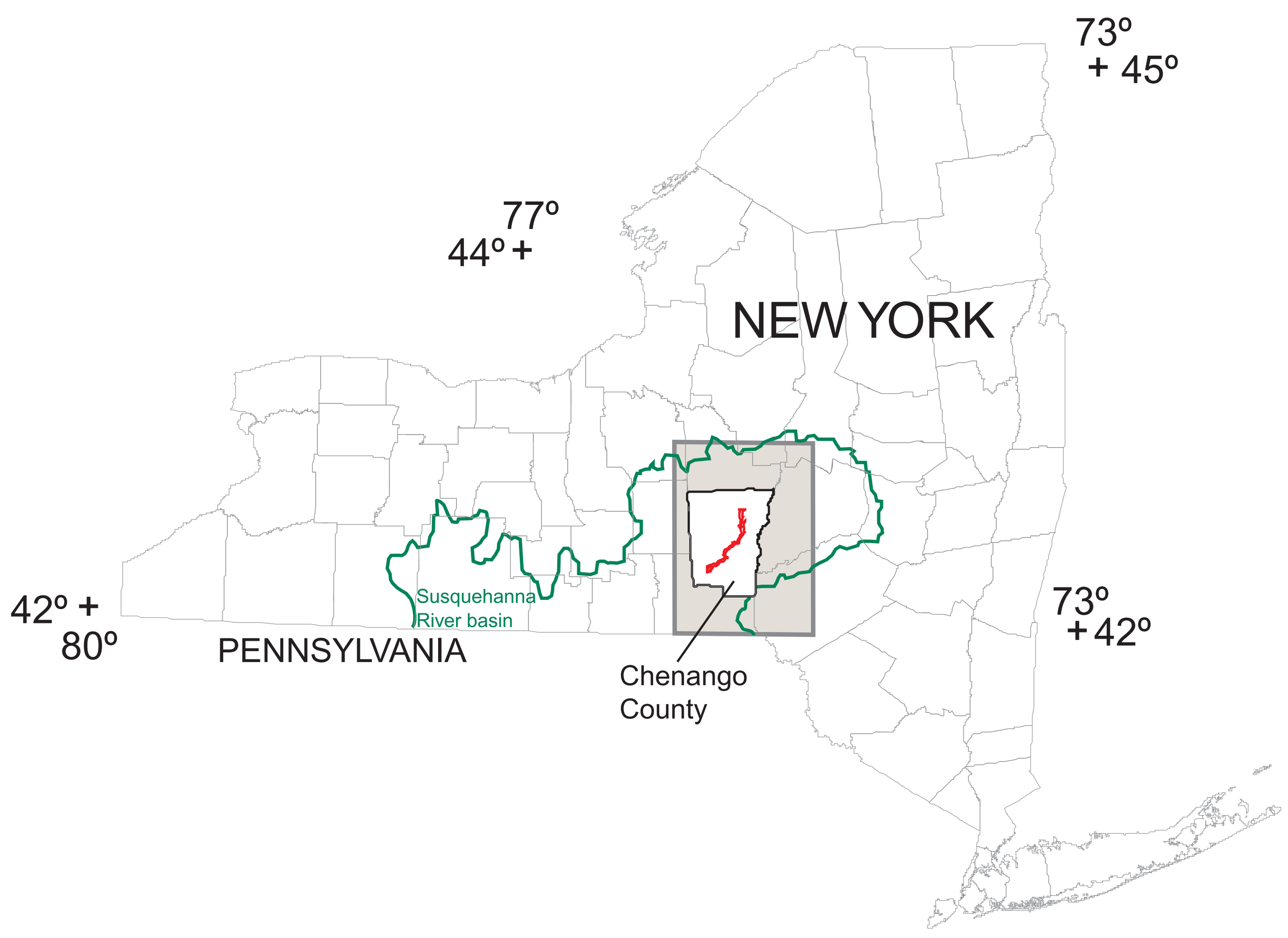
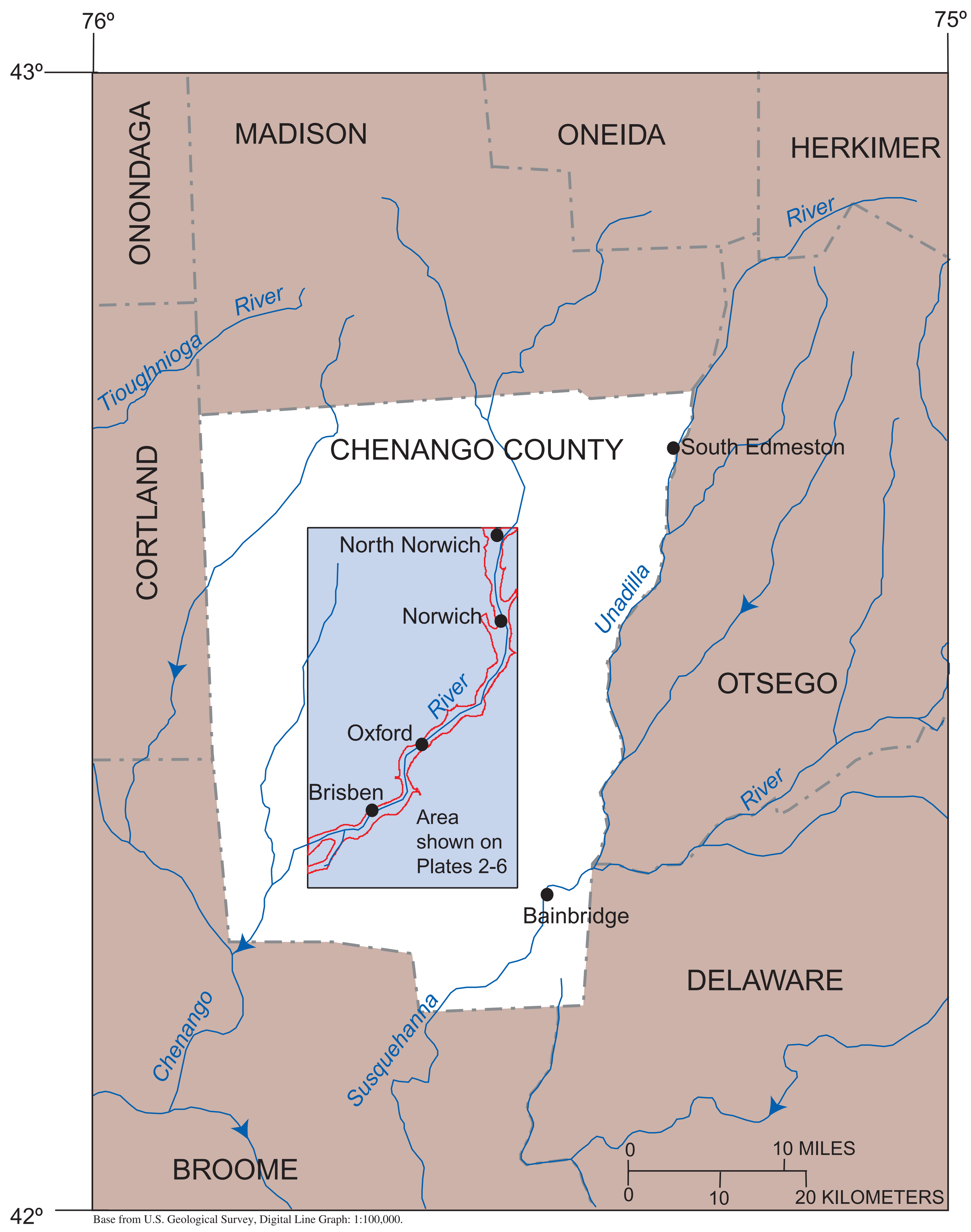
Kari K. Hetcher, Todd S. Miller, James D. Garry, and Richard J. Reynolds
Geohydrology of the Valley-Fill Aquifer in the Norwich-Oxford-Brisben Area, Chenango County, New York:
U.S. Geological Survey, Open-File Report 03-242, 7 plates, 1:24,000 scale.





