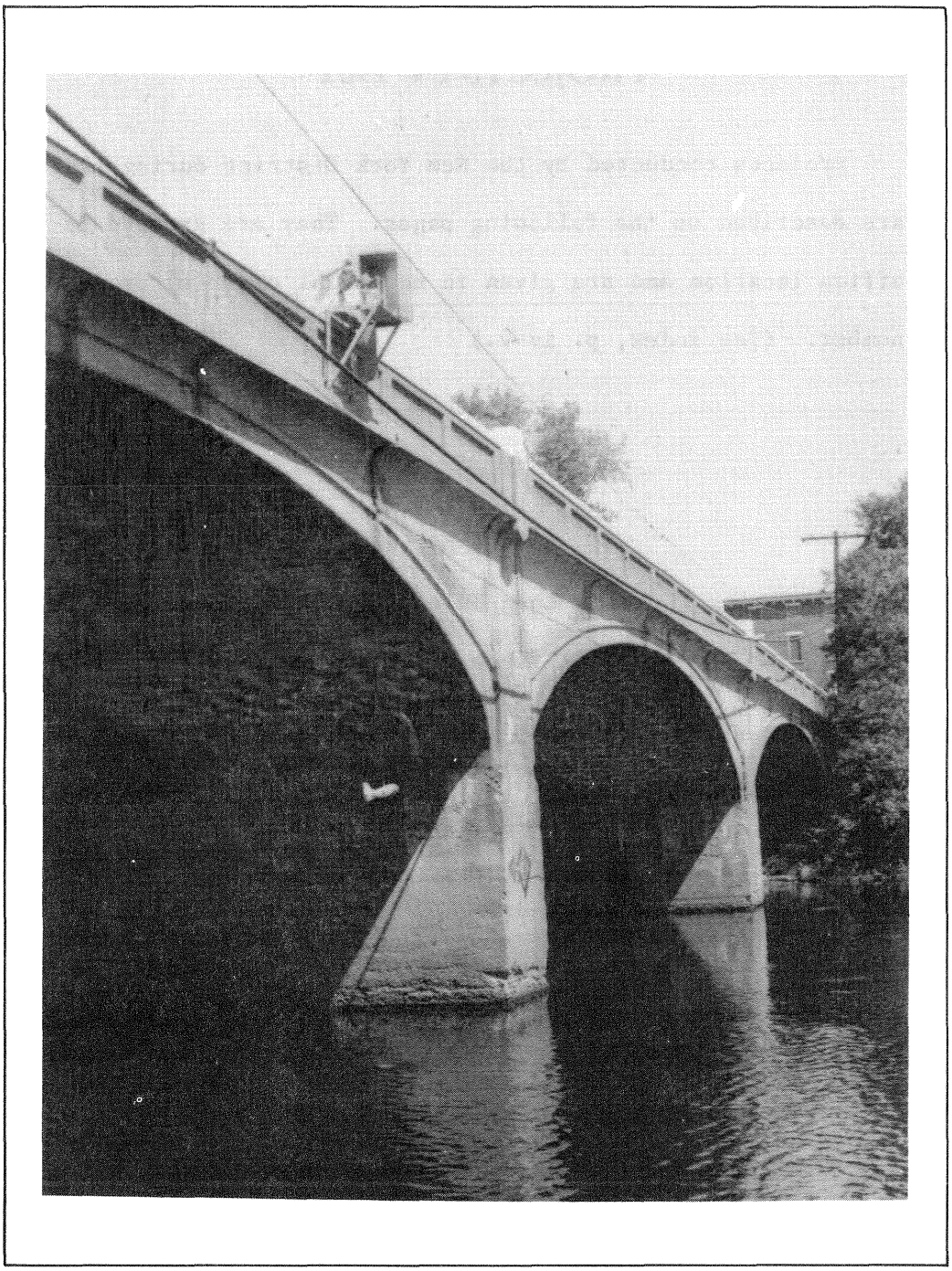
District Office	(518) 472-3107	U.S. Geological Survey Water Resources Division U.S. Post Office & Courthouse Albany, N.Y. 12201
Albany Subdistrict Office	(518) 472-3108	U.S. Post Office & Courthouse P.O. Box 744 Albany, N.Y. 12201
Ithaca Subdistrict Office	(607) 272-8722	521 West Seneca Street Ithaca, 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.--New York District organization chart with office addresses.
(List of staff members is on page 74.)

PROJECTS IN 1981

Projects conducted by the New York District during 1981 are described on the following pages. They are grouped by office location and are given in numerical order by project number. (See index, p. iv-v.)

Albany Office Projects



DONALD SEARLES

Figure 2.--Lowering water sampler into Hudson River from bridge at Rogers Island near Fort Edward, N.Y.

Surface-Water Stations
(NY 00-001)

Period of Project: Continuous since June 1898

Project Leader: George C. Gravlee

Field Location: Statewide

Principal Cooperating Agencies: New York State Department of Environmental Conservation; U.S. Army Corps of Engineers; City of New York, Department of Environmental Protection; Nassau County Department of Public Works; Suffolk County Department of Environmental Control; Suffolk County Water Authority

Problem: Surface-water information is needed for purposes of surveillance, planning, design, hazard warning, operation, and management in water-related fields such as water supply, hydroelectric power, flood control, irrigation, bridge and culvert design, wildlife management, pollution abatement, flood-plain management, and water-resources development. To provide this information an appropriate data base is necessary.

Objective: (1) To collect surface-water data for such purposes as (a) assessment of water resources, (b) operation of reservoirs or industries, (c) forecasting of stage or discharge, (d) pollution controls and disposal of wastes, (e) discharge data to accompany water-quality measurements, (f) compact and legal requirements, and (g) research or special-purpose studies. (2) To collect data to define the properties and trends in the occurrence of water in streams, lakes, and estuaries.

Approach: To use standard methods of data collection as described in the series "Techniques of Water Resources Investigations of the United States Geological Survey" and to use partial-record gaging instead of complete-record gaging where it serves the required purpose.

Progress and Significant Results: This project has started, maintained, operated, and periodically revised a network of streamflow stations to obtain basic hydrologic data needed for U.S. Geological Survey studies, public agencies, and the general public.

Plans for Next Year: To continue operation of the network with changes as needed to supply water data in the most useful form.

Completed Reports:

U.S. Geological Survey, Surface-water supply of the United States: U.S. Geological Survey Water Supply Papers. (Published through 1970.)

_____, Water resources data for New York, part 1, Surface water records: U.S. Geological Survey open-file rept. (Released annually from 1961-1974.)

_____, 1976, Water resources data for New York, water year 1975: U.S. Geological Survey Water-Data Rept. NY-75-1, 735 p.

_____, Water resources data for New York: U.S. Geological Survey Water-Data Report, v. 1, New York excluding Long Island; v. 2, Long Island. (Released annually from 1976-79.)

_____, Water resources data for New York: U.S. Geological Survey Water-Data Report, v. 1, Eastern New York excluding Long Island; v. 2, Long Island; v. 3, Western New York. (Published annually since water year 1980.)

Ground-Water Stations
(NY 00-002)

Period of Project: Continuous since July 1934

Project Leader: Roger M. Waller

Field Location: Statewide

Principal Cooperating Agencies: New York State Department of Environmental Conservation; Suffolk County Department of Environmental Control; Suffolk County Water Authority; Nassau County Department of Public Works

Problem: Long-term water-level records are needed to evaluate the effects of climatic variations on recharge to and discharge from ground-water systems and to provide a data base from which to measure the effects of development, assist in the prediction of future supplies, and provide data for water management.

Objectives: (1) To collect water-level data sufficient to provide a minimum long-term data base so that the general response of the hydrologic system to climatic variations and induced stresses is known and potential problems can be defined early enough to allow proper planning and management. (2) To provide a data base against which the short-term records acquired in areal studies can be analyzed. Such analyses provide for assessment of ground-water conditions and trends, enable prediction of future conditions, detect and define supply or contamination problems, and provide the general data base necessary for ground-water management.

Approach: To determine the most advantageous locations for long-term ground-water observations and to refine this network as records become available and as detailed areal studies more closely define the aquifers, their properties, and the stresses to which they are subjected.

Progress and Significant Results: This project has started, maintained, operated, and periodically revised a network of ground water-level stations to obtain data needed for USGS studies, government agencies, and the public in general. These data have played a significant role in helping the water managers of Long Island and elsewhere in the State to formulate long-term goals leading to the conservation of ground-water reservoirs. The data are published annually in the "Water Resources Data for New York" series.

Plans for Next Year: (1) To define areas where continuing and additional long-term records would be desirable and to establish a priority list for stations to be established should funds become available in the near future. (2) To continue operation of the network with changes as needed to supply future water-data needs. (3) To continue to publish ground-water data annually. (4) To document water-level changes in major aquifers. Evaluation of water-level trends on Long Island will continue.

Reports Completed in Last 5 Years:

Nakao, J. H., and Erlichman, F. R., 1978, The water table on Long Island, New York, in March 1975: U.S. Geological Survey Open-File Rept. 78-569, 10 p.

U.S. Geological Survey, Ground-water levels in the United States, Northeastern States: U.S. Geological Survey Water Supply Papers. (Published through 1974.)

_____, Water resources data for New York, part 2, Water-quality records: U.S. Geological Survey open-file rept. (Released annually from 1961-1974.)

_____, 1976, Water resources data for New York, water year 1975: U.S. Geological Survey Water-Data Rept. NY-75-1, 735 p.

_____, Water resources data for New York: U.S. Geological Survey Water-Data Rept., v. 1, New York excluding Long Island; v. 2, Long Island. (Released annually from 1976-79.)

_____, Water resources data for New York: U.S. Geological Survey Water-Data Rept., v. 1, Eastern New York excluding Long Island; v. 2, Long Island; v. 3, Western New York. (Published annually since water year 1980.)

Water-Quality Stations
(NY 00-003)

Period of Project: Continuous since June 1906

Project Leader: Roger J. Archer

Field Location: Statewide

Principal Cooperating Agencies: U.S. Environmental Protection Agency; New York State Department of Environmental Conservation; Suffolk County Department of Environmental Control; Suffolk County Water Authority; Nassau County Department of Public Works.

Problem: Water-resource planning and water-quality assessment require a statewide and nationwide level of information on the chemical and physical quality of rivers and streams.

Objective: To create a statewide and nationwide bank of water-quality data for Federal, State, and local planning and to provide such data where they will support other projects within the New York district.

Approach: To maintain and operate a statewide subnetwork of water-quality stations, as part of a nationwide network, to provide data on concentrations, loads, and time trends of chemical constituents of streams and rivers.

Progress and Significant Results: Samples were collected monthly at 18 surface-water stations; water-temperature data were collected daily at 23 stations; and specific-conductance data were collected daily at 12 stations. Water-quality data for the 1980 water year were published in the annual data report.

Plans for Next Year: Collection of water-quality data will continue at a slightly reduced level from last year, and data for the 1981 water year will be published in the annual data report.

Completed Reports:

U.S. Geological Survey, Quality of surface waters of the United States: U.S. Geological Survey Water-Supply Papers. (Published annually through 1970.)

_____, Water resources data for New York, part 2, Water-quality records: U.S. Geological Survey open-file rept. (Released annually from 1961-74.)

_____, 1976, Water resources data for New York, water year 1975: U.S. Geological Survey Water-Data Rept. NY-75-1, 735 p.

_____, Water resources data for New York: U.S. Geological Survey Water-Data Rept., v. 1, New York excluding Long Island; v. 2, Long Island. (Released annually from 1976-79.)

_____, Water resources data for New York: U.S. Geological Survey Water-Data Rept., v. 1, Eastern New York excluding Long Island; v. 2, Long Island; v. 3, Western New York. (Published annually since water year 1980.)

Sediment Stations
(NY 00-004)

Period of Project: Continuous since October 1974

Project Leader: Roger J. Archer

Field Location: Statewide

Cooperating Agencies: New York State Department of Environmental Conservation; U.S. Environmental Protection Agency.

Problem: Assessment of current conditions and trends in the sediment regimen by water resource planners and investigators requires a data base of sediment concentration and discharge in the streams of the State and the Nation.

Objective: To provide a data base of fluvial sediment information for streams in New York as part of a national network. The data base is to be used for Federal and local assessment, planning, and management of water resources.

Approach: To collect and analyze samples for fluvial sediment concentrations and particle-size distribution.

Progress and Significant Results: A series of stations for collection of suspended-sediment samples continued operation.

Plans for Next Year: Data collection at NASQAN and bench-mark stations will be continued; results will be published in the annual data report.

Completed Reports:

U.S. Geological Survey, 1976, Water resources data for New York, water year 1975: U.S. Geological Survey Water-Data Rept. NY-75-1, 735 p.

_____, Water resources data for New York: U.S. Geological Survey Water-Data Rept., v. 1, New York excluding Long Island, v. 2, Long Island. (Released annually from 1976-79.)

_____, Water resources data for New York: U.S. Geological Survey Water-Data Rept., v. 1, Eastern New York excluding Long Island; v. 2, Long Island; v. 3, Western New York. (Published annually since water year 1980.)

Young, R. A., and Mansue, L. J., 1978, Holocene Climatic Variations and Sedimentation Rates in Western New York (abs.), in International Association for Great Lakes Research Symposium, proceedings: Rochester, N.Y., May 1979.

Mansue, L. J., Soren, Julian, and Young, R. A., Hydrogeologic influences on sediment-transport patterns in the Genesee River basin, New York and Pennsylvania: U.S. Environmental Protection Agency (in press).

Mansue, L. J., and Bauersfeld, W. H., Streamflow and sediment-transport in the Genesee River basin, New York and Pennsylvania: U.S. Environmental Protection Agency (in press).

Mansue, L. J., Young, R. A., and Miller, T. S., Geohydrology of the Canaseraga Valley basin, Dansville, New York: U.S. Environmental Protection Agency (in review).

New York Water-Use Data (NY 79-007)

Period of Project: Continuous since January 1979

Project Leader: Deborah S. Snavely

Field Location: Statewide

Cooperating Agencies: New York State Department of Environmental Conservation; New York State Department of Health

Problem: The demand for water in New York State is unevenly distributed areally. Although records of available water supply have been collected for many years, little information on water use is readily available. Because increasing water drafts can lead to shortages, it is necessary to catalog the present uses and establish a data base of water demand.

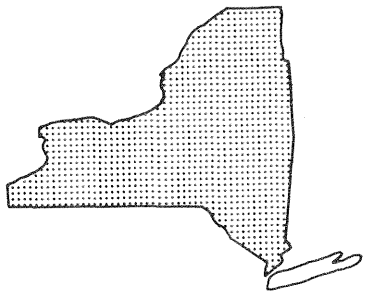
Objectives: (1) To (a) determine what water-use data are being collected by various agencies; (b) evaluate the completeness of data; and (c) determine their usefulness to the National Water-Use Data System (NWUDS) of the U.S. Geological Survey. (2) To put State agencies' data into a form compatible with the NWUDS. (3) To determine what additional data need to be collected to complete the NWUDS for New York. (4) To inventory water use within New York State and compile this information in a format suitable for statistical analysis and future water-use planning.

Approach: Data-collection needs will be determined and a detailed work plan distributed. The records of various New York State agencies that collect and store water-use data will be evaluated for usefulness in the NWUDS. New York State will be responsible for the collection of data. A system to collect and transmit data for storage in the NWUDS will be developed. The system will then be refined, and data collection will begin. USGS will be responsible for data-collection standards and for direction and management of the program.

Progress and Significant Results: A detailed plan for 1982 was written. The data collection by other New York State agencies was evaluated and compared to the requirements of the NWUDS. A report presenting water-use data for Nassau County 1973-79 was prepared. Public water-supply data for Nassau County in 1979 and 1980 was coded and is being entered into storage in the NWUDS. Withdrawal and return data are being coded for pilot counties Greene and Schoharie.

Plans for Next Year: The Nassau County report will be completed and published. The New York State Department of Environmental Conservation will augument its files to enter discharge data for upstate New York into the NWUDS. The New York State Department of Health will aggregate public water-supply figures for the State by county and basin for entry into storage. Trial retrievals will be made of the data in storage, and future reports will be planned.

Low-Flow Frequency Study (NY 77-044)



Date Project Began: October 1976

Date Project Ends: September 1983

Project Leader: Allan D. Randall

Field Location: Statewide, excluding New York City and Long Island

Cooperating Agency: New York State Department of Environmental Conservation

Problem: Although low-flow data from more than 900 stream sites in upstate New York have been published, the Survey continues to receive requests for estimates of low-flow frequencies at ungaged sites. Low-flow data and estimates at ungaged sites are widely used in designing water-supply and wastewater-treatment facilities, in evaluating the impact of wastewater discharge on receiving streams, and in reaching other administrative decisions. Techniques are needed to accurately estimate low-flow characteristics at ungaged sites.

Objectives: (1) To regionalize published low-flow data by relating low-flow characteristics to geohydrologic characteristics of the basins and measurement sites. (2) To develop techniques for estimating minimum average 7-day 10-year and 7-day 2-year flows in upstate New York. (3) To measure base flow at selected sites from which information is needed by the cooperating agency.

Approach: Studies in New York and elsewhere have shown that low flows depend upon drainage area, precipitation (amount and time distribution), geologic or aquifer properties (permeability, storage, infiltration capacity), and perhaps evapotranspiration. Seasonal and annual precipitation and runoff will be tested as indices of precipitation, and percentage of area occupied by forest and by lakes and swamps as indices of evapotranspiration. Percentage of area occupied by stratified drift will be used as a geologic variable based on previous work in Connecticut and the Susquehanna River basin. Principal tasks are to (1) evaluate published values to identify those that may underrepresent basin yield due to significant underflow through alluvium or stratified drift; (2) compile basin and hydrologic variables for each site, using results of previous studies and the LUNR file where appropriate; (3) use regression techniques to identify significant variables and anomalous stations; (4) prepare a technique manual, and (5) make measurements at partial-record stations as requested and analyze these records when adequate data are available.

