SUMMARY OF HYDROLOGIC CONDITIONS

Surface Water

Streamflow in eastern New York during the 2005 water year was variable with respect to region (fig. 1). Streamflow was highest (100 to120 percent of normal) in most of the Catskill Mountains and east of the lower Hudson River Valley, and lowest (80 to 100 percent of normal) in the Adirondack Mountains and St. Lawrence River Valley.

Above-normal rainfall during the fall and winter helped to keep contents of the New York City reservoir system above 90 percent through May (fig. 2A). Heavy rains in March and April filled several reserviors in the system beyond their capacity, which resulted in flow over the spillways. All of the five reservoirs in the New York City system in the Catskill Mountain region spilled in April in response to the heavy rains. Normal rainfall kept levels slightly below normal for the remainder of the water year.

The volume of water in the Great Sacandaga Lake was 10 to 30 percent above the long-term average (1931-2001) during the fall and winter. The lake level was drawn down during late winter to accomodate the spring snowmelt (fig. 2B); only during March was the lake level below normal. Snowmelt and heavy rains in April and May increased the lake level to above-normal. Summer precipitation was normal and helped to keep lake levels above normal through the end of the water year. The lake capacity was not exceeded; therefore, no flow over the spillway occurred during the water year.

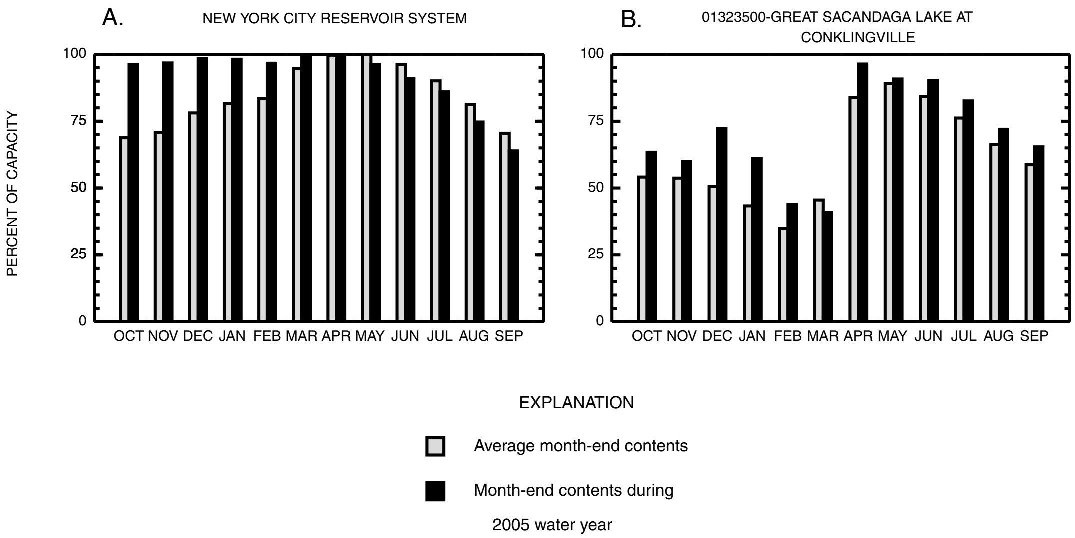

Figure 2.--Comparison of percent of capacity of average month-end reservoir contents and month-end contents during 2005 water year for two selected reservoir systems in eastern New York.

Monthly runoff (in inches) at selected streamflow-gaging stations during 2005, and the average monthly runoff at each site during 1940-99, are plotted in figure 3. Monthly runoff from October through November was generally at or above normal in southeastern New York and was below normal from there northward. Runoff during December and January was near normal throughout eastern New York. February runoff was near normal, and March runoff was about 1 inch below normal. A large storm that dumped of 2 to 5 inches of rain in the Catskill Mountain region and the Mid-Hudson Valley in April 2-3 caused monthly streamflow in those areas to be 2-4 inches above normal. That storm caused floods with recurrence intervals of 50 to 100 years in many areas along the Esopus Creek and the Delaware River and its tributaries. Twelve long-term streamflow-gaging stations in those areas recorded new peak-of-record discharges in April (table 1). May runoff was about 1 inch below normal throughout eastern New York. Runoff for the remaining months of the water year were mixed — above normal at stations in the northern Adirondack Mountains and below normal at locations from there southward. No droughts occurred in this water year.