Base from U.S. Geological Survey, Digital Line Graph: 1:100,000.

EXPLANATION

- Study Area
- County boundary
- City, town, or village
- River and direction of flow

ABSTRACT

This set of maps and geohydrologic sections depicts the geology and hydrology of aquifers in the 21.9-square-mile reach of the Chenango River valley between Brisben and North Norwich, N.Y. This report depicts the principal geographic features of the study area; locations of domestic, commercial, and municipal wells from which data were obtained to construct water-table and saturated-thickness maps and five geohydrologic sections; surficial geology; water-table altitude; generalized saturated thickness of the unconfined (water-table) aquifer; generalized thickness of the discontinuous series of confined aquifers; and five geohydrologic sections, all of which are in the northern part of the study area.

The unconsolidated material in the Chenango River valley consists primarily of three types of deposits: (1) glaciofluvial material consisting of stratified coarse-grained sediment (sand and gravel) that was deposited by meltwater streams flowing above, below, or next to a glacier; (2) glaciolacustrine material consisting of stratified fine-grained sediment (very fine sand, silt, and clay) that was deposited in lakes that formed at the front of a glacier; and (3) recent alluvial material consisting of stratified fine-to-medium grained sediment (fine-to-medium sand and silt) that was deposited on flood plains.

The water-table map was compiled from water-level data obtained from wells completed in the unconfined aquifer, and from altitudes of stream and river surfaces indicated on 1:24,000-scale topographic maps. Depth to the water table ranged from less than 5 feet below land surface near major streams to more than 75 feet on some of the kame terraces along the valley walls. Saturated thickness of the unconfined aquifer ranged from less than 1 foot near Norwich to more than 200 feet at a kame delta north of Oxford.

A discontinuous series of confined aquifers is present throughout much of the Chenango River valley north of Oxford. These aquifers consist of kame deposits, eskers, and subglacial outwash sand and gravel deposits that are overlain and confined by lacustrine fine sand, silt, and clay. The saturated thickness of these aquifers is as much as 150 feet near North Norwich.

INTRODUCTION

The Chenango River valley contains highly permeable unconfined and confined aquifers that consist of glaciofluvial and alluvial sand and gravel. These aquifers in the 21.9-square mile (mi^2) reach from North Norwich to Brisben provide water to about 14,000 people (U.S. Bureau of Census, 2000) and to many businesses. At least 9,000 of these people are served by municipal supply wells; the rest get their water from domestic wells or springs. The city of Norwich obtains water from Chenango Lake and Ransford Creek, and from aquifers (New York State Department of Health, 1982). Commercial development over these aquifers has been light, except in the city of Norwich and the surrounding area, which contains not only thousands of single-family homes and multiple-unit dwellings, but also many industrial sites and several commercial facilities. The shallow depth to the water table in most places makes these aquifers vulnerable to contamination from surface sources such as landfills, road salt, leaking fuel-storage tanks and septic systems, and urban and agricultural runoff. These aquifers are the sole source of potable ground water for several villages; thus, their protection is of vital importance to these communities.

In 2002, the U.S. Geological Survey (USGS), in cooperation with the New York State Department of Environmental Conservation (NYSDEC), compiled information from five publications (MacNish and Randall, 1982; Randall, 1972; McPherson, 1993; Cadwell, 1981; and Cadwell, 1972) on the surficial geology and geohydrology of the valley-fill aquifers in the 21.9-mi^2 reach of the Chenango River valley between North Norwich and Brisben. This report presents the hydrogeologic information of the area on 7 plates—plate 1 depicts the principal geographic features of the study area; plate 2 depicts the locations of domestic, commercial, and municipal wells from which data were obtained to construct the water-table and saturated-thickness maps (pls. 4 and 5) and five geohydrologic sections (pl. 7); plate 3 depicts surficial geology; plate 4 depicts the generalized water-table altitude; plate 5 depicts the generalized saturated thickness of the unconfined (water-table) aquifer; plate 6 depicts the generalized thickness of the discontinuous series of confined aquifers; and plate 7 depicts five geohydrologic sections, all of which are in the northern part of the study area.

HYDROLOGIC SETTING

The valley-fill aquifer system in the Chenango River valley is within Chenango County in the New York part of the Susquehanna River basin. The study area includes the Chenango River valley and the lower reaches of its major tributaries. The unconfined (surficial) aquifer consists mostly of alluvium, outwash sand and gravel, kame deltas, kame deposits (kame terraces and kame moraines), and eskers; the confined aquifers consist of buried kames along the valley sides and subglacial glaciofluvial deposits (eskers and subglacial outwash) that were deposited on top of bedrock in the central part of the valley. The confined aquifers are discontinuous in the study area and lie directly upon bedrock at most locations. Detailed information on the geologic setting and the effects of glaciation in New York can be found in Coates (1974) and Fullerton (1980).

