INTRODUCTION

Water-resources data for the 2004 water year for New York consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and ground-water levels and water quality. This volume contains records for water discharge at 151 gaging stations; stage only at 10 gaging stations; stage and contents at 4 gaging stations, and 16 other lakes and reservoirs; water quality at 29 gaging stations; and water levels at 25 observation wells. Also included are data for 31 crest-stage partial-record stations. Additional water data were collected at various sites not involved in the systematic data-collection program, and are published as miscellaneous measurements and analyses in this volume. Surface-water, ground-water, and water-quality data at all sites are listed in Eastern Standard Time (EST), unless otherwise noted. These data, together with the data in Volumes 2 and 3, represent that part of the National Water Data System operated by the U.S. Geological Survey in cooperation with State, municipal, and Federal agencies in New York.

Records of discharge and stage of streams, and contents and stage of lakes and reservoirs, were first published in a series of U.S. Geological Survey water-supply papers entitled, "Surface Water Supply of the United States." Through September 30, 1960, these water-supply papers were in an annual series and then in a 5-year series for 1961-65 and 1966-70. Records of water quality, water temperatures, and suspended sediment were published from 1941 to 1970 in an annual series of water-supply papers entitled "Quality of Surface Waters of the United States." Records of ground-water levels were published from 1935 to 1974 in a series of water-supply papers entitled "Ground-Water Levels in the United States." Water-supply papers may be consulted in the libraries of the principal cities and universities in the United States or may be purchased from the U.S. Geological Survey, Branch of Distribution, 604 South Pickett Street, Alexandria, VA 22304.

Since the 1961 water year, streamflow data and since the 1964 water year, water-quality data have been released by the Geological Survey in annual reports on a State-boundary basis. These reports provided rapid release of water data in each state shortly after the end of the water year. Through 1970 the data were also released in the water-supply paper series mentioned above.

Streamflow and water-quality data beginning with the 1971 water year, and ground-water data beginning with the 1975 water year are published only in reports on a State-boundary basis. Beginning with the 1975 water year, these Survey reports carry an identification number consisting of the two-letter State abbreviation, the last two digits of the water year, and the volume number. For example, this volume is identified as "U.S. Geological Survey Water-Data Report NY-04-1." Water-data reports are for sale in various formats by the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.

Additional information, including current prices for ordering specific reports, may be obtained from the District Office at the address given on the back of the title page or by telephone (518)285-5600.

COOPERATION

The U.S. Geological Survey and organizations of the State of New York and other agencies have had cooperative agreements for the systematic collection of water records since 1900. Organizations that assisted in collecting data included in Volume 1, water year 2004, through cooperative agreement with the Survey are:

Board of Hudson River-Black River Regulating District
Brascan Power, New York
City of Albany
City of New York, Department of Environmental Protection
County of Ulster, County Legislature
Green Island Power Authority
La Chute Hydro Company, Inc.
Mirant New York, Inc.
New York Power Authority
New York State Department of Environmental Conservation
New York State Department of Transportation
Reliant Energy
Village of Nyack

Assistance in the form of funds for collecting records at gaging stations published in this report was also given by the following:

U. S. Department of Energy

The following municipalities, organizations, and agencies aided in collecting records:

National Weather Service
Oswegatchie River-Cranberry Reservoir Commission
Plattsburgh
United Water New York
Utica Board of Water Supply

Organizations that supplied data are acknowledged in station descriptions.

SUMMARY OF HYDROLOGIC CONDITIONS

Surface Water

Runoff during the 2004 water year in eastern New York was abundant (fig. 1). Runoff was highest (150 to170 percent of normal) in most of the Catskill Mountains, and lowest (110 to 130 percent of normal) in the Adirondack Mountains, the St. Lawrence River Valley, and east of the lower Hudson River Valley.

Contents of the New York City reservoir system remained above 90 percent throughout the water year (fig. 2A). Above-normal precipitation during the summer and fall helped to keep reservoir levels from dropping during the drier winter and spring. Capacities of several reserviors in the system were exceeded, which resulted in flow over the spillways. All of the reservoirs spilled in September in response to the heavy rains from remnants of two tropical hurricanes, Frances and Ivan.

The volume of water in the Great Sacandaga Lake was 25 to 45 percent above the long-term average (1931-2003) during the fall and early winter. The lake was drawn down during the winter to accomodate the spring snowmelt (fig. 2B). Only during April was the lake level below normal. Snowmelt in April and May increased the lake to levels above normal. The wet summer helped to maintain above-normal lake levels through the end of the water year. The reservoir capacity was exceeded during several days in late May and early June, causing flow over the spillway.

