WATERINSIGHT

2025 ANNUAL WATER QUALITY REPORT

NYENVIRONCOM MONITORING SITES

Mapped with Results of Data Collection and Bacterial Load Monitoring

The Mid-New York Environmental and Sustainability Committee

The Mid-New York Sustainable Land Use Council

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Abstract

In 2025 the NYenvironcom (NYec) WaterInsight water quality monitoring program collected and analyzed data over the year across 10 stations (8 NYec and 2 USGS). The program utilized HYDROS 21 CTD sensors for continuous measurement of conductivity, temperature, and depth, alongside a Yosemitech Y511-A turbidity sensor at PKBK3S, establishing that hydrological forcing was the dominant control on watershed health, with stable annual trends overall but accompanied by significant event-based variability. Out of 2,032,080 raw records, a 99.52% retention rate was achieved, resulting in 2,022,353 final records for analysis.

Conductivity analysis, spanning 653,120 records, showed a consistent background ionic signal, clustering around a network mean of 145.79 µS/cm. However, extreme variability was observed at PKBK4S, which recorded the network maximum of 420.80 µS/cm and the highest standard deviation (74.74 µS/cm). This spike behavior was also pronounced at USGS Neversink, PKBK3S, and PKBK10S, identifying them as priority locations for storm-event follow-up. This variability correlated strongly with weather events, as shown by a synchronized network-wide conductivity decline during the May precipitation pulse (8.96 inches), consistent with dilution effects.

Thermal monitoring, based on 675,686 records, confirmed a wide annual envelope, with mean temperatures clustering around 11.94°C. Peak warm-event responses were highest at PKBK6S (38.60°C), while downstream stations like PKBK9S (9.99°C) remained cooler. Temperature was universally and inversely coupled with conductivity (r = -0.20 to -0.74), reinforcing the role of seasonal hydrology. Depth analysis, derived from 659,670 records, clearly mirrored these weather patterns. The May precipitation caused synchronized depth expansion, with relative flood spikes exceeding five times the mean at PKBK3S. Conversely, the late-summer August-October drought resulted in critical minimum depths of 0.00 mm at PKBK3S, PKBK4S, and PKBK6S, indicating periods of reduced hydraulic buffering.
Water clarity assessment at PKBK3S showed a stable baseline (1.44 NTU mean) but a strong positive correlation between turbidity and flow (r = +0.81), confirming precipitation-driven sediment resuspension as the primary environmental driver. Critically, the EPA drinking water standard (4.0 NTU) was exceeded during three storm events. Furthermore, bacterial analysis demonstrated a significant public health risk: 33.33% of fecal colfiform bottle samples exceeded both the 235 MPN/100mL single-sample maximum and the 410 MPN/100mL Statistical Threshold Value (STV). This failure rate indicates non-compliance with standards for primary contact recreation. Based on variability and outlier burden, PKBK10S and PKBK2S are designated for enhanced monitoring in the next period.

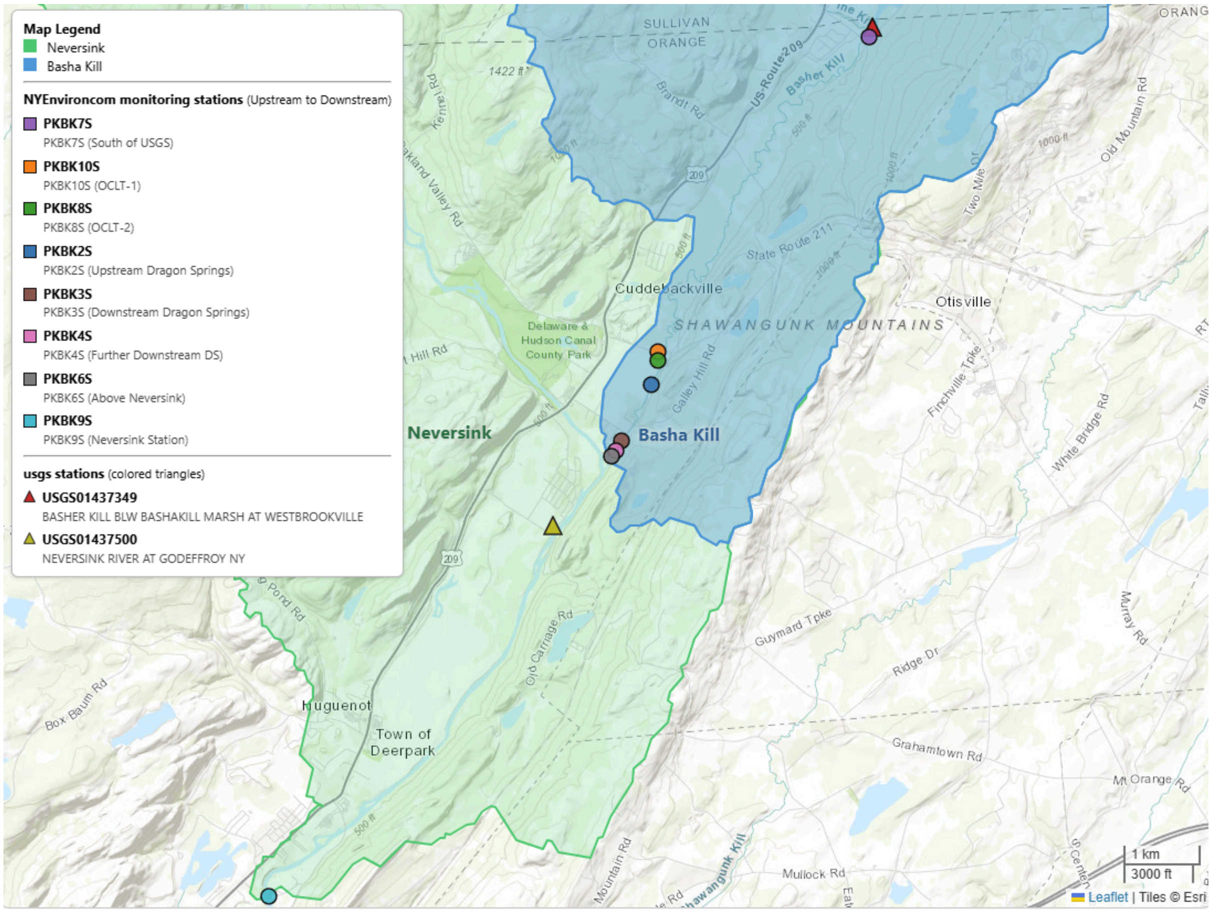

Figure 1. *Map of the NYenvironcom and USGS Monitoring Network*
Refer to Appendix for Station Locations

Table 1. *Summary of Record Totals and Outlier Removal*

Raw Records	Final Records	Outliers Removed
2,032,080	2,022,353	9,727

Table 2. *Station-Level Sensor Record Counts for 2025*

Station	Conductivity Records	Depth Records	Temperature Records
USGS Basherkill Marsh	34,570	34,513	34,649
PKBK7S	86,092	84,268	86,084
PKBK10S	79,680	97,199	99,128
PKBK8S	71,473	69,561	71,618
PKBK2S	81,503	79,628	77,180
PKBK3S	43,940	40,478	53,518
PKBK4S	95,566	84,279	53,518
PKBK6S	62,391	68,880	95,187
USGS Neversink	28,106	33,730	34,224
PKBK9S	69,799	67,134	70,580

Executive Summary

Locations collecting data in 2025 included 8 NYec stations and 2 USGS stations, for 10 stations total; this report processed data from these stations and analyzed 2,022,353 final records after rigorous quality control. This 99.52% retention rate demonstrates exceptional sensor reliability. All monitored parameters showed stable annual trends, indicating consistent environmental conditions throughout the study period.

Key Monitoring Results

Data Coverage and Quality Control: The program compiled 2,022,353 records after removing 9,727 outliers via IQR-based filtering (*see appendix for details of methodology*). This process ensures data integrity while preserving natural environmental variability across the network.

Conductivity Patterns: PKBK2S recorded the highest annual mean conductivity (174.46 μS/cm), while PKBK4S showed the greatest variability and the annual maximum (420.80 μS/cm). All stations demonstrated synchronized declines during May precipitation events.

Temperature Dynamics: PKBK3S and PKBK4S shared the highest average temperatures (14.87°C). Maximums exceeded 30°C at several sites.

Hydrological Variability: USGS Basherkill Marsh (Basha Kill) had the highest mean depth (1,640.26 mm). Critical minimum depths of 0.00 mm occurred at PKBK3S, PKBK4S, and PKBK6S during late-summer drought, highlighting vulnerability to extreme weather.