Progress and Significant Results: One to three measurements were made at about 30 partial-record stations during base-flow periods. Basin variables were compiled for about 70 continuous and partial-record stations in the Susquehanna River basin. Stations in the eastern Hudson River basin were evaluated for potential underflow.

Plans for Next Year: To (a) complete compilation of basin variables and regression analyses for Susquehanna and eastern Hudson basins, and (b) continue with other basins as time permits.

Completed Reports:

Eissler, B. B., 1978, Selected low-flow characteristics of streams in the vicinity of Warwick, Orange County, New York: U.S. Geological Survey Open-File Rept. 78-811, 21 p.

_____, 1979, Low-flow frequency analysis of streams in New York: New York State Department of Environmental Conservation, Bull. 74, 184 p.

Flood Investigations
(NY 67-045)

Period of Project: Continuous since July 1966

Project Leader: Thomas J. Zembrzuski

Field Location: Statewide

Cooperating Agency: New York State Department of Transportation

Problem: Flooding is a serious problem in many parts of the State. Information on flood occurrences and analyses of flood data are needed for use in the design of bridges, highways, and buildings, and in flood-plain zoning and flood-protection works.

Objective: To (a) provide information on magnitude and frequency of floods to agencies and individuals involved in flood-protection planning and design; (b) develop regional flood-frequency relationships for the entire State; and (c) make site studies.

Approach: To (a) collect flood data at crest-stage stations and publish annual peak discharges; (b) determine discharges for flood events, define flood profiles, and collect information on flood-plain mapping; (c) prepare reports covering individual events; and (d) make analyses to improve flood-frequency relationships for the State.

Progress and Significant Results: Peak-flow data were collected at partial-record sites. Basin characteristics for small stream sites were entered into the basin-characteristic file. Two reports were completed--a study of the Flood of November 26, 1979 near Elizabethtown, and a bridge-site study of the Chenango River in Broome County.

Plans for Next Year: To (a) collect and publish flood-peak data at small-stream partial-record sites, and (b) collect data at miscellaneous sites after notable floods.

Reports Completed in Last 5 Years:

Dunn, Bernard, and Lumia, Richard, 1977, Supplementary hydraulic analysis of the Chenango River, Broome County, New York, in relation to planned highway construction: U.S. Geological Survey Open-File Rept. 77-484, 8 p.

Zembrzuski, T. J., Jr., and Dunn, Bernard, 1977, Floodflow characteristics at proposed channel relocation site on Mohawk River near Rome, New York: U.S. Geological Survey Open-File Rept. 77-328, 18 p.

Lumia, Richard, and Dunn, Bernard, 1978, Floodflow analysis of Ninemile Creek, Onondaga County, New York: U.S. Geological Survey Open-File Rept. 78-85, 10 p.

Lumia, Richard, 1978, Supplementary hydraulic analysis of proposed bridge site on Mohawk River, Whitesboro, New York: U.S. Geological Survey Open-File Rept. 78-348, 4 p.

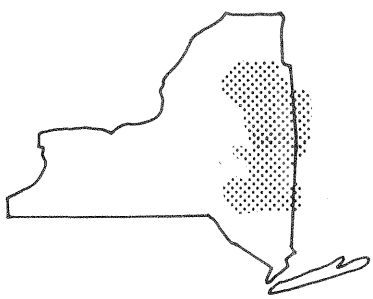
Dunn, Bernard, 1979, Floodflow characteristics of Butternut Creek and Jamesville Reservoir, Jamesville, Onondaga Co., New York, U.S. Geological Survey Open-File rept. 79-1292, 14 p.

Zembrzuski, T. J., Jr., and Dunn, Bernard, 1979, Techniques for estimating magnitude and frequency of floods on unregulated streams in New York, excluding Long Island: U.S. Geological Survey Water-Resources Investigations 79-83, 66 p.

Dunn, Bernard, 1981, Hydraulic analysis of Chenango River, Broome County, New York, in relation to State Highway plan: U.S. Geological Survey Open-File Rept. 81-1020, 10 p.

Zembrzuski, T. J., Jr., 1981, Flood of November 26-27, 1979, in Essex County, New York: U.S. Geological Survey Open-File Rept. 81-1024, 10 p.

Polychlorinated Biphenyl Transport in Upper Hudson River (NY 77-046)



Date Project Began: February 1977

Date Project Ends: September 1982

Project Leader: Roy A. Schroeder

Field Location: Hudson River basin

Cooperating Agency: New York State Department of Enviromental Conservation

Problem: The discharge of PCB's into the Hudson River by industry has degraded the quality of the river. Most of the economic and ecological impact is in the Hudson estuary below Troy, N.Y. The importance of various reaches of the nonestuarine Hudson in contributing PCB's to the estuary is not known, nor are the effects of curtailing point-source discharge of PCB's or dredging the PCB-laden sediments from the nonestuarine Hudson.

Objective: (1) To study the role of four reaches of the nonestuarine Upper Hudson River in contributing PCB's to the estuary. (2) To establish a data base on the chemical quality of Hudson River water before dredging.

Approach: Loading of PCB's in the Upper Hudson River are calculated from measurements of concentration and discharge, and results are compared for each year since 1977 to determine changes and to establish a data base on chemical quality of the river before dredging to remove contaminated sediments begins in 1982.

Progress and Significant Results: PCB concentrations during the period of high discharge that accompanied rapid snowmelt in late February 1981 were higher than in most previous years at all stations except Rogers Island. Reduced concentrations at Rogers Island may be a result of some sediment-removal and sediment-stabilizations efforts immediately above Rogers Island. Average daily PCB load transported from the upper river to the estuary has remained between 3 and 5 kg, with only slight decrease since 1977.

Plans for Next Year: Monitoring will continue in 1982 at about the same level as from 1977-81. Dredging to remove contaminated sediments in the river reach between Rogers Island and Schuylerville is scheduled to begin in 1982. Samples will be collected to evaluate the impact on river water and drinking water both during and after dredging.

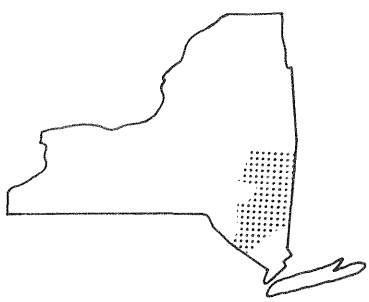
Completed Reports:

Turk, J. T., 1980, Applications of Hudson River basin PCB transport studies, in Baker, R. L., (ed.), Contaminants and sediments: Ann Arbor Science Publishers, v. 1, p. 171-183.

Turk, J. T., and Troutman, D. E., 1981, Relationship of water sources to water quality in the Hudson River, New York, during peak discharges to geologic characteristics of contributing subbasins: U.S. Geological Survey Water-Resources Investigations 80-108, 15 p.

_____, 1981, Polychlorinated biphenyl transport in the Hudson River, New York: U.S. Geological Survey Water-Resources Investigations 81-9, 11 p.

Flow in the Hudson River Estuary (NY 77-049)



Date Project Began: August 1977

Date Project Ends: September 1981

Project Leader: David A. Stedfast

Field Location: Hudson River basin

Cooperating Agencies: New York State Department of Environmental Conservation; New York City Department of Environmental Protection

Problem: Streamflow data on the Hudson River estuary are available only from daily records from the gage at Green Island (not tide affected) or by calculation of the approximate monthly net freshwater inflow at Poughkeepsie and the Battery. With continual water-resources development in the estuary, need for accurate data on total water movement at any point has developed. The collection and analysis of data, and development of a flow-simulation model will enable the USGS to provide discharge data over a large part of the estuary.

Objective: To develop a one-dimensional flow model to determine quantity and direction of flow at any given time and at any given cross section of the estuary between Albany and Poughkeepsie.

Approach: (1) To (a) determine appropriate instrumentation and locations for recording gages; (b) maintain close coordination with the USGS research team that is doing the Potomac estuary study; (c) establish three continuous gaging stations within the study reach; (d) determine channel geometry and volume of inflow throughout the estuary. (2) To use the above data in building a flow model to determine quantity and direction of flow during any given period at any site within the estuary. Results will be reviewed, and indicated adjustments will be made to the flow model.

Progress and Significant Results: Final report was completed; continuous synchronized stage data were collected at three tide gages.

Completed Reports:

Stedfast, D. A., 1980, Cross sections of the Hudson River estuary from Troy to New York City, New York: U.S. Geological Survey Water-Resources Investigations 80-24, 70 p.

Stedfast, D. A., Flow model of the Hudson River estuary, Albany to New Hamburg, New York: U.S. Geological Survey Water-Resources Investigations 81-55 (in press).

Integrated Lake/Watershed Acidification Study (NY 80-050)

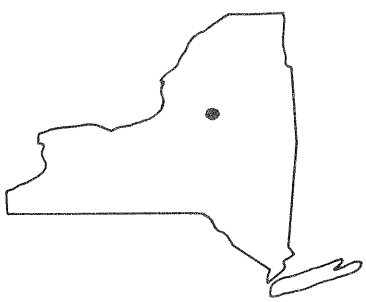
Date Project Began: September 1977

Date Project Ends: September 1982

Project Leader: Norman E. Peters

Field Location: Old Forge

Cooperating Agency: University of Virginia



Principal Contributing Agencies: Rensselaer Polytechnic Institute; Smith College; Colgate University; University of Maine; Cornell University (Department of Natural Resources and Department of Agronomy); Brookhaven National Laboratory; Tetra Tech, Inc.; Electric Power Research Institute (EPRI).

Problem: Runoff from acid rain within the last 30 years is believed to have had increasingly detrimental effects on lakes and streams in the Adirondack Mountains.

Objectives: To determine why Adirondack lakes do not respond equally to acidic atmospheric deposition by (a) defining and measuring the hydrologic components of the water budget; (b) determining the surface-water and ground-water flow patterns and the effect of each on lake-water chemistry; (c) monitoring soil moisture and soil temperature for use in estimating evapotranspiration and infiltration rates; and (d) investigating the chemical interactions in the saturated and unsaturated zones that contribute to acid production or neutralization.

Approach: Three lake basins--Woods Lake, with pH <5, Panther Lake, with pH >6, and Sagamore Lake, with pH 5 to 6, were selected for the study. The Geological Survey collects discharge data at inflows and outflows, ground-water stage from water-table observations, soil moisture from soil tensiometers, and lake levels from staff gages. These data are combined with other pertinent information such as precipitation quantity, aquifer thickness, and aquifer permeability that are collected by other members of the study to form a water budget for each of the basins. In addition, water-quality samples are collected from wells and some inflows, and the data are compared with other types of data such as soil water, surface water, lake profiles, precipitation, and throughfall, to provide a cohesive picture of the hydrologic and chemical changes of incoming acid precipitation as it moves through the watershed system.

Progress and Significant Results: A combination of annual chemical budgets, hydrologic properties of the lakes, and hydrologic properties of surface-water inlets and outlets indicate that the neutralization of acid precipitation is confined to the terrestrial environment. The acid basin contains shallower till deposits, a higher percentage of bedrock outcrop, and a less permeable aeolian silt deposit that mantles a more permeable till deposit. A combination of these physical attributes results in less contact time between the acidic atmospheric deposition and the neutralizing minerals in the soils and unconsolidated materials.

Plans for Next Year: Data collection will cease at the end of December 1981. A report comparing water budgets between the acid and neutral watersheds will be produced. Interpretation of the mineralogic and chemical interactions in the terrestrial environment will continue, and a report to summarize these findings will be produced.

Completed Reports:

Troutman, D. E., and Peters, N. E., 1980, Comparison of lead, manganese, and zinc transport in three Adirondack lake watersheds, New York, in Drablos, D. and Tollan, A. (eds.), Ecological impact of acid precipitation--

Proceedings of an international congress, Sandefjord, Norway, 1980: Oslo, Norway, SNSF Project, p. 262-263.

_____, Transport of iron, lead, manganese, and zinc in three Adirondack lake watersheds, in 2d Chemical Congress of North America: Proceedings, Aug. 1980, Las Vegas, Nev., (in press).

Galloway, J. N., Schofield, C. L., Hendrey, G. R., Peters, N. E. and Johannes, A. J., 1980, Sources of acidity in three lakes acidified during snowmelt, in Drablos, D., and Tollan, A. (eds.), Ecological impact of acid precipitation--Proceedings of an international conference, Sandefjord, Norway, 1980: Oslo, Norway, SNSF Project, p. 264-265.

Galloway, J. N., Schofield, C. L., Hendrey, G. R., Altwicker, E. R., and Troutman, D. E., 1980, An analysis of lake acidification using annual budgets, in Drablos, D., and Tollan, A. (eds.), Ecological impact of acid precipitation--Proceedings of an international conference, Sandefjord, Norway, 1980: Oslo, Norway, SNSF Project, p. 254-255.

Johannes, A. H., Galloway, J. N. and Troutman, D. E., 1980, Snowpack storage and ion release, in Drablos, D., and Tollan, A. (eds.), Ecological impact of acid precipitation--Proceedings of an international conference, Sandefjord, Norway, 1980: Oslo, Norway, SNSF Project, p. 260-261.

Galloway, J. N., Schofield, C. L., Hendrey, G. R., Peters, N. E. and Johannes, A. H., Lake acidification during spring snowmelt--process and causes (in review).

Galloway, J. N., Schofield, C. L., Peters, N. E., Hendrey, G. R. and Altwicker, E. R., Lake acidification in the Adirondacks (in review).

Drainage Area and Other Basin Characteristics of New York Streams (NY 78-057)

Date Project Began: October 1977

Date Project Ends: September 1983

Project Leader: Lloyd A. Wagner

Field Location: Statewide

Cooperating Agency: U.S. Army Corps of Engineers

Problem: Data on drainage-area size, as well as stream length and slope and the size of lakes and ponds within the drainage area, are needed for hydraulic and hydrologic studies of any given site. The drainage-area data are available for only a small percentage of sites within the State.

Objective: To promote uniformity and reduce discrepancy and contradiction among published values, and to make data on drainage areas and other basins characteristic of New York streams available to persons engaged in hydraulic and hydrologic studies.

Approach: Phase I of this study will be a compilation of all available drainage-area data; phase II will be the measurement of drainage areas and other basin characteristics such as river miles and slopes, from the latest USGS maps. This work will be done in accordance with the recommendations of the Water Resources Council, Hydrology Committee, in Committee Bulletins 4 and 14. Drainage areas at the mouth of all streams having a drainage area greater than 10 mi^2, and all named streams with a drainage area exceeding 5 mi^2, will be determined. Also, drainage areas on streams having significant hydraulic structures such as dams and bridges will be computed.

Progress and Significant Results: Phase I report was completed and is in press.

Plans for Next Year: To recompute and retabulate drainage areas in Lake Erie-Niagara River basin and streams tributary to Lake Ontario, including Oswego River basin.

Completed Reports:

Wagner, L. A., Drainage areas of New York Streams, by river basins--a stream gazetteer Part 1, data compiled as of October 1980: U.S. Geological Survey Water-Resources Investigations, Open-File Report 81-1055 (in press).

Hydrocarbon Tracer Reaeration-Coefficient Studies (NY 78-058)

Date Project Began: April 1978

Date Project Ends: March 1983

Project Leader: David A. Stedfast

Field Location: Statewide

Cooperating Agency: New York State Department of Environmental Conservation

Problem: Reaeration coefficients of streams receiving sewage are of major importance in determining water-treatment plant design and estimating the construction and operational costs. At present, these coefficients are determined by empirical methods that are expensive, time consuming, and yield only approximations of actual stream-reaeration coefficients. Indications are that hydrocarbon-tracer techniques give more accurate reaeration coefficients than currently used procedures and afford substantial savings in manpower.

Objective: To (a) calculate reaeration coefficients of selected streams through hydrocarbon tracers; (b) study relation between coefficients and

channel hydraulics; (c) develop an equation for unmeasured streams.

Approach: Hydrocarbon-tracer techniques will be used on selected streams, and hydraulic relationships will be used to develop a regional equation.

Progress and Significant Results: Reaeration measurements were made on Cowaselon Creek, Chenango River, Payne Brook, and Cayadutta Creek. A new reaeration-measurement technique of sampling during steady-state hydrocarbon gas concentrations was used on Cowaselon Creek with good results.

Plans for Next Year: (1) To make additional measurements on Cowaselon Creek and on several streams in New York State using the new steady-state technique. (2) To publish a data report on the reaeration measurements made on the Hudson River, Oswego River, and Canandaigua Outlet. (3) To complete the research and development of the new reaeration field measurement technique and to publish a report on the method.

Precipitation-Chemistry Monitoring Network for New York State (NY 80-071)

Date Project Began: October 1979

Date Project Ends: September 1982

Project Leader: Charles R. Barnes

Field Location: Statewide

Cooperating Agency: New York State Department of Environmental Conservation

Problem: Atmospheric precipitation transports significant quantities of beneficial as well as harmful chemicals. Data on annual loads delivered by precipitation are needed for geochemical budgets in basins and to discern long-term changes in precipitation quality. Exclusion of dry fallout during the interval between storms is necessary because it will alter the chemistry of water samples. Analysis of trends in precipitation chemistry in New York from data collected by the USGS since 1965 is needed to ascertain whether an increase in acidity has occurred.

Objectives: (1) To determine loads of selected chemical consituents transported by precipitation in New York. (2) To compare precipitation chemistry obtained from bulk (wet plus dry) fallout and wet fallout only. (3) To determine trends in chemical quality of bulk precipitation collected by USGS in New York since 1965.