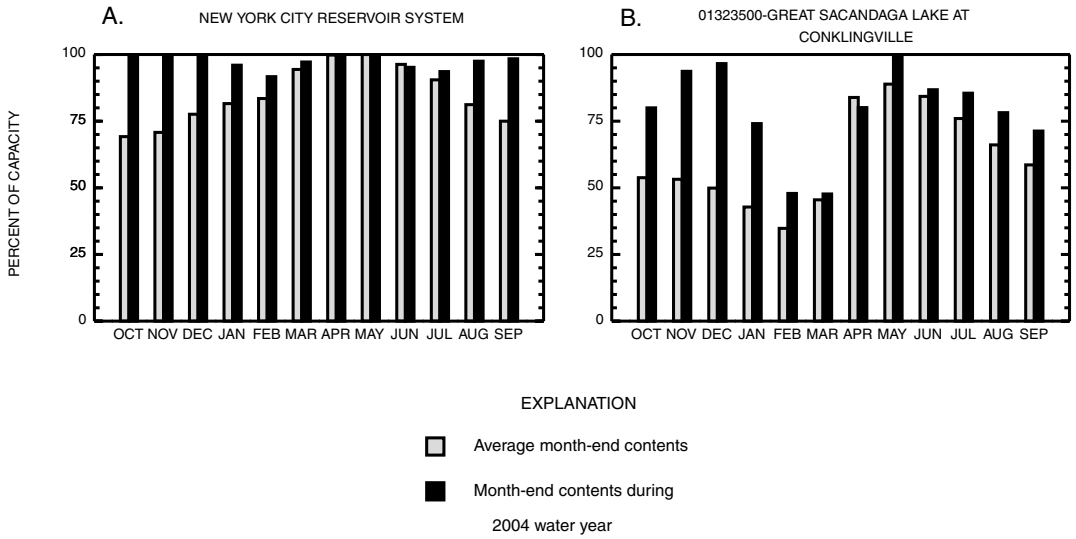

Figure 2.--Comparison of percent of capacity of average month-end reservoir contents and month-end contents during 2004 water year for two selected reservoir systems in eastern New York.

Monthly runoff (in inches) at selected streamflow-gaging stations during 2004, and the average monthly runoff at each site during 1940-99, are plotted in figure 3. Monthly runoff in eastern New York was generally at or above normal from October through December. January runoff was about normal throughout eastern New York and below normal during February. Runoff for the remaining months of the winter and through early summer were mixed--above normal at some stations and below at others. August runoff was about an inch above normal throughout eastern New York. Early September brought rainfall from the remnants of Hurricane Frances, which soaked most of eastern New York, and the remnants of Hurricane Ivan soaked the lower Hudson River Valley and the Catskill Mountains 10 days later. Many areas along the Delaware River and its tributaries experienced floods with return periods of 50 to 100 years; 8 of the 11 long-term streamflow-gaging stations in that area recorded new maximum annual mean discharges in 2004 (table 1). No droughts occurred in this water year.

Daily-discharge hydrographs for the 2004 water year at two unregulated gaging stations in eastern New York—West Branch Oswegatchie River near Harrisville in St. Lawrence County, and Wappinger Creek near Wappingers Falls in Dutchess County, are presented in figures 4 and 5, respectively. Daily discharge at Wappinger Creek was well above the 25-percent exceedence level (percentage of time that a given discharge is equaled or exceeded) during most of the fall and early winter. A cold winter caused precipitation to fall mostly as snow, which resulted in low stream discharges from late January through February. A thaw in early March melted the snowpack, but below-normal rainfall during April and May caused the discharge to quickly decrease to below-normal levels. Rainfall was normal and evenly distributed through early summer, but increased to above-normal in August and September, causing streamflow of Wappinger Creek to increase to the 10-percent exceedence level for both months. Streamflow of West Branch Oswegatchee River increased to well above the 25-percent exceedence level many times during the fall and early winter. Streamflow decreased during midwinter as the snowpack grew until a thaw in early March started the snowmelt period. A cold snap in late March temporarily hindered snowmelt, but a warm April melted the remaining snow. Above-normal precipitation in late May temporarily increased streamflow to above the 25-percent exceedence level, but the combined effects of increased transpiration through newly emerged leaves and below-normal precipitation in June caused streamflow to decrease. Precipitation during the rest of the summer was above normal and caused streamflow to be often well above the 25-percent exceedence level.

October 2003 brought a respite from the hot late-summer weather. Air temperatures throughout eastern New York were about 1°F below normal, and freezing temperatures had occurred over all of eastern New York by the end of the month. The wet weather of the four preceding months continued through October. Rainfall was generally 1 to 2 inches above normal, but Slide Mountain in the Catskill Mountains received more than 9 inches. Runoff at two streamflow-gaging stations in the Catskill Mountain region--Schoharie Creek at Prattsville and Beaver Kill at Cooks Falls (fig.3) -- was about about 4 inches above normal. Runoff was well above normal throughout eastern New York. October's abundant rainfall resulted in record October monthly discharges at several long-term streamflow-gaging stations in the Catskill Mountain