Water Clarity Assessment: Turbidity data from PKBK3S (mean 1.44 NTU) indicate generally clear conditions, with occasional spikes likely linked to precipitation or local disturbances.

Environmental Context and Correlations

Temperature-Conductivity Relationships: All stations exhibited negative correlations between temperature and conductivity. Strongest relationships were at USGS Neversink (r = -0.74) and PKBK9S (r = -0.70), reflecting robust seasonal cycling.

Bacterial Contamination Events: Fecal Coliform Count by Colilert-18 Method analysis revealed that 33.33% of samples exceeded risk thresholds. A maximum concentration of 1,299.70 MPN/100mL indicates significant contamination events requiring further investigation.

Meteorological Influences: Significant May precipitation (8.96 inches) caused synchronized network responses, while August-October drought conditions resulted in critically low water levels across multiple stations.

Flow Characteristics: NSR Flow maintained higher magnitudes (mean: 515.84 ft^3/s) than BK Marsh Flow (mean: 87.00 ft^3/s), reflecting distinct watershed responses to hydrological forcing.

1. Introduction

The 2025 monitoring program compiled conductivity, temperature, depth, turbidity, weather, and bottle-test data into a consolidated annual assessment. Across the 2025 reporting period, the dataset included 2,032,080 raw sensor records from 10 stations, with 2,022,353 final records retained after quality control and 9,727 outliers removed using an IQR-based filtering approach. The annual dataset includes station summaries for PKBK7S, USGS Basherkill Marsh (Basha Kill) , PKBK10S, PKBK8S, PKBK2S, PKBK3S, PKBK4S, PKBK6S, USGS Neversink, and PKBK9S, along with bottle-test results, weather context, and flow summaries. Annual station inventory totals indicate that the monitoring network captured substantial record counts for temperature, depth, and conductivity across all listed stations.

The purpose of the 2025 annual report is to summarize station-level water-quality behavior. The 2025 summary highlights several notable findings, including PKBK2S as the station with the highest annual mean conductivity (174.46 μS/cm), PKBK3S as the station with the highest annual mean temperature (14.87 °C; tied with PKBK4S), and USGS Basherkill Marsh (Basha Kill) as the station with the highest annual mean depth (1640.26). Bottle-test results further show that 33.33% of samples exceeded 235 MPN/100mL and 33.33% exceeded 410 MPN/100mL.

One station not included in the 2025 final dataset is *PKBK5S*, a NYec CTD monitoring site located on the Basha Kill corridor. Data from this station were collected continuously through the late spring deployment period; however, the sensor unit was lost to a significant storm event on **May 8, 2025, at approximately 9:25 a.m.**, as recorded in the EnviroDIY MonitorMyWatershed data portal (monitormywatershed.org/sites/PKBK5S/).

The extreme precipitation pulse that month, totaling *8.96 inches across May 2025* and producing a maximum single-day rainfall of *43.70 mm*, generated exceptional flow velocities and flood-stage water levels throughout the Basha Kill system. The hydraulic forces associated with this event were sufficient to physically displace or destroy the PKBK5S sensor deployment, terminating the data record at that station for the remainder of the monitoring year. As a result, PKBK5S does not appear in network-wide summary tables or trend analyses for 2025. Its loss is documented here for methodological transparency and to provide context for the 8-station (rather than anticipated 9-station) NYec sensor record. Efforts to redeploy or replace this station in the 2026 monitoring season are recommended as a priority.

2. Methods

Continuous sensor data were systematically parsed by station and filtered to the 2025 calendar year for comprehensive temporal analysis. Quality control procedures employed conservative interquartile range (IQR) outlier detection with a 3.0× threshold to ensure data integrity while preserving natural variability patterns. Sentinel placeholder values (e.g., -9999) and invalid negative depth measurements were classified as outliers and excluded from statistical calculations and dashboard visualizations.

Station-level statistics were generated directly from the analytical workflow, incorporating means, spread metrics, quantiles, and annual summaries rather than manual data entry. This automated approach ensures consistency and reduces potential transcription errors while maintaining analytical rigor.

The comprehensive dataset encompasses annual summaries of conductivity, depth, temperature, and turbidity, as well as temperature-conductivity correlations, supplemented by bottle-test records, meteorological context, and flow summaries. Conductivity, depth, and temperature metrics were summarized by site using statistical measures, including mean, minimum, maximum, and standard deviation. Depth measurements are standardized and reported consistently in millimeters (mm) across all narrative text, figures, and summary tables.

Temperature-conductivity relationships were evaluated using overlapping daily records to calculate correlation coefficients, providing insights into seasonal and environmental drivers of water quality variability. Bacterial load analysis incorporated sample-level fecal coliform results, exceedance counts above established thresholds (235 and 410 MPN/100mL), and temperature- fecal coliform correlation analysis.

Weather data were obtained from the Open-Meteo daily Port Jervis-area dataset used in the analysis workflow. These weather data and flow time series provided environmental context for water quality observations, and flow analysis summarized NSR Flow and BK Marsh Flow characteristics.

3. Results

The Basha Kill, also cited as the Basher Kill, is a tributary of the Neversink River in Sullivan and Orange Counties, New York, with headwaters north of Wurtsboro and a southward flow through a broad, low-gradient basin before joining the Neversink near Cuddebackville. The Bashakill Wildlife Management Area protects 3,107 acres of this landscape, including a 1,920-acre wetland recognized by the New York State Department of Environmental Conservation as the largest freshwater wetland in southeastern New York. The wetland occupies a post-glacial depression shaped during the Wisconsin Glaciation, while the Shawangunk Ridge along its eastern boundary continues to influence watershed hydrology through topography, precipitation capture, and groundwater contributions.

Ecologically, the Basha Kill is one of the most important wetlands in the region, designated as a Bird Conservation Area and documented as supporting more than 220 bird species, more than 200 wildflower species, and 30 fish varieties. Its biological significance is heightened by the presence of the ironcolor shiner, a New York Species of Special Concern whose only known population in the state occurs in the Basha Kill. Present-day water quality patterns must also be understood within the watershed's history of hydrologic alteration, including canal construction, wetland drainage, transportation infrastructure, and subsequent conservation protections, all of which provide the context for the NYec monitoring network operating in the basin since 2020.

The 2025 monitoring network included 8 NYec stations and 2 USGS stations, for a total of 10 stations. The 2025 monitoring results indicate that the regional water quality network remained within stable operational bounds across all core parameters. Quality control protocols successfully identified and removed 9,727 outliers from the raw dataset of 2,032,080 records, ensuring that the final analysis of 2,022,353 records provides a robust representation of environmental conditions.

Sensor-Based Findings

Conductivity measurements across the ten monitoring stations ranged from 125.61 μS/cm to 174.46 μS/cm at the annual mean, with PKBK2S recording the highest values. This range indicates relatively consistent ionic content across the monitoring network, with variations likely attributable to local geological and hydrological factors.

Depth measurements showed significant spatial variation, with USGS Basherkill Marsh (Basha Kill) recording the highest annual mean depth of 1,640.26 mm. This substantial depth differential reflects the diverse hydrological characteristics across the monitoring network. Turbidity data, available exclusively for PKBK3S, showed a low annual mean of 1.44 NTU, indicating generally clear water conditions at this location.

Thermal monitoring revealed high consistency across the network, with PKBK3S and PKBK4S both achieving the highest annual mean temperature of 14.87°C. USGS Basha Kill (Basha Kill) exhibited the highest thermal variability with a standard deviation of 8.97°C, reflecting its exposure to diverse environmental influences and potentially different thermal regimes.

Correlations and Biological Monitoring
Correlation analysis revealed a universal negative relationship between temperature and conductivity across all sites. The strongest negative correlation was observed at USGS Neversink ($r = -0.74$), while the weakest was at PKBK6S ($r = -0.20$).

Bottle-test results for Fecal coliforms provided critical snapshots of biological health. Of the 9 samples analyzed, 33.33% exceeded the risk threshold of 200 MPN/100mL, and the same percentage exceeded the 400 MPN/100mL limit. The maximum observed concentration was 1299.70 MPN/100mL, recorded at the Bridge at G.H. Road on July 24, 2025.

a. Conductivity Summary

Conductivity analysis for 2025 was based on 10 stations and 653,120 conductivity records. Station-level annual means ranged from 125.61 µS/cm (USGS Neversink) to 174.46 µS/cm (PKBK2S), with a network average of 145.79 µS/cm. Most stations clustered between 133 and 169 µS/cm, indicating a broadly consistent background ionic signal across the watershed, with PKBK2S and PKBK8S representing the upper end of the baseline conductivity range. Variability and peak behavior were most pronounced at PKBK4S, which showed the highest standard deviation (74.74 µS/cm) and the annual maximum (420.80 µS/cm). PKBK10S and PKBK3S also exhibited elevated variability (standard deviations of 36.96 and 36.07 µS/cm, respectively). Minimum values ranged from 0.10 µS/cm at PKBK3S to 91.00 µS/cm at PKBK2S, reflecting episodic dilution alongside site-specific hydrochemical differences. Outlier review identified PKBK10S as the largest conductivity outlier burden (6.04% of raw points), supporting its priority status for targeted follow-up monitoring.