Daily-discharge hydrographs for the 2005 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, indicating wet conditions. November and March discharges were about normal. Discharge of Wappinger Creek after the April 2-3 storm decreased to below normal and remained so through most of the remainder of the water year. September discharge was well below the 75-percent exceedence level, indicating extremely dry conditions. Discharge of West Branch Oswegatchee River was well below normal during October and November. Warm weather during December and early January melted snow which produced above-normal discharges. Discharge remained below normal during the remainder of the winter into early summer; except during the April storm, which caused above-normal levels temporarily. Stream discharge was variable during June and July, and was generally well below normal in August , and well above normal in September.

Monthly Conditions

The 2005 water year began with a relatively dry October. Rainfall in most of eastern New York was 1 to 2 inches below normal, except in the St. Lawrence River Valley, where it was normal. Air temperatures throughout eastern New York were within 1°F of normal. Runoff was above normal south of the Mohawk River Valley and as much as 1 inch below normal from there northward. The New York City reservoir system month-end contents were at 95 percent of capacity (about 25 percent above normal) and the Great Sacandaga Lake contents were at about 65 percent of capacity.

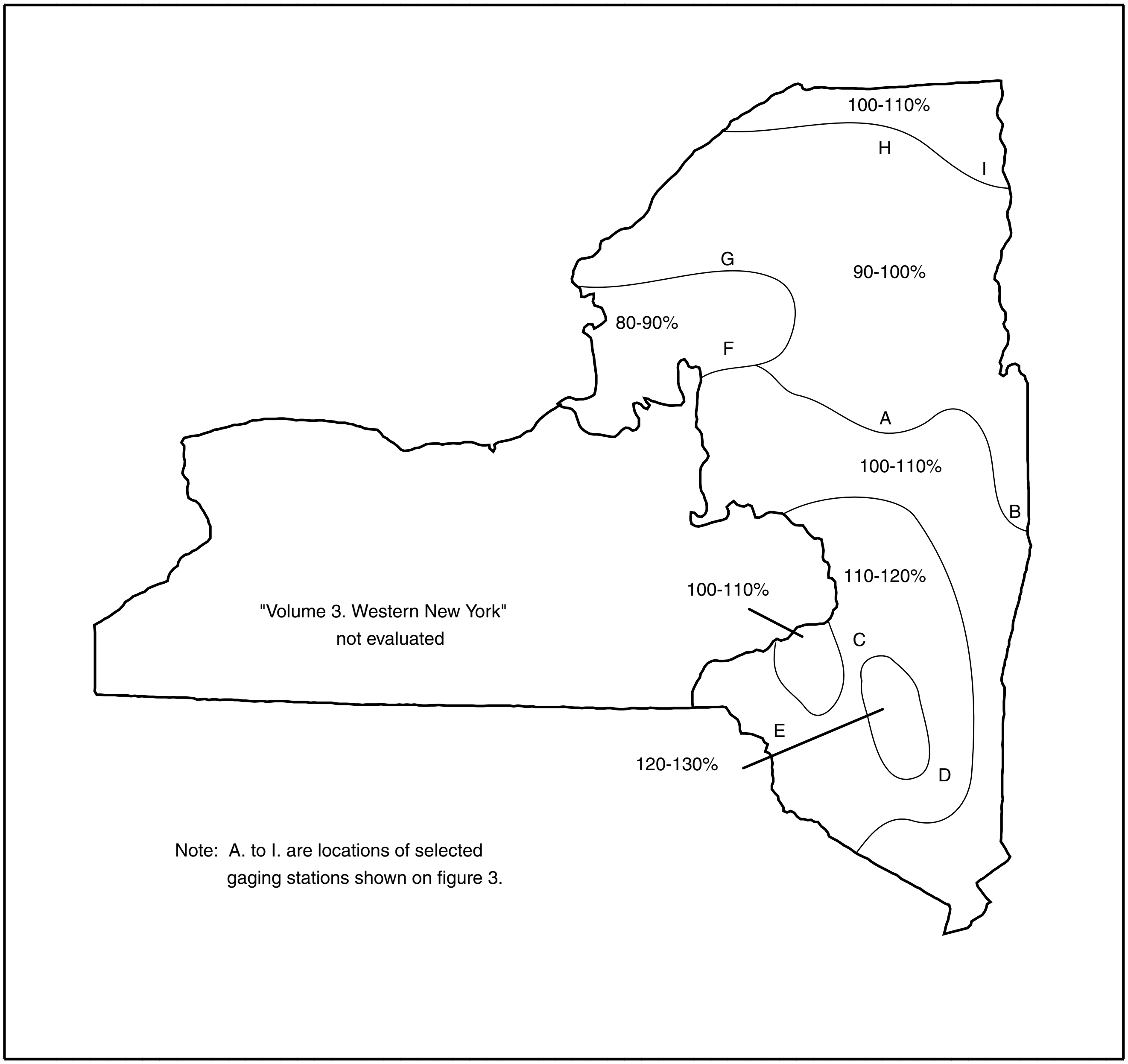

Figure 1.--2005 water year runoff as a percentage of the average annual runoff for 1940-99 for eastern New York excluding Long Island.

