

Ground-Water Sampling Program of the Hudson River Basin Study

BACKGROUND

In 1991, the U.S. Geological Survey (USGS) implemented a National Water-Quality Assessment (NAWQA) program to (1) describe the status of, and trends in, the quality of large, representative parts of the Nation's surface-water and ground-water resources, and (2) provide a scientific explanation of the major natural and human factors that affect the quality of these resources. In addressing these goals, the program is producing nationally consistent water-quality information that will be useful to water-resource managers and policy makers at the National, State, and local levels.

The NAWQA program is designed to integrate water-quality information collected at differing areal scales and consists of 60 areas, or study units, nation-wide. The study units were selected to include parts of most of the major river Basins and aquifers systems in the Nation. In 1991, the Hudson River Basin study unit was among the first 20 NAWQA study units to begin data collection



Figure 1.--Location of study unit survey in Hudson River basin

GROUND-WATER-SAMPLING PROGRAM

The objectives of the ground-water component of the Hudson River Basin study are to describe ground-water-quality conditions in the study area and relate them to the natural and human factors that may affect them. The sampling program includes (1) a study-unit survey, (2) two land-use studies to examine ground water in selected agricultural and urban areas, and (3) a ground-water-flowpath study. Since 1991, water samples have been collected at more than 100 sites for these three components and measured in the field for pH, specific conductance, alkalinity, and other chemical properties, including concentrations of major inorganic constituents, nutrients, and pesticides; some samples were also analyzed for volatile organic compounds. The first component of the study (study-unit survey) is intended to obtain ground-water quality data from selected sites throughout the Basin and, therefore, to provide a broad indication of current water-quality conditions. The second component (two land-use studies) focuses on the factors that affect ground-water quality in an urban and agricultural area. The third component (ground-water flowpath study) which was undertaken at the smallest scale, examines the rela-

tions among ground-water quality and (1) subsurface flowpaths, (2) interaction between surface water and ground water, and (3) the distribution and transport of contaminants in ground-water.

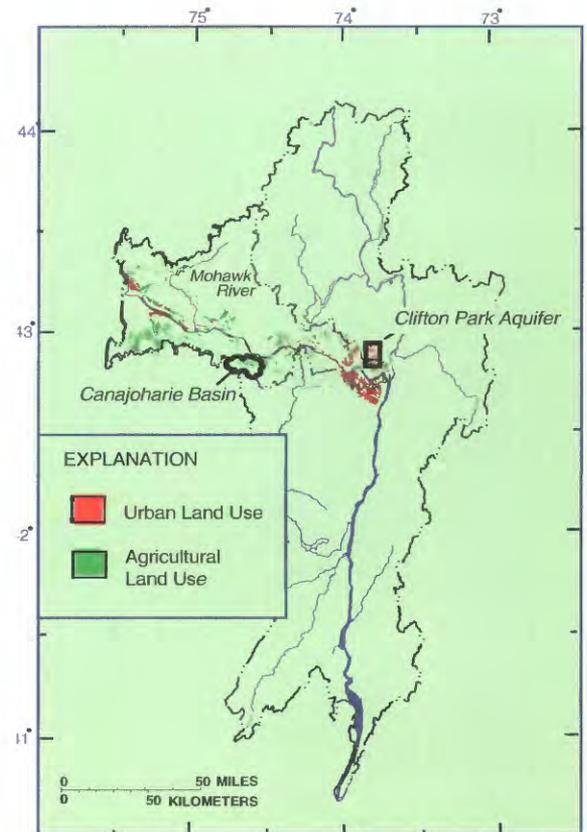
Study-Unit Survey

The Hudson River Basin study-unit ground-water survey was designed to characterize the ground-water quality of the Mohawk and Hudson Valleys (fig. 1). This was begun in October 1994 and entailed water sampling at 50 domestic wells in urban, agricultural, and forested settings within the Mohawk and Hudson River Valleys. The wells range in depth from 6 ft (feet) to more than 400 ft below land surface. Some of the wells tap unconsolidated surficial deposits (alluvium, till, and stratified drift), and some are completed in bedrock. The Mohawk and Hudson River Valleys together contain 25 percent of the Hudson River Basin's population but represent 50 percent of the Basin's ground-water use. Results of this survey have provided information on the occurrence and distribution of a comprehensive array of physical properties, major inorganic compounds, nutrients, pesticides, volatile organic compounds, and radon in ground-water resources of the Mohawk and Hudson River Valleys.