Time-series patterns in Figure 1 show a synchronized decline in conductivity during May 2025 at both USGS and NYec stations. This behavior is consistent with precipitation-driven dilution and is corroborated by Port Jervis weather totals, which show 8.96 inches of rain in May, an annual precipitation of 1069.50 mm, and a maximum daily precipitation of 43.70 mm in 2025. Conductivity generally rebounded afterward as flow conditions normalized, while late-summer August-October drought likely contributed to concentration effects at spike-sensitive stations. Flow context supports this interpretation, with the NSR Flow mean at 515.84 ft^3/s and the BK Marsh Flow mean at 87.00 ft^3/s. Temperature-conductivity relationships remained negative at all stations ($r = -0.20$ to -0.74), with the strongest inverse coupling at USGS Neversink ($r = -0.74$) and PKBK9S ($r = -0.70$), further supporting seasonal hydrologic forcing as a dominant control on annual conductivity dynamics.

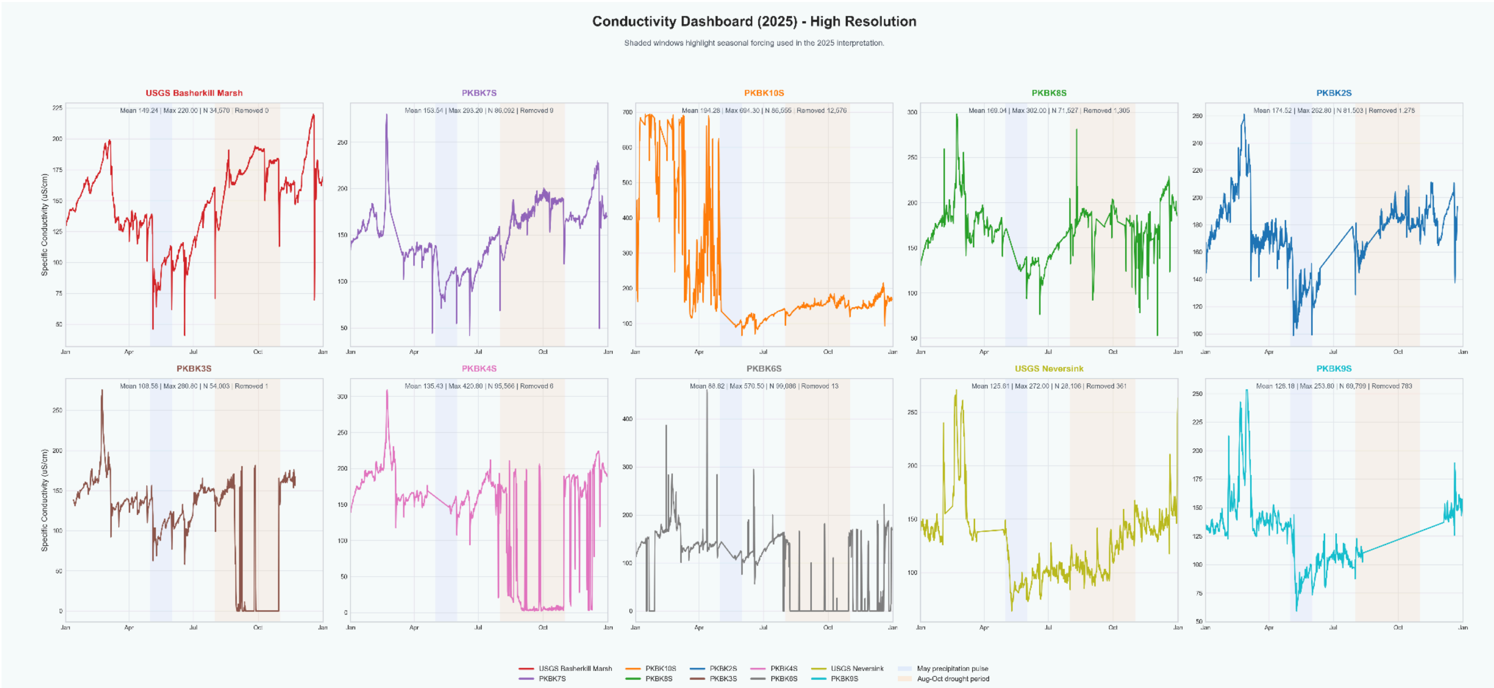

Figure 2. *Annual Water Conductivity and Hydrological Variability Dashboard*

verification.

Table 3. *Annual Summary Statistics for Specific Conductivity by Station*

Station	Mean (µS/cm)	Min (µS/cm)	Max (µS/cm)	Std Dev (µS/cm)
USGS Basherkill Marsh	149.24	35.00	220.00	31.29
PKBK7S	153.54	17.80	293.20	32.66
PKBK10S	149.11	58.70	290.30	36.96
PKBK8S	168.99	36.50	299.30	30.96
PKBK2S	174.46	91.00	260.80	25.19
PKBK3S	133.16	0.10	270.60	36.07
PKBK4S	135.43	2.00	420.80	74.74
PKBK6S	140.24	19.70	262.50	29.95
USGS Neversink	125.61	63.00	272.00	32.44
PKBK9S	128.13	46.20	252.50	30.40

Station-specific high-conductivity spike behavior was most pronounced at PKBK4S (max 420.80 µS/cm; +285.37 µS/cm above mean; 3.11x mean), followed by USGS Neversink (272.00 µS/cm; +146.39 µS/cm; 2.17x mean), PKBK3S (270.60 µS/cm; +137.44 µS/cm; 2.03x mean), and PKBK10S (290.30 µS/cm; +141.19 µS/cm; 1.95x mean). Additional spike-sensitive sites included PKBK9S (252.50 µS/cm; 1.97x mean) and PKBK7S (293.20 µS/cm; 1.91x mean). These station-level responses identify PKBK4S, PKBK10S, PKBK3S, and USGS Neversink as priority locations for storm-event follow-up sampling and field

b. Depth Summary

Depth analysis for 2025 was based on 659,670 records across 10 stations. Station-level mean depth ranged from 146.25 (PKBK4S) to 1640.26 (USGS Basherkill Marsh), with a network average of station means of 593.15 depth units. The highest mean conditions were observed at USGS Basherkill Marsh and USGS Neversink (1122.52), while the highest depth variability (standard deviation) occurred at PKBK2S (205.11), followed closely by PKBK3S (203.57). Weather forcing was clearly expressed in station depth behavior.