Approach: To (a) continue a 12-station network for collection of bulk fallout and analyze monthly for major cations, major anions, macronutrients, selected heavy metals, and quantity; (b) establish automatic sensing wet/dry collectors at six of the above sites and analyze wet fallout on a storm basis and a water-wash of dry fallout monthly; and (c) statistically analyze USGS data for temporal trends in chemical quality of bulk precipitation.

Progress and Significant Results: Installation of six wet/dry collectors was completed. Hydrogen ion concentration in precipitation has increased only slightly in New York as a whole since 1965; however, in western New York the increase is significant. Sulfate ion concentrations have decreased, especially in urban areas. Nitrate ion concentrations are not changing.

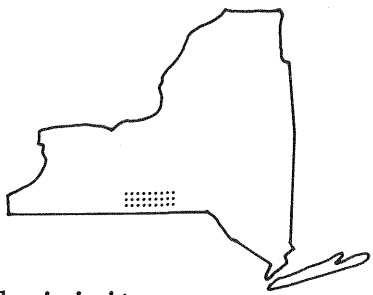
Plans for Next Year: Chemistry from bulk and wet-only sampling will be compared. The network will continue to operate 12 bulk collectors and 6 wet/dry collectors. Data for 1965-1980 will be compiled and published.

Completed Reports:

Peters, N. E., Schroeder, R. A., and Troutman, D. E., 1981, Temporal trends in the acidity of precipitation and surface waters of New York: U.S. Geological Survey Water-Supply Paper (in press).

Barnes, C. R., Schroeder, R. A., and Peters, N. E., 1981, Trends in acid precipitation in New York, 1965-78: American Chemical Society, Division of Environmental Chemistry, Conf. proc. (in review).

Aquifer Model for Binghamton Area, Susquehanna River basin (NY 79-074)



Date Project Began: October 1979

Date Project Ends: September 1982

Project Leader: Allan D. Randall

Field Location: Binghamton, Johnson City, Endicott, and vicinity

Cooperating Agency: Susquehanna River Basin Commission

Problem: The Susquehanna River Basin Commission has responsibility for management of water resources in the basin, including approval of proposed ground-water withdrawals exceeding 0.1 Mgal/d. The Commission believes that aquifer models would help predict effects of new wells on existing wells and river flows. New withdrawals are most likely near urban areas, where ground-water use is already substantial, and only in such areas can the hydrologic data be obtained. The communities of Binghamton, Johnson City, Endicott, and Vestal constitute the largest urban area in the Susquehanna basin in New York for which no model has yet been prepared.

Objective: To prepare and calibrate a digital model of the study area.

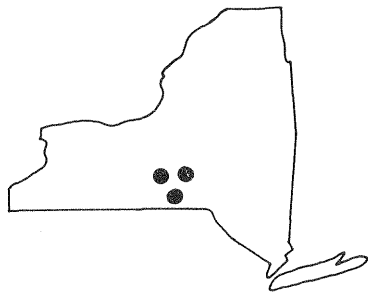
Approach: To (a) collect the data most needed for calibration of an aquifer model, including an updated well inventory, pumpage and water-level data, pumping tests, and head measurements beneath streams near production wells; (b) compile a preliminary version of the aquifer model to simulate shallow and deep gravels that are locally separated by clay layers; (c) determine sensitivity of the model to variation in each aquifer property; (d) compile a sub-

model for Clinton Street-Ballpark aquifer because of excellent data for calibration; and (e) modify code as needed to fit local data and conditions, and refine the models.

Progress and Significant Results: In 1981, test wells were drilled at five locations on riverbanks or islands near municipal well fields. Water levels resulting from normal municipal pumping and during special tests were observed in these and other wells. Synoptic water-level measurements were made in April and October in all accessible wells. A suitable model has been developed.

Plans for Next Year: To (a) analyze aquifer tests and geologic data; (b) compile and calibrate model; and (c) write report.

Detailed Ground-Water Studies in Selected Areas, Susquehanna River basin, New York (NY 80-081)



Date Project Began: October 1979

Date Project Ends: September 1982

Project Leader: Richard J. Reynolds

Field Location: Central New York

Cooperating Agency: Susquehanna River Basin Commission

Problem: Sand and gravel aquifers in valleys cut off from major streams form a significant source of water for municipal or industrial water supply or for low-flow augmentation because the aquifers are not hydraulically connected to the stream. One such aquifer at Cortland, previously studied, requires more detailed information over a larger area to aid water-management planning. Reconnaissance studies of separated aquifers at Kattellville and Smyrna are needed to assess water-yielding potential at those sites.

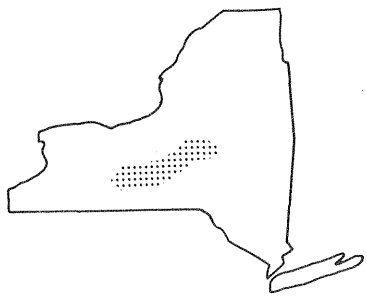
Objectives: To (a) update and expand a digital model of part of the Cortland urban area, including the Otter Creek aquifer, and (b) investigate the geohydrology of separated aquifers at Kattellville and Smyrna.

Approach: (1) To revise the model of Cortland urban area to provide more realistic simulation of hydrologic boundaries and leakage from Otter Creek using newly developed modeling techniques. (2) To extend the area represented on the model to cover the Tioughnioga River area. (3) To determine aquifer diffusivity by installing river-bank wells and monitoring floods. At Kattellville, the well inventory will be updated and test wells drilled along the river bank to determine aquifer lithology and diffusivity. Long-term observation wells will be established and aquifer tests run. Similar data collection at Smyrna will be supplemented by geophysical studies. Reports on each site will be written and published.

Progress and Significant Results: Smyrna: Well inventory and test drilling were completed and supplemented with seismic-refraction profiles. A long-term observation well was installed. Water-table, surficial geology, depth-to-bedrock, and saturated thickness maps were prepared. Report is in progress. Cortland: Six observation wells to calculate aquifer diffusivity at three sites were installed, and water levels are being monitored. Two tests holes were drilled to confirm the presence of a confining unit. Well inventory was completed. Seepage run was made on the Tioughnioga River near Cortland to determine the ground-water contribution. Available flood-wave data are being analyzed. Model grid was expanded to include area along the river; coding of model is in progress. Kattleville: A test hole was drilled to bedrock and a long-term observation well was installed.

Plans for Next Year: (1) To write report on stratified-drift aquifer near Smyrna. (2) To calibrate expanded Cortland model, perform sensitivity analysis, make predictive runs, and write report.

Headwater Valley Aquifers in the Susquehanna River Basin, New York (NY 80-083)



Date Project Began: October 1979

Date Project Ends: September 1982

Project Leader: Allan D. Randall

Field Location: Central New York

Cooperating Agency: Susquehanna River Basin Commission

Problem: Late summer flows of streams in the Susquehanna River Basin commonly are inadequate for uses such as water supply or sewage dilution. Ground water has been proposed as an alternative to costly surface reservoirs for streamflow augmentation, and for alternative or seasonal water supplies in low-flow periods, but because productive aquifers adjacent to large streams are normally in hydraulic connection with the streams, induced infiltration from pumping the aquifers would largely nullify streamflow gains. At least 16 broad valleys along the northern divide of the Susquehanna River basin, remote from large streams, contain saturated sand and gravel. Hydrologic characteristics of these aquifers are not known well enough to evaluate their potential yield to meet seasonal demands.

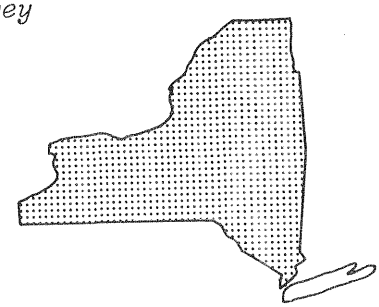
Objectives: To quantitatively describe one or two representative drift aquifer(s) along the divide of the Susquehanna River basin and assess the potential effects on streamflow that would result from large seasonal ground-water withdrawals so that a better understanding of the potential for such development in similar aquifers can be obtained; also to briefly describe aquifer geometry in similar valleys not studied in detail.

Approach: (1) To conduct reconnaissance of headwater-valley aquifers with seismic exploration and well-data compilation and select representative aquifers for quantitative study after consultation with the Susquehanna River Basin Commission. (2) To measure base flow of minor stream(s) draining the selected aquifers to evaluate yield under present conditions. (3) To simulate the aquifers with a two-dimensional digital model, calibrate with stream and observation-well data, and assess effects of aquifer pumping through model analyses. (4) To publish a report summarizing the geohydrology, the model analysis, and applicability of results to other headwater aquifers.

Progress and Significant Results: Well inventory and geologic reconnaissance have been completed in 13 headwater valleys, and interpretations have been drafted for some. A common feature of several valleys is a southward-thinning wedge of till at or near the top of the outwash near the divide. Evaluation of streamflow measurements from one valley have led to estimates of underflow and ground-water yield.

Plans for Next Year: To complete reconnaissance, data collection, and interpretation, begin quantitative evaluation of three selected valleys, and write report.

New York Cooperative Snow Survey (NY 80-086)



Date Project Began: October 1981

Date Project Ends: September 1982

Project Leader: Ronald V. Allen

Field Location: Statewide excluding Long Island

Principal Contributing Agencies: New York State Departments of Environmental Conservation and Transportation; Hudson River-Black River Regulating District; City of New York, Department of Environmental Protection.

Problem: Data on runoff from spring snowmelt are important to management of hydroelectric operations, flood forecasting, and reservoir control. Snow-cover information is needed for predicting the magnitude of spring runoff and preparing for runoff extremes. The increasing acidity of surface waters has been correlated with fish toxicity. Acids stored in the snowpack are released during snowmelt, causing a sharp increase in the acidity of surface waters. Therefore, data on the distribution of chemical constituents of the snowpack are needed to assess potential loads of toxic chemicals during snowmelt.

Objectives: To (a) compile and interpret snowcover information on approximately 400 snow courses throughout the State, (b) prepare summaries of synoptic measurements, (c) publish statistical analyses of selected snow courses for 1961-80, and (d) determine the distribution of hydrogen ion, chloride, and

specific conductance in the snowpack and its subsequent changes by accumulation, melting, and sublimation over the winter period.

Approach: Data from 400 sites, provided from 11 contributing agencies, will be compiled. A summary of current conditions is issued Friday of each survey week, six times each winter. The compilation of historical data (snow depth and water equivalent) will be done by rearranging the data base such that the files will be compatible with standard statistical computer programs. Customizing the programs will enable variable comparison combinations of sites within river basins. Summary tables and maps of the chemical quality of snowpack samples will be produced.

Progress and Significant Results: Data-collection activities were diminished by the selection of key snow courses so that field-measurement responsibility of the USGS was reduced from 81 to 21 snow courses. Preliminary interpretation of last year's snow sampling results indicates that the pH of snowcover is very low at the higher elevations. Higher specific-conductance values were observed in samples having higher pH, which suggests that neutralization is caused by dry particulate matter that accumulated in the snowpack. For the statistical data summary, a method has been developed to perform a reliable statistical analysis of historical snow-quantity data.

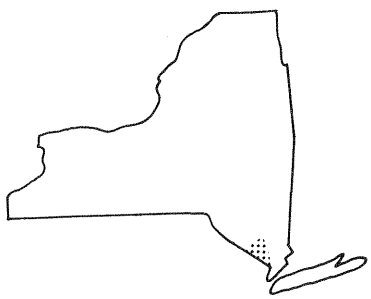
Plans for Next Year: To publish a statistical summary of snow-survey data representing water years 1961-80 for selected river basins, using the approach developed for the Delaware River basin. A report will also be produced summarizing the distribution and changes in the chemical quality of the snowpack during the winters of 1981 and 1982.

Completed Reports:

U.S. Geological Survey, New York cooperative snow survey: Albany, N.Y. (Compilation and summary of snow data, issued monthly during winter since 1937.)

_____, Eastern Snow Conference, Snow cover surveys: National Weather Service. (Annual summary of snow-cover data for New York, issued since 1941.)

Evaluation of Rainfall-Runoff Data Network, Rockland County (NY 80-087)



Date Project Began: October 1979

Date Project Ends: July 1982

Project Leader: Richard Lumia

Field Location: Rockland County

Cooperating Agency: Rockland County Drainage Agency

Problem: Development in Rockland County has increased flooding and complicated the management of flood plains, drainage systems, and bridge and culvert designs. The Rockland County Drainage Agency has requested an evaluation of rainfall-runoff data collected by the U.S. Geological Survey since 1975 and a determination of what further data are necessary to develop a predictive model for sound management of flood plains, drainage systems, and structural designs.

Objectives: To (a) evaluate the current rainfall-runoff data network in Rockland County, and (b) determine what additional data will be needed to develop the capability for estimating flood probabilities on selected streams.

Approach: Each site will be evaluated with respect to reliability of stage-discharge relationships and validity of rainfall data. Preliminary modeling of acceptable watersheds will be done with the HEC-1 Flood Hydrograph Package to define rainfall-runoff relationships. The relative accuracy of storm hydrograph prediction will dictate whether additional data are needed. If warranted, a procedure for selection of further study sites will be defined. Nine of the 12 rainfall-runoff sites will be discontinued; data from the remaining three will be used for additional model verifications.

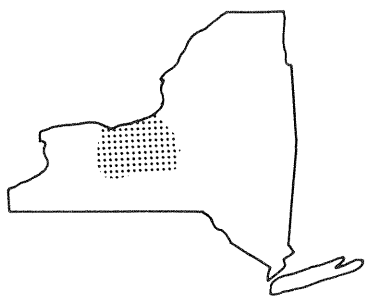
Progress and Significant Results: Rainfall-runoff models were successfully developed for 10 of the 12 rainfall-runoff sites using HEC-1. The average difference between observed and simulated peak discharges for all sites and events decreased from 41.7 percent to 25.0 percent after seasonal adjustment of model parameters. Results indicate that the models may be useful in updating flood-frequency estimates at each site.

Plans for Next Year: Flood-frequency estimates will be determined for each modeled site. Long-term rainfall data from Central Park will be applied to each model, and simulated annual peak flows will be generated. Flood frequencies will be determined through standard log-Pearson type III analyses.

Completed Reports:

Lumia, Richard, 1981, Evaluation of rainfall-runoff data network, Rockland County, New York: U.S. Geological Survey Water-Resources Investigations 81-49 (in press).

Computation of Inflows and Outflows of Eight Regulated Lakes, Oswego River Basin, New York (NY 80-092)



Date Project Began: January 1980

Date Project Ends: March 1981

Project Leader: Richard Lumia

Field Location: Oswego River basin

Cooperating Agency: U.S. Army Corps of Engineers

Problem: Daily inflows and outflows of eight regulated lakes and three river sites for 1930-79 are needed to aid in future evaluations of lake-regulation procedures in the Oswego River basin.

Objectives: To (a) compile data available in files of USGS, State, local, and private sources; (b) compute daily inflows to the eight lakes; and (c) compute daily outflows as necessary.

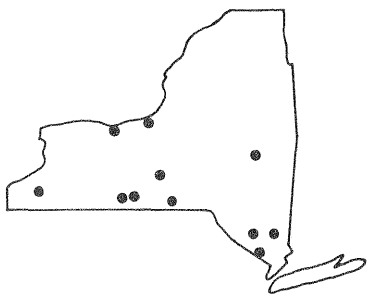
Approach: Available data will be retrieved and (or) compiled from USGS computer files and files of State, local, and private sources. Inflows (minus evaporation and possible ground-water leakage) will be computed from the basic continuity equation: Inflow = outflow $\pm$ Δ storage $\pm$ diversions. A technique for evaluating computed inflows will be developed.

Progress and Significant Results: Daily inflow and outflow values were computed for the eight regulated lakes. A technique for smoothing lake-level curves was developed to improve estimates of daily change in lake storage. Statistical analyses indicate that the smoothing technique significantly improved the reliability of computed inflows. For days when daily outflow or lake-level data were missing, inflows were estimated through regression analyses.

Completed Reports:

Lumia, Richard and Moore, R. B., 1981, Computation of inflows and outflows of eight regulated lakes in the Oswego River basin, New York: U.S. Geological Survey Water-Resources Investigations (in review).

Hydrology of Selected Major Aquifers in Upstate New York (NY 81-093)



Date Project Began: October 1980

Date Project Ends: December 1981

Project Leader: Roger M. Waller

Field Location: New York excluding Long Island

Cooperating Agency: New York State Department of Health

Problem: The New York State Department of Health (NYSDH) is charged with protecting underground sources of drinking water from contaminants that may be introduced through injection of fluid wastes (other than domestic wastewater). NYSDH has selected 11 major aquifers that supply the greatest number of people (over 1/2 million) via public water-supply systems. All aquifers selected tap unconsolidated deposits, and most are associated with stream valleys. The aquifers must be delineated and their water source and quality characterized to provide a basis for use in future siting of waste-disposal systems.

Objective: (1) To provide hydrogeologic information on 11 selected aquifers in upstate New York as part of the NYSDH Underground Injection Control program. Specifically, the project will describe each aquifer in terms of (a) hydrologic characteristics, area, and thickness of aquifer and overlying material; (b) ground-water flow system, including recharge and discharge areas and hydrologic boundaries; (c) areas susceptible to contamination; (d) general water quality; (e) land use; (f) needs for additional information; and (g) other pertinent characteristics. (2) To compile a bibliography of published and other sources of information on each aquifer.

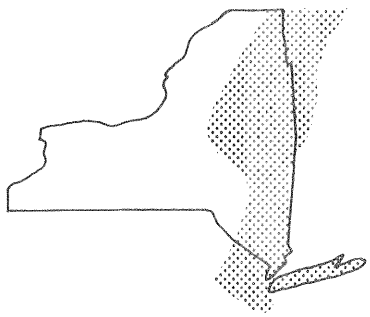
Approach: For each aquifer, available maps and reports, supplemented by well data from files of various agencies and by reconnaissance field surveys, will be used to produce maps and cross sections showing the ground-water flow system, areas susceptible to contamination, estimated well yields, and geologic conditions. Each set of maps will be released to the open file. A final report containing a text and maps on each aquifer will be prepared.

