

HUDSON RIVER SALT-FRONT REPORT

April 1 through September 30, 2007

By Timothy F. Hoffman

Data were collected for water-surface elevation, water temperature, and **specific conductance**¹ from April 1 through September 30, 2007, at three United States Geological Survey (USGS) monitoring stations on the Hudson River: Hudson River below Poughkeepsie (01372058); Hudson River at South Dock at West Point (01374019); and Hudson River south of Hastings-on-Hudson (01376304) (fig. 1). Specific-conductance data were used to estimate the upstream location of the **salt front** in the lower Hudson River estuary during this period. These data are provisional and subject to revision pending final publication in the USGS New York Water Science Center annual data report for **Water Year 2007**. The data report is no longer published in paper form but will be available on-line in 2008. Near real-time provisional data from these sites are available on the worldwide web at: <http://ny.water.usgs.gov/htmls/pub/projects.html>.

Discharge Conditions in the Hudson River basin

Daily discharges of three streams in the Hudson River basin—Hudson River above Lock 1 near Waterford (01335754, representing the **Upper Hudson River basin**), Mohawk River at Cohoes (01357500, representing the **Mohawk River basin**), and Wappinger Creek near Wappingers Falls (01372500, representing the **Lower Hudson River basin**)—are presented to summarize **discharge** conditions across the entire basin from April 1 through September 30, 2007 (figs. 2-4)². Daily discharges across the entire Hudson River basin were above average 12 percent of the time, average 57 percent of the time, and below average 31 percent of the time during this period (table 1). Most of the **above-average discharges** occurred during April across all three basins, whereas most of the **below-average discharges** occurred in August and September in the Upper Hudson River basin, June and September in the Mohawk River basin and in May and June in the Lower Hudson River basin (table 2). Daily discharges during this 183-day monitoring period were mostly average in all three basins. Maximum daily discharges, in cubic feet per second (ft³/s), occurred on April 24 at Waterford (about 33,800 ft³/s), April 17 at Cohoes (75,300 ft³/s), and April 16 at Wappingers Falls (7,640 ft³/s). Minimum daily discharges occurred on August 22 at Waterford (2,080 ft³/s), September 8 at Cohoes (304 ft³/s), and on September 30 at Wappingers Falls (13 ft³/s). Minimum discharges at Waterford and Cohoes were affected by regulation.

¹ Boldface terms are explained in Glossary.

² The 25th, 50th, and 75th **percentiles** as shown in figures 2 – 4 indicate periods when discharges were below average, average, and above average, respectively. Percentiles are based on 25 years of data at Hudson River above Lock 1 near Waterford, and 49 years of data at both Mohawk River at Cohoes and Wappinger Creek near Wappingers Falls.

Data Summaries

Water-Surface Elevation

Daily mean, daily high, and daily low water-surface **elevations** at Poughkeepsie, West Point, and Hastings-on-Hudson are shown for April 1 through September 30, 2007, in figures 5 - 6.³ Maximum and minimum water-surface elevations for this period are listed in table 3. Data for June 12 through 14 are partially unavailable at Poughkeepsie as a result of an instrument malfunction.

Maximum water-surface elevations, in feet (ft), were recorded on April 16 at Poughkeepsie (6.08 ft), West Point (5.80 ft), and Hastings-on-Hudson (5.91 ft). Minimum water-surface elevations were recorded on April 9 at Poughkeepsie (-1.60 ft), West Point (-1.60 ft), and Hastings-on-Hudson (-1.77 ft). It is unlikely that the maximum or minimum water-surface elevations during April 1 through September 30 at Poughkeepsie occurred during periods of unavailable data.

Water Temperature

Daily mean, daily maximum, and daily minimum water temperatures at Poughkeepsie, West Point, and Hastings-on-Hudson are shown for April 1 through September 30, 2007, in figures 7 - 8. Maximum and minimum water temperatures for this period are listed in table 3. Data for June 12 through 14 are partially unavailable at Poughkeepsie as a result of an instrument malfunction.

Maximum water temperatures, in degrees Celsius (°C), were recorded on August 8, 9, and 13 at Poughkeepsie (27.5°C); on August 8 at West Point (28.0°C); and on August 7, 8, and 9 at Hastings-on-Hudson (28.0°C). Minimum water temperatures were recorded on April 17 and 18 at Poughkeepsie (4.0 °C); April 1, 2, 3, 17, 18, 19, and 20 at West Point (4.5 °C); and April 1, 2, 8, and 9 at Hastings-on-Hudson (4.5 °C). It is unlikely that the maximum or minimum water temperatures during April 1 through September 30 at Poughkeepsie occurred during periods of unavailable data.

Specific Conductance

Daily mean, daily maximum, and daily minimum specific conductance at Poughkeepsie, West Point, and Hastings-on-Hudson are shown from April 1 through September 30, 2007, in figures 9 - 10. Maximum and minimum specific conductances for this period are listed in table 3. Data for June 12 through 14 are partially unavailable at Poughkeepsie as a result of an instrument malfunction.

Maximum specific conductance, in **microsiemens per centimeter at 25°C** ($\mu\text{S}/\text{cm}$ at 25°C), was recorded on September 30 at Poughkeepsie (1,770 $\mu\text{S}/\text{cm}$ at 25°C); on September 24 and 25 at West Point (12,400 $\mu\text{S}/\text{cm}$ at 25°C); and on June 4 at Hastings-on-Hudson (27,200 $\mu\text{S}/\text{cm}$ at 25°C). Minimum specific conductance was recorded on May 2, 3, and 4 at Poughkeepsie (145 $\mu\text{S}/\text{cm}$ at 25°C); on May 9, 25, and 26 at West Point (160 $\mu\text{S}/\text{cm}$ at 25°C); and April 24 at Hastings-on-Hudson (219 $\mu\text{S}/\text{cm}$ at 25°C). It is unlikely that the maximum or minimum specific conductance during April 1 through September 30 at Poughkeepsie occurred during periods of unavailable data.

³ Water-surface elevations are relative to mean sea level (**National Geodetic Vertical Datum of 1929**).

Salt-Front Delineations

The salt front is the saltwater/freshwater interface, defined in this report as the location where specific conductance equals 500 $\mu\text{S}/\text{cm}$ at 25°C (or 100 milligrams per liter chloride concentration). Three **high-slack-tide delineations** were made during the summer of 2007 to verify the location of the salt front estimated by regression. The regression estimates the upstream location of the salt front based on daily mean specific conductance at each salt monitoring station. **Low-slack-tide** delineations were made immediately before or after the high-slack-tide delineations to determine the distance the salt front moved during the tidal cycle. Salt-front delineations are shown in figure 11; the locations of the salt front found during these delineations and the corresponding regression-estimated locations are listed in table 4. Water depth and specific conductance, measured at 58 cross-sections during these delineations, are listed in table 5. The location of the salt front is measured in **river miles (RM)** above the Battery, NY.

On July 17, a high-slack-tide delineation located the salt front at RM 67.2, 0.6 river miles upstream of the regression-estimated river mile of 66.6. A corresponding low-slack-tide delineation located the salt front at RM 63.4. The longitudinal movement of the salt front during this tidal cycle was 3.8 river miles. A second high-slack-tide delineation made on August 1 located the salt front at RM 72.2, 1.2 river miles downstream of the regression-estimated river mile of 73.4. A corresponding low-slack-tide delineation located the salt front at RM 67.5. The longitudinal movement of the salt front during this tidal cycle was 4.7 river miles. A third high-slack-tide delineation made on September 6 located the salt front at RM 75.9, 1.2 river miles downstream of the regression-estimated river mile of 77.1. A corresponding low-slack-tide delineation located the salt front at RM 72.4. The longitudinal movement of the salt front during this tidal cycle was 3.5 river miles.

Regression Analysis

The location of the salt front is estimated using multiple linear regressions developed for each station. These regressions may be updated once a year based on the results of at least three high-slack-tide salt-front delineations and the corresponding daily mean specific conductance at each monitoring station (table 6). The delineations on August 1 and September 6 were not included in the Hastings regression as the model appears to lose sensitivity at the extreme upper end of the regression. Revised regression curves and statistics for the 2007 water year at Hastings-on-Hudson, West Point, and Poughkeepsie are presented in figs. 12-14. Daily salt-front locations at high-slack-tide, computed from the 2007 water-year salt-front delineations and revised regression equations, are presented in figure 15 and table 7. The estimated salt-front location ranged from below RM 16.0 to RM 77.7 (September 28) from October 1, 2006, through September 30, 2007. Estimated locations below RM 16.0 are not published because they are below the calibration limits of the Hastings-on-Hudson regression equation.

Glossary

Above-average discharge is the range of discharges that are greater than the 75th percentile of all discharge values. (See also "Percentile.")

Average discharge is the range of discharge between the 25th and 75th percentiles of all discharge values. (See also "Percentile.")

Below-average discharge is the range of discharges that are less than the 25th percentile of all discharge values. (See also "Percentile.")

Daily discharge is the arithmetic mean of discharge passing a stream cross section during a 24-hour day. (See also "Discharge.")

Delineation, in this report, refers to collection of specific-conductance data in river cross sections during specific parts of tide cycles, beginning downstream and moving upstream.

Discharge is the rate at which matter passes through a cross section of a stream channel or other water body per unit of time. The term commonly refers to the volume of water (including, unless otherwise stated, any sediment or other constituents suspended or dissolved in the water) that passes a cross section in a stream channel, canal, etc., within a given period of time and is generally expressed in cubic feet per second.

Elevation is the height or vertical distance above or below the National Geodetic Vertical Datum of 1929. (See also "National Geodetic Vertical Datum of 1929".)

High-slack-tide is the point in the tide cycle that follows high tide, when the water is moving neither upstream nor downstream.

Low-slack-tide is the point in the tide cycle that follows low tide, when the water is moving neither upstream nor downstream.

Lower Hudson River basin is that part of the Hudson River basin downstream from the Federal Dam in Troy, NY (RM 153.7). (See fig. 1)

Microsiemens per centimeter ($\mu\text{S}/\text{cm}$) is a unit expressing electrical conductivity of a solution, as measured between opposite faces of a 1-centimeter cube of solution at a specified temperature. Siemens is the International System of Units nomenclature. It is synonymous with mhos and is the reciprocal of resistance, in ohms. (See also "Specific-conductance.")

Mohawk River basin is that part of the Hudson River basin that drains into the Mohawk River. (See fig. 1)

National Geodetic Vertical Datum of 1929 (NGVD of 1929) is a fixed reference adopted as a standard geodetic datum for elevations determined by leveling. It was formerly called "Sea Level Datum of 1929" or "mean sea level." Although the datum was derived from the mean sea level at 26 tide stations, it does not necessarily represent local mean sea level at any particular place.

Percentile is a value on a scale of 100 that indicates the percentage of a distribution that is equal to or below it. On a graph of daily discharge, for example, a river's daily discharge at the 75th percentile is equal to or greater than 75 percent of the daily discharge values recorded on this day of the year during the years indicated.

River mile (RM) is the curvilinear distance, in miles, measured upstream from the Battery in New York City along the meandering path of the river channel and is used to denote location along the river.

Salt front is the saltwater/freshwater interface, defined in this report as the furthest daily upstream location where specific-conductance exceeds 500 microsiemens per centimeter ($\mu\text{S}/\text{cm}$) at 25°C (or 100 milligrams per liter chloride concentration) at some point in the cross-section (See also **Specific conductance**.)

Specific conductance is a measure of the ability of a solution to conduct an electrical current over a 1-centimeter distance and adjusted to 25 degrees Celsius. Specific conductance is equivalent to the reciprocal of the resistance of the solution and is expressed in microsiemens per centimeter. Specific conductance is directly proportional to the chloride concentration and thus the salinity of the Hudson River.

Upper Hudson River basin is that part of the Hudson River basin upstream from the Federal Dam in Troy, NY (RM 153.7). (See fig. 1)

Water year is the 12-month period from October 1 through September 30 of the following year. The water year is designated by the calendar year in which it ends and includes the first 9 of the 12 months of the year in which it ends and the last three months of the previous year. Thus, the year ending September 30, 2006, is called the "2006 water year."

Illustrations and Tables

Fig.1. Locations of Hudson River salt-front monitoring sites, Hudson River below Poughkeepsie (USGS station 01372058), Hudson River at South Dock at West Point (01374019), and Hudson River south of Hastings-on-Hudson (01376304), and three stream gaging stations in the Hudson River basin, Hudson River above Lock 1 at Waterford (01335754), Mohawk River at Cohoes (01357500), and Wappinger Creek at Wappingers Falls (01372500).