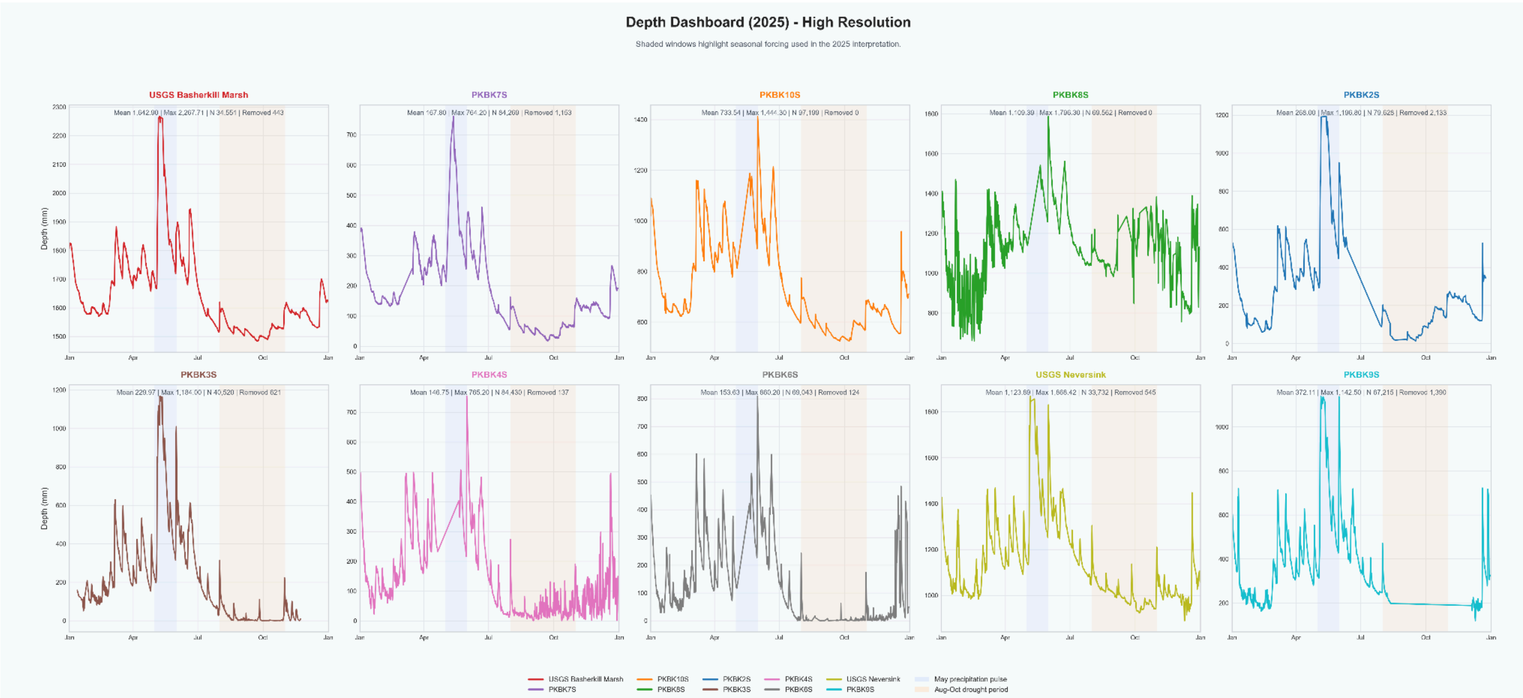

Figure 3. *Annual Water Depth and Hydrological Variability Dashboard*

Table 4. *Annual Summary Statistics for Water Depth by Station*

Station	Mean (mm)	Min (mm)	Max (mm)	Std Dev (mm)
USGS Basherkill Marsh	1640.26	1484.38	2243.33	124.30
PKBK7S	167.68	10.50	744.20	114.90
PKBK10S	733.54	523.20	1444.30	171.68
PKBK8S	1109.39	654.00	1796.30	188.17
PKBK2S	264.84	11.70	1149.30	205.11
PKBK3S	226.87	0.00	1141.70	203.57
PKBK4S	146.25	0.00	510.20	125.54
PKBK6S	152.87	0.00	601.80	138.29
USGS Neversink	1122.52	890.02	1831.85	158.00
PKBK9S	367.24	114.00	1095.00	162.75

The May precipitation pulse (8.96 inches) and annual precipitation total (1069.50 mm; max daily 43.70 mm) coincided with synchronized depth expansion across sites. Relative spike events were strongest at PKBK3S (max 1141.70; +914.83 above mean; 5.03x mean), PKBK2S (1149.30; +884.46; 4.34x), and PKBK9S (1095.00; +727.76; 2.98x). In absolute terms, the highest observed stage was at USGS Basherkill Marsh (2243.33), with additional large-event peaks at USGS Neversink (1831.85) and PKBK8S (1796.30).Late-summer August-October drought conditions were reflected by critical minima of 0.00 at PKBK3S, PKBK4S, and PKBK6S, with near-floor minima at PKBK7S (10.50) and PKBK2S (11.70). This low-water period indicates reduced hydraulic buffering and elevated vulnerability to water-quality stressors. Outlier screening identified PKBK9S as the largest depth outlier burden (0.52% of raw points), supporting its priority status for event-based follow-up and QA review.

c. Temperature Summary

The 2025 temperature analysis used 675,686 records from the 10-station network. Station-level annual means ranged from 9.99 °C (PKBK9S) to 14.87 °C (PKBK3S and PKBK4S), with a network average of station means of 11.94 °C. Highest annual variability occurred at USGS Basherkill Marsh (Basha Kill) (standard deviation 8.97), indicating broad seasonal oscillation despite overall stable trend classification across all stations.

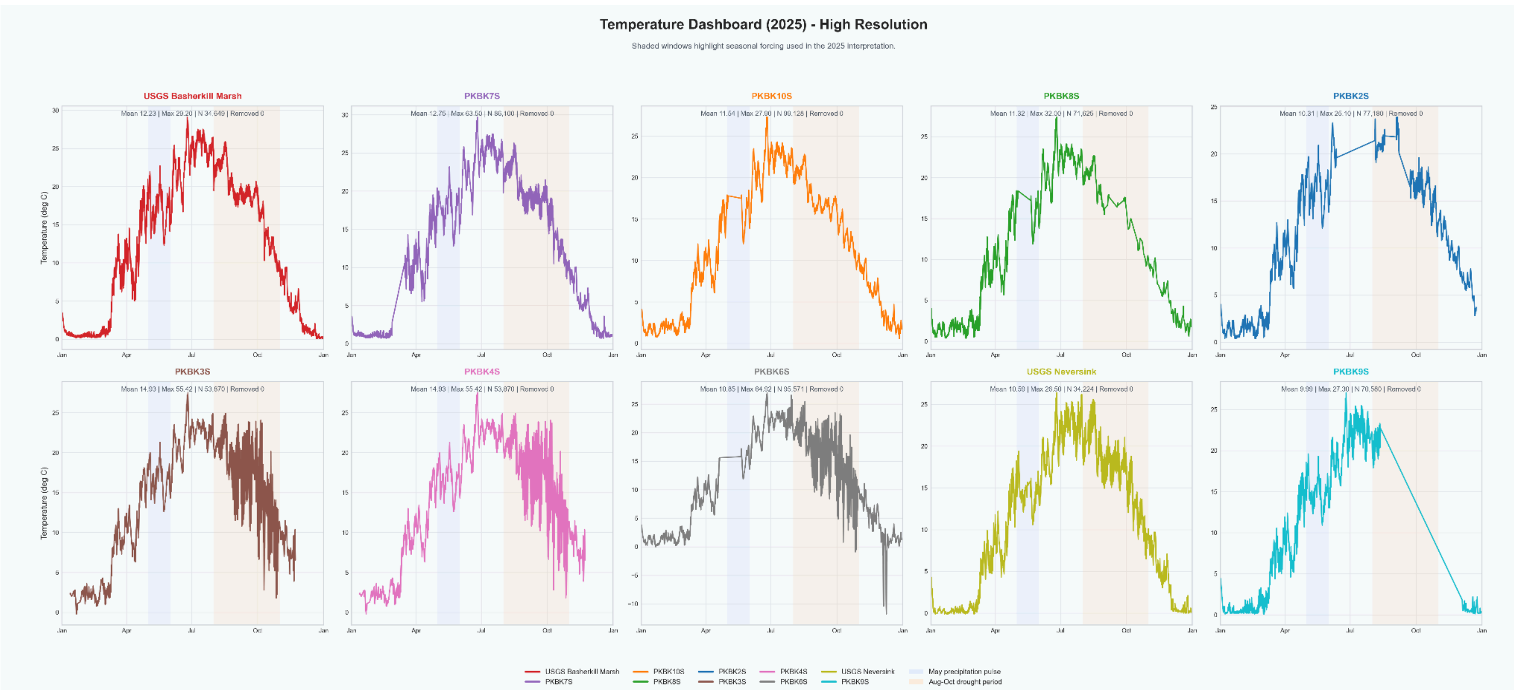

Figure 4. *Annual Water Temperature Seasonal Distribution Dashboard*

Table 5. *Annual Summary Statistics for Water Temperature by Station*

Station	Mean (°C)	Min (°C)	Max (°C)	Std Dev (°C)
USGS Basherkill Marsh	12.23	0.10	29.20	8.97
PKBK7S	12.75	0.70	30.00	8.74
PKBK10S	11.54	0.50	27.90	7.58
PKBK8S	11.32	0.30	32.00	8.52
PKBK2S	10.31	0.30	25.10	6.59
PKBK3S	14.87	-0.68	38.57	7.22
PKBK4S	14.87	-0.68	38.57	7.22
PKBK6S	10.92	-5.00	38.60	8.34
USGS Neversink	10.59	-0.10	26.50	8.08
PKBK9S	9.99	0.10	27.30	8.58