SUMMARY OF HYDROLOGIC CONDITIONS--Continued

Surface Water--Continued

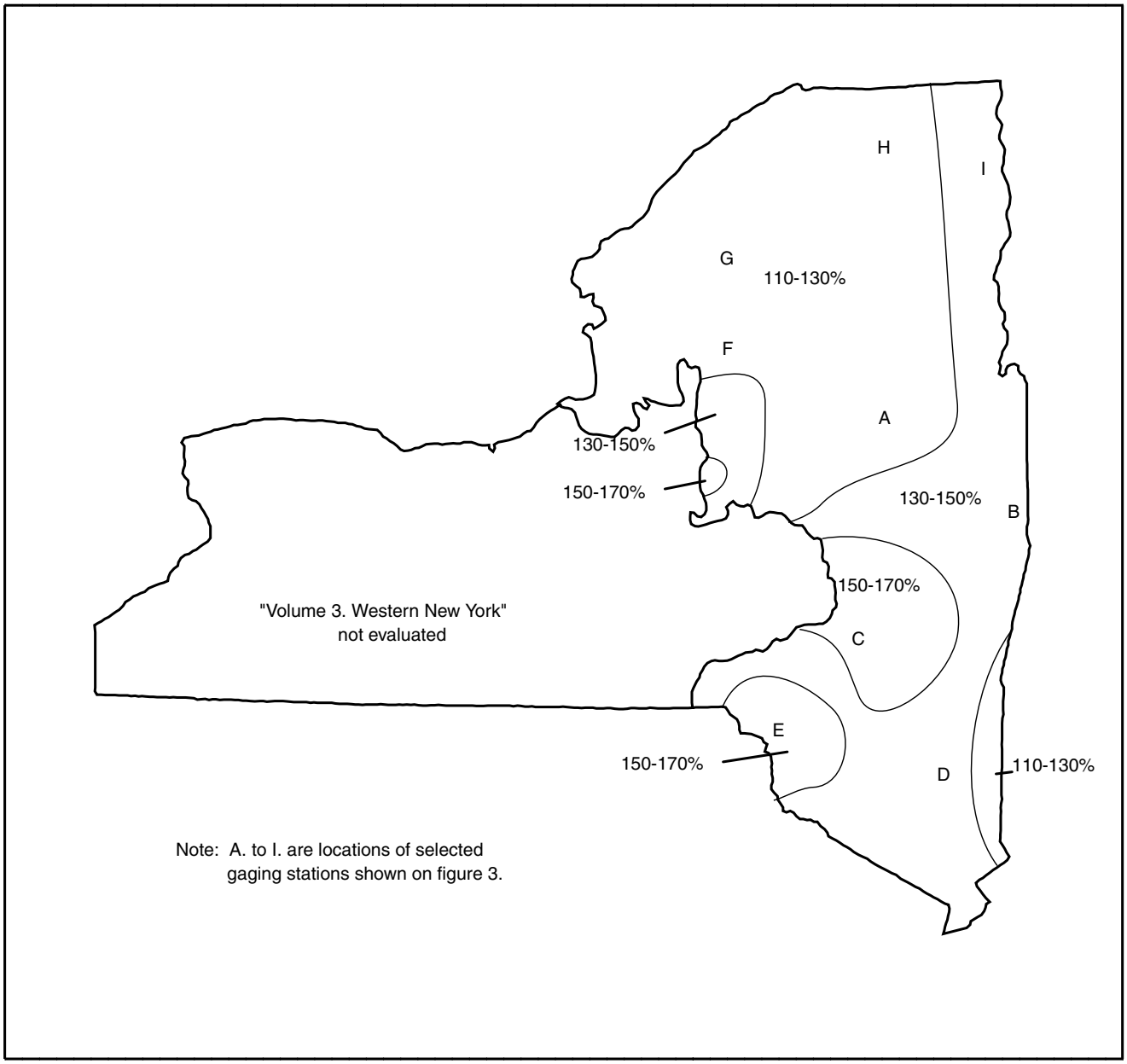

Figure 1.--2004 water year runoff as a percentage of the average annual runoff for 1940-99 for eastern New York excluding Long Island.