Progress and Significant Results: The first aquifer map was published; the rest are near completion. First draft of atlas is nearly complete.

Completed Reports:

Miller, T. S. and others, 1981, Geohydrology of the valley-fill aquifer in the Cortland-Homer-Preble area, Cortland and Onondaga Counties, New York: U.S. Geological Survey, Open-File Report 81-1022 (7 sheets).

Headwater Locations (NY 81-096)



Date Project Began: October 1980

Date Project Ended: September 1981

Project Leader: Benjamin B. Eissler

Field Location: Southeastern New York and Northern New Jersey

Cooperating Agencies: U.S. Army Corps of Engineers

Problem: The Corps of Engineers is required to make regulatory decisions based on the location of headwaters (the stream site upstream from which average flow is less than 5 ft^3/s). The jurisdictional area of the Corps' New York District encompasses streams tributary to Lake Champlain (within the U.S.) and streams tributary to the Hudson River and the Atlantic Ocean between the Hudson and the Manasquan River basin in New Jersey.

Objective: To provide the Corps of Engineers with a list of the location of headwater points on each stream within the jurisdictional boundaries, and maps showing basin boundaries and location of headwater points.

Approach: For the Hudson, Lake Champlain, and New Jersey basins, regression analyses will be made from records of gaging stations in drainage areas of less than 50 mi^2 and low-flow partial-record stations in areas less than 20 mi^2. For streams on Long Island, mean annual flow will be based largely on channel length and flows at gaging-station and partial-record-sites. Formula(s) developed from the regression analysis will yield estimated average runoff per mi^2, which will then be used to establish the headwaters point of 5 ft^3 average flow on each stream.

Progress and Significant Results: Final report has been prepared.

Completed Reports:

Eissler, B. B., Headwater locations of streams in Lake Champlain, Hudson River, and Atlantic Slope basins in New York and Northern New Jersey: U.S. Geological Survey, Open-File Rept. (in review).

Flood Frequency in Urbanized Stream Basins (NY 81-097)

Date Project Began: January 1981

Date Project Ends: September 1983

Project Leader: David A. Stedfast

Field Location: Statewide

Cooperating Agency: New York State Department of Transportation

Problem: To avoid or minimize the potential for flooding in newly developing areas, community planners, land developers, and design engineers need to know the effects of urbanization on storm flows. In addition, the replacement of inadequate hydraulic structures in urbanized areas requires accurate estimates of a design flood. No comprehensive studies to quantify the effect of urbanization on floodflow characteristics of streams in New York have been made.

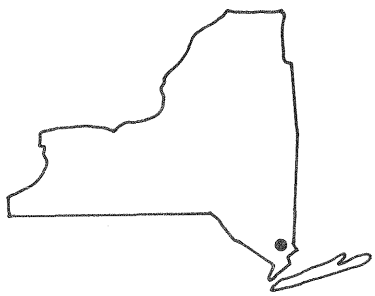
Objective: To (a) evaluate published methods of determining flood-frequency relationships for ungaged streams in urban areas (streamflow data from gaged streams having urbanized basins will be used to test the applicability of each method), and (b) identify those methods that yield the best predictions for urbanized basins. If none are deemed appropriate, efforts to develop a method suitable for New York streams will be proposed.

Approach: For at least 10 sites, the HEC-1 Flood Hydrograph Package will be used to synthesize long-term, homogeneous peak discharge data. The synthetic record will be used in Log-Pearson Type III analyses to develop flood frequency curves. These curves will be compared to those derived from the various selected estimating techniques. Results will be evaluated, and methods producing the best results will be documented.

Progress and Significant Results: (1) Identified 19 urban gaged streams for possible use in study. (2) Completed literature search for published techniques for determining flood-frequency discharges for ungaged urban watersheds. (3) Measured most basin characteristics of gaged sites.

Plans for Next Year: To (a) complete collection of basin characteristics; (b) synthesize long-term discharge data for those with short periods of record and those that have undergone significant changes in urbanization; and (c) determine flood-frequency discharges for all gaged urban streams in New York.

Contaminants in Saw Mill River (NY 81-100)



Date Project Began: October 1980

Date Project Ends: September 1983

Project Leader: Robert J. Rogers

Field Location: Westchester County

Cooperating Agency: Westchester County Department of Health.

Problem: Studies of bottom material from the Saw Mill River suggest a downstream enrichment in heavy metals and organochlorine compounds, which could present a health hazard to users of the Yonkers Public Water Supply and pose a general management concern over the deterioration of river quality.

Objective: To (a) determine which contaminants are present, (b) establish their association with sediment, (c) formulate predictions on their mobility and concentration in the river, and (d) identify potential sources.

Approach: (1) Bottom material will be analyzed for heavy metals, pesticides and other synthetic organic chemicals, and macronutrients. (2) Similar analyses will be done on various size fractions of bottom material from a few locations. (3) Similar analyses will be done on suspended material concentrated by centrifugation. Information on association of contaminants with various size fractions will be used to predict their mobility. (4) Statistical tests on bottom analyses will be used to distinguish between nonpoint urban sources and point sources such as illegal dumping or industrial discharge.

Progress and Significant Results: Bottom sediment samples from 19 sites were analyzed for heavy metals and macronutrients. Sediment from six sites was separated into six size fractions, and each fraction was analyzed separately. Sediment samples from 11 sites were analyzed for pesticides and organochlorine compounds; also, samples from five sites were analyzed for "priority pollutants." Analytical results from the initial sampling indicate enrichment by heavy metals downstream.

Plans for Next Year: Soil samples will be collected in the basin to determine background levels of metals. Suspended-sediment samples will be collected and analyzed. Experiments will be conducted to evaluate the effectiveness of ceramic tiles as scavengers of heavy metals in the stream and as tracers of sources of heavy metals.

Evaluation of Surface-Water Network (NY 81-101)

Date Project Began: October 1980

Date Project Ends: September 1982

Project Leader: Thomas J. Zembrzuski, Jr.

Field Location: Statewide

Cooperating Agency: New York State Department of Environmental Conservation.

Problem: Each year, allocation of manpower and (or) funding require decisions on the need for each measurement station in the various streamflow networks (daily discharge, crest-stage gage, and low flow). The decisions cannot be made without evaluation of the accuracy, need for, and Federal interest in data produced from each gage.

Objective: (1) To prepare a summary of all surface-water data-collection activities, including purpose and cooperating agencies, and determine adequacy of present records for each site to fulfill the stated purposes. (2) Through consultation with cooperators and evaluation of the accuracy of data on runoff characteristics at each site, determine the economic value of continuing data-collection activities. (3) Prepare a report on each station indicating reasons for continuation, benefit of record, and Federal interest.

Approach: (1) Review files and consult with cooperators to determine the type and amount of data needed from each station. (2) Determine whether the data will improve accuracy of runoff statistics, and determine through regression analyses how well the data can be transferred to ungaged sites. (3) Use published techniques to decide what type of data-collection program is needed for each basin, and evaluate which gages should be continued and where additional gages are needed. (4) Prepare a report summarizing the need for data from each present station, and the need for additional sites.

Progress and Significant Results: Updated streamflow characteristics were entered into the basin-characteristics file. Groundwork for entering surface-water gaging-station inventory into computer file has been prepared.

Plans for Next Year: To (a) complete summary of surface-water gaging activities; (b) perform regression analyses to test how well data can be transferred to ungaged sites; (c) evaluate adequacy of network; and (d) prepare report.

Acid Precipitation Bibliography (NY 81-107)

Date Project Began: April 1981

Date Project Ended: September 1981

Project Leader: Denise A. Wiltshire

Funding: Federal program

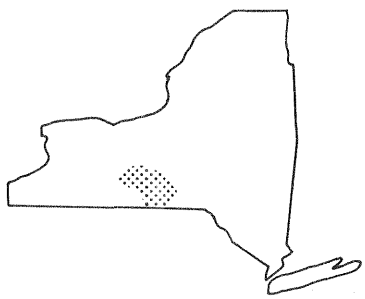
Problem: Studies of the ecological impact of acidic atmospheric deposition (acid precipitation) have increased dramatically in recent years. As the literature becomes more prolific and diverse, its accessibility becomes more difficult. An information source or guide to published literature would facilitate the study of this widespread environmental phenomenon.

Objective: To (1) review, assess, and annotate the pertinent literature on the environmental effects of acidic atmospheric deposition, and (2) publish an annotated bibliography.

Approach: To (a) continue computerized searches of bibliographic data bases such as "GEOREF" and "Selected Water Resources Abstracts" that began in 1978 for the Integrated Lake/Watershed Acidification Study (project 050); (b) evaluate references for relevance; (c) develop a list of key words as the basis of a systematic subject arrangement of references; (d) write annotations of each relevant article based on the abstract, introduction, and summary; (e) store and code information on magnetic disk to provide automated access by key word and author(s), and (f) publish the material as a bibliography in the USGS Circular series.

Progress and Significant Results: Computerized literature searches were conducted and the results reviewed. About 800 references were selected for the bibliography. Annotations and subject indexing are underway.

Bedrock-Well Cluster Study (NY 81-110)



Date Project Began: June 1981

Date Project Ends: September 1982

Project Leader: Allan D. Randall

Field Location: South-central New York

Funding: Federal program

Problem: Most of south-cental New York is an upland where many domestic wells tap shale bedrock beneath poorly permeable glacial till. Numerous housing clusters that have developed in the upland are supplied by wells that yield adequate water individually but, where closely spaced, may collectively overtax the bedrock water supply. An evaluation of yields from the bedrock is needed to properly determine maximum density of cluster housing.

Objective: To (1) evaluate the effects of size, spacing, density, and location of housing clusters on ground-water levels, yields, and quality, and (2) suggest optimum design of cluster-housing developments based on available water supply.

Approach: In the initial phase, case histories of three housing clusters will be evaluated. The potentiometric-surface configuration and any yield or water-quality problems will be studied in relation to rate and distribution of withdrawals; hydraulic conductivity will also be calculated. In the second phase, information on additional cluster housing (collected as part of planned project to evaluate the bedrock aquifer in the Susquehanna basin) will be incorporated in an analysis of design and management of well clusters.

Progress and Significant Results: Analysis of housing clusters was completed; a nontechnical report is in preparation.

Plans for Next Year: To complete report and undertake the second phase if companion project (083) is funded.

Northeastern Glacial Valley Aquifer Analysis (NR 81-123)

Date Project Began: September 1981

Date Project Ends: September 1986

Project Leader: Forest P. Lyford

Field Location: Northeastern U.S. excluding Long Island

Funding: Federal Program

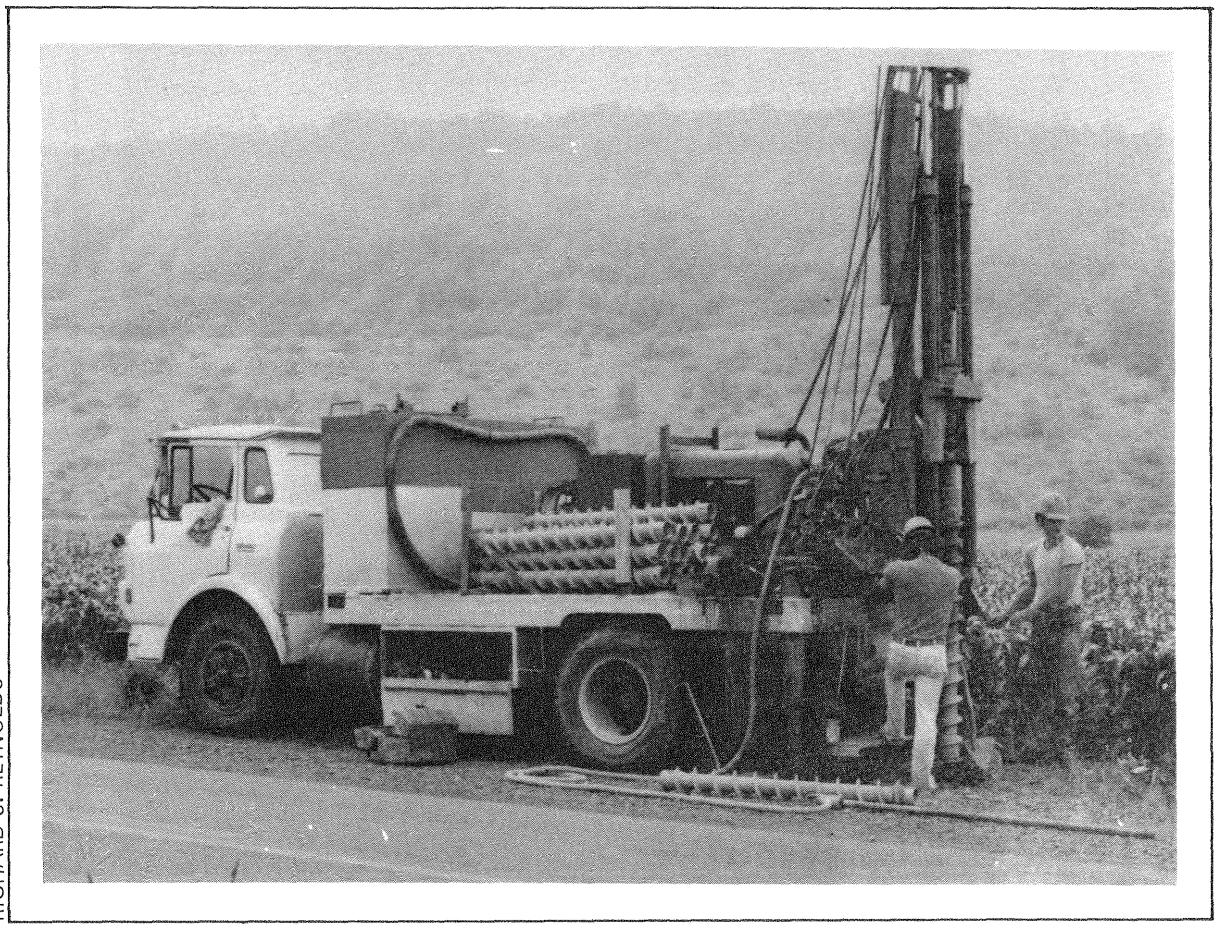
Problem: Heavily populated parts of the Northeast face problems in providing adequate quantities of water for industrial and municipal users, especially during periods of drought. Glacial valley deposits yield large quantities of ground water for many uses; additional ground-water development may be possible in many areas. A study is needed to assess the availability of ground-water resources in the Northeast and to develop methods for predicting the effects of pumping and climate on quantity and quality.

Objectives: (1) To describe the distribution and general character of glacial-valley aquifers in New York, Ohio, Pennsylvania, New Jersey, Connecticut, Rhode Island, Massachusetts, vermont, New Hampshire, and Maine. (2) To describe the factors and processes controlling the occurrence, flow, chemical quality, and

development potential of ground water throughout the area. (3) To classify the potential for water production from aquifers on the basis of such factors as depositional history, stream-connection characteristics, present rates of withdrawal, and water quality. (4) To develop modeling or other techniques to predict effects of pumping.

Approach: The study will use available water-use, hydrologic, and water-quality data to describe the distribution and characteristics of aquifers. Insofar as possible, aquifers or basins will be classified into categories according to common hydrologic characteristics. The factors and processes controlling ground-water flow and quality will be studied through simulation of representative aquifers or basins of each category. Available techniques for data storage, retrieval, and analysis will be used to process large quantities of certain types of data such as water withdrawals and water quality.

Plans for Next Year: To (a) assemble a staff of three hydrologists in addition to the project leader; (b) solicit project proposals from USGS staff in the project area, and (c) prepare a project-planning document.



RICHARD J. REYNOLDS

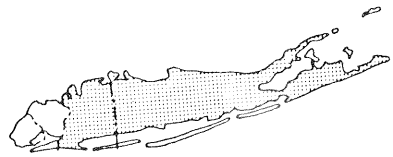
Figure 3.--Geological Survey auger rig drilling test hole for observation well near Cortland, N.Y.

Syosset Office Projects

EDWARD T. OAKSFORD

Figure 4.--Meteorological station at Meadowbrook artificial-recharge site.

Analysis of Long Island Hydrologic Data (NY 65-023)



Period of Project: Continuous since July 1964

Project Leader: George W. Hawkins

Field Location: Nassau and Suffolk Counties

Cooperating Agencies: Nassau County Department of Public Works; Suffolk County Department of Health Services; Suffolk County Water Authority.

Problem: The ground-water reservoir underlying Long Island is the sole source of freshwater for more than 3 million people. Declining water levels, salt-water encroachment into aquifers, and contamination from industrial and domestic wastes and agricultural practices pose a serious threat to this water supply. To monitor the ground-water reservoir, data are systematically collected at more than 500 observation wells and more than 70 surface-water sites. Monitoring alone is insufficient; the data must be continually analyzed and interpreted to provide water-management agencies with a basis for making sound decisions.

Objectives: (1) To support all local computer hardware and systems software for office projects and personnel. (2) To reduce the massive quantities of data to machine-readable form and to develop and support software for storing, retrieving, and manipulating the data for use by USGS hydrologists and technical personnel of cooperating agencies. (3) To support one-time requests for data analyses that sometimes inspire new projects and reports.

Approach: (1) To plan and conduct investigations of computer instrumentation and data processing techniques to provide efficient, economical processing of hydrologic and administrative data. (2) To analyze, design, and develop new methods and systems to support and improve efficiency of scientific investigations, data collection, and administrative activities of the District.