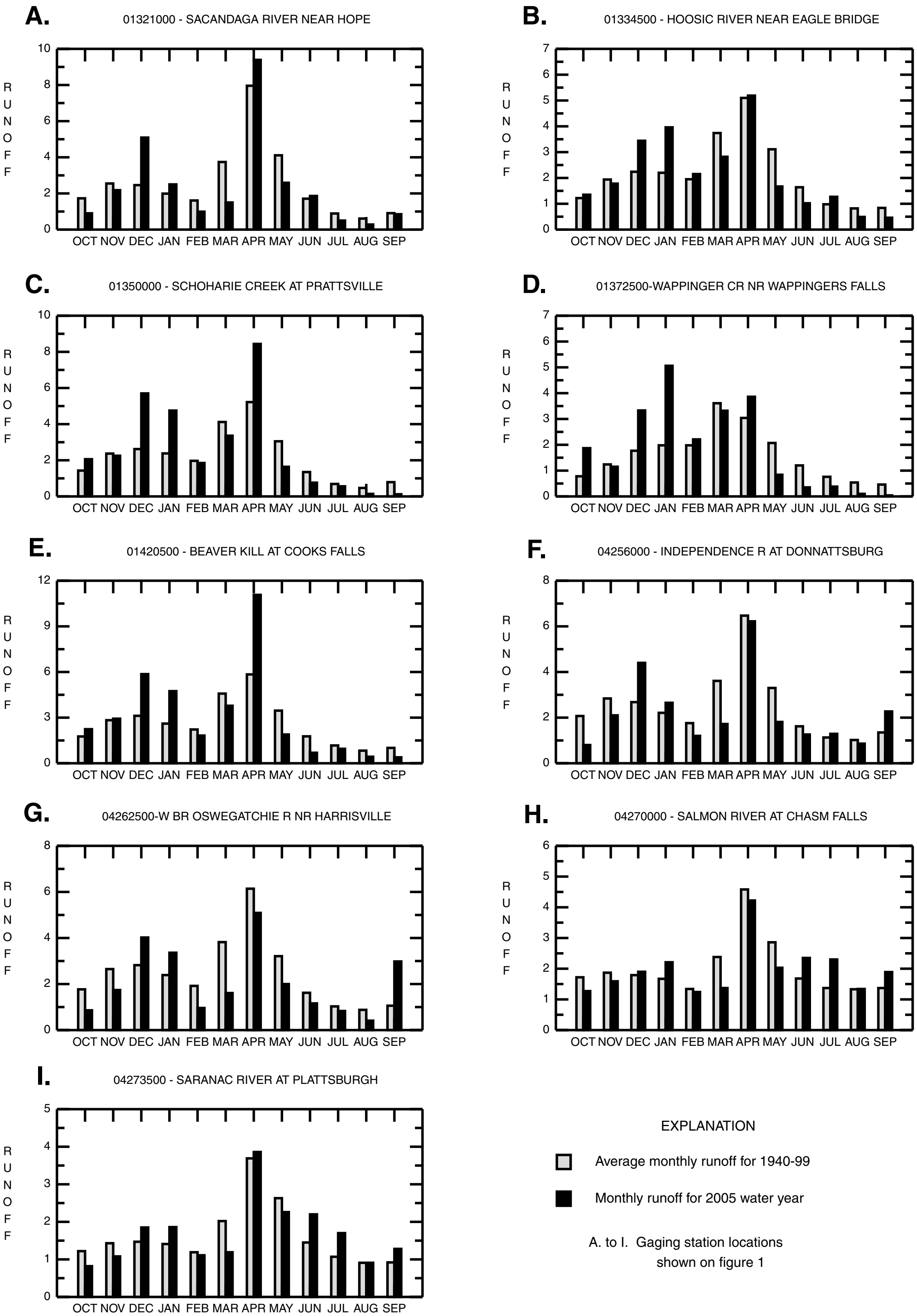

Figure 3.--Comparison of monthly runoff (in inches) for 2005 water year and average monthly runoff for 1940-99 for selected gaging stations in eastern New York (site locations are shown on figure 1).