2-15. Graphs showing:

2. Daily discharge data for Hudson River above Lock 1 near Waterford (01335754), April 1 through September 30, 2007, and daily discharges for 25th, 50th, and 75th percentiles, April 1 through September 30, 1976-2000.
3. Daily discharge data for Mohawk River at Cohoes (01357500), April 1 through September 30, 2007, and daily discharges for 25th, 50th, and 75th percentiles, April 1 through September 30, 1952-2000.
4. Daily discharge data for Wappinger Creek near Wappingers Falls (01372500) April 1 through September 30, 2007, and daily discharges for 25th, 50th, and 75th percentiles, April 1 through September 30, 1952-2000.
5. Daily mean water-surface elevations in the Hudson River at Poughkeepsie, West Point, and Hastings-on-Hudson salt-front monitoring stations, April 1 through September 30, 2007.
6. Daily high, mean, and low water-surface elevations in the Hudson River at Poughkeepsie, West Point, and Hastings-on-Hudson salt-front monitoring stations, April 1 through September 30, 2007.
7. Daily mean water temperatures in the Hudson River at Poughkeepsie, West Point, and Hastings-on-Hudson salt-front monitoring stations, April 1 through September 30, 2007.
8. Daily maximum, mean, and minimum water temperatures in the Hudson River at Poughkeepsie, West Point, and Hastings-on-Hudson salt-front monitoring stations, April 1 through September 30, 2007.
9. Daily mean specific conductance in the Hudson River at Poughkeepsie, West Point, and Hastings-on-Hudson salt-front monitoring stations, April 1 through September 30, 2007.
10. Daily maximum, mean, and minimum specific conductance in the Hudson River at Poughkeepsie, West Point, and Hastings-on-Hudson salt-front monitoring stations, April 1 through September 30, 2007.

11. High-slack-tide and low-slack-tide delineations and selected delineation locations made on July 17, August 1, and September 6, 2007.
12. Distance of the salt front upstream from the Battery in relation to daily mean specific conductance at Hastings-on-Hudson, N.Y.
13. Distance of the salt front upstream from the Battery in relation to daily mean specific conductance at West Point, N.Y.
14. Distance of the salt front upstream from the Battery in relation to daily mean specific conductance at Poughkeepsie, N.Y.
15. Location of salt front (500 microsiemens per centimeter at 25 degrees Celsius), in the Hudson River at high-slack-tide, based on delineations and regressions of daily specific-conductance data from Hastings-on-Hudson, West Point, and Poughkeepsie, April 1 through September 30, 2007.

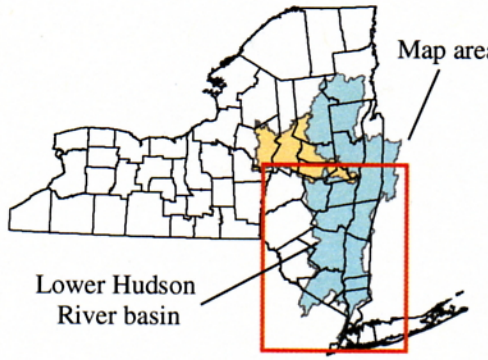
- Table 1.
1. Total number and percentage of days of above-average, average, and below-average discharges across the entire Hudson River basin from April 1, through September 30, 2007.
 2. Number and percentage of days of above-average, average, and below-average discharges at Hudson River above Lock 1 near Waterford (USGS station 01335754), Mohawk River at Cohoes (01357500), and Wappinger Creek at Wappingers Falls (01372500), April 1 through September 30, 2007.
 3. Maximum and minimum water-surface elevation, water temperature, and specific conductance at Hudson River below Poughkeepsie (01372058), Hudson River at South Dock at West Point (01374019), and Hudson River south of Hastings-on-Hudson (01376304), April 1 through September 30, 2007.
 4. Salt-front locations found during high-slack-tide and low-slack-tide delineations on July 17, August 1 and September 6, 2007, and the corresponding location of the salt front estimated by regression for the given day.
 5. Depth and specific-conductance data measured at selected cross-sections during delineations on July 17, August 1, and September 6, 2007.
 6. Location of the salt front found by delineation and the corresponding daily mean specific conductance at each monitoring station.
 7. Daily salt-front locations at slack-high tide from October 1, 2006, through September 30, 2007, estimated from the 2007 water year salt-front delineations and revised regression equations.

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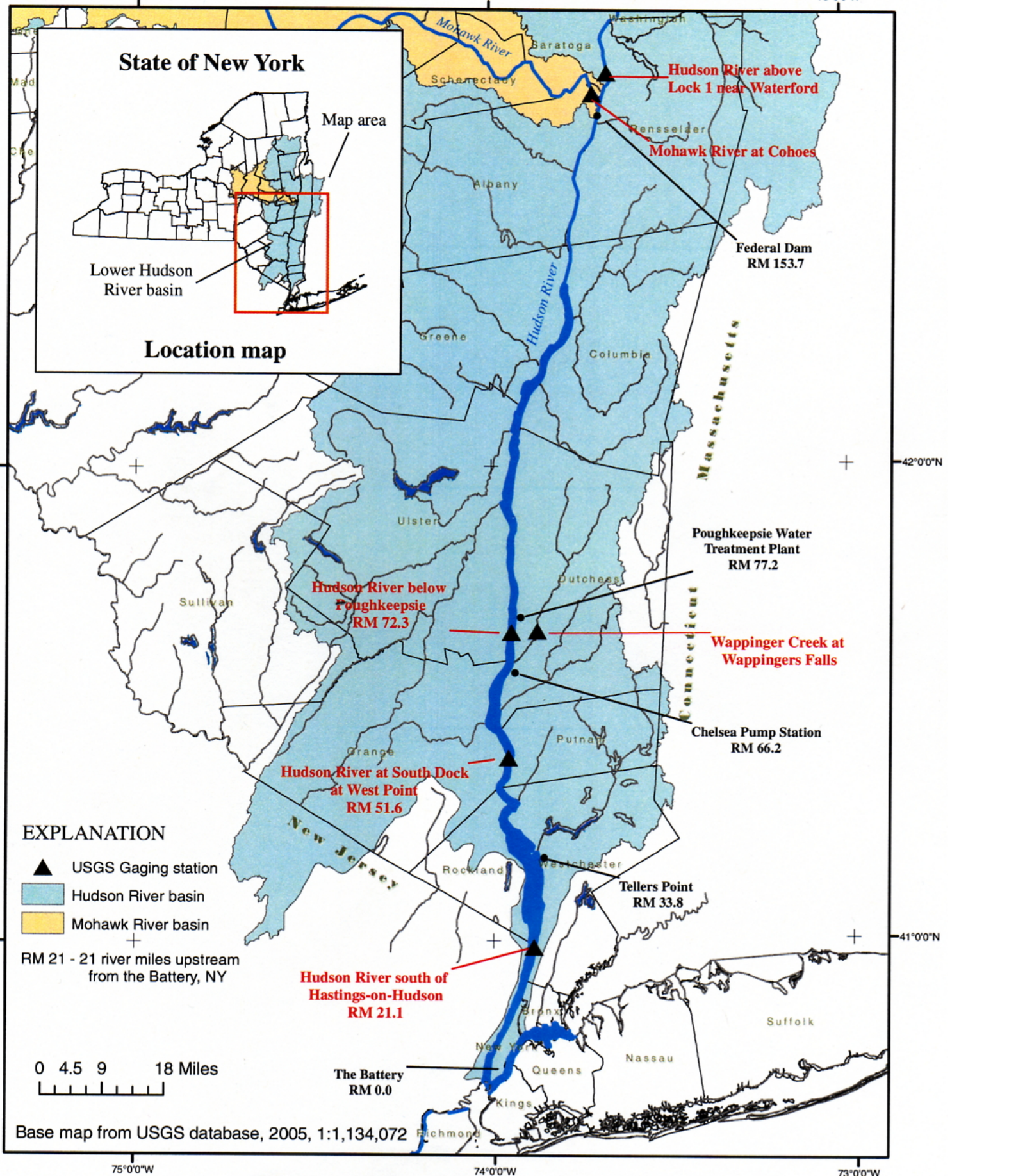
74°0'0"W

73°0'0"W

State of New York



Location map



EXPLANATION

- ▲ USGS Gaging station
- Hudson River basin
- Mohawk River basin
- +

RM 21 - 21 river miles upstream from the Battery, NY



Base map from USGS database, 2005, 1:1,134,072

75°0'0"W

74°0'0"W

73°0'0"W

Figure 1.-- Location of Hudson River salt front-monitoring stations and three stream gages in the Hudson River basin, NY.

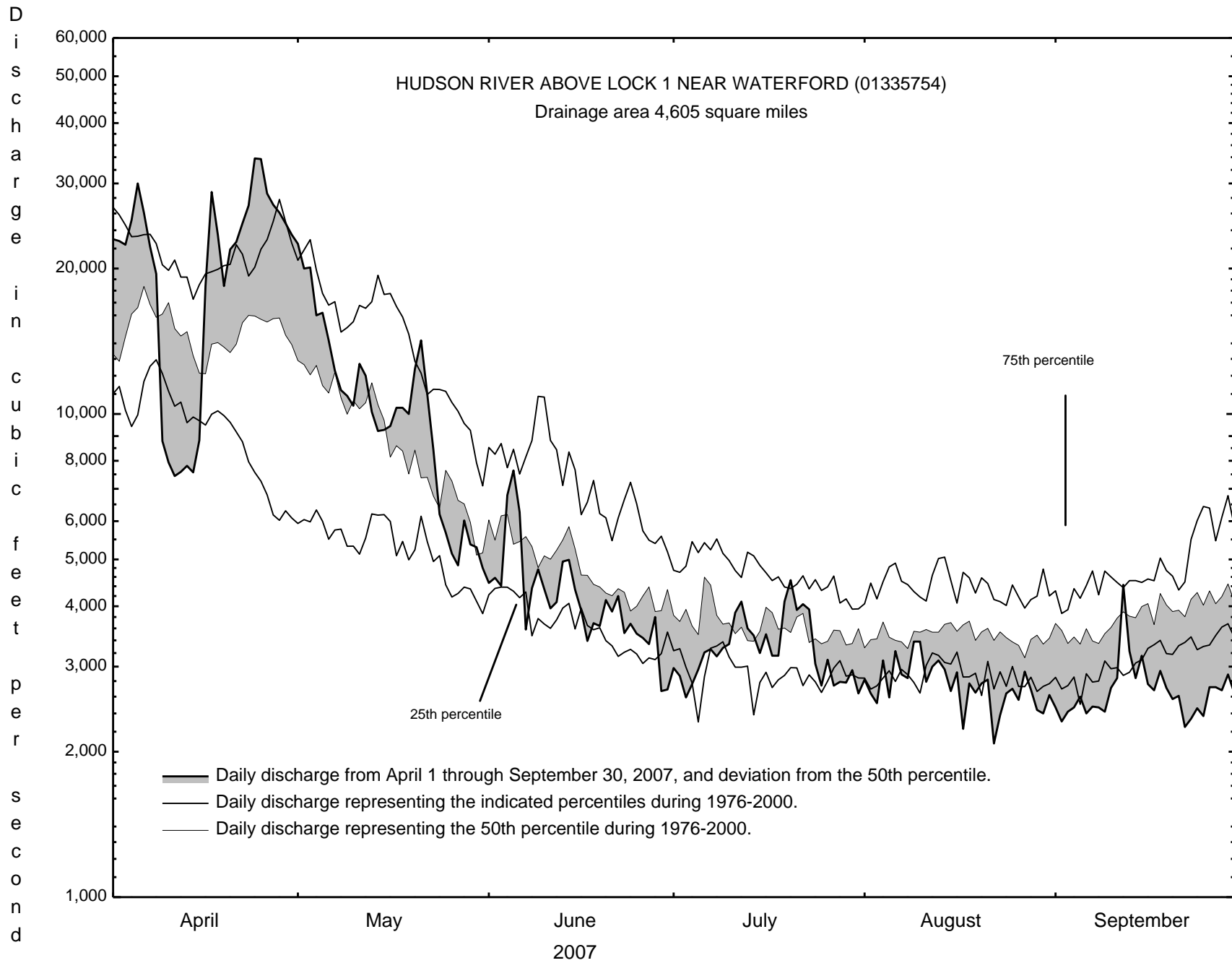


Figure 2.--Daily discharge data for Hudson River above Lock 1 near Waterford, N.Y., October 1, 2006, through March 31, 2007, and daily discharges for selected percentiles, October 1 through March 31, 1976-2000. Location shown in fig. 1.