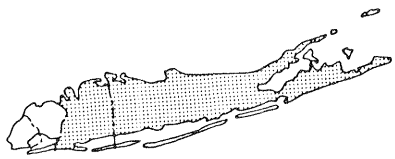
Progress and Significant Results: Hardware has been integrated and software has been written to monitor numerous water-quality constituents at a remote recharge facility. A water-qualtity program was developed to compare new laboratory data with the site's questionable data. A program was written to produce pages for the water-level section of the annual data report without cutting or splicing. A map of the Northeastern region was digitized.

Plans for Next Year: Continued support of project objectives. Additional data will be stored in the well data base.

Completed Reports:

Hawkins, G. W., 1979, Processing groundwater-level data by digital computer: Hydrological Sciences Bull., v. 24, no. 4, p. 529-538.

Evaluation of the Quality of Water on Long Island (NY 65-024)



Period of Project: Continuous since July 1964

Project Leader: William J. Flipse, Jr.

Field Location: Nassau and Suffolk Counties

Cooperating Agencies: Suffolk County Department of Health Services; Suffolk County Water Authority; Nassau County Department of Public Works.

Problem: Ground water is the only source of supply for most of Long Island. Urbanization has radically altered its chemical quality, particularly in the western part of the two-county area. Systematized collection and interpretation of water-quality data are needed to assist in sound water-management decisions for Long Island.

Objective: To evaluate the natural physical and chemical character of water on Long Island and the effects of man's activities on water quality.

Approach: To review and interpret available data and to collect additional data where needed for interpretation and definition of water-quality trends.

Progress and Significant Results: N^{15}/N^{14} ratios of nitrate in ground water under fertilized fields, and nitrogenous species at various steps in the sewage-treatment process, were described, interpreted, and published.

Plans for Next year: To (a) review well-characteristics data and water-quality data to identify wells being influenced by sources of ground-water contamination, and (b) compare ground-water and surface-water data to identify water-quality characteristic of Long Island or its subregions.

Reports Completed in Last 5 Years:

Katz, Brian, Ragone, S. E., and Harr, C. A., 1977, Nitrogen in water in Nassau and Suffolk Counties, Long Island, New York: U.S. Geological Survey Open-File Rept. 77-433, 46 p.

Kreitler, C. W., Ragone, S. E., and Katz, B. G., 1977, Nitrogen isotope ratios of ground water nitrate, Long Island, New York (abs.): National Water Well Association mtg., 1 p.

Ragone, S. E., Katz, B. G., Lindner, J. B., and Flipse, W. J., 1977, Chemical quality of ground water in Nassau and Suffolk Counties, Long Island, New York--1952 through 1976: U.S. Geological Survey Open-File Rept. 76-845, 93 p.

Reynolds, Richard, and Ragone, S. E., 1977, Water-quality data for Nassau and Suffolk Counties, New York--July 1974 to September 1975: U.S. Geological Survey Open-File Rept. 77-154, 37 p.

Katz, B. G., Ragone, S. E., and Lindner, J. B., 1978, Monthly fluctuations in the quality of ground water near the water table in Nassau and Suffolk Counties, Long Island, New York: U.S. Geological Survey Water Resources Investigations 78-41, 38 p.

Kreitler, C. W., Ragone, S. E., and Katz, B. G., 1978, N^{15}/N^{14} ratios of ground-water nitrate, Long Island, New York: Ground Water, v. 16, no. 6, pp. 404-409.

Katz, B. G., 1979, Background organic-chemical quality of a sole-source aquifer intended for artificial recharge on Long Island, N.Y. (abs.): EOS, v. 60, no. 46, H71.

Katz, B. G., and Krulikas, R. K., 1979, Analyses of ground water by different laboratories--a comparison of test results: U.S. Geological Survey Open-file Rept. 79-1063, 8 p.

Katz, B. G., Lindner, J. B., and Ragone, S. E., 1980, A comparison of nitrogen in shallow ground water from sewered and unsewered areas, Nassau County, New York, from 1952-76: Ground Water, v. 18, no. 6, p. 607-616.

Katz, B. G., and Mallard, G. E., 1980, Chemical and microbiological monitoring of a sole-source aquifer intended for artificial recharge: U.S. Geological Survey Open-File Rept. 80-567, 18 p.

Ragone, S. E., Katz, B. G., Kimmel, G. E., and Lindner, J. B., 1980, Nitrogen in ground water and surface water in sewered and unsewered areas, Nassau County, New York: U.S. Geological Survey Water Resources Investigations 80-21, 64 p.

Flipse, W. J., Jr., Katz, B. G., Lindner, J. B., and Markel, R., Assessment of nitrogen sources in ground water in a residential community in central Long Island, New York: Ground Water (in review).

Hydrologic and Water-Quality Effects of Artificial Recharge with Reclaimed Water on the Operation of Recharge Basins and Wells, Nassau County (NY 76-037)

Date Project Began: July 1975

Date Project Ends: September 1982

Project Leader: Edward J. Koszalka

Field Location: Central Nassau County

Cooperating Agency: Nassau County Department of Public Works

Progress and Significant Results: Various management alternatives have been assessed with use of the existing regional ground-water model. Two sub-regional models have been successfully coupled to the regional model. A computer program to simulate radial flow is in press and a report on its use for pump-test analysis is in review. The appropriateness of using the Survey's two-fluid model for study of Montauk is under study in conjunction with another project.

Plans for Next Year: Work will begin on an improved three-dimensional ground-water flow model that will include the Lloyd aquifer, which was not included in previous models. Streamflow estimates used in the model will be improved by use of stremflow correlations of baseflows of small ungaged streams. Management simulations will be made on the already developed models for the cooperating agencies.

Reports Completed in Last 5 Years:

Getzen, R. T., 1977, Analog-model analysis of regional three-dimensional flow in the ground-water reservoir of Long Island, New York: U.S. Geological Survey Professional Paper 982, 49 p.

Harbaugh, A. W., and Getzen, R. T., 1977, Stream simulation in an analog model of the ground-water system on Long Island, New York: U.S. Geological Survey Water Resources Investigations 77-58, 15 p.

Harbaugh, A. W., and Reilly, T. E., 1977, Analog-model analysis of effects of waste-water management on the ground-water reservoir in Nassau and Suffolk Counties, New York, Report III--Reduction and redistribution of ground-water pumpage: U.S. Geological Survey Open-File Rept. 77-148, 24 p.

Kimmel, G. E., Ku, H. F. H., Harbaugh, A. W., Sulam, D. J., and Getzen, R. T., 1977, Analog model prediction of the hydrologic effects of sanitary sewerage in southeastern Nassau and southwestern Suffolk Counties, New York: Long Island Water Resources Bull. 6, 25 p.

Reilly, T. E., 1978, Convective contaminant transport to pumping well: American Society Civil Engineers, Journal Hydraulics Division, v. 104, no. HY12, p. 1565-1575.

Aronson, D. A., Reilly, T. E., and Harbaugh, A. W., 1979, Use of storm-water basins for artificial recharge with reclaimed water, Nassau County, Long Island, New York--A hydraulic feasibility study: Long Island Water Resources Bull. 11, 57 p.

Reilly, T. E., and Harbaugh, A. W., 1980, A comparison of analog and digital modeling techniques for simulating three-dimensional ground-water flow on Long Island, New York: U.S. Geological Survey Water Resources Investigations 80-14, 40 p.

Reilly, T. E., A Galerkin finite-element flow model for the transient response of a radially symmetric aquifer: U.S. Geological Survey Water-Supply Paper (in press).

Aronson, D. A., Reilly, T. E., and Harbaugh, A. W., 1979, Use of storm-water basins in Artificial recharge with reclaimed water, Nassau County, New York--a hydraulic feasibility study: Long Island Water Resources Bull. 11, 58 p.

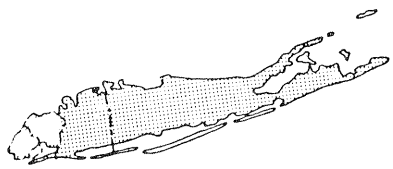
Ehrlich, G. G., Ku, H. F. H., Vecchioli, John, and Ehlke, T. A., 1979, Microbiological effects of recharging the Magothy aquifer at Bay Park, N.Y., with tertiary-treated sewage: U.S. Geological Survey Professional Paper 751-E, 18 p.

Aronson, D. A., 1980, The Meadowbrook artificial-recharge project in Nassau County, Long Island, New York: Long Island Water Resources Bull. 14, 23 p.

_____ 1980, Use of highly treated wastewater to recharge the ground-water reservoir in Nassau County, Long Island, New York, in American Society of Civil Engineers, Proceedings of the ASCE Environmental Engineering Division, 1980, National Conference on Environmental Engineering: p. 214-220.

Vecchioli, John, Ku, H. F. H., and Sulam, D. J., 1980, Hydraulic effects of recharging the Magothy aquifer, Bay Park, New York, with tertiary-treated sewage: U.S. Geological Survey Professional Paper 751-F, 21 p.

Impact of Future Sewering and the Effects of Proposed Mitigating Actions on the Fresh-Water Resources of Long Island (NY 78-053)



Date Project Began: January 1979

Date Project Ends: March 1982

Project Leader: Thomas E. Reilly

Field Location: Nassau and Suffolk Counties

Cooperating Agencies: Nassau County Department of Public Works; Suffolk County Department of Health Services.

Problem: A lowering of the water table and a decrease in streamflow have been well documented in sewered areas of southwest Nassau County. Similar effects are expected in southeast Nassau and southwest Suffolk Counties, where large-scale sewer construction is underway. Because effluent will be discharged to the ocean, fresh-water discharge into Great South Bay will be decreased. As a condition of funding the sewer construction, EPA has requested the counties to determine the anticipated extent of the impact of sewers on the streams and the bay, and to address methods of mitigating these effects.

Objective: To determine (a) the present volume of fresh-water discharge into Great South Bay from 36 tributary streams and from direct ground-water discharge; (b) the impact of sewering (with ocean outfall) on the total fresh-water discharge and on individual streams; and (c) the effectiveness of stream augmentation by shallow and (or) deep recharge wells.

Approach: Observation wells and stratigraphic test holes will be used to define the extent and thickness of the Gardiners clay. Aquifer tests will be conducted to determine the properties of the aquifers and the confining beds. Laboratory analyses of cores will also be used to determine the hydraulic properties of the Gardiners clay. Streamflow will be determined at several sites along each stream. A three-dimensional model of the aquifer-stream system will be used to determine fresh-water discharge. The model will predict the decline in the water table, the reaches of streams that will be dewatered, and the spatial and temporal changes in fresh-water discharge.

Progress and Significant Results: Suffolk County and Nassau County sub-regional models have been completed and calibrated for both steady-state and treansient conditions. Predictive runs to assess the impact of implementation of sanitary sewers have been made. Results indicate significant decreases in streamflow in Nassau County.

Plans for Next Year: Complete reports and analysis of management alternatives.

Completed Reports:

Prince, K. R., 1980, Preliminary investigation of a shallow ground-water flow system associated with Connetquot Brook, Long Island, New York: U.S. Geological Survey Water-Resources Investigations 80-47, 41 p.

Sulam, D. J., 1980, Delineation of ground-water contributing areas, Southern Suffolk County, New York: U.S. Geological Survey Water Resources Investigations 80-346, 4 p.

Ku, H. F. H., and Simmons, D. L., 1981, Base flow of streams in Nassau County Sewer districts 2 and 3, Long Island, New York 1978-79: U.S. Geological Survey Water-Resources Investigations 81-420, 32 p.

Prince, K. R., 1981, Use of flow-duration curves to evaluate effects of urbanization on streamflow patterns on Long Island, New York: U.S. Geological Survey Water-Resources Investigations 80-114, 24 p.

Reynolds, R. J., 1982, Base flow of streams on Long Island, New York: U.S. Geological Survey Water-Resources Investigations 81-48, 33 p.

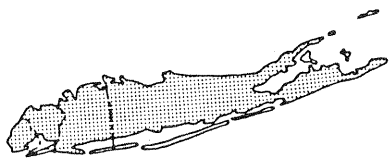
Simmons, D. L., and Reynolds, R. J., Effects of urbanization on base flow to south-shore streams on Long Island, New York: American Water Resources Association Bulletin (in press).

Lindner, J. B., and Reilly, T. E., Analysis of three pump tests in an unconfined aquifer on Long Island, New York: U.S. Geological Survey (in review).

Prince, K. R., Streamflow augmentation at Fosters Brook, Long Island, New York--A hydraulic feasibility study: U.S. Geological Survey Water-Supply Paper (in review).

Reilly, T. E., Buxton, H. T, Franke, O. L., and Wait, R. L., Digital model study of the effects of sewering and extreme variations in natural recharge on ground-water levels and streams, Long Island, New York--Part 1--Model development for Suffolk County: U.S. Geological Survey (in review).

Hydrologic Models of the Long Island Ground-Water Flow System (NY 69-054)



Date Project Began: July 1968

Date Project Ends: December 1981

Project Leader: Thomas E. Reilly

Field Location: Long Island

Cooperating Agencies: Nassau County Department of Public Works; Suffolk County Department of Health Services; Suffolk County Water Authority

Problem: Declining ground-water levels, streamflow depletion, saltwater encroachment into aquifers, and pollution with industrial and domestic wastes pose a serious threat to the potable water supply of Long Island, which is heavily dependent upon ground water as a source for domestic, public, and industrial water supplies. Local governments are keenly aware of the importance of ground water, and their water-management decisions require a knowledge of the hydrologic system. This knowledge can best be obtained through model studies.

Objective: (1) To provide decisionmakers with quantitative estimates of physical changes in the ground-water system that would result from stresses imposed through various management schemes. (2) To estimate the effects that stresses within the ground-water system would have on the quantity and quality of surface water. (3) To determine rates and directions of ground-water flow under natural and stressed conditions, and to use these velocity data to predict changes in water quality resulting from movement of pollutants and natural contaminants.

Approach: Several models will be developed to study aspects of the ground-water flow system. They will include areal multilayer digital and analog models, cross-sectional digital models, and radial-flow digital models. New techniques, including the coupling of flow and transport models, will be developed and tested. Existing models will be periodically refined with data collected specifically for model verification and with data from current studies.

Progress and Significant Results: Various management alternatives have been assessed with use of the existing regional ground-water model. Two sub-regional models have been successfully coupled to the regional model. A computer program to simulate radial flow is in press and a report on its use for pump-test analysis is in review. The appropriateness of using the Survey's two-fluid model for study of Montauk is under study in conjunction with another project.

Plans for Next Year: Work will begin on an improved three-dimensional ground-water flow model that will include the Lloyd aquifer, which was not included in previous models. Streamflow estimates used in the model will be improved by use of stremflow correlations of baseflows of small ungaged streams. Management simulations will be made on the already developed models for the cooperating agencies.

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Harbaugh, A. W., and Reilly, T. E., 1977, Analog-model analysis of effects of waste-water management on the ground-water reservoir in Nassau and Suffolk Counties, New York, Report III--Reduction and redistribution of ground-water pumpage: U.S. Geological Survey Open-File Rept. 77-148, 24 p.

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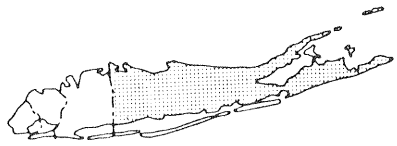
Reilly, T. E., and Harbaugh, A. W., 1980, A comparison of analog and digital modeling techniques for simulating three-dimensional ground-water flow on Long Island, New York: U.S. Geological Survey Water Resources Investigations 80-14, 40 p.

Reilly, T. E., A Galerkin finite-element flow model for the transient response of a radially symmetric aquifer: U.S. Geological Survey Water-Supply Paper (in press).

Appraisal of Hydrogeologic Conditions in Suffolk County, New York (NY 68-061)



Date Project Began: March 1968

Date Project Ends: December 1981

Project Leader: Richard K. Krulikas

Field Location: Suffolk County

Cooperating Agencies: Suffolk County Water Authority; Suffolk County Department of Health Services.

Problem: Ground water is the sole source of public-supply water for over 1 million residents of Suffolk County, but development and exploitation of the ground-water reservoir concurrent with the large increase in population is causing deterioration of ground-water supplies. Hydrologic information is essential in formulating water-management decisions on the use, protection, and conservation of water resources.

Objective: To (a) determine altitudes of major hydrogeologic units penetrated by wells throughout the county; (b) construct contour maps and cross sections showing the extent and relationships of the major hydrogeologic units; (c) prepare summary maps of water levels, pumpage, and general chemical quality of ground water.

Approach: (1) To develop knowledge of the hydrogeologic framework of the ground-water reservoir system from well logs, electric logs, and formation cores. (2) To determine qualitative and quantitative relationships from measurement of water levels in wells, test drilling, and chemical analyses.

Progress and Significant Results: A hydrologic data report and a subsurface hydrologic map were completed. Collection, correlation, and interpretation of hydrologic data was continued. Evaluation of local and areal hydrogeologic relationships was continued.

Plans for Next Year: (1) To interpret hydrogeologic data from geophysical well logs, electric logs, and formation cores to evaluate local ground-water trends. (2) To emphasize a detailed interpretation phase of qualitative and quantitative relationships of water quality from landfill leachate, salt-water encroachment, and organic contamination to the ground-water reservoir system.

Reports Completed Since 1975:

Erlichman, F. R., 1979, Distribution of ground-water withdrawals on Long Island, New York, by area, aquifer, and use in 1973: Long Island Water Resources Bull. 11, 16 p.

Krulikas, R. K., 1981, Hydrogeologic data from selected wells and test holes in Suffolk County, Long Island, New York, 1972-1980: U.S. Geological Survey Water-Resources Investigations 81-500, open-file report, 27 p.