Surface Water--Continued

November saw continued warm and dry weather. Air temperatures averaged as much as 1°F above of normal. Precipitation was about 1 inch below normal and snow fell in all parts of eastern New York. Runoff was slightly below normal in the Adirondack Mountains and northward but was normal to the south. The New York City reservoirs remained at near 95 percent of capacity, and the Great Sacandaga Lake contents were about 10 percent above normal.

December air temperatures were normal, except for readings in the western Adirondack Mountains and Lake Champlain Valley, where they averaged about 1°F below normal. December precipitation in eastern New York was about an inch above normal. Runoff was well above normal throughout the region, especially in the Hudson River Valley and Catskill Mountains. The New York City reservoir system contents were near 100 percent of capacity, and the Great Sacandaga Lake contents near 75 percent of capacity.

January air temperatures were warm initially, but the frigid weather during the second half of the month brought the monthly average temperature to about 2°F below normal. January precipitation was about normal, except in the southern Catskill Mountain region, where it was about 2 inches above normal. Runoff throughout eastern New York was above normal, especially at stations south of the Adirondack Mountains where it was about 2 inches above normal. The New York City reservoir contents for January increased to near 100 percent of capacity (15 percent above normal), and the Great Sacandaga Lake contents decreased to about 60 percent of capacity (still about 15 percent above normal), by the end of January.

February air temperatures in eastern New York were 1 to 2°F above normal. February precipitation was about normal, and runoff was within an inch of normal. The New York City reservoir contents remained above 95 percent of capacity, whereas the Great Sacandaga Lake was drawn down to about 45 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 2 to 4°F below normal, and the Catskill Mountain region had the greatest departure from normal. Precipitation was normal south of the Mohawk River Valley and 1 to 2 inches below normal from there northward. The New York City reservoir system was at 100 percent of capacity. Contents of the Great Sacandaga Lake decreased to about 40 percent of capacity.

April air temperature was about 4°F warmer than normal, and precipitation was about 3 inches above normal. The storm of April 2-3 dropped 2 to 5 inches of rain in the Catskill Mountains and Mid-Hudson Valley, the greatest recorded amount (5.69 inches) fell at East Jewett, in Greene County. The stormflow caused all New York City reservoirs in the Catskill Mountain region to spill. New instantaneous peak-of-record discharges were recorded at several long-term streamflow-gaging stations downstream from the reservoirs on four streams — Esopus Creek, Neversink River, East Branch Delaware River and Delaware River, and upstream of the reservoir on Esopus Creek (table 1). Most streamflow-gaging stations throughout southeastern New York recorded their annual maximum instantaneous discharge during this storm, wheras runoff in the Adirondack Mountains and northward remained normal. The New York City reservoir system and the Great Sacandaga Lake were at 100 percent and 95 precent of capacity, respectively, by April 30.

May brought cool, dry weather to most of eastern New York. Air temperatures were 3 to 4°F below normal, and precipitation was about half of the 4-inch normal for May. Runoff throughout eastern New York was about an inch below normal. New York City reservoir contents remained near 100 percent of capacity; Great Sacandaga Lake contents decreased to 90 percent of capacity by month’s end.

June 2005 was the warmest June on record in New York State. Air temperatures in eastern New York were 4 to 6°F above normal, and above-90°F readings were common during the last week of the month. Rainfall was normal, except in the Lake Champlain region, where it was about 2 inches above normal Runoff was about an inch below normal south of the Mohawk River Valley and an inch above normal from there northward. Reservoir contents in the New York City system dropped slightly below normal to about 90 percent of capacity, and the Great Sacandaga Lake contents were above normal at 90 percent of capacity.

July air temperatures were above normal; readings in most of eastern New York were 2 to 3°F above normal; temperatures in the lower Hudson River Valley were slightly lower. Rainfall was slightly above normal, except in the St. Lawrence Valley, where it was about 3 inches above normal. Runoff during July was about normal in most areas but was about 1 inch above normal north of the Adirondack Mountains. Reservoir contents decreased by about 5 percent of capacity in both reservoir systems; contents were slightly below normal in the New York City system; slightly above normal in the Great Sacandaga Lake.

August air temperatures remained warm and averaged 3 to 4°F higher than normal through the region. Rainfall and runoff were about normal. Reservoir contents were near 75 percent of capacity (about 5 percent below normal) in the New York City reservoir system and about 75 percent of capacity (5 percent above normal) in the Great Sacandaga Lake.