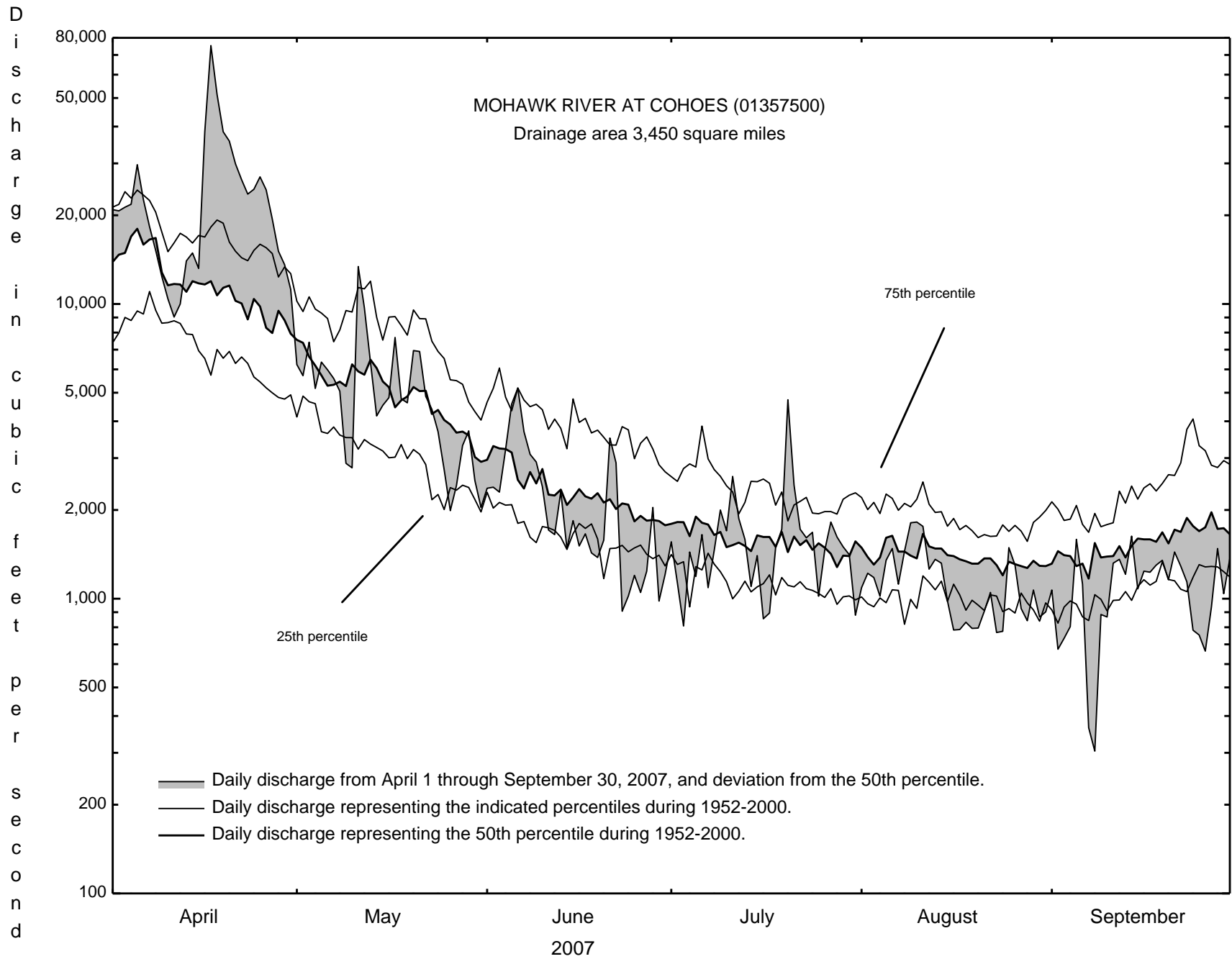


Figure 3.--Daily discharge data for Mohawk River at Cohoes (01357500), April 1 through September 30, 2007, and daily discharges for selected percentiles, April 1 through September 30, 1952-2000. Location shown in fig. 1.

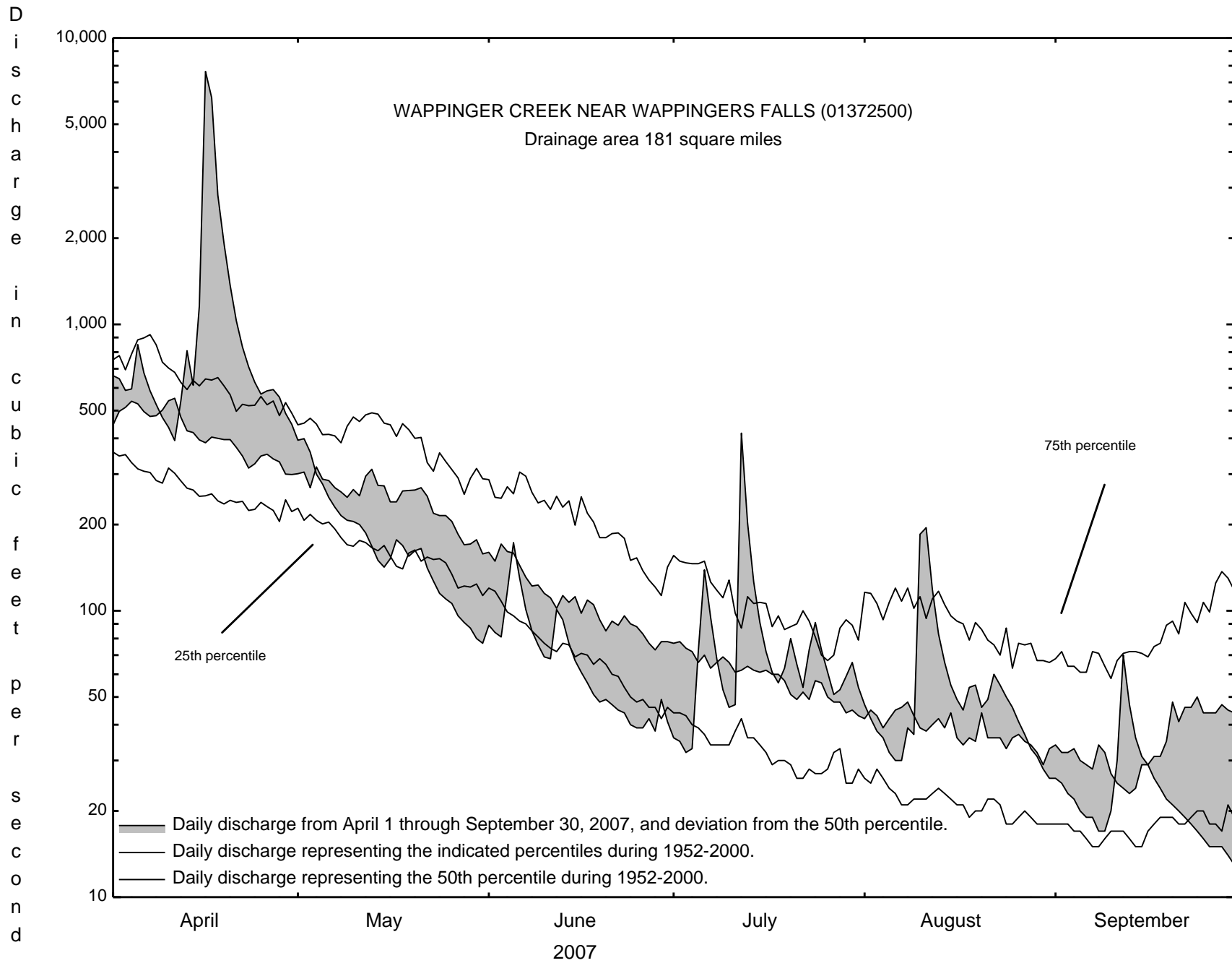
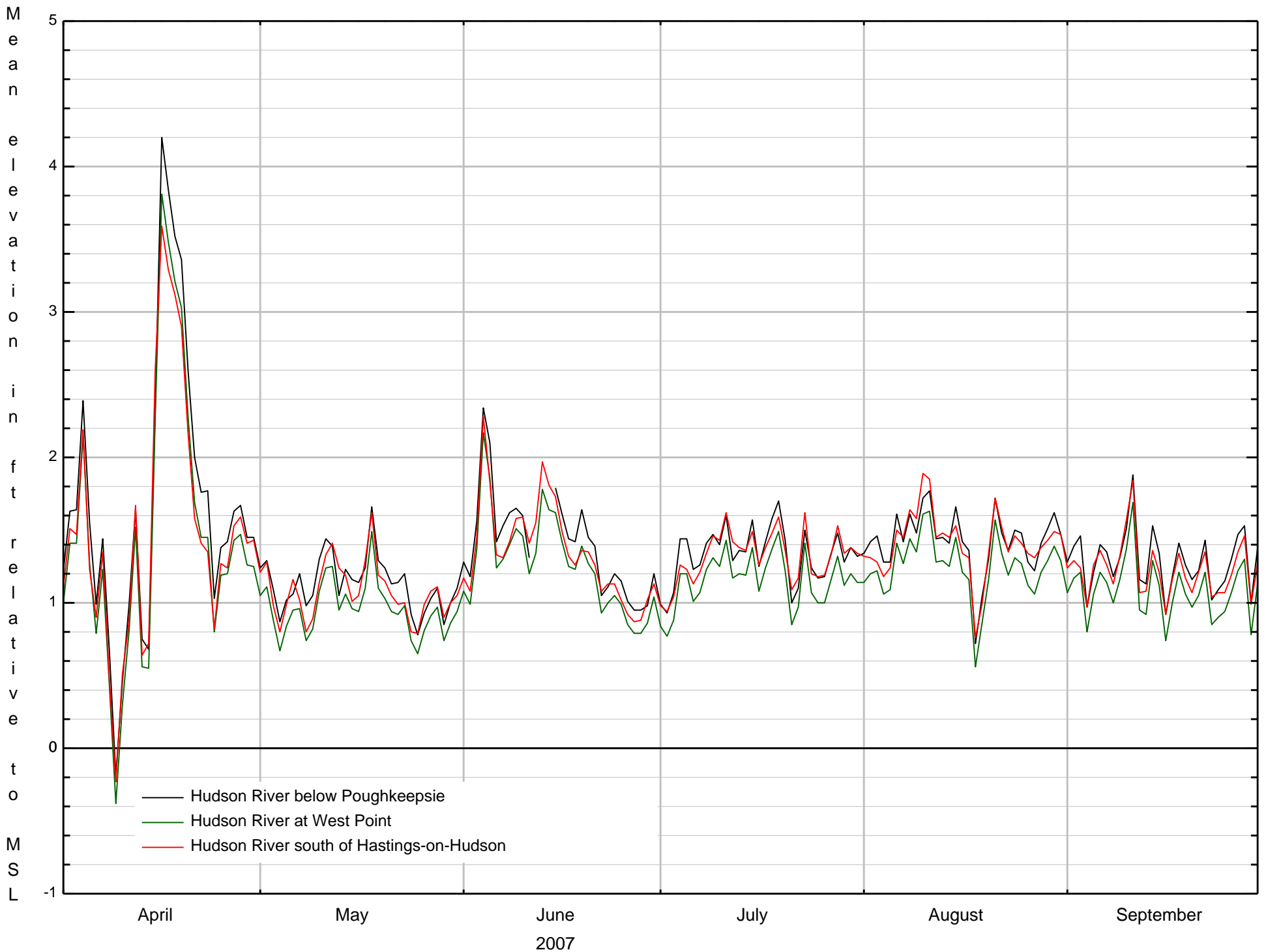


Figure 4.--Daily discharge data for Wappinger Creek near Wappingers Falls, April 1 through September 30, 2007, and daily discharges for selected percentiles, April 1 through September 30, 1952-2000. Location shown in fig. 1.



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 Figure 5.-- Daily mean water-surface elevations relative to mean sea level (MSL) for the Hudson River below Poughkeepsie, at West Point, and south of Hastings-on-Hudson salt-front monitoring stations, April 1 through September 30, 2007. Zero ft elevation is mean sea level (from National Geodetic Vertical Datum of 1929). Locations shown in fig. 1.