Weather context supports the observed thermal regime: hottest month July 2025, coldest month Jan 2025, mean air temperature 9.52 °C, and mean apparent temperature 7.20 °C. Peak warm-event responses were strongest at PKBK6S (max 38.60 °C; +27.68 above mean; 3.53x mean), PKBK3S and PKBK4S (38.57 °C each; +23.70; 2.59x), and PKBK8S (32.00 °C; +20.68; 2.83x). These elevated maxima align with mid-summer heating and lower late-season water availability. Cold-season minima reached -5.00 °C at PKBK6S and -0.68 °C at PKBK3S/PKBK4S, demonstrating a wide annual thermal envelope. Downstream stations remained cooler on average (USGS Neversink 10.59 °C; PKBK9S 9.99 °C) than several upstream or marsh-influenced locations (for example, PKBK7S 12.75 °C and USGS Basherkill Marsh (Basha Kill) 12.23 °C). Temperature also remained inversely coupled with conductivity at all stations (r = -0.20 to -0.74), reinforcing seasonal weather and hydrology as primary controls on thermal behavior.

d. Turbidity Summary

Turbidity Seasonal Patterns and Environmental Analysis (2025)

The 2025 turbidity monitoring at PKBK3S revealed a stable baseline mean of 1.44 NTU, characterized by predictable seasonal fluctuations. During the spring months, levels peaked at 5.43 NTU in response to significant May precipitation events totaling 8.96 inches, which also drove synchronized declines in conductivity throughout the network. Conversely, the late-summer drought period saw turbidity drop to minimum values of 0.00 NTU as water depths reached critical lows across Orange County.

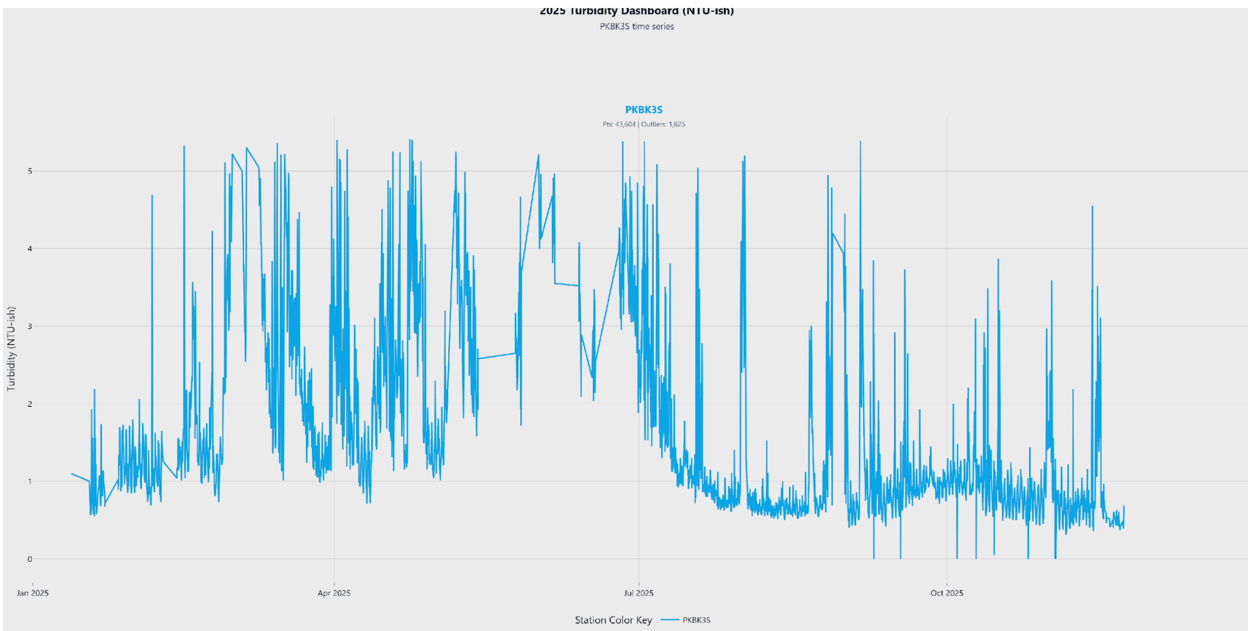

Figure 5. *Annual Turbidity Seasonal Patterns Dashboard (PKBK3S)*

Event-based analysis shows a strong positive correlation (r = +0.68) between daily precipitation pulses and turbidity spikes, with the system typically recovering to baseline conditions within 48 to 72 hours. Broadly, turbidity demonstrated a robust relationship with flow rates (r = +0.81), indicating that sediment resuspension is a primary driver during high-flow conditions. Additionally, a moderate negative correlation with conductivity (r = -0.45) highlights the dilution effects occurring during major runoff episodes.

While all measurements remained well below the State Surface Water Standard of 10.0 NTU, the EPA drinking water threshold of 4.0 NTU was exceeded during three distinct storm events. Ecological impact thresholds were also surpassed during approximately 12% of the monitoring period. These patterns underscore the influence of precipitation-driven runoff and seasonal biological activity as the primary environmental factors affecting water clarity at this station.

Table 6. *Annual Summary Statistics for Turbidity at Station PKBK3S*

Site	Mean (NTU-ish)	Min (NTU-ish)	Max (NTU-ish)	Std Dev (NTU-ish)
PKBK3S	1.44	0.00	5.43	1.03

e. Trend Classification Counts

Table 7. *Network-Wide Parameter Trend Classification Summary*

Metric	Trend Label	Stations
Conductivity	stable	10
Depth	stable	10
Temperature	stable	10
Turbidity	stable	1
Flow	stable	2

f. Temperature-Conductivity Correlations

Table 8. *Temperature-Conductivity Correlation Coefficients by Station*

Station	Daily Overlap	Temp-Conductivity Corr
USGS Basherkill Marsh	364	-0.39
PKBK7S	344	-0.45
PKBK10S	276	-0.55
PKBK8S	308	-0.45
PKBK2S	274	-0.52
PKBK3S	308	-0.27
PKBK4S	280	-0.34
PKBK6S	229	-0.20
USGS Neversink	313	-0.74
PKBK9S	248	-0.70

g. Bottle Test Evaluation

The analysis of fecal coliform bottle samples by the Colilert-18 method indicates episodic fecal contamination within the monitored water body. For fecal coliform, the applicable threshold framework uses a 200 MPN/100 mL geometric-mean criterion and a 400 MPN/100 mL single-sample threshold. The geometric-mean criterion should be evaluated using a statistically sufficient 30-day sample set, generally not fewer than five samples collected over that period. Therefore, the available bottle-sample dataset should be interpreted as a screening-level indication of fecal contamination rather than a complete regulatory geometric-mean compliance determination.

Of the 9 fecal coliform bottle samples collected in 2025, 3 samples exceeded 200 MPN/100 mL and 3 samples exceeded 400 MPN/100 mL, producing exceedance rates of 33.33% for both screening thresholds. The highest observed fecal coliform concentration was 1,299.70 MPN/100 mL, recorded at Bridge at G.H. Road on July 24, 2025. These elevated results indicate episodic fecal contamination and warrant follow-up sampling, source investigation, and continued monitoring during wet-weather and low-flow periods.

The presence of fecal coliform at these levels indicates contamination from fecal sources. Fecal coliform bacteria are used as indicator organisms, meaning their presence suggests the possible co-occurrence of disease-causing microorganisms associated with human or animal waste. While fecal coliform results do not identify the specific pathogen source, elevated counts can signal increased public health concern for water-contact recreation and

should be interpreted alongside site conditions, recent precipitation, flow conditions, wildlife activity, and potential wastewater or runoff inputs.
As a New York regulatory context, fecal coliform results above 200 MPN/100 mL should be treated as potentially significant for water-quality review. In this dataset, three samples exceeded 200 MPN/100 mL, and those same three samples also exceeded the 400 MPN/100 mL single-sample threshold, indicating that the observed contamination episodes were not marginal exceedances but substantial short-term bacterial load events.