September air temperatures were 4 to 5°F warmer than normal throughout eastern New York. Rainfall in the St. Lawrence River Region was about 2 inches above normal and about 1 inch below normal south of the Mohawk River. Consequently, runoff was low (well below the 25 percent exceedence level) at West Branch Oswegatchie near Harrisville. Similarily, the consecutive dry months of August and September in the lower Hudson River Valley resulted in streamflow well below the 25 percent exceedence level at Wappinger Creek near Wappingers Falls. The Great Sacandaga Lake contents decreased to 60 percent of capacity but remained about 5 percent above normal. The New York City reservoir-system contents decreased to 65 percent of capacity, about 5 percent below normal.

Surface Water--Continued

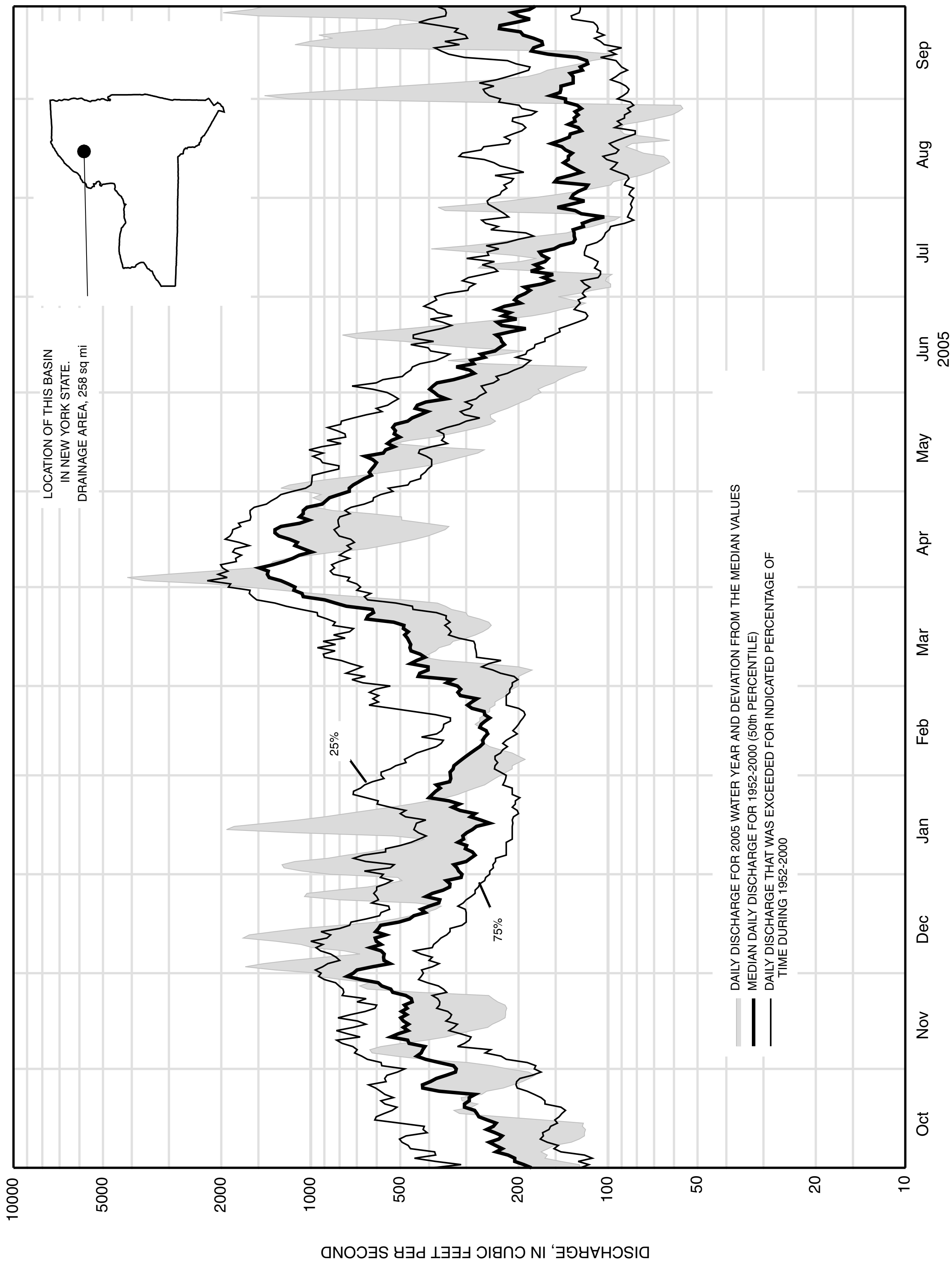

FIGURE 4.--WEST BRANCH OSWEGATCHIE RIVER NEAR HARRISVILLE

Surface Water--Continued

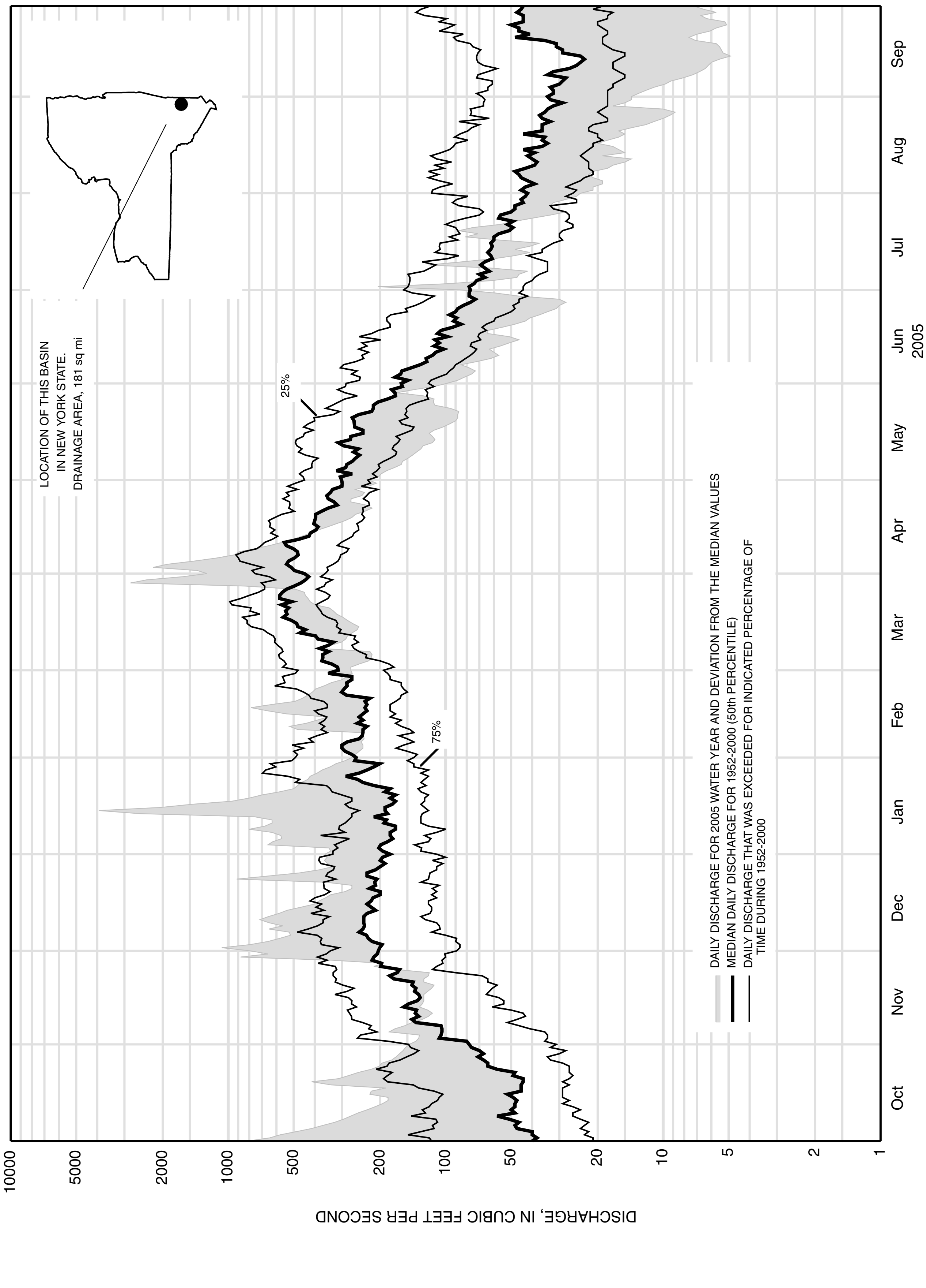

FIGURE 5.--WAPPINGER CREEK NEAR WAPPINGERS FALLS

Surface Water--Continued

Table 1: Historical flood peaks and peaks during the flood of April 2-4 at selected U.S. Geological Survey streamflow-gaging stations in Hudson River Basin and Delaware River Basin, New York. Recurrence intervals equal to and above 25 years include the April flood in the statistical analysis.