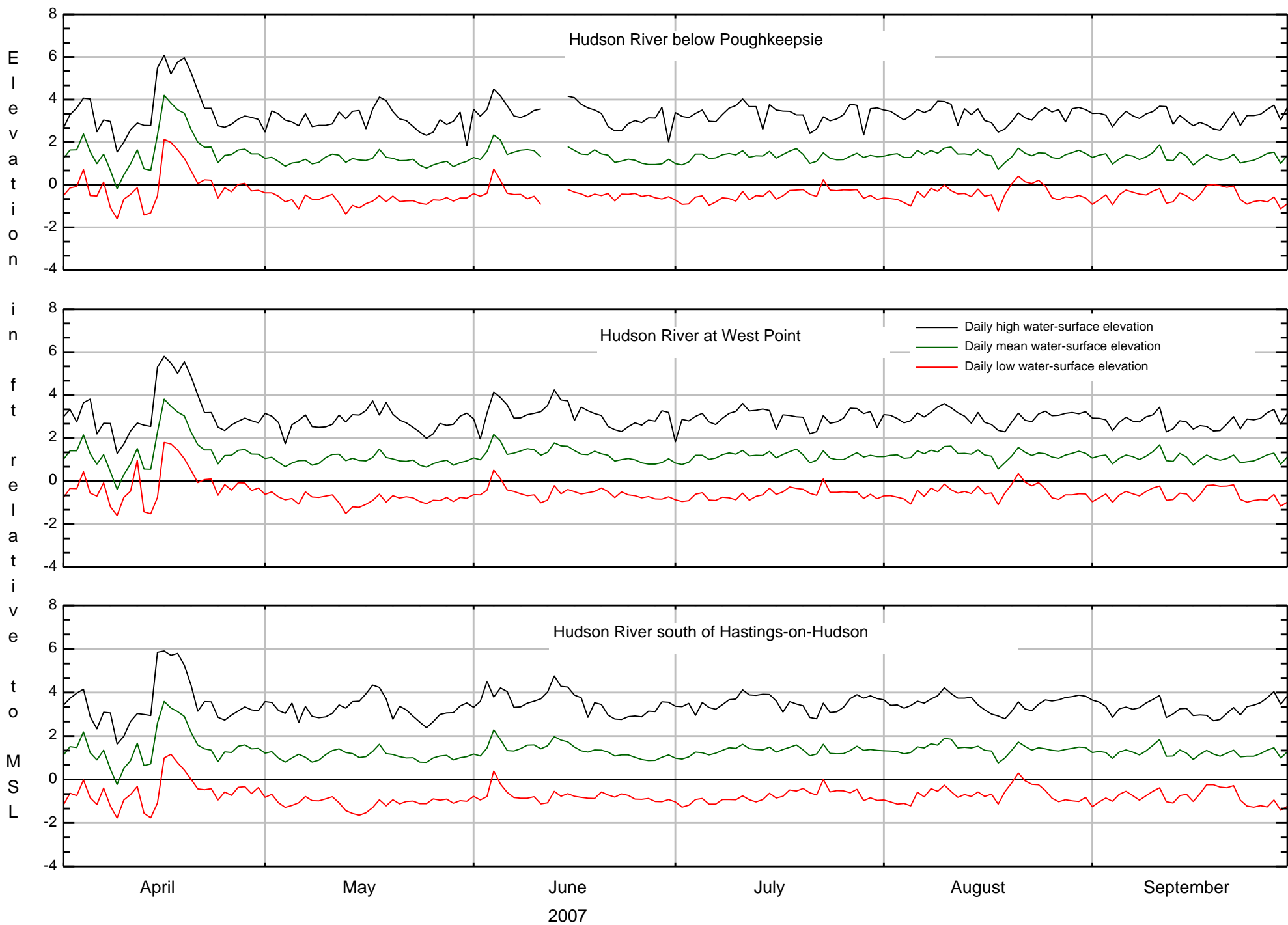


Figure 6.-- Daily high, mean, and low water-surface elevations relative to mean sea level (MSL) for the Hudson River below Poughkeepsie, at West Point, and south of Hastings-on-Hudson salt-front monitoring stations, April 1 through September 30, 2007. Zero ft elevation is mean sea level (from National Geodetic Vertical Datum of 1929). Locations shown in fig. 1.

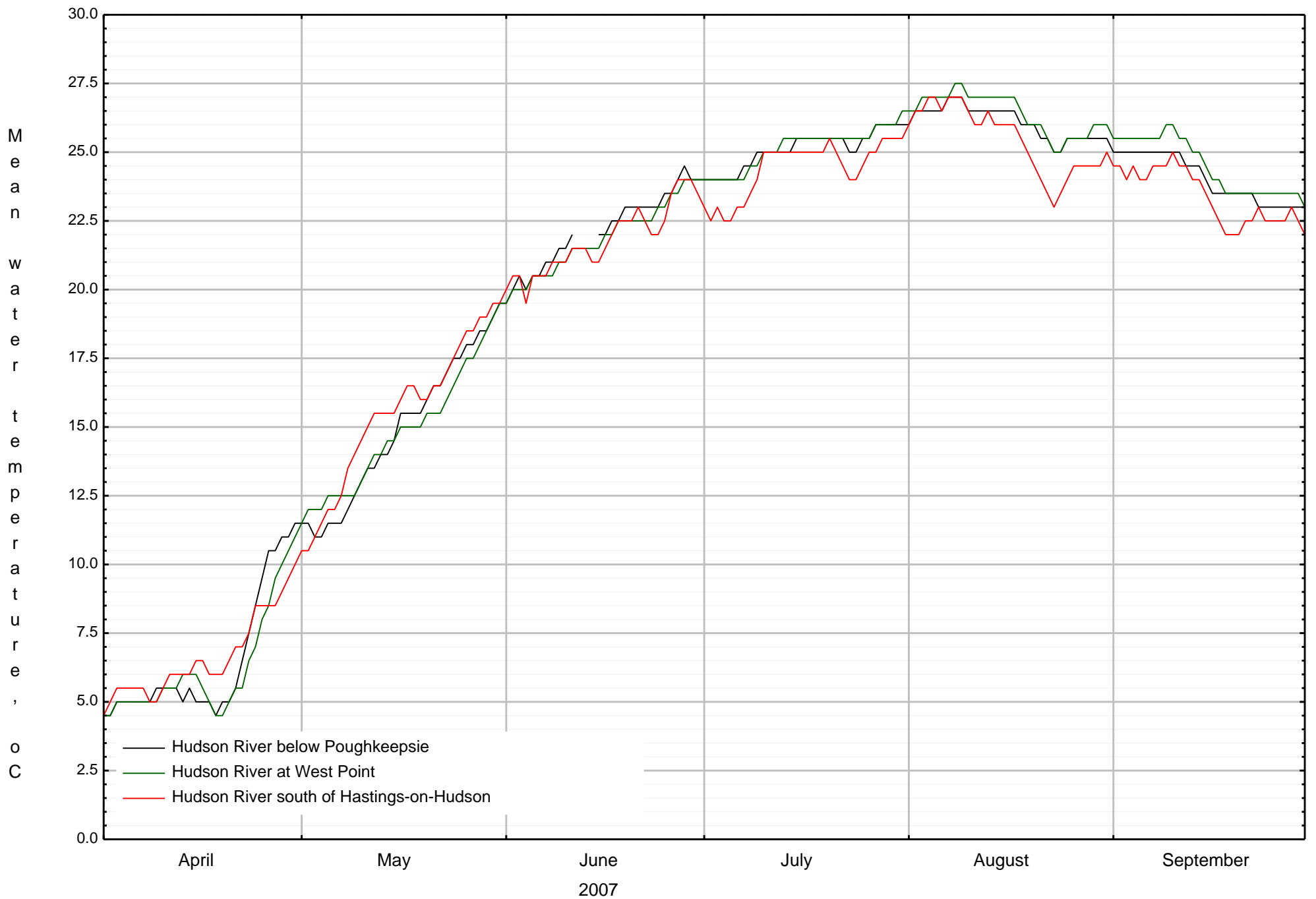


Figure 7.--Daily mean water temperatures in degrees Celsius for the Hudson River below Poughkeepsie, at West Point, and south of Hastings-on-Hudson salt-front monitoring stations, April 1 through September 30, 2007. Locations shown in fig. 1.

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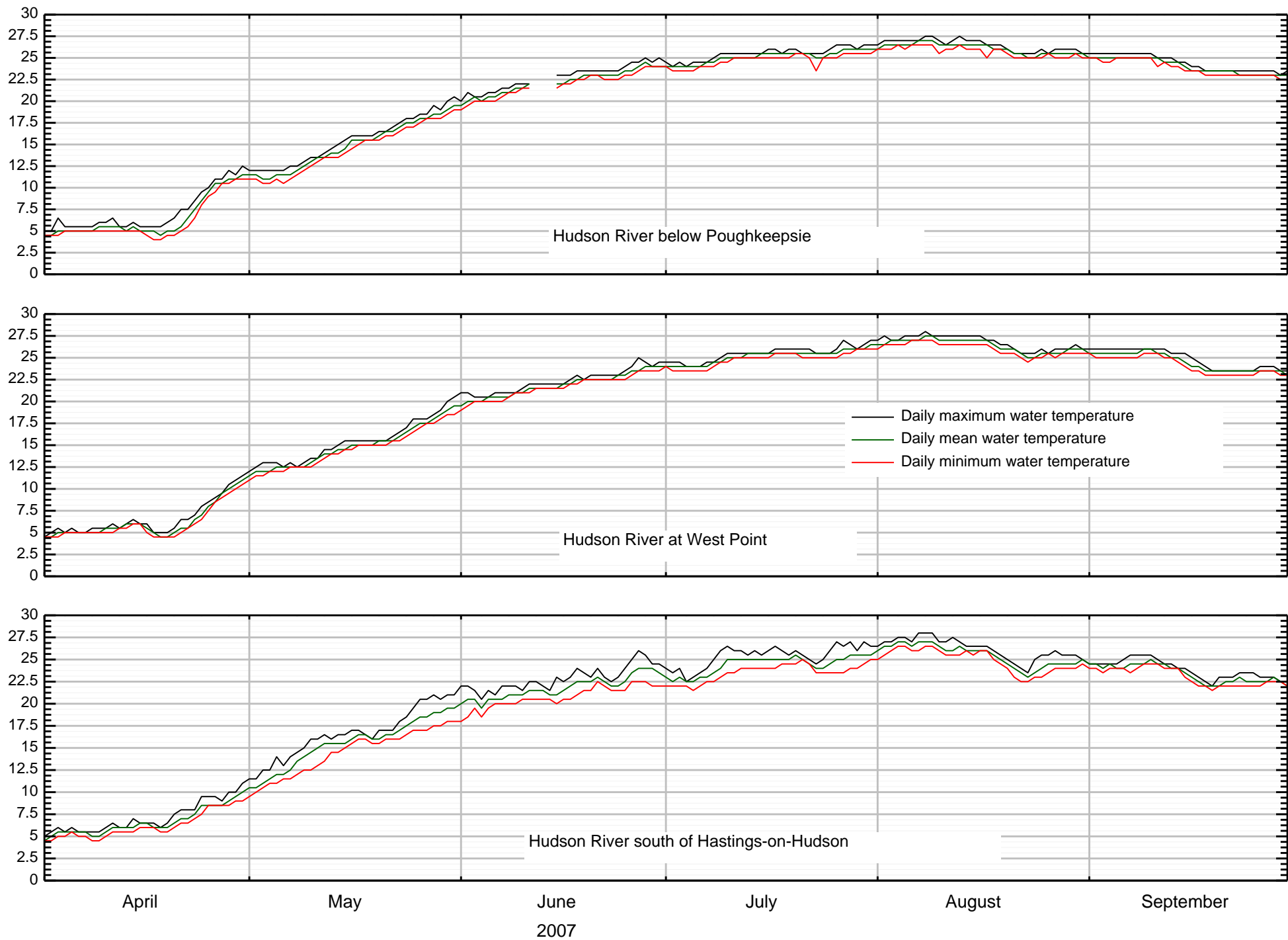


Figure 8.-- Daily maximum, mean, and minimum water temperatures in degrees Celsius for the Hudson River below Poughkeepsie, at West Point, and south of Hastings-on-Hudson salt-front monitoring stations, April 1 through September 30, 2007. Locations shown in fig. 1.