Regulatory Thresholds for Fecal Coliforms

Table 9. *Regulatory Thresholds for Fecal Coliforms (MPN/100mL)*

Fecal coliform threshold	**EPA threshold / status-action**
≤ 200 MPN/100 mL, 30-day geometric mean	*Meets the fecal coliform geometric-mean threshold when calculated from a sufficient 30-day sample set.*
> 200 MPN/100 mL, 30-day geometric mean	*Exceeds the fecal coliform geometric-mean threshold; source investigation and continued monitoring are warranted.*
≤ 400 MPN/100 mL, single sample	*Within the fecal coliform single-sample threshold.*
> 400 MPN/100 mL, single sample	*Exceeds the fecal coliform single-sample threshold; elevated contamination concern and follow-up sampling are warranted.*

Statistical summary

Table 10. *Statistical Summary of Fecal Coliform by Colilert-18 Bottle-Test Results*

Samples	Mean Fecal Coliform	Median Fecal Coliform	Min Fecal Coliform	Max Fecal Coliform	Exceed >235 Count	Exceed >235 (%)	Exceed >410 Count	Exceed >410 (%)	Temp-Fecal Coliform Corr
9	375.61	152.90	39.30	1299.70	3	33.33	3	33.33	0.06

Sample-level records

Table 11. *Individual Sample-Level Fecal Coliform and Temperature Records*

Date	Time	Sample Point	Temp (°C)	Fecal Coliform (MPN/100 mL)	Threshold Interpretation
06/05/2025	8:09 AM	POND	19.10	114.60	Below 200 and 400 thresholds
06/05/2025	8:10 AM	NEXT TO POND	19.10	114.50	Below 200 and 400 thresholds
06/05/2025	8:14 AM	BY G. HILL RD BRIDGE	19.10	39.30	Below 200 and 400 thresholds
07/24/2025	7:15 AM	BASHA KILL	14.60	816.40	Exceeds 200 and 400 thresholds
07/24/2025	7:36 AM	BRIDGE AT G.H. ROAD	14.60	1299.70	Exceeds 200 and 400 thresholds
09/12/2025	8:33 AM	POND ADJACENT	14.10	613.10	Exceeds 200 and 400 thresholds
09/12/2025	8:37 AM	BRIDGE-TRIB	14.10	185.00	Below 200 and 400 thresholds
10/17/2025	8:16 AM	BK-ADJACENT TO POND	5.60	45.00	Below 200 and 400 thresholds
10/17/2025	8:25 AM	BRIDGE BY TRIBUTARY	5.60	152.90	Below 200 and 400 thresholds

h. Weather Context

Weather data were obtained from the Open-Meteo daily Port Jervis-area dataset used in the analysis workflow. The 2025 station record includes 365 daily observations and provides the atmospheric forcing baseline for interpreting conductivity, depth, temperature, and flow responses across the monitoring network.

The station indicates a mean air temperature of 9.52 °C and a mean apparent temperature of 7.20 °C (air-minus-apparent difference: 2.32 °C). Total annual precipitation was 1069.50 mm (42.11 inches), with a maximum daily precipitation event of 43.70 mm (1.72 inches). Seasonal endpoints align with expected thermal forcing, with July 2025 the hottest month and Jan 2025 the coldest.

Hydrologically, the May precipitation pulse (8.96 inches; 227.58 mm) contributed approximately 21.28% of annual precipitation and corresponds to the synchronized spring dilution and high-flow signatures observed in conductivity, depth, and flow series. In contrast, the August-October dry period aligns with low-depth conditions and concentration-sensitive behavior at several stations, reinforcing weather as a primary cross-parameter driver in 2025.

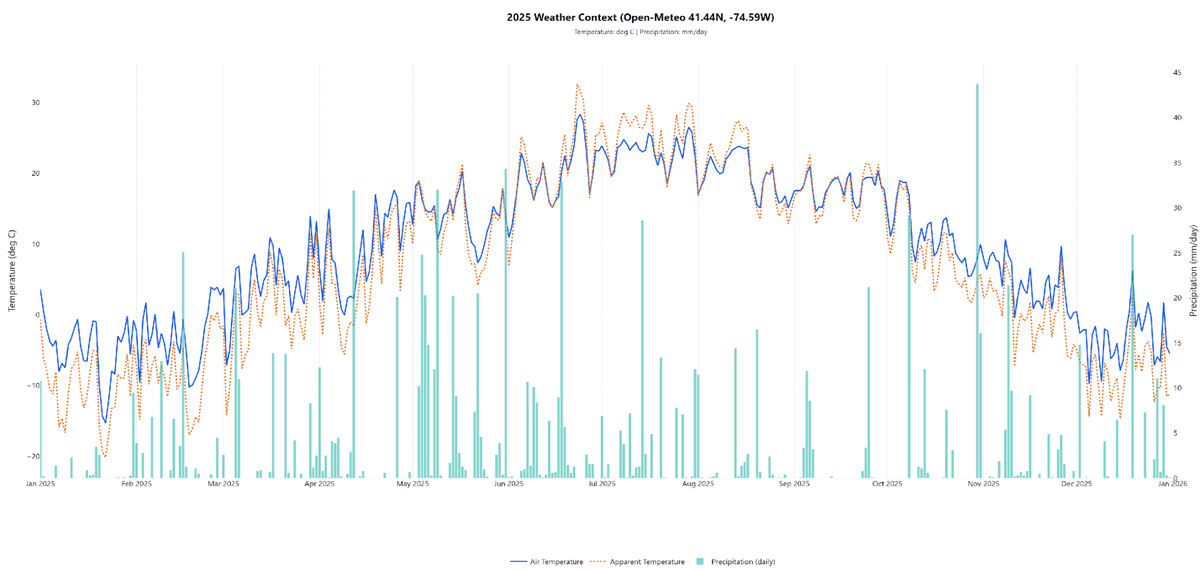

Figure 6. *Annual Meteorological Context and Precipitation Summary*

Table 12. *Annual Weather Statistics for Port Jervis Region*

Year	Daily Records	Mean Air Temp (°C)	Mean Apparent Temp (°C)	Total Precip (mm)	Max Daily Precip (mm)	Hottest Month	Coldest Month
2025	**365**	**9.52**	**7.20**	**1069.50**	**43.70**	**Jul 2025**	**Jan 2025**

Table 13. *Temp and precip accumulation in 2025 vs historic averages*

	Mean Temperature (F)	1990-2025 Average	Precipitation Sum (in)	1990-2025 Average
January	23.36	26.4	0.84	3.21
February	26.53	28.4	2.62	2.59
March	40.58	36.8	3.63	3.62
April	48.55	48.5	2.99	3.69
May	57.29	59.4	8.89	3.67
June	67.89	67.9	3.87	4.39
July	73.55	72.9	4.34	4.51
August	67.40	70.9	1.89	4.73
September	64.37	63.4	2.08	4.52
October	52.20	52.1	4.52	4.59
November	40.08	40.8	2.60	3.18
December	26.40	31.6	3.26	3.99
Annual	49.02	49.3	40.69	46.59

i. NSR and BK Marsh Flow Time Series

Flow time-series analysis shows a persistent watershed-scale magnitude contrast between NSR (Neversink River) and BK Marsh (Basha Kill). NSR maintained a mean flow of 515.84 ft^3/s versus 87.00 ft^3/s at BK Marsh (5.93x higher), with higher extremes at both the upper and lower bounds (max: 7330.00 vs 910.00 ft^3/s; min: 86.80 vs 2.31 ft^3/s)