[mi^2, square miles, ft^3/s, cubic feet per second.]

USGS station number	Station name	Drainage area (mi^2)	Period of record	Previous maximum of record		Flood of April 2-4, 2005		
				Date of Peak	Peak discharge (ft^3/s)	Date of Peak	Peak discharge (ft^3/s)	Recurrence interval (years)
HUDSON RIVER BASIN								
01362197	Bushnellsville Creek at Shandaken	11.4	1951,56,72-05	10/15/55	1,830	04/02/05	2,700	>100
01362200	Esopus Creek at Allaben	63.7	1963-2005	03/30/51	a20,000	04/02/05	21,700	60
01364500	Esopus Creek at Mount Marion	419	b1971-2005	04/05/87	b22,500	04/03/05	30,500	80
DELAWARE RIVER BASIN								
01417500	East Branch Delaware River at Harvard	458	b1955-2005	09/18/04	b20,600	04/03/05	21,400	60
01420500	Beaver Kill at Cooks Falls	241	1913-2005	01/19/96	42,900	04/03/05	50,700	>100
01420980	East Branch Delaware River above Read Creek at Fishs Eddy	766	b1955-2005	09/18/04	b56,300	04/03/05	65,100	>100
01425000	West Branch Delaware River at Stilesville	456	b1964-2005	03/16/86	b14,300	04/03/05	14,800	25
01426500	West Branch Delaware River at Hale Eddy	595	b1964-2005	03/15/86	b18,700	04/03/05	21,500	45
01427510	Delaware River at Callicoon	1,820	1975-2005	09/18/04	107,000	04/03/05	114,000	70
01428500	Delaware River above Lackawaxen River near Barryville	2,020	b1964-2005	09/18/04	b112,000	04/03/05	118,000	60
01434000	Delaware River at Port Jervis	3,070	b1964-2005	09/18/04	b151,000	04/03/05	166,000	70
01436000	Neversink River at Neversink	92.6	b1954-2005	06/23/72	b6,130	04/03/05	25,900	>100
01437500	Neversink River at Godeffroy	307	b1954-2005	08/19/55	b33,000	04/03/05	32,500	>100

a About

b Since current degree of regulation

Water Quality

The water-quality data presented herein consist of 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 generally 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 µS/cm (microsiemens per centimeter at 25.0°C). Water-surface elevation and specific conductance 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). Water temperature at Poughkeepsie and West Point exceeded the period of record by less than 0.5°C; water temperature at Hastings-on-Hudson was within the range reported for period of record. Maximum water-temperatures at all three sites occurred about 2 weeks later than the maximum for period of record. The salt front in 2005 moved from less than 10 miles to 73 miles upstream from the Battery in New York City - a range of more than 63 miles. This upstream movement has been exceeded many times during the 13 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 7 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 29.0°C on August 14 at the Hudson River south of Hastings-on-Hudson; the maximum recorded water-temperature at sites in the Delaware River Basin was 32.0°C on July 20 at the Delaware River above Lackawaxen River near Barryville.

Water samples were collected daily throughout the year 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 (1977-2004). Fixed-frequency and storm-based samples were collected from the Mohawk River at Cohoes throughout the year to quantify the daily and annual export of suspended sediment from the Mohawk River basin. Daily suspended-sediment discharges were within the range reported for the period of record (1954-2004).

Water Quality--Continued

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

The samples collected for suspended-sediment concentration at the Hudson River below Poughkeepsie were used to calibrate and verify a relation between concentration and acoustic backscatter that can be used to estimate the net suspended-sediment discharge at the site.

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 2005 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 2005 water year. New period-of-record monthly maximum water levels were measured in well A-654 for January and April. Water levels in well Du-1009 were above the median for less than half the water year during October through January and April. During February, March, and May through September, levels were at or below the median. New period-of-record monthly maximum water level was measured in well Du-1009 for January. New period-of-record monthly minimum water levels were measured in well Du-1009 for May and June.

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 above the median for about half the water year during October, December through February, April, and August through September. During November, March, and May through July, levels were at or below the median. Water levels in well St-40 were at or above the median for the water year, except during May through August and a part of March when they were at or below the median. Water levels in well W-533 were at or above the median for the water year for about half the water year during the first part of October, December through February, parts of March and April, and parts of June and July. During October through November, parts of March and April, May through half of June, and August through September, levels were ar or below the median.