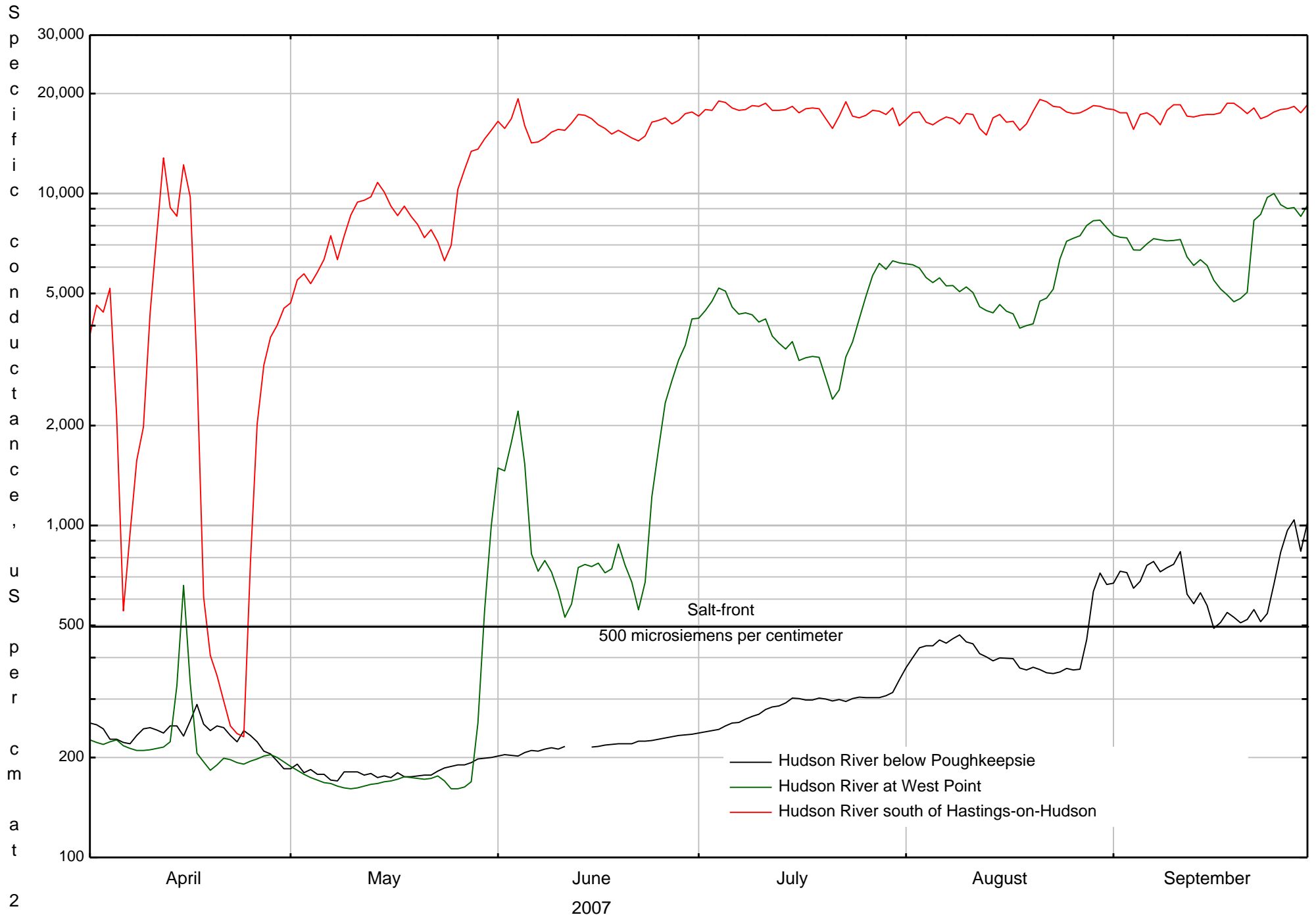


Figure 9.--Daily mean specific conductance in microsiemens per centimeter at 25 degrees Celsius for the Hudson River below Poughkeepsie, at West Point, and south of Hastings-on-Hudson salt-front monitoring stations, April 1 through September 30, 2007. The salt front is located at 500 microsiemens per centimeter. Locations shown in fig. 1.

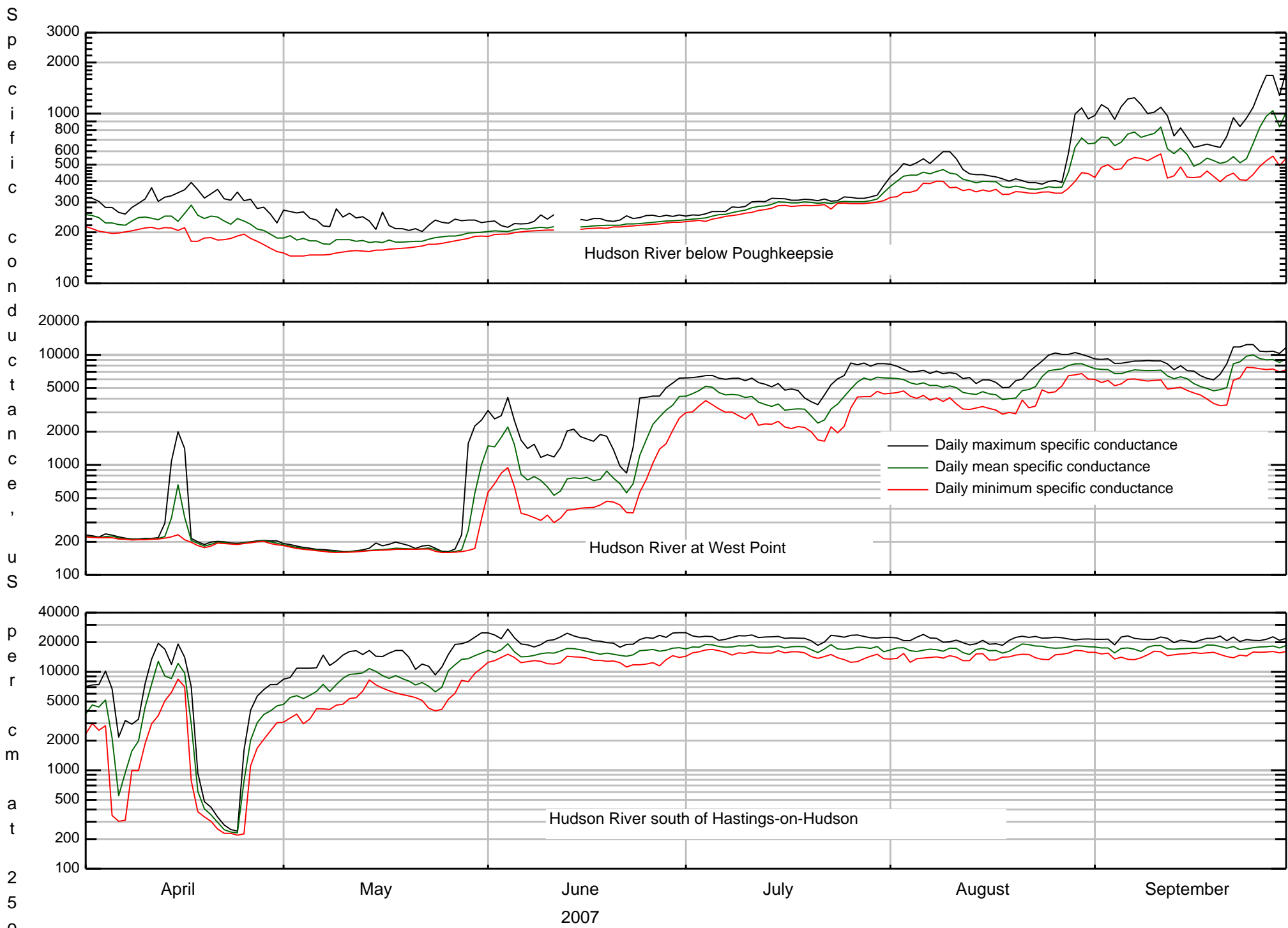
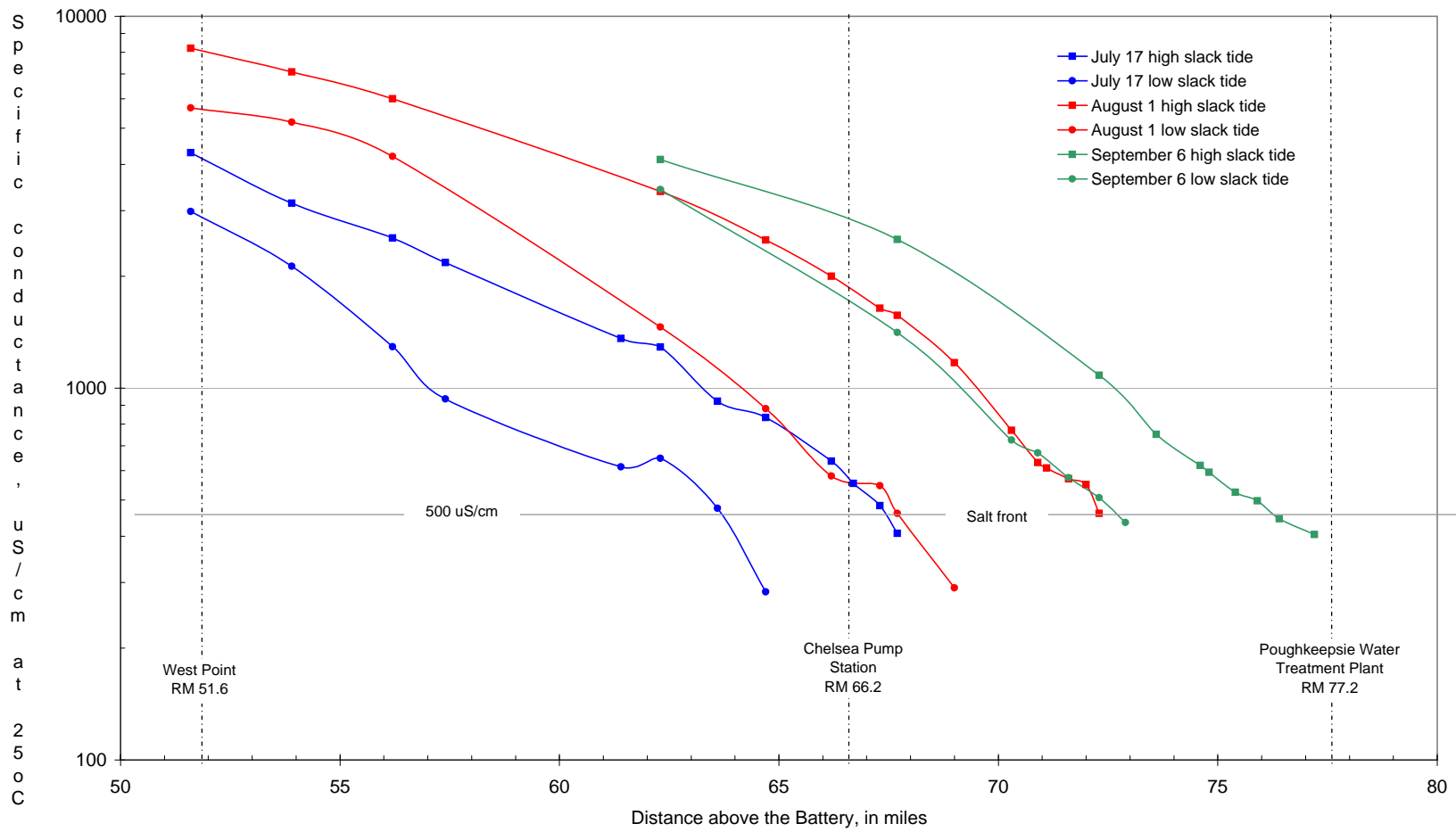


Figure 10.-- Daily maximum, mean, and minimum specific conductance for the Hudson River below Poughkeepsie, at West Point, and south of Hastings-on-Hudson salt-front monitoring stations, April 1 through September 30, 2007. The salt front is located at 500 microsiemens per centimeter. Locations shown in fig. 1.