SUMMARY OF HYDROLOGIC CONDITIONS--Continued

Surface Water--Continued

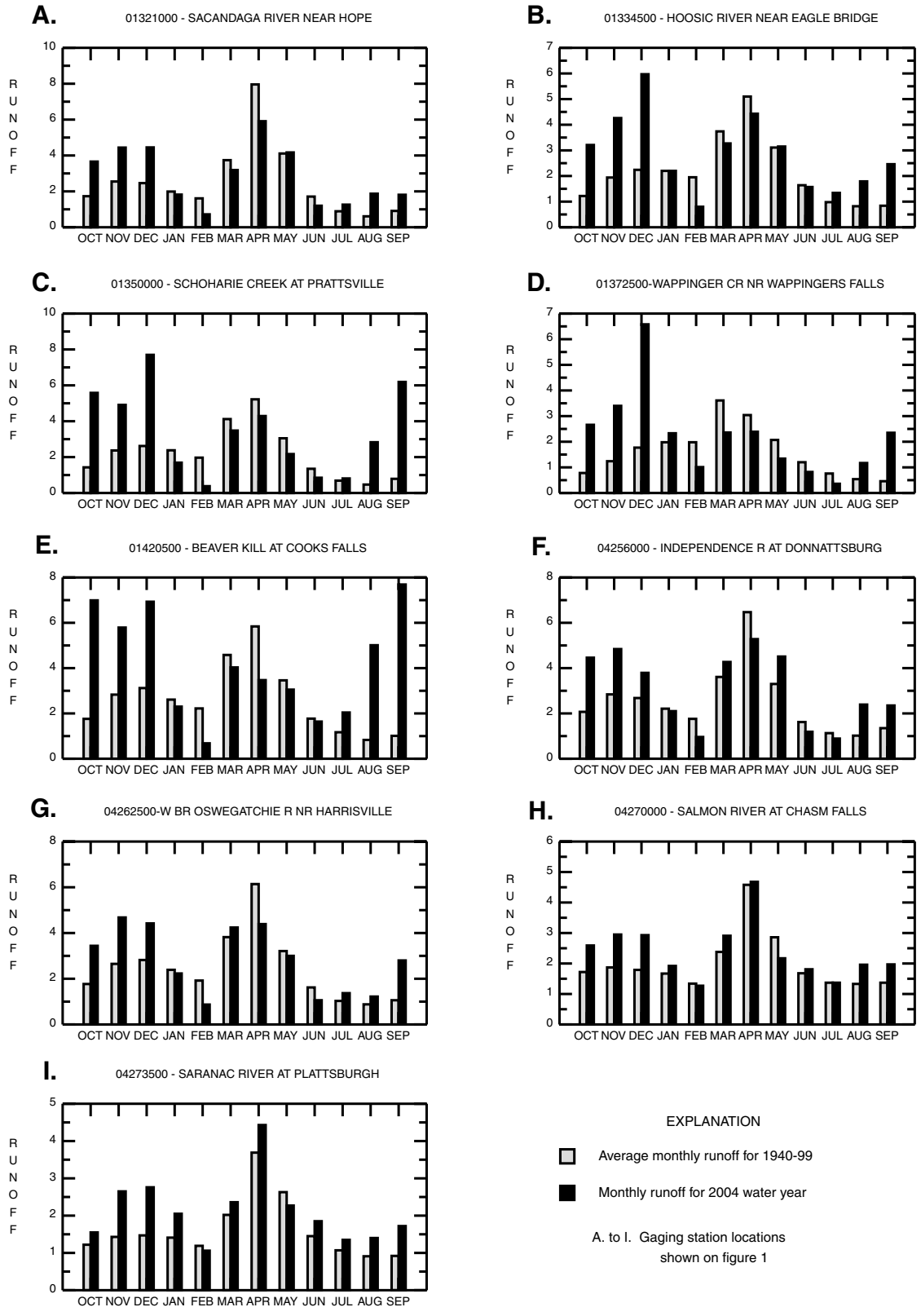

Figure 3.--Comparison of monthly runoff (in inches) for 2004 water year and average monthly runoff for 1940-99 for selected gaging stations in eastern New York (site locations are shown on figure 1).

Surface Water--Continued

region. The New York City reservoir system month-end contents were at 100 percent capacity, and the Great Sacandaga Lake contents were about 80 percent capacity, about 25 percent above normal.

Air temperatures in November averaged 2 to 3°F warmer than normal. Precipitation was slightly greater than normal in most areas except the Mohawk River Valley, where it was normal. Runoff was above normal throughout eastern New York. Again, streamflow-gaging stations in the Catskill Mountains recorded the greatest departures-above-normal, and new record November monthly discharges were recorded at several long-term streamflow-gaging stations in the Catskill region. The New York City reservoir contents remained at 100 percent capacity, and the Great Sacandaga Lake contents were about 95 percent capacity, about 40 percent above normal.

December air temperatures averaged 1°F above normal, but readings below 0°F were common in the Adirondack Mountains. The coldest temperature of the month (-15°F) was recorded at Lake Placid on December 5. Wet weather continued into December, and precipitation in eastern New York was 1 to 3 inches above normal. The wettest region was the Hudson River Valley. Air temperatures for December were about normal. Runoff continued to be well-above normal throughout the region, especially in the Hudson River Valley and Catskill Mountains. The New York City Reservoir contents remained at 100 percent capacity, and the Great Sacandaga Lake contents remained about 97 percent capacity, almost twice the normal volume.

January was cold and dry. Temperatures were 7 to 9°F below normal, and temperatures below 0°F were reported throughout eastern New York. Highmarket, in Lewis County, reported a low temperature of -40°F on January 26. Precipitation was 1 to 2 inches below normal. The formation of river ice and little precipitation reduced runoff to levels normal for January. The New York City reservoir contents had decreased to 95 percent of capacity (10 percent above normal), and the Great Sacandaga Lake contents decreased to about 75 percent of capacity (still about 40 percent above normal), by the end of January.

Air temperatures warmed to normal in February, but several towns in the St. Lawrence River Valley recorded temperatures of -30°F. Precipitation was about an inch below normal throughout eastern New York. Runoff was about 1 inch below normal as the low air temperatures kept moisture locked in the snowpack. The New York City reservoir contents remained above 90 percent of capacity whereas the Great Sacandaga Lake was drawn down to about 50 percent of capacity to accomodate the spring runoff. The contents of both reservoir systems were about 10 percent above normal at the end of February.

March air temperatures were 3 to 4°F above normal, and precipitation was about 1 inch below normal. Runoff was about 1 inch below normal. Snowmelt in early March caused streamflow at West Branch Oswegatchie River to rise above the 25-percent exceedence level, only to drop below the 75-percent exceedence level from a cold snap later in the month. The same pattern occurred on Wappinger Creek, although less pronounced. Runoff at most stations was about 1 inch below normal south of the Adirondack Mountains and normal northward. The New York City reservoir system was at 100 percent of capacity. Contents of the Great Sacandaga Lake increased to about 80 percent of capacity in response to the late-winter snowmelt.

April was about 1°F warmer than normal, and precipitation was about normal. Runoff was about 1 inch below normal, except north of the Adirondack Mountains, where it was normal. The New York City reservoir system and the Great Sacandaga Lake were at 100 percent and 80 precent of capacity, respectively, by April 30.

Warm, wet weather prevailed over most of eastern New York during May. Only the lower Hudson River Valley received normal amounts of precipitation. The onset of transpiration with leaf emergence, combined with the dry soils, caused streamflow to decline to about an inch below normal in most areas. In contrast, flow of Independence River at Donnattsburg in Lewis County was about 1 inch above normal. New York City reservoir contents remained near 100 percent of capacity. The contents of the Great Sacandaga Lake increased to 100 percent of capacity by month's end and flowed over the spillway during several days in late May and early June.

June temperatures in eastern New York were 1 to 2°F below normal. Rainfall and runoff were within an inch of normal. Reservoir contents in the New York City system dropped slightly to about 95 percent of capacity, and the Great Sacandaga Lake contents were above normal at 85 percent of capacity.