Appraisal of Hydrogeologic Conditions in Nassau County, New York (NY 71-070)

Date Project Began: July 1970

Date Project Ends: December 1981

Project Leader: Chabot Kilburn

Field Location: Nassau County

Cooperating Agency: Nassau County Department of Public Works

Problem: Intensive development of Nassau County ground-water resources requires updated and more detailed knowledge of the hydrogeologic framework. These data will be used in construction of models and in geochemical, waste-disposal, and other studies required for management and conservation of the county's ground water, its sole source of fresh water.

Objective: To (a) determine altitudes of major hydrogeologic units penetrated by wells throughout the county; (b) construct contour maps and cross sections showing the extent and relationships of the major hydrogeologic units; (c) prepare summary maps of water levels, pumpage, and general chemical quality of ground water.

Approach: To (a) review and integrate hydrogeologic data from previously published areal studies; (b) examine available well logs and review computerized data from selected wells for use in basic-data printout, and (c) prepare structure-contour maps. Water samples from selected wells will be collected for chemical analysis. Well cuttings and cores will be collected from new wells for microscopic examination.

Progress and Significant Results: Report on the hydrologic situation in the northern part of the Town of Oyster Bay has been written and is in review. The report updates geohydrology of the area and documents trends in water levels and pumpage that have occurred from 1950-80. A report on the availability of ground-water pumpage data for Nassau from 1920-79 was completed. Hydrologic data on most deep wells drilled in Nassau County during 1980 was obtained. Three observation-test wells, to assist in the study of the occurrence of salt water underlying part of the Great Neck area, were drilled by the Nassau County Department of Public Works.

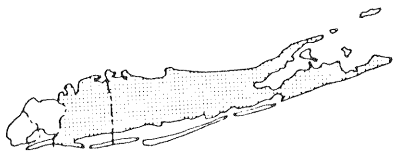
Plans for Next Year: To (a) review and update water-level monitoring network for Magothy and Lloyd aquifers in Nassau County, and (b) begin compilation of data to update hydrogeology of the southern half of Nassau County.

Completed Reports:

Kilburn, Chabot, 1979, Hydrogeology of the Town of North Hempstead, Nassau County, Long Island, N.Y.: Long Island Water Resources Bull. 12, 87 p.

Kilburn, Chabot, Ground-water pumpage in Nassau County, Long Island, New York, New York, 1920-77, a data compilation: U.S. Geological Survey Water-Resources Investigations, Open-File Rept. 81-499 (in press).

Urban Hydrology of Long Island (NY 79-073)



Date Project Began: October 1979

Date Project Ends: September 1982

Project Leader: Henry F. H. Ku

Field Location: Nassau and Suffolk Counties

Cooperating Agency: Long Island Regional Planning Board

Problem: Runoff from precipitation on Long Island is being routed to the numerous recharge basins that are distributed broadly on the island. Approximately 60 Mgal/d of runoff reaches the ground-water reservoir through recharge basins. Although substantial filtering occurs through soils, large amounts of pollutants reach the ground-water system. It has been concluded that storm-water basins contribute significant concentrations of pollutants to the ground water.

Objectives: To (a) determine the type, quantity, and fate of pollutants in runoff to basins, (b) evaluate the changes in runoff that result from various management practices, and (c) determine changes in runoff as it infiltrates the floor of the basin.

Approach: Five recharge basins draining areas representing various land uses will be used as study sites. Highly sophistocated instruments will be used to collect data on precipitation, runoff volume, runoff quality, and quality of water that infiltrates to the water table. Water samples will be collected both manually and automatically and analyzed for organic and inorganic indicators, bacteriological indicators, and esthetic indicators.

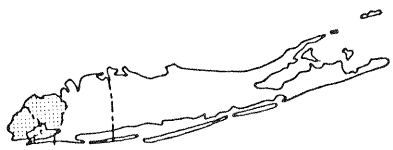
Progress and Significant Results: More than 30 storms have been monitored to date. For each event, stormwater runoff, precipitation, and ground water were collected and analyzed for organic and inorganic constituents as well as bacteria. Analysis for volatile and nonvolatile "priority pollutants" in runoff and ground water at each of the four instrumented recharge basin sites has been completed. Statistics on the physical characteristics of each of the basins have been compiled. Reduction and preliminary analysis of water-quality data has begun. Equipment has been received and construction begun on the instrumentation of the fifth recharge basin.

Plans for Next Year: Sample collection and analysis will continue with emphasis in the most recently instrumented recharge basin. Data reduction and interpretation will be the major emphasis during the coming year.

Completed Reports:

Mallard, G. E., 1980, Microorganisms in stormwater--a summary of recent investigations: U.S. Geological Open-File Rept. 80-1198, 18 p.

Ground Water in Kings and Queens Counties (NY 79-076)



Date Project Began: August 1979

Date Project Ends: September 1983

Project Leader: Herbert T. Buxton

Field Location: Western Long Island

Cooperating Agencies: New York State Department of Environmental Conservation; New York City Department of Environmental Protection.

Problem: Urbanization and severe overpumping in western Long Island have caused the cessation of all pumping for public supply in Kings and western Queens Counties. At present, water supply in Kings and Queens Counties depends on nearly 700 Mgal/d from upstate New York surface-water sources, but during recent periods of severe drought, this supply was unreliable. Expanded use of ground water would alleviate the problem, but data are lacking to design a suitable management plan.

Objectives: To determine whether the ground-water reservoir of western Long Island is still a usable source of water supply and, if so, to make pertinent scientific information available for the formulation of a management plan for its development. Two basic questions will be addressed: whether the ground-water quality is suitable for use as a supplement to the public water supply, and what quantity of water can be withdrawn without inducing saltwater intrusion.

Approach: (1) To (a) develop a network of wells to monitor ground-water levels and ground-water quality in the three major aquifers in western Long Island; (b) measure ground-water levels and quality to determine present hydrologic conditions and current trends, and (c) be prepared to monitor response of ground-water system to any implemented pumping scheme. (2) To map the geology of unconsolidated deposits to define geometry of ground-water system. (3) To investigate the effects of urbanization on the hydrologic system. (4) To construct, verify, and calibrate a digital model and evaluate ground-water management alternatives. (5) Prepare reports summarizing results of the study.

Progress and Significant Results: Preliminary mapping of hydrogeologic units was completed. A well network for monitoring ground-water levels and ground-water quality was developed. Reconnaissance sampling of ground-water quality was done, with special attention to the distribution of chloride and nitrate in the major aquifers. Ground-water levels were measured, and a map of the configuration of the water table was completed.

Plans for Next Year: To (a) conduct additional water-quality sampling to better define present ground-water quality and identify possible trends; (b) measure water levels in the three major aquifers and construct a map of the water table and potentiometric surfaces in the deeper aquifers, and (c) construct and calibrate a three-dimensional ground-water flow model.

Completed Reports:

Buxton, H. T., Soren, Julian, Posner, Alex, and Shernoff, P. K., Reconnaissance of the water resources of western Long Island, New York: U.S. Geological Survey Open-File Report 81-1186 (in press).

Long Island Regional Aquifer Study (NY 80-084)

Date Project Began: October 1979

Date Project Ends: September 1983

Project Leader: Murray S. Garber

Field Location: Islandwide

Funding: Federal program

Problem: To obtain the most effective use of the ground-water resource of Long Island, it will be necessary to undertake quantative studies, particularly modeling ground-water flow in three dimensions. The existing model must be expanded to encompass unmodeled areas and be modified to conform with the constraints imposed by adjacent flow models.

Objective: The five-layer Long Island model will be expanded to include the Lloyd aquifer as a sixth layer. A fine-grid six-layer model of western Long Island will be designed, calibrated, and interfaced with the Long Island model on the east and the adjacent model in New Jersey. The position and movement of the saltwater interface in the coastal aquifers will be evaluated.

Approach: The Lloyd aquifer will be modeled by finite-difference methods in two dimensions and appended to the five-layer model. A finer grid will be used to model the western part of the area. The model will be compatible with the Long Island model on the east and New Jersey coastal plain models to the west. The model will be formulated from a series of maps showing transmissivity, geologic structure, surface, and water chemistry. These maps will be compiled from published and unpublished data and maps as well as data from some new observation wells planned for Kings and Queens Counties.

Progress and Significant Results: The steady-state two-dimensional finite difference model is essentially complete. Some "fine tuning" of the model may be needed, depending on results of transient-state runs.

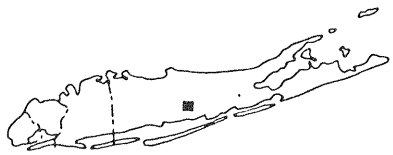
Plans for Next Year: The two-dimensional model will be added to the existing Island-wide five-layer, three-dimensional model.

Role of the Unsaturated Zone in Basin Recharge with a Denitrified Sewage Effluent (NY 80-085)

Date Project Began: October 1979

Date Project Ends: September 1982

Project Leader: Tully M. Robison



Field Location: Medford, Suffolk County

Funding: Federal USGS Research Funds

Problem: As a continuation of studies already conducted at this site, further attention will be given to the disposal of highly treated wastewater by recharging the ground-water reservoir through basins. Whereas initial studies dealt solely with physical, chemical, and microbiological processes during high-rate recharge, this study will examine the same processes during low-rate and intermittent recharge.

Objectives: To (a) evaluate the treatment capability of the unsaturated zone under low-rate and intermittent recharge conditions, and (b) analyze the flow and solute-transport characteristics of the unsaturated zone.

Approach: To accomplish the objectives, 1-foot slugs of drinking water and effluent, spiked with chloride, nitrate, ammonium, and potassium ions, will be introduced into the test basin. Time-volumetric water samples from several depths in the unsaturated zone below the basin will be chemically analyzed. Analysis of data will yield knowledge of the flow and solute-transport characteristics of the medium under this recharge regime. Samples of the medium will be taken for microbiological study to assess the role of microorganisms in altering the nitrogenous ions. A similar study will be made under a continuous-application regime. The changes that occur as the recharge rate slows through to surface clogging will be observed. Much of the data obtained from the above activities will be computer processed, and computer simulations of the system will be made.

Progress and Significant Results: The test basin was recharged with daily 0.3-m slugs of drinking water and effluent from an advanced-treatment sewage plant. The recharge was periodically spiked with chloride, nitrate, ammonium, and potassium ions. Timed and measured water samples were taken at various depths in the unsaturated zone and were chemically analyzed, permitting the progress of the water and solutes to be monitored. Cores of the medium were taken for microbiological testing. When drinking water was used for slugs, the chloride and nitrate ions behaved conservatively. However, some of the

ammonium was retarded in the system, later appearing in the samples as nitrate. The experiment was repeated with effluent. During a period in which the basin was being seasoned before spiking, an apparent plant malfunction caused a considerable amount of nitrate to be released. This accidental release was followed, and again the nitrate behaved conservatively. A subsequent spike of ammonium was again retarded in the system. Toward the end of this test a potassium ion spike was introduced to strip the ammonium from the system. The freed ammonium was detected in the shallow samplers but was apparently nitrified before reaching the lower samplers. Considerable data on the flow and dispersion characteristics of the unsaturated zone were obtained.

Plans for Next Year: Computer analysis of data from last year's experiments will be made. Continuous application of effluent will begin. The basin will be protected from light to minimize algal activity. As the basin begins to clog, chloride and nitrogenous tracers will be introduced into the basin. Chemical analysis of water samples taken at various depths and times will yield information on the chemical, physical, and microbiological processes taking place in the unsaturated zone during diminishing flow. Cores taken at different depths will aid in defining the microbiological aspects. Much of the collected data will be analyzed on the computer.

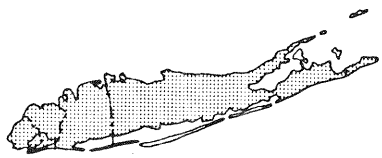
Completed Reports:

Oaksford, E. T., 1978, Water manometer tensiometers installed and read from the land surface: ASTM Geotechnical Testing Journal, v. 1, no. 4, p. 199-202.

Prill, R. C., Oaksford, E. T., and Potorti, J. E., 1979, A facility designed to monitor the unsaturated zone during infiltration of tertiary-treated sewage, Long Island, New York: U.S. Geological Survey Water Resources Investigations 79-48, 14 p.

Prill, R. C., Oaksford, E. T., and Potorti, J. E., The role of unsaturated zone in aquifer recharge where tertiary-treated sewage is applied to basins constructed in glacial outwash deposits, Long Island, New York: U.S. Geological Survey Professional Paper (in review).

Technology for Ground-Water Management Plan, Long Island (NY 81-095)



Date Project Began: October 1980

Date Project Ends: December 1981

Project Leader: Tully M. Robison

Field Location: Islandwide

Cooperating Agencies: New York State Department of Environmental Conservation

Problem: Nearly one-half of Long Island's population is dependent upon ground water. It is possible that a shortage of potable ground-water will occur. To forestall this shortage, Federal, State, and local agencies wish to begin ground-water management and need to know techniques that can be used to evaluate ground-water problems, to use ground-water data, and to develop alternative management plans.

Objective: The New York State Department of Environmental Conservation has set up committees composed of Federal, State, and local agencies to develop a comprehensive statewide ground-water management plan. The USGS will provide the technical foundation for the committees' work. Although the role of the USGS will be limited to Long Island, the study will have considerable transfer value for the upstate committee.

Approach: Methods of evaluating water quality and quantity problems will be identified by literature search and consultations. Theoretical examples will be used to demonstrate the applicability of present techniques and the feasibility of proposed techniques. The type of data needed for an integrated system of ground-water management will be determined together with methods of collecting, storing, and using the data. In consultation with State and local agencies, alternative management schemes will be devised, with emphasis on the technological and data requirements of each. The USGS water-research group will be consulted on some aspects of the study.

Progress and Significant Results: (1) Geological Survey staff made presentations and participated in workshops at a seminar on ground-water management information at Cornell University, Ithaca, N.Y., assisted the New York State Department of Environmental Conservation and Cornell University in assigned tasks, participated in meetings and task groups of the Long Island Ground-Water Management Technical subcommittee, reviewed parts of the "Ground-water management of Long Island" report, assisted the project consultant by providing material for their report and by reviewing part of that report, and provided computer-generated maps of Long Island based on locations provided by NYSDEC or USGS computer files. (2) An annotated bibliography of Geological Survey Long Island ground-water reports, and a map showing locations of all cross sections of Long Island in Geological Survey reports, were made.

Plans for Next Year: (1) To participate in meetings and task groups of the Long Island Ground-Water Management Technical Subcommittee and make technical suggestions and evaluations. (2) To technically review all reports from NYSDEC, Cornell University, and the consultant. (3) To make a computer-model run showing the impacts of future water use on Long Island.

Ground Water Resources of Montauk Area (NY 81-102)

Date Project Began: October 1980

Date Project Ends: September 1983

Project Leader: Keith R. Prince

Field Location: South Fork of Suffolk County

Cooperating Agencies: Suffolk County Department of Health Services; Suffolk County Water Authority.

Problem: The sole source of fresh water in the Montauk area occurs in Pleistocene glacial deposits that are in direct contact with tidewater at the shores. The ground-water system contains several relatively thin, lenticular "bubbles" of fresh ground water that "float" on top of saline water. During periods of heavy ground-water pumpage in the village of Montauk, operation of public-supply wells must be staggered to reduce upconing of saline water. It is feared that the local fresh-water resources will not be adequate to meet future demands.

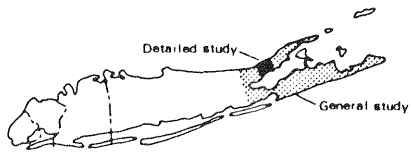
Objective: To define (a) the size and configuration of fresh-water lenses in the vicinity of Montauk, (b) the response of these lenses to natural fluctuations in precipitation and to the seasonal pumping stress, and (c) their probable response to proposed schemes for future development.

Approach: All available hydrologic data will be used to develop a digital flow model of the area to provide a better understanding of the hydrologic system. Field data will also be used to test a new Survey fresh-water/saline-water flow model designed to simulate two-dimensional flow of fresh water and salt water in a single aquifer where the waters are separated by sharp interface. The ground-water flow model could be used to evaluate the safe yield of present and future public-supply wells and the effect of natural and other man-induced stresses on the local hydrologic system.

Progress and Significant Results: A cross-sectional flow model was designed to aid in conceptualization of the flow system and to improve the data collection network. Eight test holes were drilled for geologic information and to determine thickness of freshwater zone. A water-table observation-well network was designed and installed. All available data were used to prepare a water-table map. A fresh-water/saline-water flow model was modified for the Montauk area, and model development was begun.

Plans for Next Year: Additional test wells and observation wells will be drilled as needed. Water samples from wells screened near the interface will be analyzed for chloride content to determine trends in movement of the interface. Development and calibration of the fresh-water/saline-water flow model will continue.

Aldicarb Pesticide in Ground Water in Suffolk County (NY 81-103)



Date Project Began: November 1980

Date Project Ends: July 1983

Project Leader: Julian Soren

Field Location: Eastern Suffolk County

Cooperating Agencies: Suffolk County Department of Health Services; Suffolk County Water Authority.

Problem: The highly toxic pesticide aldicarb was introduced to Long Island agriculture in 1975, principally for growing potatoes. In August 1979 this pesticide and some of its toxic breakdown products were detected in the shallow ground water of eastern Suffolk County, where potatoes are the main crop.

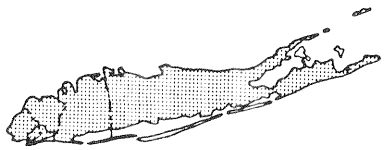
Objective: (1) To define areas where ground-water contamination by pesticides, particularly aldicarb, has occurred. (2) To determine areas of application and detection and relationships to ground-water flow and recharge patterns. (3) To delineate any ground-water environments in the area that do not seem to be readily susceptible to the pesticide contamination.