a

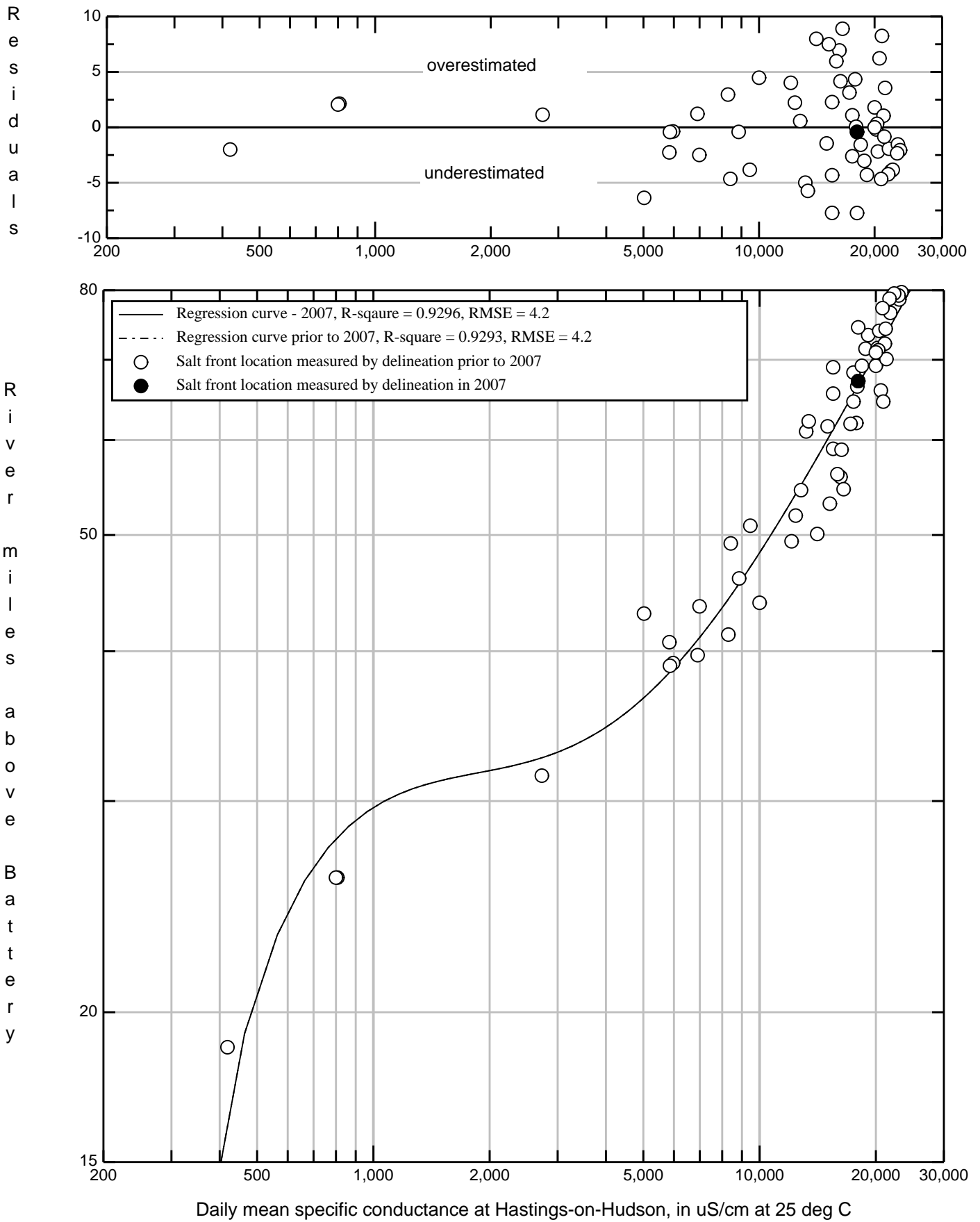


Figure 12.-- Distance of the salt front upstream from the Battery in relation to daily mean specific conductance at Hastings-on-Hudson, N.Y. Location is shown in Fig. 1.

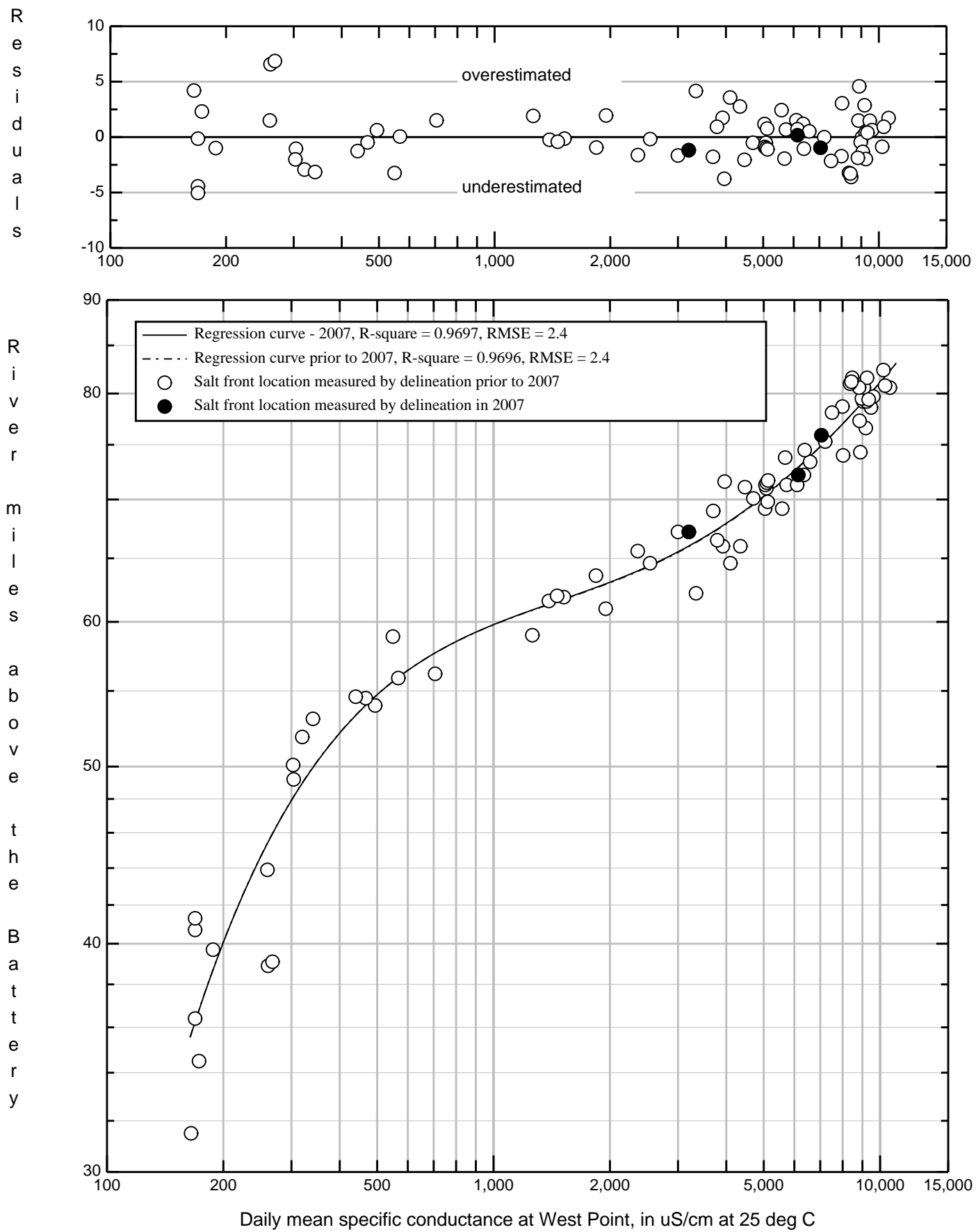


Figure 13.-- Distance of the salt front upstream from the Battery in relation to daily mean specific conductance at West Point, N.Y. Location is shown in Fig. 1.

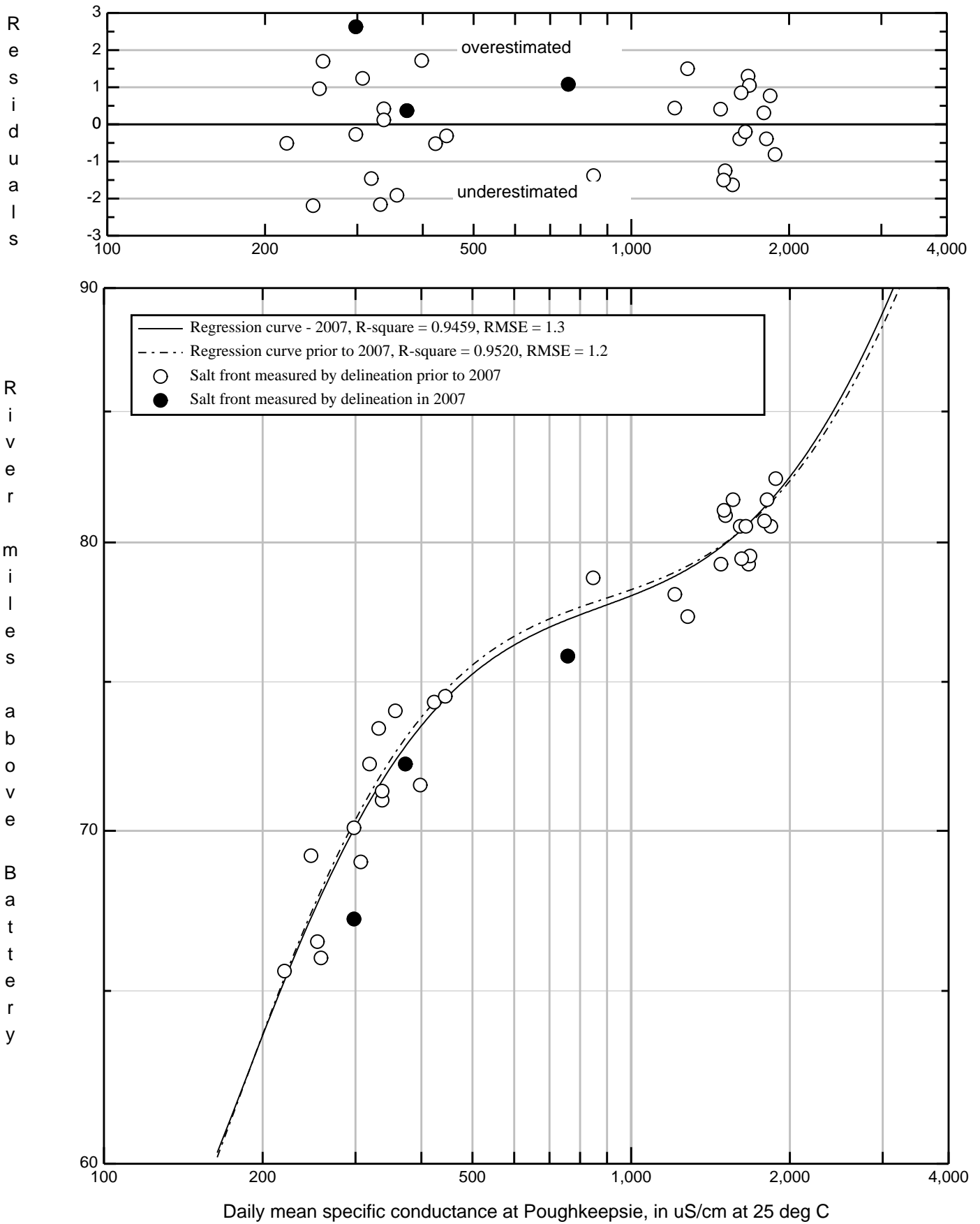


Figure 14.-- Distance of the salt front upstream from the Battery in relation to daily mean specific conductance below Poughkeepsie, N.Y. Location is shown in Fig. 1.

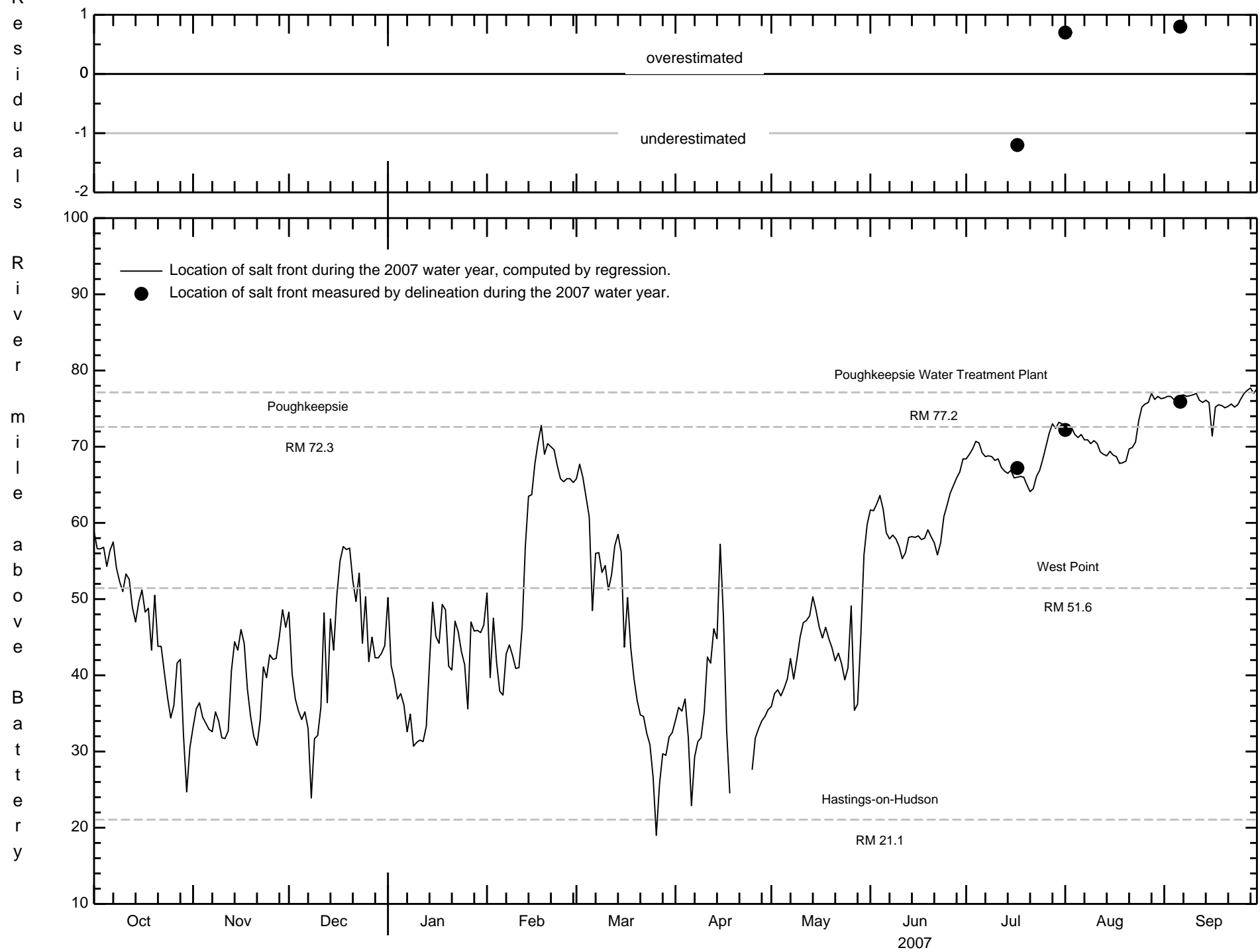


Figure 15.-- Location of salt front in Hudson River at high-slack-tide, based on delineations and regressions of daily specific conductance data from Hastings-on-Hudson, West Point, and Poughkeepsie stations, October 1, 2006, through September 30, 2007. Locations are shown in fig. 1.