The unconfined (surficial) aquifer is recharged by (1) precipitation, (2) infiltration from losing reaches of streams, (3) induced infiltration of river water by pumping wells, and (4) hillside runoff that seeps into the coarse-grained valley-fill deposits along the edges of the valley (MacNish and Randall, 1982; Randall and others, 1988; Morrissey and others, 1988). Water in the unconfined aquifer discharges to the main stem of the Chenango River, to adjacent springs and swamps, and to pumping wells.

Streams may gain or lose water through the bed material, depending on whether the water level in the stream is above or below the water table. Reaches in which the water level in the stream is higher than the local water table lose water to the aquifer, and reaches in which the water table is higher than the stream-water level gain water from the aquifer. The Chenango River typically gains water from the aquifers, whereas the tributaries typically gain water in the uplands but lose some or all of it through leakage on alluvial fans where they enter the Chenango valley (Ku and others, 1975; Randall, 1978; Morrissey and others, 1988). Alluvial fans are a major source of recharge to valley-fill aquifers (Randall, 1978; MacNish and Randall, 1982) because they permit rapid infiltration of stream water to the underlying aquifer. A description of this process is given on plate 4, in the section “Water-Table Altitude”.

REFERENCES CITED

Cadwell, D.H., 1972, Late Wisconsinan deglaciation chronology of the Chenango River valley and vicinity, New York: State University of New York at Binghamton, Ph.D. thesis, p. 102.

--------- 1981, Glacial geology of the Chenango River Valley between Binghamton and Norwich, New York, in New York State Geological Association Guidebook for Field Trips in South-Central New York: Albany, New York State Museum, Journal Series no. 326, p. 17.

Coates, D.R., 1974, Reappraisal of the Glaciated Appalachian Plateau: in Coates, D.R., ed., Glacial geomorphology—Proceedings of the Fifth Annual Geomorphology Symposia Series: Binghamton, N.Y., State University of New York at Binghamton, p. 205-243.

Fullerton, D.S., 1980, Preliminary correlation of post-Erie interstadial events (16,000-10,000 radiocarbon years before present), Central and Eastern Great Lakes Region, and Hudson, Champlain, and St. Lawrence Lowlands, United States and Canada: U.S. Geological Survey Professional Paper 1089, p. 52.

Ku, H.F., Randall, A.D., and MacNish, R.D., 1975, Streamflow in the New York part of the Susquehanna River Basin: U.S. Geological Survey Bulletin 71, p. 130.

MacNish, R.D., and Randall, A.D., 1982, Stratified-drift aquifers in the Susquehanna River Basin, New York: New York State Department of Environmental Conservation Bulletin 75, p. 52.

McPherson, W.S., 1993, Hydrogeology of unconsolidated deposits in Chenango County, New York: U.S. Geological Survey Water-Resources Investigations Report 91-4138, p. 43.

Morrissey, D.J., Randall, A.D., and Williams, J.H., 1988, Upland runoff as a major source of recharge to stratified drift in the glaciated Northeast, in Randall, A.D., and Johnson, A.I., eds., The Northeast glacial aquifers: American Water-Resources Association Monograph Series 11, p. 17-36.

New York State Department of Health, 1982, New York State atlas of community water system sources: Albany, N.Y., p. 79.

Randall, A.D., 1972, Records of wells and test borings in the Susquehanna River Basin, New York: New York State Department of Environmental Conservation Bulletin 69, p. 92.

--------- 1978, Infiltration from tributary streams in the Susquehanna River Basin, New York: U.S. Geological Survey Journal of Research, v. 6, no. 3, p. 285-297.

Randall, A.D., Snavely, D.S., Holecek, T.J., and Waller, R.M., 1988, Alternative sources of large seasonal water supplies in the headwaters of the Susquehanna River Basin, New York: U.S. Geological Survey Water-Resources Investigations Report 85-4127, p. 121.

U.S. Bureau of the Census, 2000, Census of population and housing: http://www.empire.state.ny.us/nysdc/: accessed April 2002.

Geohydrology of the Valley-Fill Aquifer in the Norwich-Oxford-Brisben Area, Chenango County, New York

By
Kari K. Hetcher, Todd S. Miller, James D. Garry, and Richard J. Reynolds
2003
Plate 1 - Introduction

For additional information write to:
District Chief, U.S. Geological Survey, 425 Jordan Road, Troy, NY 12180

Copies of this report are available on-line at http://ny.usgs.gov or can be purchased from:
U.S. Geological Survey, Branch of Information Services, Box 25286, Denver, CO 80225-0286