Air temperatures in July were normal. Rainfall was variable, depending on location; it was about 2 inches below normal in extreme northern New York and 2 to 4 inches above normal in the Catskill Mountain region, where ten inches of rainfall was recorded at Slide Mountain. The last week in July brought 1 to 3 inches of rainfall at many locations in southeastern New York. Runoff was below normal during early July but the heavy rains during the later half of the month caused daily streamflow of Wappinger Creek to rise above the 25-percent exceedence level. Reservoir contents remained relatively unchanged through July.

August, like July, was extremely wet. Rainfall in eastern New York was 2 to 4 inches above normal and exceeded 10 inches at Port Jervis in Orange County and Liberty in Sullivan Country. Monthly mean air temperatures were about normal. The heavy rains caused well-above normal runoff in the Catskill Mountain region. Runoff at Schoharie Creek at Prattsville and Beaver Kill at Cooks Falls was more than three times the normal amount. New record August monthly discharges were recorded at seven stations in the Catskill Mountains. Reservoir contents were near capacity in the New York City reservoir system and about 15 percent above normal in the Great Sacandaga Lake.

Air temperature in September was 2 to 3°F warmer than normal throughout eastern New York. Rainfall in the region north of the Mohawk River Valley was normal, and runoff was within an inch of normal. The Great Sacandaga Lake contents remained about 10 percent above normal. Remnants of two tropical hurricanes, Frances followed by Ivan 10 days later, caused severe flooding in the southern Catskills. Combined runoff totals of 6 to 8 inches from the two storms were common throughout southeastern New York. The excessive rains caused the New York City reservoirs on the East and West Branches of the Delaware River to spill. The entire New York City reservoir-system contents were at 99 percent capacity. New instantaneous peak-of-record discharges were established at several long-term streamflow-gaging stations downstream from the Pepacton Reservoir in the upper Delaware River basin. This month's abundant rainfall also resulted in record September monthly discharges at several long-term streamflow-gaging stations in the Catskill region (table 1). Most streamflow-gaging stations throughout southeastern New York recorded their annual maximum instantaneous discharge during September.