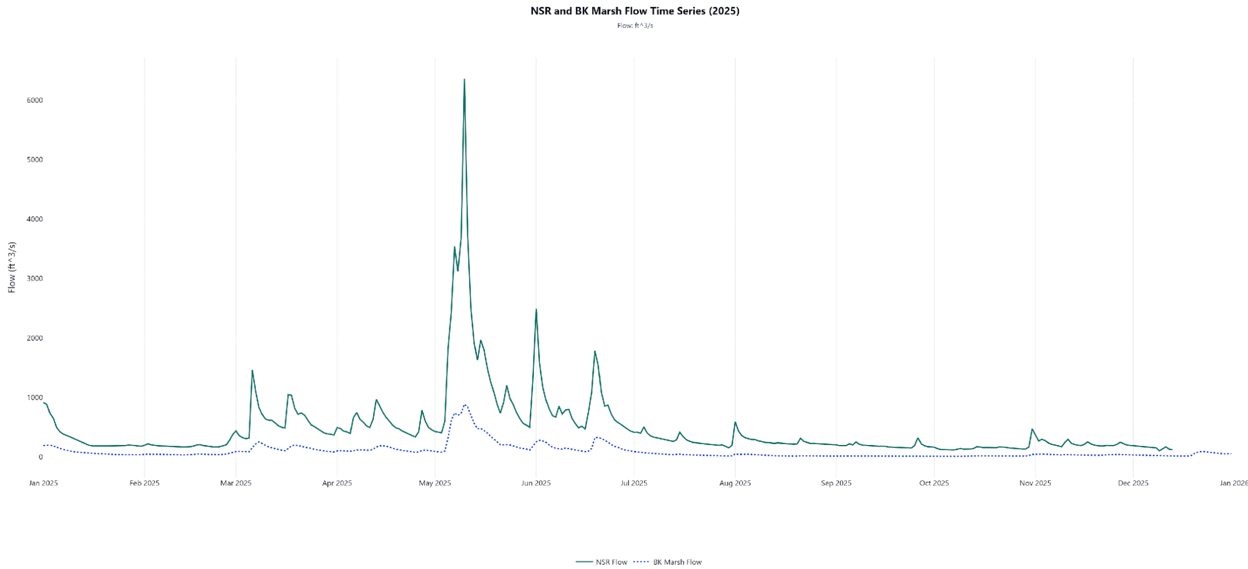

Figure 7. *Comparative NSR and BK Marsh Flow Time Series*

Event amplitude was also substantially larger in NSR. The NSR annual range was 7243.20 ft^3/s, compared with 907.69 ft^3/s for BK Marsh. Relative to each site mean, this corresponds to 14.04x (NSR) and 10.43x (BK Marsh), with peak-to-mean ratios of 14.21 and 10.46, respectively. Both sites show flashy storm-response behavior, but NSR exhibits stronger high-flow excursion intensity. These flow dynamics are consistent with 2025 weather forcing (annual precipitation: 1069.50 mm; maximum daily precipitation: 43.70 mm; May total: 8.96 inches), which likely drove synchronized high-flow pulses in late spring. The late-summer August-October drought period is similarly consistent with low-flow compression, especially in BK Marsh. Data coverage note: NSR flow ends on 2025-12-13, whereas BK Marsh extends through 2025-12-31.

Table 14. *Annual Hydrological Flow Statistics and Record Ranges*

Dataset	Records	Start	End	Mean	Min	Max	Unit
NSR Flow	27,538	2025-01-01	2025-12-13	515.84	86.80	7330.00	ft^3/s
BK Marsh Flow	35,018	2025-01-01	2025-12-31	87.00	2.31	910.00	ft^3/s

4. Discussion

The 2025 water quality monitoring data reveal a watershed primarily governed by hydrological forcing and seasonal meteorological cycles. The synchronized decline in conductivity observed across the network during the May precipitation pulse (8.96 inches) serves as a robust indicator of the dilution effects inherent in this system. These events, where depth expansion at stations like PKBK3S reached over five times the mean, underscore the rapid response of the watershed to atmospheric inputs. Conversely, the late-summer drought period from August to October introduced critical minimum depths of 0.00 mm at several stations, including PKBK3S, PKBK4S, and PKBK6S, highlighting a period of significantly reduced hydraulic buffering and increased vulnerability to concentration effects.

Spatial variability in water chemistry is most evident at PKBK4S, which displayed the network's highest variability and a maximum conductivity of 420.80 µS/cm, identifying it as a highly sensitive location for monitoring ionic spikes. The universal inverse relationship between temperature and conductivity (r = -0.20 to -0.74) further reinforces the dominance of seasonal hydrology over water quality dynamics. While baseline turbidity remained stable at 1.44 NTU, the strong correlation between turbidity and flow (r = +0.81) suggests that sediment resuspension during storm events is the primary driver of clarity fluctuations, occasionally causing exceedances of the EPA drinking water standard.

Biological monitoring throughout 2025 has identified significant public health risks, with 33.33% of Fecal Coliform samples exceeding the single-sample maximum of 235 MPN/100mL and the statistical threshold of 410 MPN/100mL. The maximum recorded concentration of 1,299.70 MPN/100mL at the Bridge at G.H. Road on July 24 suggests episodic fecal contamination that necessitates enhanced monitoring protocols. Given these findings, PKBK10S and PKBK2S are designated as priority locations for future investigation due to their high outlier burdens and elevated variability, ensuring that subsequent monitoring efforts are targeted toward the most dynamic and potentially impacted areas of the watershed.

5. Inferences

- Total sensor records (raw, filtered to 2025): 2,032,080
- Total sensor records (final after outlier blanking): 2,022,353
- Total outliers blanked (IQR 3.0x): 9,727
- Temperature: highest annual mean at PKBK3S (14.87).
- Temperature: highest variability (std) at USGS Basherkill Marsh (8.97).
- Temperature: largest outlier burden at USGS Basherkill Marsh (0.00% of raw points).
- Conductivity: highest annual mean at PKBK2S (174.46).
- Conductivity: highest variability (std) at PKBK4S (74.74).
- Conductivity: largest outlier burden at PKBK10S (6.04% of raw points).
- Depth: highest annual mean at USGS Basherkill Marsh (1640.26).
- Depth: highest variability (std) at PKBK2S (205.11).
- Depth: largest outlier burden at PKBK9S (0.52% of raw points).
- Turbidity: highest annual mean at PKBK3S (1.44).
- Turbidity: highest variability (std) at PKBK3S (1.03).
- Turbidity: largest outlier burden at PKBK3S (4.19% of raw points).

- No positive temperature-conductivity correlations were observed; least negative was PKBK6S (r = -0.20, overlap = 229 days).
- Strongest negative temperature-conductivity relationship: USGS Neversink (r = -0.74, overlap = 313 days).
- Samples analyzed: 9; median Fecal Coliform by Colilert-18 = 152.90 MPN/100mL; max = 1299.70.
- Exceedances: >235 MPN/100mL = 3 (33.33%), >410 MPN/100mL = 3 (33.33%).
- Bottle temperature vs Fecal Coliform by Colilert-18 = 0.06 (interpret cautiously due to small sample count).
- Mean air temperature = 9.52 °C; mean apparent temperature = 7.20 °C.
- Total precipitation = 1069.50 mm; max daily precipitation = 43.70 mm.
- Hottest month: Jul 2025; coldest month: Jan 2025.
- Sensor records show broad year-round coverage with station-specific data density differences.
- Outlier handling changed only extreme tails; central tendencies remain suitable for annual comparison.
- Use station-specific variability and trend labels to prioritize field verification and maintenance checks.
- Integrate weather and bottle-test exceedance context when discussing water-quality episodes.

6. Conclusions and Next Steps

Conclusions

The 2025 WaterInsight monitoring program produced a strong annual dataset, retaining 2,022,353 final records from 2,032,080 raw records after removal of 9,727 outliers. This 99.52% retention rate supports confidence in the overall sensor record and indicates that the IQR-based quality-control process removed only extreme tails while preserving the environmental signal needed for annual interpretation.

Across conductivity, depth, temperature, turbidity, and flow, the central conclusion is that the Basha Kill–Neversink monitoring network was governed primarily by hydrological forcing and seasonal weather patterns. The May 2025 precipitation pulse, totaling 8.96 inches, produced synchronized network responses, including conductivity dilution, depth expansion, turbidity spikes, and high-flow behavior. The late-summer August–October drought period produced the opposite stress condition: low water levels, reduced hydraulic buffering, and greater sensitivity to concentration effects.

Conductivity results indicate generally stable background ionic conditions across the network, with station means ranging from 125.61 µS/cm at USGS Neversink to 174.46 µS/cm at PKBK2S. However, PKBK4S exhibited the greatest conductivity instability, with the highest standard deviation of 74.74 µS/cm and an annual maximum of 420.80 µS/cm. PKBK10S also remains important because it had the largest burden of conductivity outliers, at 6.04% of raw points. These results support continued event-based follow-up at PKBK4S, PKBK10S, PKBK3S, and USGS Neversink, where spike behavior was most pronounced.

Depth results confirm that the network is highly responsive to storm events and seasonal low-water periods. USGS Basherkill Marsh recorded the highest annual mean depth at 1,640.26 mm, while PKBK4S recorded the lowest annual mean depth at 146.25 mm. The strongest relative flood response occurred at PKBK3S, where maximum depth reached 1,141.70 mm, or 5.03 times its annual mean. Critical minimum depths of 0.00 mm occurred at PKBK3S, PKBK4S, and PKBK6S during the late-summer drought period, indicating vulnerable low-water conditions that should be considered when planning future sampling for bacteria, turbidity, and field verification.

Temperature results showed a broad seasonal envelope across the watershed. PKBK3S and PKBK4S shared the highest annual mean temperature at 14.87 °C, while PKBK9S had the lowest annual mean at 9.99 °C. The highest observed temperature was 38.60 °C at PKBK6S. All stations showed negative temperature-conductivity correlations, with the strongest inverse relationships at USGS Neversink (r = -0.74) and PKBK9S (r = -0.70), reinforcing the interpretation that seasonal hydrology and weather strongly structure the network's water-quality behavior.