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 of above the median during the water year except in November through December, February through March and parts of April, May, and June when they were at or below the median. Water levels in Ro-18 were at or above the median for about half of the water year during October through February and April. During March and the end of April through September, levels were at or below the median. New period-of-record monthly maximum water level was measured in well Ro-18 for January.

In summary, the ground-water levels generally were above the long-term median from October through February during the 2005 water year. New period-of-record and near-record maximum water levels were measured in many wells for January. Water levels generally were near or below medians in March and May through September. Large amounts of precipitation in April resulted in above median water levels with new period-of-record and near-record maximum water levels measured in many wells.

Ground Water--Continued

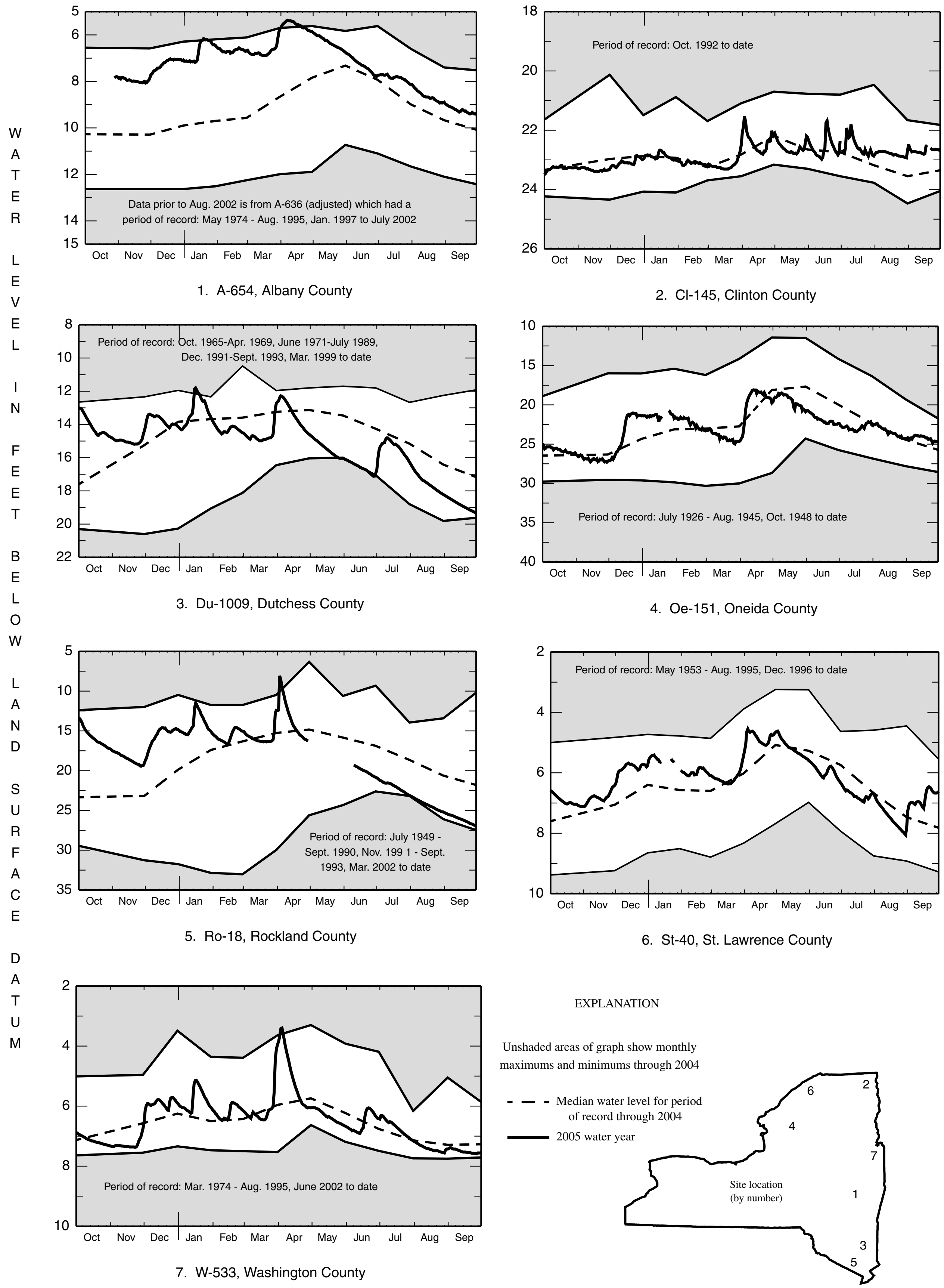

Figure 6.--Ground-water levels at selected observation wells in eastern New York.