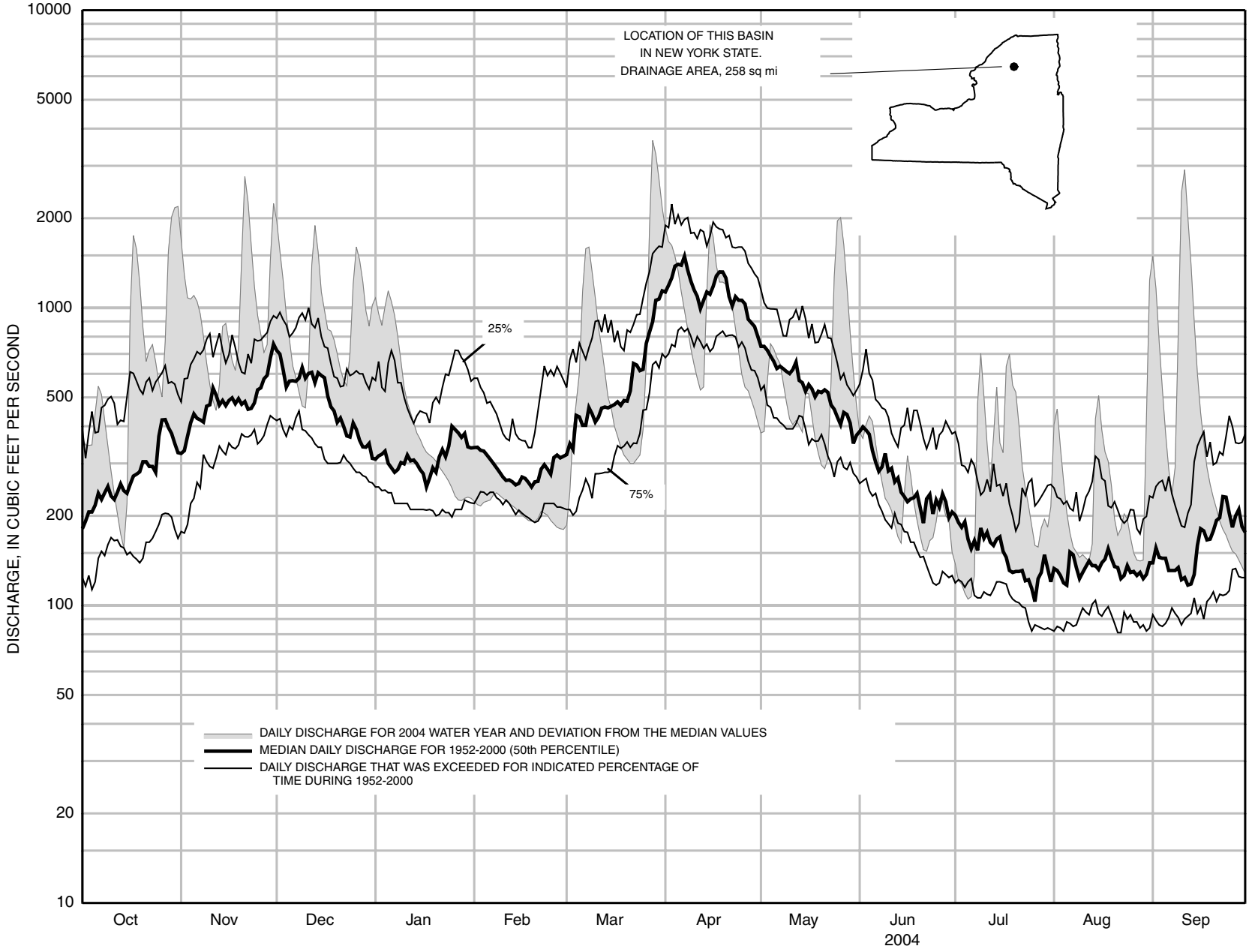

FIGURE 4.--HYDROGRAPHIC COMPARISONS, WEST BRANCH OSWEGATCHIE RIVER NEAR HARRISVILLE

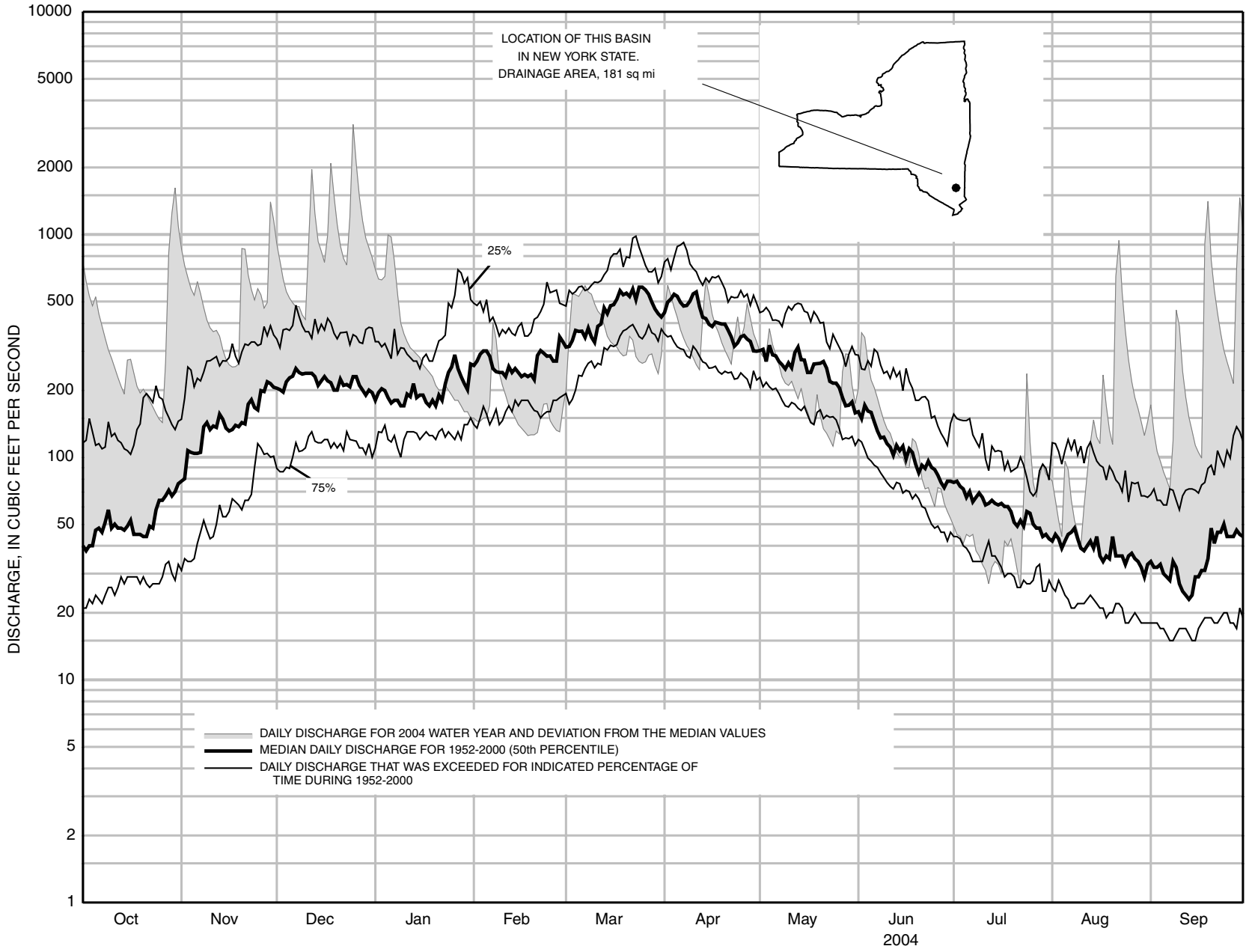

FIGURE 5.--HYDROGRAPHIC COMPARISONS, WAPPINGER CREEK NEAR WAPPINGERS FALLS

SUMMARY OF HYDROLOGIC CONDITIONS--Continued

Surface Water--Continued

Table 1.--September mean and annual mean discharges for the 2004 water year and previous maximums for selected sites in the Catskill Mountains area of southeastern New York.

Station number	Station name	Drainage area (mi^2)	Period of record	Previous September maximum of record		Sept. 2004 mean discharge (ft^3/s)	Previous annual maximum of record		2004 annual mean discharge (ft^3/s)
				Water year	Mean discharge (ft^3/s)		Water year	Mean discharge (ft^3/s)	
01350000	Schoharie Cr at Prattsville	237	1902-2004	1960	1,150	1,310	1978	873	724
01417000	East Br Delaware R at Downsville	372	a1955-2004	2003	1,080	1,420	1956	507	644
01417500	East Br Delaware R at Harvard	458	a1955-2004	2003	1,520	1,730	1956	688	882
01420500	Beaver Kill at Cooks Falls	241	1913-2004	2003	1,520	1,660	1928	936	878
01420980	East Br Delaware R above Read Cr at Fishs Eddy	766	a1955-2004	2003	3,390	3,950	1973	1,590	2,020
01423000	West Br Delaware R at Walton	332	1950-2004	1977	1,330	1,310	1976	833	841
01425000	West Br Delaware R at Stilesville	456	a1964-2004	1972	1,610	1,910	1997	1,050	1,060
01426500	West Br Delaware R at Hale Eddy	595	a1964-2004	2003	1,700	2,570	1978	1,410	1,380
01427510	Delaware R at Callicoon	1,820	1975-2004	2003	7,160	9,040	1978	3,970	4,590
01428500	Delaware R above Lackawaxen R near Barryville	2,020	a1964-2004	2003	8,100	10,300	1973	4,650	5,320
01434000	Delaware R at Port Jervis	3,070	a1964-2004	2003	12,300	15,100	1973	7,220	7,820
01437500	Neversink R at Godeffroy	307	a1954-2004	2003	783	1,140	1956	704	665