[Estimated salt-front locations downstream of river mile 16.0 from April 19 through 24 are not plotted because they are beyond the calibration limits of the Hastings-on-Hudson regression equation.]

Table 1. Total number and percentage of days of above average, average, and below average discharge across the entire Hudson River basin from April 1 through September 30, 2007.

[Days above average, days above the 75th percentile; days below average, days below the 25th percentile; days average, days between the 25th and 75th percentiles. Percentage of total days, percentage of days when discharge was above average, average, and below average during the 183-day monitoring period. Locations are shown in figure 1.]

Month	¹ Days above average	¹ Days average	¹ Days below average
April	44	39	7
May	4	71	18
June	2	49	39
July	9	61	23
August	3	54	36
September	1	41	48
Total ¹ days	63	315	171
Percentage of total			
¹days	11	57	31

¹Days are the combined sum of days for the Hudson River above Lock 1 near Waterford, Mohawk River at Cohoes, and Wappinger Creek nr Wappingers Falls corresponding to the indicated discharge condition during each month (table 2). The total number of days is equal to 3 times the 183-day monitoring period, or 549 days.

Table 2. Number of days of above average, average, and below average discharge at Hudson River above Lock 1 near Waterford, Mohawk River at Cohoes, and Wappinger Creek at Wappingers Falls, April 1 through September 30, 2007.

[Days above average, days above the 75th percentile; days below average, days below the 25th percentile; days average, days between the 25th and 75th percentiles. Percentage of total days, percentage of days when discharge was above average, average, and below average during the 183-day monitoring period. Locations are shown in figure 1.]

Station	Month	Days above average	Days average	Days below average
A. Hudson River above Lock 1 near Waterford (01335754, Upper Hudson River basin)	April	14	9	7
	May	3	28	0
	June	0	25	5
	July	1	19	11
	August	0	6	25
	September	1	3	26
	Total		19	90
	Percentage of total days	10	49	40
B. Mohawk River at Cohoes (01357500, Mohawk River basin)	April	15	15	0
	May	1	27	3
	June	2	15	13
	July	3	20	8
	August	0	20	11
	September	0	16	14
	Total		21	113
	Percentage of total days	11	62	27
C. Wappinger Creek at Wappingers Falls (01372500, Lower Hudson River basin)	April	15	15	0
	May	0	16	15
	June	0	9	21
	July	5	22	4
	August	3	28	0
	September	0	22	8
	Total		23	112
	Percentage of total days	13	61	26

Table 3.-- Maximum and minimum water-surface elevations, water-temperature, and specific-conductance data for the Hudson River below Poughkeepsie, at South Dock at West Point, and South of Hastings-on-Hudson monitoring stations, April 1 through September 30, 2007.

[uS/cm at 25°C, microsiemens per centimeter at 25 degrees Celsius; NGVD 29, National Geodetic Vertical Datum of 1929. Locations shown in fig. 1]

Station	Water-surface elevation (feet above NGVD 29)			
	Maximum		Minimum	
	Feet	Date	Feet	Date
Poughkeepsie	6.08	Apr. 16	-1.60	Apr. 9
West Point	5.80	Apr. 16	-1.60	Apr. 9
Hastings-on-Hudson	5.91	Apr. 16	-1.77	Apr. 9

Station	Water temperature (°C)			
	Maximum		Minimum	
	°C	Date	°C	Date
Poughkeepsie	27.5	Aug. 8, 9, 13	4.0	Apr. 17, 18
West Point	28.0	Aug. 8	4.5	Apr. 1, 2, 3, 17, 18, 19, 20
Hastings-on-Hudson	28.0	Aug. 7, 8, 9	4.5	Apr. 1, 2, 8, 9

Station	Specific conductance (uS/cm at 25°C)			
	Maximum		Minimum	
	°C	Date	°C	Date
Poughkeepsie	1,770	Sept. 30	145	May 2, 3, 4
West Point	12,400	Sept. 24, 25	160	May 9, 25, 26
Hastings-on-Hudson	27,200	Jun. 4	219	Apr. 24

Table 4.-- Salt-front locations found during high-slack-tide and low-slack-tide delineations and the corresponding location of the salt front estimated by regression for the given day.

[RM, river miles, measured in curvilinear distance upstream from the Battery in New York City]

Date	Tide	Found by delineation (RM)	Estimated by regression (RM)
Jul. 17	High	67.2	66.6
	Low	63.4	*****
Aug. 1	High	72.2	73.4
	Low	67.5	*****
Sept. 6	High	75.9	77.1
	Low	72.4	*****

*****The regressions estimate the daily upstream location of the salt front and thus do not estimate the location of the salt front at low-slack-tide.

Table 5. --Depth and specific conductance measured at selected cross-sections of the Hudson River on July 17, August 1, and September 6, 2007.

[Depths are measured in feet below water surface. Spec. cond., specific conductance, in microsiemens per centimeter at 25°C. Deepest measurements are 5 feet above bottom. Mean time, in Eastern Standard Time (EST).]

Date and cross-section	Position in cross-section, facing downstream					
	Left		Center		Right	
	Depth	Spec. cond.	Depth	Spec. cond.	Depth	Spec. cond.
July 17	Low slack					
West Point	70	2,425	60	2,988	60	2,705
River mile: 51.6	35	2,414	30	2,521	30	2,653
Mean time: 0932	5	2,408	5	2,483	5	2,565
Foundry	--	--	60	2,126	--	--
River mile: 53.9	--	--	30	1,879	--	--
Mean time: 0946	--	--	5	1,688	--	--
Breakneck Point	--	--	75	1,293	--	--
River mile: 56.2	--	--	35	1,253	--	--
Mean time: 0954	--	--	5	1,213	--	--
Pollepel Island	--	--	35	935	--	--
River mile: 57.4	--	--	15	911	--	--
Mean time: 1000	--	--	5	910	--	--
Newburg	--	--	30	614	--	--
River mile: 61.4	--	--	15	593	--	--
Mean time: 1012	--	--	5	579	--	--
Newburg-Beacon Bridge	20	647	40	433	30	438
River mile: 62.3	10	617	20	428	15	433
Mean time: 1024	5	568	5	425	5	418
Empire	10	475	25	380	40	297
River mile: 63.6	5	464	10	380	20	298
Mean time: 1041	--	--	5	386	5	310
Castle Point	--	--	45	283	--	--
River mile: 64.7	--	--	20	283	--	--
Mean time: 1054	--	--	5	282	--	--
July 17	High slack					
West Point	70	3,843	65	4,300	65	4,275
River mile: 51.6	35	3,567	30	3,654	30	4,050
Mean time: 1353	5	3,069	5	3,322	5	3,480
Foundry	--	--	70	3,143	--	--
River mile: 53.9	--	--	35	2,958	--	--
Mean time: 1405	--	--	5	2,827	--	--

Table 5. --Depth and specific conductance measured at selected cross-sections of the Hudson River on July 17, August 1, and September 6, 2007.(continued)

[Depths are measured in feet below water surface. Spec. cond., specific conductance, in microsiemens per centimeter at 25°C. Deepest measurements are 5 feet above bottom. Mean time, in Eastern Standard Time (EST).]

Date and cross-section	Position in cross-section, facing downstream					
	Left		Center		Right	
	Depth	Spec. cond.	Depth	Spec. cond.	Depth	Spec. cond.
July 17	High slack (cont.)					
Breakneck Point	--	--	80	2,533	--	--
River mile: 56.2	--	--	40	2,520	--	--
Mean time: 1419	--	--	5	2,255	--	--
Pollepel Island	--	--	35	2,175	--	--
River mile: 57.4	--	--	15	2,176	--	--
Mean time: 1427	--	--	5	1,817	--	--
Newburg	--	--	40	1,359	--	--
River mile: 61.4	--	--	20	1,342	--	--
Mean time: 1447	--	--	5	819	--	--
Newburg-Beacon Bridge	30	1,040	40	1,150	30	1,224
River mile: 62.3	15	1,006	20	1,098	15	1,127
Mean time: 1501	5	1,290	5	768	5	800
Empire	--	--	40	922	--	--
River mile: 63.6	--	--	20	851	--	--
Mean time: 1515	--	--	5	646	--	--
Castle Point	--	--	45	834	--	--
River mile: 64.7	--	--	20	660	--	--
Mean time: 1524	--	--	5	511	--	--
Chelsea Pump Station	30	609	50	607	45	636
River mile: 66.2	15	600	25	457	20	403
Mean time: 1542	5	550	5	426	5	350
Danskammer Point	70	541	55	496	45	554
River mile: 66.7	35	505	25	395	20	450
Mean time: 1556	5	422	5	350	5	329
Wappinger Creek	70	450	60	460	40	483
River mile: 67.3	35	383	30	417	20	375
Mean time: 1610	5	480	5	328	5	297
New Hamburg	--	--	65	407	--	--
River mile: 67.7	--	--	30	364	--	--
Mean time: 1618	--	--	5	399	--	--

Table 5. --Depth and specific conductance measured at selected cross-sections of the Hudson River on July 17, August 1, and September 6, 2007.(continued)

[Depths are measured in feet below water surface. Spec. cond., specific conductance, in microsiemens per centimeter at 25°C. Deepest measurements are 5 feet above bottom. Mean time, in Eastern Standard Time (EST).]

Date and cross-section	Position in cross-section, facing downstream					
	Left		Center		Right	
	Depth	Spec. cond.	Depth	Spec. cond.	Depth	Spec. cond.
August 1	Low slack					
West Point	45	5,480	55	4,080	60	5,670
River mile: 51.6	20	5,300	25	4,950	30	5,600
Mean time: 0848	5	5,230	5	5,240	5	5,400
Foundry	--	--	60	5,190	--	--
River mile: 53.9	--	--	30	4,770	--	--
Mean time: 0901	--	--	5	3,900	--	--
Breakneck Point	--	--	60	4,200	--	--
River mile: 56.2	--	--	30	3,440	--	--
Mean time: 0913	--	--	5	3,100	--	--
Newburg-Beacon Bridge	--	--	30	1,460	--	--
River mile: 62.3	--	--	15	1,460	--	--
Mean time: 0928	--	--	5	1,420	--	--
Castle Point	--	--	35	880	--	--
River mile: 64.7	--	--	15	800	--	--
Mean time: 0938	--	--	5	740	--	--
Chelsea Pump Station	--	--	50	580	--	--
River mile: 66.2	--	--	25	407	--	--
Mean time: 0945	--	--	5	370	--	--
Wappinger Creek	60	546	45	310	35	330
River mile: 67.3	30	463	20	310	15	320
Mean time: 0955	5	400	5	320	5	320
New Hamburg	65	460	60	300	55	305
River mile: 67.7	30	390	30	330	25	310
Mean time: 1006	5	350	5	330	5	310
Marlboro	--	--	40	280	--	--
River mile: 69.0	--	--	20	280	--	--
Mean time: 1017	--	--	5	290	--	--
August 1	High slack					
West Point	75	4,800	65	8,200	60	8,050
River mile: 51.6	35	4,850	30	7,750	30	8,010
Mean time: 1402	5	4,870	5	7,100	5	7,000

Table 5. --Depth and specific conductance measured at selected cross-sections of the Hudson River on July 17, August 1, and September 6, 2007.(continued)

[Depths are measured in feet below water surface. Spec. cond., specific conductance, in microsiemens per centimeter at 25°C. Deepest measurements are 5 feet above bottom. Mean time, in Eastern Standard Time (EST).]