Approach: This study will be used to select sites for more intensive investigations, both where contamination has occurred and where it has not been detected. Previous detections of aldicarb will be studied to provide a data base for general study of the affected areas, and histories of aldicarb applications will be obtained. Wells will be installed to obtain lithologic data, and cores will be analyzed for adsorbed aldicarb and for potential aldicarb desorption by typical recharge water. Water-level data should help to determine local ground-water flows. The roles of lithology and ground-water flow and recharge flux in the saturated and unsaturated zones will be evaluated as to their effects on the pesticide. Water-quality samples will be collected for analyses by a USGS laboratory.

Progress and Significant Results: Contaminated areas have been delineated. An area has been selected for specific study. Collection of water-level data is continuing.

Plans for Next Year: To complete exploratory drilling and observation-well installations. Water samples will be collected and analyzed, and geology and water table will be mapped. Data will be collected, analyzed, and compiled for the final report.

Ground Water Contamination on Long Island (NY 81-105)



Date Project Began: March 1981

Date Project Ends: September 1982

Project Leader: Gail E. Mallard

Field Location: Islandwide

Cooperating Agencies: Federal program

Problem: Ground water is the sole source of fresh water for nearly 3.2 million residents of Long Island. The quality of ground-water resources has been gradually diminished through continued population growth and attendant urbanization and industrialization. Extensive coverage of ground-water contamination on Long Island by the media has awakened public interest in this problem, but occasionally misinformation or lack of knowledge have enflamed public opinion and engendered a public mistrust of water managers and government agencies. Moreover, little information has been made available to the public regarding management alternatives that might help alleviate the contamination problem.

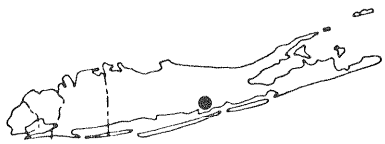
Objective: The public needs to be informed about (1) the basic principles of ground-water occurrence, (2) the causes and effects of ground-water contamination on the island, and (3) possible solutions to the problem.

Approach: A report will be prepared in concise, nontechnical language. It will describe the hydrologic cycle, ground-water occurrence and movement, response of the ground-water system to natural and man-induced stresses, and the importance of ground water as a source of potable water. It will then delineate types, sources, and extent of contamination on the island and will describe the factors and processes that affect the quality, quantity, and use of ground water on Long Island. It will also discuss water-management's role in ground-water use and in developing and implementing methods to alleviate ground-water contamination.

Progress and Significant Results: Individuals have been selected to write the report, and a detailed outline has been prepared, and report writing has begun.

Plans for Next Year: Text and illustrations will be finished, and the final report will be compiled for publication.

Landfill-Leachate Model, Town of Brookhaven (NY 81-108)



Date Project Began: July 1981

Date Project Ends: September 1983

Project Leader: Eliezer J. Wexler

Field Location: Suffolk County

Cooperating Agencies: Town of Brookhaven

Problem: Area residents downgradient from landfills have doubts as to the integrity of landfill liners and are concerned about the direction of movement, magnitude, and impact of the leachate plume that would result if no liner were present or if leaks should develop.

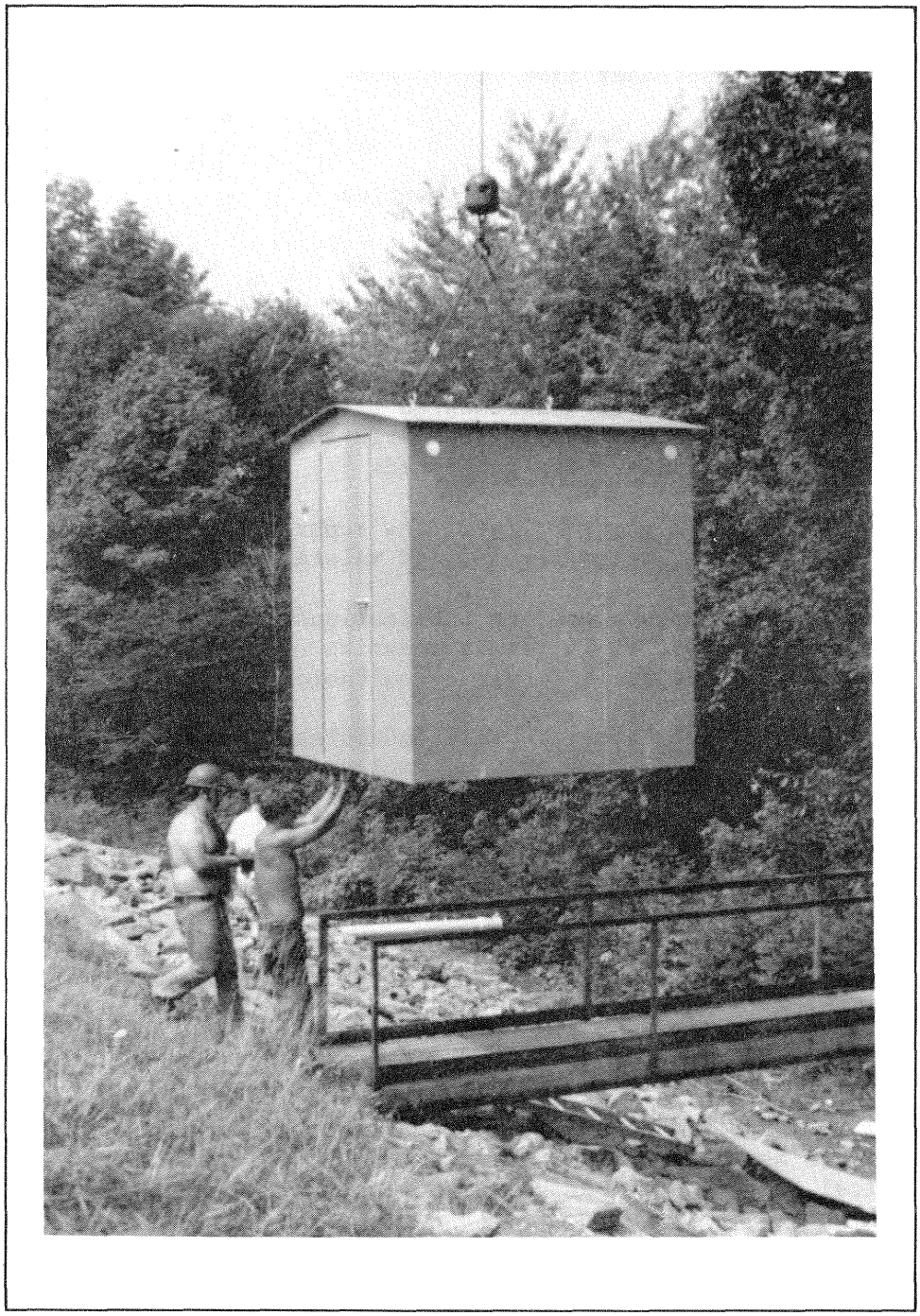
Objective: To (a) determine optimum location and depth for additional observation wells needed to locate plumes of leachate from the site under study, and (b) develop a predictive solute-transport model for the site.

Approach: The landfill to be studied receives residential and commercial solid waste from the Town of Brookhaven. A water-table map of the area will be drawn to provide information about the direction and approximate rates of ground-water flow and will aid in the siting of additional monitoring wells to insure detection of a leachate plume. Geologic and hydrologic information will be used to develop a solute-transport model. If a plume of leachate is detected during the project, data on its extent and movement will help determine mechanisms of transport and will be used in calibrating the model.

Progress and Significant Results: Pertinent literature and historical data were reviewed. Preliminary reconnaissance of the area was completed. The landfill-monitoring network was reviewed and found inadequate. Together with the cooperator, the first phase of a new monitoring network was designed and should be implemented in November 1981. Sites were selected for additional water-table observation wells to be installed in December 1981. Input data required for a two-dimensional flow model are being assembled.

Plans for Next Year: Additional data from new observation wells will be assembled, and a local wate-table map will be drawn. Water-quality data from the new monitoring network will be analyzed to determine whether ground-water quality close to the site has been degraded. Additional work on the ground-water flow and solute transport models will be conducted.

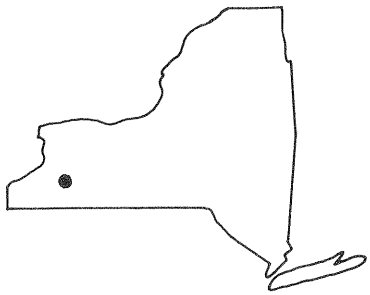
Ithaca Office Projects



PATRICIA ROBERTSON

Figure 5.--Installing new gage house on Susquehanna River at Vestal, N.Y.

Radiohydrology of Waste-Burial Ground at Western New York Nuclear Service Center (NY 75-035)



Date Project Began: February 1975

Date Project Ends: September 1981

Project Leader: Marcel P. Bergeron

Field Location: Erie and Cattaraugus Counties

Funding: Federal program

Problem: More than 100 test holes were constructed in 1960-61 as part of the initial investigation of the site. Several test holes were drilled in 1973-74 as part of an EPA project, and more were drilled in 1975-79 as part of this study. Nearly all holes were instrumented with piezometers, and undisturbed cores were obtained from drilling. The large amount of uncorrelated data in storage needs to be organized and published.

Objective: To publish a geohydrologic data report that will include well logs, geologic sections, water levels, and related data.

Approach: To review current project publications, search data files, establish a numbering system to permit indexing and data retrieval, and present data in table or graph format as suitable.

Progress and Significant Results: Well schedules, logs of test borings, and measured geologic sections have been assembled from recent publications and previous studies of the site. A numbering system has been developed to permit indexing and data retrieval. All available well schedules have been processed and entered into the ground-water site-inventory system. All data are summarized and presented in a report now in review.

Plans for Next Year: To compile records of radiochemical analyses of ground water, surface water, and soils; surface-water flow; and sediment data; and summarize these data in a report.

Completed Reports:

Bergeron, M. P., Records of wells, test borings, and geologic sections near the Western New York Nuclear Service Center, West Valley, New York: U.S. Geological Survey, Water-Resources Investigations (in review).

LaFleur, R. G., 1979, Glacial geology and stratigraphy of Western New York Nuclear Service Center and vicinity, Cattaraugus and Erie Counties, New York: U.S. Geological Survey Open-File Rept. 79-989, 15 p., 8 pls.

Prudic, D. E., 1978, Installation of water- and gas-sampling wells in low-level radioactive-waste burial trenches, West Valley, New York: U.S. Geological Survey Open-File Rept. 78-718, 70 p.

_____, 1979, Recharge to low-level radioactive waste burial trenches 11 through 14, West Valley, New York: U.S. Geological Survey Open-File Rept. 79-990, 5 p.

_____, 1979, Core sampling beneath low-level radioactive-waste burial trenches, West Valley, Cattaraugus County, New York: U.S. Geological Survey Open-File Rept. 79-1532, 55 p.

_____, 1979, Permeability of covers over low-level radioactive-waste burial trenches, West Valley, New York: U.S. Geological Survey Water-Resources Investigations 80-55, 35 p.

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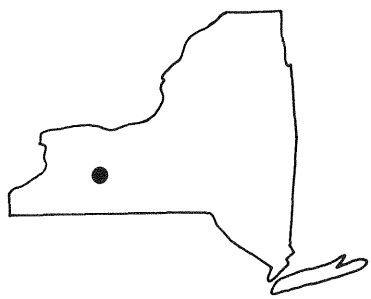
Assessment of Nonpoint Source Discharges from Switzer Creek Basin (NY 79-065)



Date Project Began: October 1978

Date Project Ends: September 1981

Project Leader: Donald A. Sherwood

Field Location: Upper Susquehanna River basin

Cooperating Agency: Susquehanna River Basin Commission

Problem: The Susquehanna River Basin Commission (SRBC) initiated a program for assessment of nonpoint source pollution in the basin to identify areas that warrant detailed studies. Because initial reports indicated that the available data were inadequate for detailed assessment of pollution from nonpoint sources, additional data collection was recommended to provide a detailed assessment of farming practices, soils, and topography of this section of the basin.

Objective: To provide a quantitative assessment of suspended sediment and nutrient (phosphorus, nitrogen) discharges from Switzer Creek. Because the sediment and nutrient transport may be affected by seasonal factors, an attempt will be made to establish seasonal trends. If the data are insufficient, only load data will be presented. Total nitrogen, phosphorus, and suspended-sediment discharges from the study basin will be estimated. Data will be collected over a 2-year period.

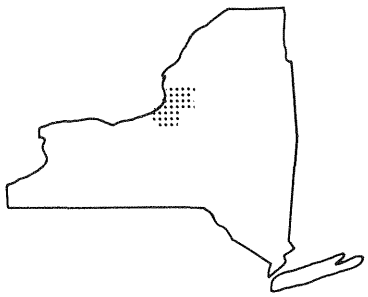
Approach: The Switzer Creek gaging station has been reactivated, and data are being collected. Observers and automatic sampling are being used to determine daily and storm discharges of nitrogen (total kjeldahl nitrogen, NO_2 + NO_3, and NH_3 - N), phosphorus and orthophosphate, dissolved and suspended organic carbon, and suspended sediment loads for the basin. Sediment is being collected on a daily basis; the other constituents on a twice-weekly and storm basis. Precipitation samples are being collected and analyzed by USGS to determine atmospheric input of nutrients. Storm discharge as well as general discharge is being sampled to document the nutrient and sediment discharges from the basin.

Progress and Significant Results: Data collection for project was completed in September 1980. During the study, Switzer Creek discharged a total of 1,184 tons of suspended sediment amounting to 338 tons per acre. Nitrogen (NO_2 + NO_3) discharges totaled nearly 24,000 pounds, while total kjeldahl nitrogen loads totaled about 6,000 pounds. Approximately 80 percent of the nitrogen load is transported during base flow, primarily in the form of NO_2 + NO_3. During high flow organic nitrogen becomes the major fraction. Phosphorus is transported primarily during high flow because of its affinity for particulate matter. Discharges of total orthophosphorus as PO_4 amounted to 618 pounds during the study. Correlations between nutrient concentration and streamflow were developed using the statistical analysis system (SAS) general linear models procedure to define linear regression equations. Final report is in preparation.

Completed Reports:

Sherwood, D. A., An assessment of nonpoint source nutrient discharges from Switzer Creek basin, Central New York: U.S. Geological Survey Water-Resources Investigations (in review).

Migration of Chemical Wastes from Landfills in Oswego County (NY 79-075)



Date Project Began: August 1979

Date Project Ends: September 1981

Project Leader: Henry R. Anderson

Field Location: Oswego County

Cooperating Agency: Oswego County Planning Board

Problem: Chemical-waste dump sites pose a contamination threat to the water resources and environment of the county. The county needs to know the hydrogeologic conditions at sites where chemical wastes are processed, stored, or buried, to ensure protection of their ground-water and surface-water resources.

Objectives: To determine (a) the chemical quality of ground water beneath and downgradient from selected landfills; (b) the direction and rate of movement of ground water and contaminants; and (c) the source of industrial organics in Fulton municipal well water.

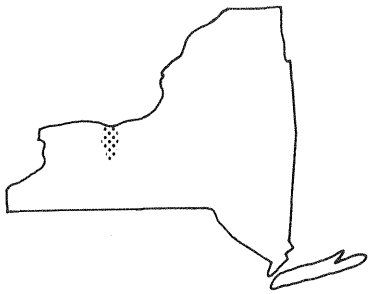
Approach: Field reconnaissance will include mapping, geophysical surveys, and measurement of conductance and pH. Test drilling will be done. Springs, seeps, stream reaches, and ground water will be analyzed for toxic organics and metals. Intensive drilling and testing for organics will be done in the Fulton well field.

Progress and Significant Results: Project was completed; final report is in review.

Completed Reports:

Anderson, H. R., Ground-water conditions and leachate movement near chemical wastes sites in Oswego County, New York: U.S. Geological Survey Water-Resources Investigations (in review).

Irondequoit Creek Urban Runoff Study in Monroe and Ontario Counties (NY 80-080)



Date Project Began: October 1979

Date Project Ends: October 1982

Project Leader: William M. Kappel

Field Location: Irondequoit Creek

Funding: Federal program

Problem: Eutrophication of Irondequoit Bay is believed to result partly from nonpoint-source nutrients derived from urban areas within the Irondequoit Creek basin. Neither the diversion of sewage from the bay nor a reduction in the combined storm-sewer overflows to the bay have significantly alleviated nutrient enrichment problems.

Objectives: To (a) evaluate the effects of runoff loads from catchment areas representing selected urban land uses on the quality and quantity of urban runoff, (b) estimate the total annual loads of selected constituents transported to Irondequoit Bay, and (c) evaluate various proposed management practices for the bay's wetland area in terms of their effectiveness in removing contaminants from stream water entering the bay.

Approach: Streamflow and dissolved nutrients in runoff from urban catchment areas representing selected land uses will be measured during periods of storm runoff. The storm-runoff data will be analyzed on an event basis for each catchment area to determine rainfall-runoff relationships and to quantify constituent loads. A network of continuous-record streamflow gages and partial-record water-quality stations along Irondequoit Creek will be used to quantify the loads from the various land uses.

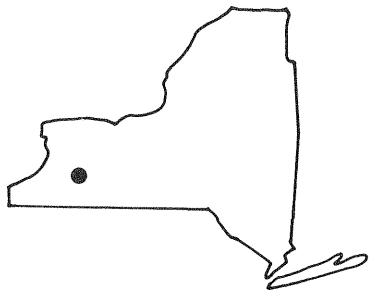
Progress and Significant Results: Collection of data on flow, precipitation, and water quality was completed in September 1981, data analysis and modeling have begun. Land-cover analysis was completed through use of Landsat imagery. Wetlands evaluation is underway, with possible continuation beyond study.

Plans for Next Year: To (a) complete data analyses for use in basin modeling; (b) use flow and quality modeling for land-use sites and complete urban watershed model.