a Since current degree of regulation

Water Quality

The water-quality data presented herein include water temperature, specific conductance, and concentrations of nutrients, major ions, pesticides, and sediment at selected ground-water and surface-water sites in New York State. Additional water-quality data are periodically collected for other programs or projects and are usually published in separate project reports.

Data on water-surface elevation, specific conductance, and water temperature were collected from three sites in the Hudson River estuary (below Poughkeepsie, at South Dock at West Point, and south of Hastings-on-Hudson) and were analyzed to locate the salt front (saltwater/freshwater interface), defined as the location where the specific conductance is 500 microsiemens per centimeter at 25.0°C (µS/cm). Water-surface elevation, specific conductance, and temperature at all three sites were within the ranges reported for period of record (1991-2004 for West Point; 1992-2004 for Poughkeepsie and Hastings-on-Hudson). The salt front in 2004 moved from less than 10 to 68 miles upstream from the Battery in New York City—a range of more than 58 miles. This upstream movement has been exceeded several times during 12 years of data collection; in 1995 the salt front moved as far as 82 miles upstream from the Battery.

Daily minimum, maximum, and mean water-temperature data were collected at seven sites in the Hudson River Basin and at 12 sites in the Delaware River Basin. The maximum recorded water temperature at sites in the Hudson River Basin was 27.0°C on August 3 and 4 at the Hudson River south of Hastings-on-Hudson; the maximum recorded water temperature at sites in the Delaware River Basin was 28.0°C on July 2 at the Delaware River above Lackawaxen River near Barryville.

Daily samples were collected throughout the year for analysis of suspended-sediment concentration from the Hudson River at Waterford to quantify the daily and annual export of suspended sediment from the upper Hudson River basin. Daily suspended-sediment discharges were within the range reported for the period of record (1977-2003).

Data collected for the Hudson River Basin National Water-Quality Assessment program document the physical properties of surface water at three surface-water sites in the basin and the concentrations of pesticides, sediment, nutrients, and major ions. Data collected at 10 sites on reservoirs for the New York City Reservoir Pesticide Monitoring Project characterize pesticide concentrations in water used for public drinking-water supplies. Data from the Croton Pesticide Monitoring Project document the concentrations of pesticides and pesticide-degradation products at more than 15 surface-water sites in the Croton River basin that receive urban and residential runoff.

Samples collected for analysis of suspended-sediment concentration at the Hudson River below Poughkeepsie were used to calibrate and verify a relation between acoustic back scatter and suspended-sediment concentration used to estimate the net suspended-sediment discharge at the site.

SUMMARY OF HYDROLOGIC CONDITIONS--Continued

Ground Water

Ground-water levels in shallow, water-table aquifers under natural (non-pumping) conditions in eastern New York typically show a seasonal pattern of change during the water year. Water levels rise in response to aquifer recharge from precipitation. Rates of aquifer recharge vary locally and are affected by many factors, including the timing and amount of precipitation, the rate of evapotranspiration, the soil-moisture content, and the amount of local runoff. Evapotranspiration includes physical evaporation, transpiration by vegetation, and ground-water evapotranspiration. Recharge typically is greatest during the late fall and from early to mid-spring, when transpiration is minimal, and the ground is not frozen. Water levels rise during the spring in response to recharge and generally exceed those that occur in the fall, primarily because the melting snowpack provides additional recharge. Water levels decline during the late spring and summer, when plant growth and water temperatures increase the rate of evapotranspiration and thereby reduce the rate of recharge. Storms, if of sufficient intensity and duration, can provide minor recharge to shallow aquifers during summer. Precipitation in New York is (on the average) fairly evenly distributed by month; thus, the annual summer decline in ground-water levels is due primarily to the decrease in recharge that results from increased evapotranspiration.

Confined aquifers are less responsive to recharge events than water-table aquifers. Water levels in confined aquifers generally show a subdued and delayed water-level response to recharge events because their hydraulic connection to the overlying unconfined aquifers is indirect. Changes in atmospheric pressure can cause transient, but significant, water-level changes in wells that tap confined aquifers.

The minimum, maximum, and median long-term monthly water levels and the water levels at seven selected observation wells during the 2004 water year are plotted in hydrographs in figure 6. The hydrographs for well A-654 in Albany County (east-central New York) and well Du-1009 in Dutchess County (southeastern New York) illustrate seasonal water-level fluctuations in water-table, sand and gravel aquifers. Water levels in well A-654 were above the median for all of the 2004 water year. New period-of-record monthly maximum water levels were measured in well A-654 for December, January, August, and September. Water levels in well Du-1009 were above the median for less than half the water year during October through December and August through September. During January through July, levels were at or below the median. New period-of-record monthly maximum water levels were measured in well Du-1009 for October, November, and December.