Date and cross-section	Position in cross-section, facing downstream					
	Left		Center		Right	
	Depth	Spec. cond.	Depth	Spec. cond.	Depth	Spec. cond.
August 1	High slack (cont.)					
Foundry	--	--	70	7,080	--	--
River mile: 53.9	--	--	35	6,530	--	--
Mean time: 1411	--	--	5	6,180	--	--
Breakneck Point	--	--	75	6,000	--	--
River mile: 56.2	--	--	35	5,720	--	--
Mean time: 1418	--	--	5	5,400	--	--
Newburg-Beacon Bridge	--	--	35	3,380	--	--
River mile: 62.3	--	--	15	3,370	--	--
Mean time: 1431	--	--	5	2,700	--	--
Castle Point	--	--	40	2,500	--	--
River mile: 64.7	--	--	20	2,340	--	--
Mean time: 1438	--	--	5	1,740	--	--
Chelsea Pump Station	--	--	50	2,000	--	--
River mile: 66.2	--	--	25	1,490	--	--
Mean time: 1444	--	--	5	1,110	--	--
Wappinger Creek	--	--	65	1,640	--	--
River mile: 67.3	--	--	30	1,600	--	--
Mean time: 1449	--	--	5	980	--	--
New Hamburg	--	--	65	1,570	--	--
River mile: 67.7	--	--	30	1,380	--	--
Mean time: 1454	--	--	5	1,000	--	--
Marlboro	--	--	40	1,170	--	--
River mile: 69.0	--	--	20	1,030	--	--
Mean time: 1458	--	--	5	960	--	--
Clinton Point	--	--	60	770	--	--
River mile: 70.3	--	--	30	710	--	--
Mean time: 1504	--	--	5	720	--	--
Barnegat	--	--	60	630	--	--
River mile: 70.9	--	--	30	615	--	--
Mean time: 1511	--	--	5	570	--	--

Table 5. --Depth and specific conductance measured at selected cross-sections of the Hudson River on July 17, August 1, and September 6, 2007.(continued)

[Depths are measured in feet below water surface. Spec. cond., specific conductance, in microsiemens per centimeter at 25°C. Deepest measurements are 5 feet above bottom. Mean time, in Eastern Standard Time (EST).]

Date and cross-section	Position in cross-section, facing downstream					
	Left		Center		Right	
	Depth	Spec. cond.	Depth	Spec. cond.	Depth	Spec. cond.
August 1 (cont.) High slack						
Lions	--	--	50	560	--	--
River mile: 71.1	--	--	25	610	--	--
Mean time: 1516	--	--	5	570	--	--
Lagoon	--	--	45	530	--	--
River mile: 71.6	--	--	20	530	--	--
Mean time: 1522	--	--	5	570	--	--
Horn	--	--	45	550	--	--
River mile: 72.0	--	--	20	500	--	--
Mean time: 1527	--	--	5	510	--	--
IBM/Kedem	15	365	45	460	55	450
River mile: 72.3	10	350	20	440	25	380
Mean time: 1535	5	350	5	430	5	330
September 6 Low slack						
Newburg-Beacon Bridge	25	3,190	40	3,420	35	2,690
River mile: 62.3	10	3,120	20	2,950	15	2,510
Mean time: 1413	5	2,810	5	2,300	5	2,200
New Hamburg	--	--	65	1,411	--	--
River mile: 67.7	--	--	30	1,278	--	--
Mean time: 1433	--	--	5	1,000	--	--
Clinton Point	--	--	55	725	--	--
River mile: 70.3	--	--	30	649	--	--
Mean time: 1519	--	--	5	541	--	--
Barnegat	65	669	55	622	55	525
River mile: 70.9	30	612	30	594	30	522
Mean time: 1538	5	563	5	525	5	448
Lagoon	50	574	45	559	55	466
River mile: 71.6	25	548	25	543	25	439
Mean time: 1542	5	546	5	467	5	391
IBM/Kedem	55	507	45	492	55	378
River mile: 72.3	30	477	25	479	30	372
Mean time: 1551	5	491	5	445	5	369

Table 5. --Depth and specific conductance measured at selected cross-sections of the Hudson River on July 17, August 1, and September 6, 2007.(continued)

[Depths are measured in feet below water surface. Spec. cond., specific conductance, in microsiemens per centimeter at 25°C. Deepest measurements are 5 feet above bottom. Mean time, in Eastern Standard Time (EST).]

Date and cross-section	Position in cross-section, facing downstream					
	Left		Center		Right	
	Depth	Spec. cond.	Depth	Spec. cond.	Depth	Spec. cond.
September 6 Low slack (cont.)						
Milton	55	418	50	370	50	346
River mile: 72.9	30	419	25	386	25	346
Mean time: 1602	5	435	5	390	5	347
September 6 High slack						
Newburg-Beacon Bridge	30	3,990	40	4,090	35	4,120
River mile: 62.3	15	3,480	20	3,960	15	3,390
Mean time: 0828	5	3,180	5	3,040	5	3,130
New Hamburg	--	--	65	2,510	--	--
River mile: 67.7	--	--	30	2,260	--	--
Mean time: 0844	--	--	5	1,920	--	--
IBM/Kedem	50	804	45	918	55	1,074
River mile: 72.3	25	779	20	914	30	1,082
Mean time: 0900	5	772	5	780	5	715
Pirates Canoe Boat Club	--	--	50	751	--	--
River mile: 73.6	--	--	25	706	--	--
Mean time: 0912	--	--	5	644	--	--
Oakes	--	--	75	619	--	--
River mile: 74.6	--	--	35	586	--	--
Mean time: 0919	--	--	5	441	--	--
Central Hudson Power	--	--	55	594	--	--
River mile: 74.8	--	--	25	487	--	--
Mean time: 0923	--	--	5	421	--	--
Lincoln	--	--	60	525	--	--
River mile: 75.4	--	--	30	500	--	--
Mean time: 0928	--	--	5	413	--	--
Mid-Hudson Bridge	55	480	55	498	60	493
River mile: 75.9	25	473	25	461	30	460
Mean time: 0935	5	460	5	419	5	387
Poughkeepsie RR Bridge	50	445	50	417	65	357
River mile: 76.4	25	435	25	409	30	358

Mean time: 0947 5 435 5 386 5 359

Table 5. --Depth and specific conductance measured at selected cross-sections of the Hudson River on July 17, August 1, and September 6, 2007.(continued)

[Depths are measured in feet below water surface. Spec. cond., specific conductance, in microsiemens per centimeter at 25°C. Deepest measurements are 5 feet above bottom. Mean time, in Eastern Standard Time (EST).]

Date and cross-section	Position in cross-section, facing downstream					
	Left		Center		Right	
	Depth	Spec. cond.	Depth	Spec. cond.	Depth	Spec. cond.
September 6	High slack (cont.)					
Pough. Water Treat. Plant	50	402	50	389	55	345
River mile: 77.2	25	404	25	376	25	342
Mean time: 1002	5	398	5	367	5	342

Table 6.--Location of the salt front found by delineation in 2007 and the corresponding daily mean specific conductance at each monitoring station. These data were used to verify and update the regressions.

[RM, river miles above the Battery; uS/cm at 25°C, microsiemens per centimeter at 25 degrees Celsius]

Date	Location of salt front found by delineation (RM)	Daily mean specific conductance (uS/cm at 25°C)		
		Poughkeepsie	West Point	Hastings-on- Hudson
Jul. 17	67.2	298	3,200	18,000
Aug. 1	¹ 72.2	373	6,140	¹ 16,700
Sept. 6	¹ 75.9	758	7,050	¹ 17,500

[¹ Delineation data on Aug. 1 and Sept. 6 were not included in the Hastings-on-Hudson regression.]

Table 7.--Daily salt-front locations in river miles above the Battery at slack-high-tide from October 1, 2006, through September 30, 2007, estimated from the 2007 water year salt-front delineations and revised regression equations. Maximum upstream location of the salt front was 77.7 river miles above the Battery on Sept. 28.

[*****, estimated salt-front river mile below model calibration limit of 16.0 river miles]

Day	October	November	December	January	February	March
1	58.9	33.2	48.3	50.2	50.8	65.8
2	56.6	35.6	40.2	41.3	39.7	67.7
3	56.6	36.4	36.9	39.4	47.5	66.0
4	56.8	34.5	35.3	36.9	41.7	63.4
5	54.3	33.7	34.2	37.6	37.9	60.8
6	56.4	32.9	35.2	36.1	37.4	48.5
7	57.5	32.6	33.0	32.6	42.8	56.0
8	54.1	35.2	23.9	34.9	44.0	56.1
9	52.3	34.0	31.7	30.7	42.6	53.5
10	51.0	31.8	32.1	31.2	40.9	54.4
11	53.3	31.7	35.8	31.5	41.0	51.2
12	52.6	32.7	48.2	31.3	46.3	53.2
13	48.9	40.6	36.4	33.3	56.9	57.0
14	47.0	44.4	47.4	41.6	63.5	58.5
15	49.6	43.3	43.3	49.6	63.7	56.2
16	51.2	46.0	50.5	45.1	67.8	43.7
17	48.3	44.2	55.0	44.2	70.6	50.2
18	48.8	38.2	56.9	49.3	72.8	43.6
19	43.3	34.6	56.5	48.6	69.0	39.6
20	50.5	32.0	56.7	41.2	70.4	36.7
21	43.8	30.8	52.4	40.7	70.0	34.8
22	43.8	34.1	49.7	47.1	69.6	34.6
23	40.4	41.1	53.4	45.7	67.5	32.4
24	37.1	39.7	44.2	43.1	65.8	30.9
25	34.4	42.7	50.3	41.4	65.4	26.6
26	36.1	42.1	41.8	35.6	65.8	19.0
27	41.6	42.2	45.0	47.0	65.8	25.7
28	42.1	45.1	42.3	45.8	65.3	29.7
29	32.1	48.6	42.3	45.9	---	29.5
30	24.7	46.3	42.9	45.6	---	31.9
31	30.5	---	43.9	46.6	---	32.5
Max	58.9	48.6	56.9	50.2	72.8	67.7
Min	24.7	30.8	23.9	30.7	37.4	19.0

Table 7 (cont.).--Daily salt-front locations in river miles above the Battery at slack-high-tide from October 1, 2006, through September 30, 2007, estimated from the 2007 water year salt-front delineations and revised regression equations. Maximum upstream location of the salt front was 77.7 river miles above the Battery on Sept. 28.

[*****, estimated salt-front river mile below model calibration limit of 16.0 river miles]

Day	April	May	June	July	August	September
1	34.1	35.9	61.7	68.4	72.9	76.4
2	35.8	37.6	61.6	69.0	72.8	76.6
3	35.3	38.1	62.5	69.7	72.5	76.6
4	36.9	37.3	63.6	70.7	71.6	76.2
5	31.9	38.3	61.8	70.5	71.2	76.4
6	22.9	39.5	58.7	69.2	71.6	76.7
7	29.3	42.2	57.9	68.7	70.9	76.8
8	31.3	39.5	58.4	68.8	70.9	76.6
9	31.8	42.1	57.9	68.7	70.4	76.7
10	35.2	45.0	56.9	68.2	70.8	76.8
11	42.4	46.9	55.3	68.4	70.4	77.0
12	41.6	47.2	56.1	67.3	69.3	76.1
13	46.1	47.8	58.1	66.8	69.0	75.8
14	44.8	50.3	58.2	66.5	68.8	76.1
15	57.2	48.5	58.1	66.9	69.4	75.8
16	47.8	46.3	58.3	65.9	68.9	71.4
17	32.9	44.9	57.8	66.0	68.7	75.2
18	24.5	46.3	58.0	66.1	67.8	75.5
19	*****	44.8	59.1	66.0	67.9	75.4
20	*****	43.6	58.2	65.0	68.1	75.1
21	*****	41.9	57.4	64.1	69.7	75.3
22	*****	42.9	55.8	64.5	69.9	75.6
23	*****	41.5	57.4	66.1	70.6	75.2
24	*****	39.4	60.8	66.9	73.4	75.5
25	27.6	41.0	62.3	68.4	75.2	76.3
26	31.8	49.1	63.9	70.1	75.6	77.0
27	33.0	35.4	64.9	71.8	75.8	77.4
28	34.0	36.2	65.9	73.0	77.0	77.7
29	34.6	45.0	66.7	72.4	76.2	77.0
30	35.5	55.8	68.4	73.2	76.6	77.6
31	---	59.8	---	73.0	76.3	---
Max	57.2	59.8	68.4	73.2	77.0	77.7
Min	*****	35.4	55.3	64.1	67.8	71.4