Completed Reports:

Kappel, W. M., 1981, The Irondequoit Creek urban hydrology study at Rochester, New York--an assessment of field methods [abs.]: EOS, v. 62, no. 17, p. 279.

Geohydrology and Radioisotope Movement at Western New York Nuclear Service Center (NY 80-088)



Date Project Began: January 1980

Date Project Ends: May 1984

Project Leader: William M. Kappel

Field Location: West Valley

Cooperating Agency: Nuclear Regulatory Commission

Problem: The study of two facilities--the nuclear-fuel reprocessing plant and associated fuel and waste-storage area (North Plateau study area), and the area around the Nuclear Regulatory Commission's (NRC) burial area--is of great importance to the NRC and the State. The geology and hydrology of the unconsolidated material overlying the bedrock, and the extent or potential for contamination by radioisotopes within each area, must be understood and considered when deciding whether to move the facilities elsewhere.

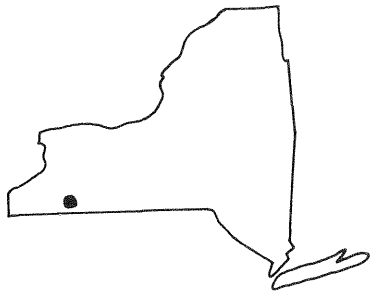
Objectives: The study is a multiagency effort coordinated by the NRC. The USGS will define (a) the extent of the shallow gravel deposits and the location and thickness of units underlying the gravel at the North Plateau area; (b) the ground-water flow regime through the shallow gravel and the underlying units of the North Plateau area; (c) the ground-water flow in the till and lacustrine units at the NRC burial area; and (d) streamflow leaving both areas.

Approach: (1) To establish three surface-water monitoring stations and drill approximately 10 shallow auger holes in the North Plateau study area. (2) To drill two to three deeper holes in the glacial deposits of the North Plateau. At the NRC burial study area, shallow holes will be hand augered and piezometers installed. Several deeper test holes will be drilled around the burial area to determine hydraulic properties of the till and the underlying lacustrine unit. (3) To continue collection of water-level and radiochemical data from streams, seeps, and shallow gravel wells in the North Plateau area, and incorporate the data into ground-water flow models. A report summarizing results of the study of these areas will be prepared.

Progress and Significant Results: Records of flow from two North Plateau stations and one station between the the high- and low-level waste-burial area continued. Three ground-water level recorders were put into operation in the North Plateau area. Changes in site operations and responsibilities delayed drilling around the high-level waste burial area until 1982. Contract specifications were prepared.

Plans for Next Year: (1) Proceed with drilling around the high-level waste burial ground. (2) Continue data collection at all recording stations. (3) Assist New York State Geological Survey in collection of water and core samples for analysis.

Simulating Interaction of Ground Water and Surface Water, and Resulting Water-Quality Changes, Cattaraugus County (NY 80-094)



Date Project Began: August 1980

Date Project Ends: September 1982

Project Leader: Marcel P. Bergeron

Field Location: Cattaraugus County

Cooperating Agency: New York State Department of Environmental Conservation

Problem: A shallow, permeable gravel aquifer in Cattaraugus County has been developed to supply industrial, municipal, and private water needs. The aquifer has been contaminated by nitrogen compounds, but the contaminants are contained within the cone of depression beneath an industrial park. To plan for additional ground-water development, it is necessary to define the relationships between ground water, surface water, zones of ground-water contamination, and wastewater discharges to streams.

Objective: (1) To define the interactions between ground water, surface water, and water quality and to simulate and predict the impact of increased ground-water development on (a) ground-water levels, (b) regional ground-water quality, (c) current ground-water contamination-containment schemes, and (d) streamflow. (2) To determine where streamflow reduction occurs and evaluate the resulting decrease in assimilative capacity and consequent or potential change in stream-water quality.

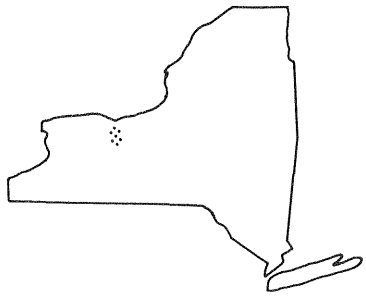
Approach: (1) To analyze published reports and available geologic, ground-water, streamflow, and water-quality data and to obtain additional data. (2) To expand the ground-water model to include additional aquifer areas and stream reaches, quantify recharge induced from different stream segments, and quantify resulting streamflow reduction in the affected reaches. (3) To determine changes in ground-water levels, ground-water quality, streamflow, and stream-water quality in response to several combinations of amounts and locations of ground-water withdrawals, contamination levels, waste discharges, and streamflow conditions.

Progress and Significant Results: Well inventories have been obtained to expand a previously developed hydrologic model. The model also has been altered to simulate the interaction between the aquifer system and streams. Periodic water-level measurements are being made in selected observation wells. Initial calibration of the model has begun.

Plans for Next Year: Streamflow measurements will be made during a base-flow period to quantify ground-water and surface-water interaction. Periodic water-level measurements of selected observation wells will be continued. Additional test holes will be drilled, and observation wells will be installed to further refine aquifer geometry and hydrology near the industrial well field and in the expanded area of the model. Calibration of the hydrologic

model will be completed, and the model will be used to predict changes in ground-water levels and flow, quantify induced infiltration from streams, and estimate changes in the direction and rate of movement of contaminated ground water and changes in stream-water quality in response to different amounts and locations of ground-water withdrawals, ground-water contamination, and waste discharges to streams. A report will be prepared summarizing project results.

Evaluation of Irondequoit Wetland (NY 81-106)



Date Project Began: March 1981

Date Project Ends: September 1982

Project Leader: William M. Kappel

Field Location: Upper wetland unit south of Irondequoit Bay, Rochester

Cooperating Agencies: Federal program

Problem: The U.S. Geological Survey is currently studying the Irondequoit basin as part of the National Urban Runoff Program (NURP) to determine the chemical quality of urban runoff. The wetlands are to be studied as a best management practice for stormwater renovation. Before a control structure is installed, the natural function of the wetland needs to be determined to evaluate its present uptake efficiency. The proposed structure would maximize use of the wetland as a large detention pond, thereby increasing renovation capabilities.

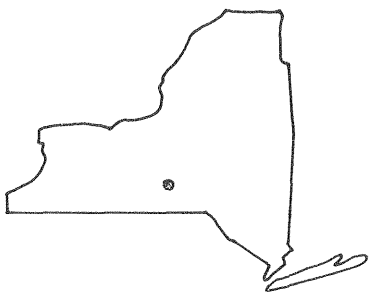
Objective: To use results of dye-tracer studies and backwater simulation studies, combined with observed reductions in nutrients and sediments (provided by NURP study), to predict the stormwater-renovation efficiency of the wetland under alternative management schemes.

Approach: (1) To survey several cross sections through the wetland-stream system. (2) To use step-backwater programs to estimate flow conditions in the wetland for different hypothetical control conditions at the narrows. (3) To introduce dye at the wetland inlet during four or more periods of moderate to high flows, and determine relative dye concentration in the main channel, in the secondary high-flow channel, and throughout the flooded areas of the wetland during each study period. (4) To calculate retention time, relative flow through each channel, and distribution of dye concentrations throughout the wetland for the different flow conditions studied. (5) To relate observed reductions in nutrients and sediment (NURP data for the same storm events) to dye-concentration distribution and retention time. (6) To combine results to predict stormwater-renovation efficiency under different (hypothetical) control conditions at the narrows.

Progress and Significant Results: Previous data (U.S. Army Corps of Engineers) were verified and used with selected cross-sectional surveys for the backwater analysis. Hypothetical control weirs were used to develop initial wetland submergence conditions, and flows ranging from 500 to 10,000 ft^3/s were modeled. Lack of heavy rainfall events limited dye runs to one low flow and one moderate flow. No storm was large enough to cross into the secondary channel.

Plans for Next Year: High flows, including spring runoff, will be used to evaluate the present function of the secondary channel. Reservoir routing will be applied to determine the duration of flooding for various control structures and inflow hydrographs. A summary of results will be included in the Irondequoit project (NY-080) report.

Symposium on Impact of Waste on Ground Water (NY 81-109)



Date Project Began: July 1981

Date Project Ends: August 1982

Project Leader: Richard P. Novitzki

Field Location: Ithaca, NY

Funding: U. S. Geological Survey, Office of Earth Sciences Applications

Problem: Ground-water contamination has become a critical problem. Information concerning the impact of wastes on ground water, siting of waste-disposal and storage facilities, techniques of toxic-waste disposal, and other relevant factors must be disseminated. Exchange of this information between professionals in both the public and private sectors is strongly needed.

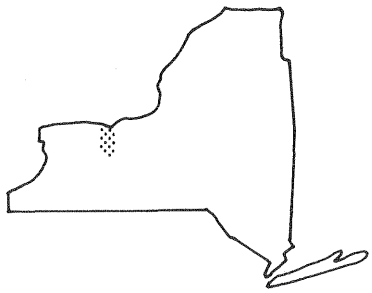
Objective: A symposium to be held in Ithaca, N.Y., from June 28-July 1, 1982 will provide a forum for the exchange of information concerning the impact of landfills, chemical-waste disposal, and nuclear storage sites on ground water and is designed to promote interaction between researchers, regulators, managers, site operators, waste generators, and concerned citizens. The program will include publication of the proceedings and a list of related conferences.

Approach: The symposium will include the formal presentation of papers, panel discussions, informal discussions, poster presentations, and the opportunity for informal contacts between those who need help and those who may provide assistance. Staff will attend related symposia to develop mailing lists and to meet with potential paper contributors. Papers will be received, edited, revised, and assembled for publication. The proceedings, included in the cost of registration, will be in loose-leaf format, readily rearranged or updated to be useful for individual needs and will also be made available for sale to nonattendees.

Progress and Significant Results: An initial announcement and call for papers was prepared and mailed to approximately 2,500 persons and agencies in the northeastern States. Abstracts have been received and are being screened. Cosponsorship has been arranged, and cosponsors' suggestions incorporated in structuring the preliminary program agenda. Facilities have been reserved.

Plans for Next Year: (1) To (a) screen abstracts, invite specific papers, and prepare final program agenda; (b) receive papers, edit and revise them, and arrange for reproduction in conference proceedings. (2) To hold conference at Sheraton Hotel June 28-July 1, 1982.

Effects of Urban Construction on Water Quality (NY 81-111)



Date Project Began: June 1981

Date Project Ends: June 1982

Project Leader: William M. Kappel

Field Location: Irondequoit Creek basin

Cooperating Agencies: Federal program

Problem: Housing construction in urban areas may have considerable impact on quantity and quality of storm runoff. Proper management of urban areas requires an understanding of the impact of construction, including both short-term and long-term changes in hydrologic and water-quality characteristics.

Objective: To (a) observe flow, sediment, and heavy-metals transport from a small urban basin undergoing extensive construction, and (b) compare runoff and water-quality characteristics of these areas to those in other urban areas not affected by construction. From the resulting differences, determine the need for a longer study to document hydrologic and water-quality changes during the transition from an undisturbed state through disturbance (construction) and finally to new, stable land use.

Approach: Supplement the data-collection plan by determining flow, sediment, metals, and nutrient transport from an area containing housing construction. Cross-sectional "grab" samples will be collected during major storms, and these samples will be matched with instantaneous flows. The resulting data will be extrapolated to estimate sediment and nutrient loads from all construction areas within each subbasin.

Progress and Significant Results: Several storms of various intensities and durations were sampled, and discrete samples for all storms are being analyzed. Although only 15 percent of the 224-acre watershed is undergoing construction, the amounts of sediment collected indicate high rates of erosion, even with erosion-control measures in place.

Plans for Next Year: To finish collection of data and analyze construction-site reports. The data from this study will be applied to the urban runoff model of the Irondequoit basin study (80-080).

Water Quality of Otisco Lake (NY 81-112)

Date Project Began: August 1981

Date Project Ends: September 1984

Project Leader: Todd S. Miller

Field Location: Onondaga County

Cooperating Agencies: Onondaga County Environmental Council

Problem: Turbidity, associated with fine-grained sediment and algal blooms, has impared recreational use of Otisco Lake and limits its continued use as a water-supply source. Information needed for management decisions includes (a) the amount of sediment in the lake, (b) the source and rate of sediment and nutrients entering the lake, and (c) seasonal variation of water quality.

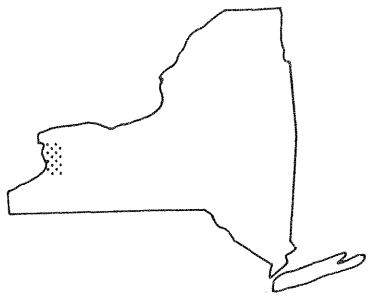
Objective: To (a) define the extent, thickness, and character of sediments south of the causeway that divides the lake into northern and southern parts, (b) define seasonal variation in turbidity and chemical characteristics of lake water, (c) estimate sediment and nutrient transport into the lake, and (d) assess capability of the wetland at the southern end of the lake to retain sediment and nutrients under current conditions and under alternative management schemes.

Approach: (1) To conduct seismic analysis and obtain core sediments to determine thickness, extent, and nature of sediments. Water samples will be collected north and south of the causeway and analyzed for turbidity, nutrients, temperature, pH, dissolved oxygen, and specific conductance. (2) To determine streamflow entering and leaving the lake by supplementing the gage at the outlet with installation of a full-time gage at the inlet and part-time gages at other tributaries. (3) To conduct backwater analysis and a dye-tracer study to estimate sediment and nutrient retention in the wetland.

Progress and Significant Results: Six gaging station sites were selected, and shelter and monitoring facilities were designed. Construction of stations started in September. A preliminary probe of lake-bottom sediments was conducted to determine their nature and the feasibility of a seismic analysis.

Plans for Next Year: To complete installation of sediment stations and conduct seismic profiles south of the causeway to determine thickness and extent of organic sediments.

Selected Aquifers in Western New York (NY 81-113)



Date Project Began: August 1981

Date Project Ends: September 1983

Project Leader: Todd S. Miller

Field Location: Erie County

Cooperating Agencies: Erie County

Problem: Erie County needs to understand the hydrologic and water-quality characteristics of its aquifers to evaluate the potential impact of contamination from landfills, buried gasoline tanks, and land use.

Objective: (1) To describe the hydrologic characteristics of the aquifers, direction and rates of ground-water movement, significant recharge areas, and areal variation of water quality. (2) To establish a monitoring network to define background levels of selected water-quality indicators and identify areas of contamination. This network would be monitored by the cooperator after this project terminates.

Approach: (1) Collect and compile information on geology, hydrology, and water quality of the selected areas. (2) Auger test holes and install wells in areas lacking data. (3) Select wells that may be accessible for sampling. (4) Develop maps showing water-table altitude, bedrock surface, saturated thickness, and direction of ground-water flow. (5) Sample selected wells and streams for chemical analysis to define areal distribution of water quality.

Progress and Significant Results: Available hydrologic information was collected and compiled. Test drilling was conducted at two sites; limited aquifers were found at both sites. Water and soil samples were collected for chemical analysis.

Plans for Next Year: To select two more sites for investigation, do more test drilling and water sampling, compile data, begin final report.

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Cooperating Agencies in 1981

The U.S. Geological Survey and organizations of the State of New York and other agencies have had joint funding agreements for the systematic collection and interpretation of water data since 1900. Organizations that entered into joint funding agreements with the New York District during 1981 are:

Bonneville Power Administration
Central New York State Park and Recreation Commission
City of Albany, Department of Water and Water Supply
City of Auburn
City of New York, Department of Environmental Protection
City of Rochester, Water Bureau
City of Rochester, Irondequoit Bay Pure Waters District
County of Chautauqua, Planning Department
County of Cortland, Planning Department
County of Dutchess, Civil Defense
County of Erie, Department of Environment and Planning
County of Monroe, Water Authority
County of Monroe, Department of Health
County of Nassau, Department of Public Works
County of Onondaga, Department of Public Works
County of Onondaga, Water Authority Commission, Environmental Management Council
County of Oswego, Planning Board
County of Putnam, Highway Department
County of Rockland, Drainage Agency
County of Suffolk, Department of Health Services
County of Suffolk, Water Authority
County of Ulster, County Legislature
County of Westchester, Department of Public Works
Federal Power Commission
Hudson River-Black River Regulating District
Irondequoit Bay Pure Waters District
Long Island Regional Planning Board

Cooperating Agencies in 1981

New York State Department of Environmental Conservation,
  Bureau of Monitoring and Surveillance,
  Bureau of Standards and Compliance,
  Bureau of Water Research,
  Office of Program Development, Planning, Research
  Division of Air
New York State Department of Health
New York State Department of Transportation
Oswegatchie River-Cranberry Reservoir Commission
Power Authority of the State of New York
St. Lawrence Seaway Development Corporation
Susquehanna River Basin Commission
Town of Brookhaven
Town of Clarkston
Town of Warwick
University of Virginia
U.S. Army Corps of Engineers
  Buffalo, Baltimore, Philadelphia, Pittsburg,
  and New York Districts
U.S. Environmental Protection Agency
U.S. Nuclear Regulatory Commission
Village of Nyack, Board of Water Commissioners

The following organizations aided in collection of records:

Municipalities of Batavia, Canandaigua, Cortland, Harrison, Jamestown, Lancaster, Mamaroneck, Oneida, Plattsburgh, Rochester, Rome, Rye, Syracuse, Tarrytown, and Yonkers: Cornell University; Central Hudson Gas and Electric Corp.; Indian River Co.; New York State Electric and Gas Corp.; Niagara Mohawk Power Corp.; Rochester Gas and Electric Corp.; Rushford Lake Recreation District; Orange and Rockland Utilities, Inc.

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