Well Oe-151 in Oneida County (northern New York), St-40 in St. Lawrence County (extreme northern New York), and W-533 in Washington County (east-central New York) also reflect seasonal fluctuations in water-table, sand and gravel aquifers. Water levels in well Oe-151 were at or below the median for about half the water year from the middle of February until the beginning of April and from May until August. During October through the middle of February, most of April, and September, levels were at or above the median. Water levels in well St-40 were at or above the median for the water year, except during October and parts of May through July when they were at or below the median. Water levels in well W-533 were at or below the median for the water year except for November through January, May through June, and August through September when they were at or above the median. A new period-of-record monthly maximum water level was measured in well W-533 for December.

Water-level conditions at well Cl-145 in Clinton County (extreme northeastern New York) and Ro-18 in Rockland County (southeastern New York) illustrate seasonal fluctuations in semi-confined, bedrock aquifers. Water levels in well Cl-145 were at or above the median during the water year except in October and April through August when they were at or below the median. A new period-of-record monthly minimum water level was measured in well Cl-145 for July. Water levels in Ro-18 were at or above the median for about half of the water year during October through January and part of August through September. During February through half of August, levels were at or below the median. New period-of-record monthly maximum water levels were measured in well Ro-18 for December and September.

In summary, the ground-water levels generally were above the long-term median from October through January during the 2004 water year. New period-of-record and near-record maximum water levels were measured in many wells for December and January. Water levels generally were near or below medians from February through July. Large amounts of precipitation in August and September resulted in above median water levels with new period-of-record and near-record maximum water levels measured in many wells.

SUMMARY OF HYDROLOGIC CONDITIONS--Continued

Ground Water--Continued

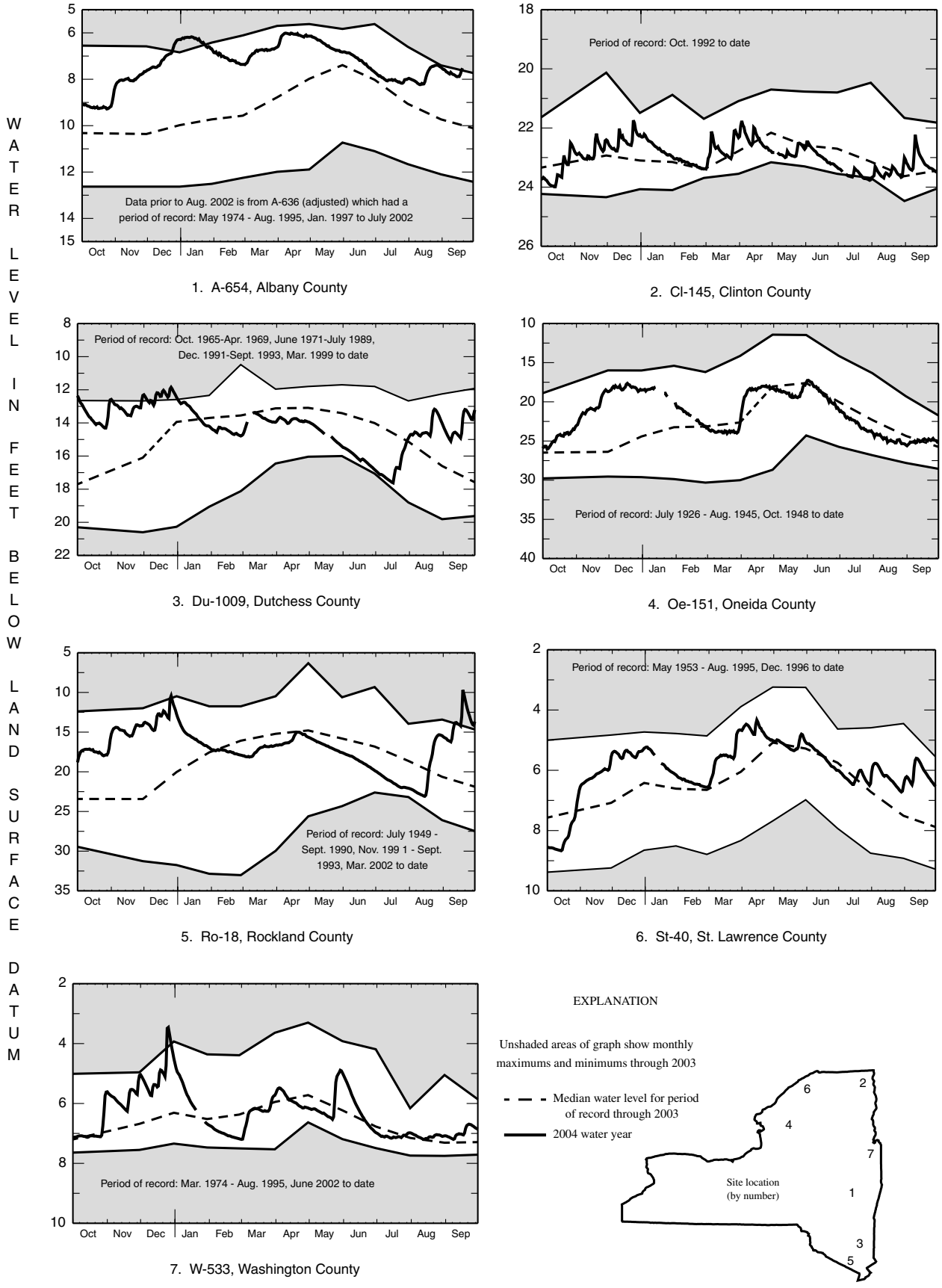

Figure 6.--Ground-water levels at selected observation wells in eastern New York.