Land-Use Survey

Two surveys were designed to examine the effects of urban and agricultural land-use on ground-water quality in water-table aquifers. The urban land-use study, conducted during 1993-94, was mostly within the Capital District region and included wells in Albany, Schenectady, and Saratoga Counties (fig 2). Samples were collected from 15 newly installed observation wells completed in water-table aquifers underlying mixed urban-residential and commercial land. Well depths ranged from 10 to 50 ft below land surface. An additional ten older wells that tap the Clifton Park aquifer, an important source of drinking water in an area of rapid population growth in Saratoga County, also were sampled; these wells ranged in depth from 10 to 120 ft below land surface. The general chemical quality of shallow ground water underlying urban land also was examined; samples were analyzed for physical properties, major inorganic compounds, pesticides, volatile organic compounds, and radon.

The agricultural-land-use study, conducted during 1994, was conducted in agricultural areas in the Mohawk Valley Physiographic Province, primarily in Montgomery and Oneida Counties. The dominant agricultural land use includes row crops, specifically corn, alfalfa, and soybeans. Water samples were collected from 23 newly installed observation wells screened from 10 to 74 ft below land surface. Ten of these wells were installed in the Canajoharie Creek watershed, an area of intensive agricultural activity in Montgomery County. All water samples were analyzed for physical properties, major inorganic constituents, nutrients, and pesticides.



Base from U.S. Geological Survey
1:100,000 Digital Line Graphs
Albers Equal-Area Conic projection
Standard parallels 29° 30' and 45° 30'
central meridian 74°

Figure 2.—Locations of land-use surveys.

Ground-Water-Flowpath Study

The flowpath study was designed to examine the relation between water quality and land use in greater detail than was possible in either the study-unit survey or the land-use studies. The flowpath study attempts to relate horizontal and vertical differences and temporal changes in water quality to the direction and rate of ground-water-flow and dissolved contaminants from intensive agricultural practices in the Canajoharie Creek watershed. An additional objective is to define the extent and role of interaction between the shallow ground-water flow system and Canajoharie Creek, and the effect of this interaction on water quality in the aquifer and the stream.

The 1-square-mile study area is bounded on two sides by Canajoharie Creek and on the other two by till-mantled hills or drumlins, and is underlain by unconsolidated glacial deposits, including lacustrine clay, sand, and gravel. Most of the area is under cultivation of row crops, and many of the fields are drained by tiles that discharge directly into drainage ditches that flow into the creek (fig. 3).

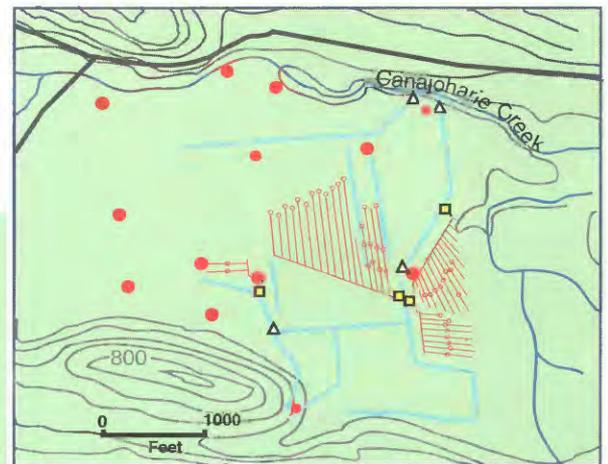
The sampling network consists of 18 newly in-installed wells, many along a transect from the base of the hills to the creek. Wells are screened in both the shallow semiconfined aquifer 5 to 10 ft below land surface, and in the confined aquifer, which lies at variable depths ranging from 30 ft to 70 ft below land surface.



Location Map

Explanation

- 800 — Topographic contour - shows land surface altitude, in feet
- Drainage Ditch
- Tile Drains
- Observation Well
- Tile Drain
- △ Drainage Ditch sampling site



Base from Sprout Brook Quadrangle, 1943, 1:24,000

Figure 3.—Sampling locations in ground-water flowpath study

Water samples were collected from all wells and from selected tile drains and throughout the ditches, as well as from Canajoharie Creek. All samples were analyzed for nutrients, pesticides, physical properties, and major inorganic constituents.

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