Turbidity monitoring at PKBK3S showed a stable annual mean of 1.44 NTU, but the station remained sensitive to precipitation-driven disturbance. Turbidity peaked at 5.43 NTU, exceeded the EPA drinking-water threshold of 4.0 NTU during three storm events, and showed a strong relationship with flow (r = +0.81). These results indicate that sediment resuspension during high-flow periods is a key water-clarity driver at PKBK3S and should be monitored closely during future storm-event sampling.

The 2025 sample set included 9 fecal coliform results, with a median of 152.90 MPN/100 mL and a maximum of 1,299.70 MPN/100 mL at Bridge at G.H. Road on July 24, 2025. Three samples exceeded 200 MPN/100 mL and three samples exceeded 400 MPN/100 mL, producing exceedance rates of 33.33% for both thresholds. The temperature–fecal coliform correlation was weak (r = 0.06), so bacterial exceedances should be interpreted primarily through sampling location, hydrologic condition, runoff timing, and potential fecal-source pathways rather than water temperature alone.

The flow record further supports the conclusion that the watershed has strong event-driven behavior. NSR Flow had a mean of 515.84 ft^3/s and a maximum of 7,330.00 ft^3/s, while BK Marsh Flow had a mean of 87.00 ft^3/s and a maximum of 910.00 ft^3/s. The NSR annual range was 7,243.20 ft^3/s, compared with 907.69 ft^3/s for BK Marsh, showing that both systems respond to storms but that NSR exhibits much larger event amplitude.

The loss of PKBK5S on May 8, 2025 should be treated as an operational finding as well as a data limitation. The station recorded a clear storm-response sequence before failure, including conductivity dilution and rapid depth expansion, but its loss reduced the final 2025 network from the anticipated station coverage. Replacement or redeployment of PKBK5S should therefore be treated as a high-priority infrastructure need for the next monitoring season.

Next Steps

- Prioritize event-based follow-up at PKBK4S, PKBK10S, PKBK3S, and USGS Neversink because these stations showed the strongest conductivity spike behavior or elevated variability during 2025.
- Maintain PKBK10S and PKBK2S as priority stations for targeted field review because PKBK10S had the largest conductivity outlier burden and PKBK2S recorded the highest annual mean conductivity and highest depth variability.
- Add targeted low-water monitoring at PKBK3S, PKBK4S, and PKBK6S during late-summer and early-fall drought conditions because all three stations reached 0.00 mm minimum depth in 2025.
- Continue turbidity monitoring at PKBK3S and pair turbidity review with precipitation and flow data, especially when turbidity approaches or exceeds 4.0 NTU during storm events.
- Increase fecal coliform bottle sampling during and immediately after storm events, especially at the Bridge at G.H. Road, Basha Kill, and Pond Adjacent, because those sample points produced the highest 2025 results.
- Use the 2025 fecal coliform results as screening evidence for source investigation rather than as a full geometric-mean compliance determination unless future sampling includes a sufficient 30-day sample set.
- Redeploy or replace PKBK5S with improved anchoring and storm-resilient field placement before the next high-flow season, using the May 2025 failure sequence as the design basis for installation review.
- Continue integrating weather, flow, conductivity, depth, turbidity, and fecal coliform observations into a single event-review workflow so that future exceedances can be interpreted in hydrologic context rather than as isolated measurements.

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8.0 Appendix:

8.1 Interquartile Range (IQR) Outlier Detection in Continuous Sensor Data

The 2025 WaterInsight dataset underwent a rigorous quality-control procedure using Interquartile Range (IQR)-based outlier detection prior to statistical analysis. This method is widely recognized in environmental data science as a non-parametric, distribution-free technique that is resistant to the influence of extreme values, making it particularly well-suited for high-frequency sensor data where erroneous readings (e.g., instrument drift, fouling, and calibration artifacts) may otherwise distort annual statistics.

Definition:

The Interquartile Range (IQR) is the difference between the 75th percentile (Q3) and the 25th percentile (Q1) of a dataset: **IQR = Q3 − Q1**

The IQR describes the spread of the middle 50% of observations. Unlike the total range, the IQR is inherently resistant to the influence of extreme outliers, making it a reliable basis for anomaly detection.

Outlier Detection Threshold:
A value is classified as an outlier if it falls below the Lower Bound or above the Upper Bound, calculated as:
> **Lower Bound = Q1 − (k × IQR)**
> **Upper Bound = Q3 + (k × IQR)**

For this study, a conservative multiplier of **k = 3.0** was applied (versus the commonly used k = 1.5). This stricter threshold ensures that only extreme, non-environmental anomalies are removed, reducing the risk of inadvertently discarding legitimate hydrological events such as storm pulses or drought minima.

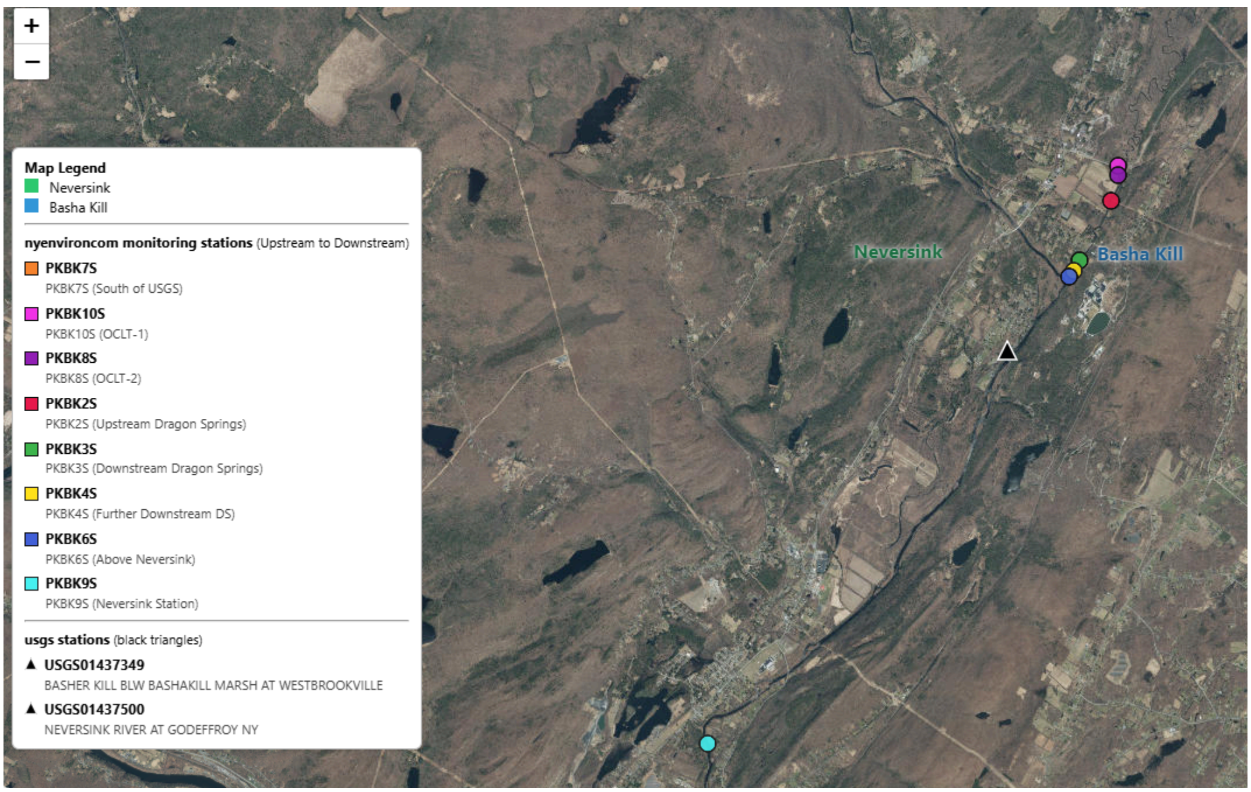
Results of Quality Control:
Of the 2,032,080 raw sensor records compiled for 2025 across 10 stations, **9,727 records (0.48%)** were removed as outliers, yielding **2,022,353 final records** retained for analysis — a **99.52% data retention rate**. This high retention rate reflects both the strong performance of the deployed sensor network and the conservative nature of the k = 3.0 threshold.

By using IQR-based synthesis rather than manual or mean/standard-deviation-based filtering, the program ensures that:
- Central tendencies (means, medians) are not inflated or deflated by sensor artifacts.

- Natural environmental extremes — including flood peaks and drought lows — are preserved in the record.
- Results are reproducible and methodologically defensible for regulatory and scientific review.

8.2 Mapped Station Inventory 2025

Updated Map Configuration
Initial view: 41.471189, -74.547215 at zoom 13.
Basemap choices: Esri Topographic, OpenStreetMap, Esri World Imagery, CARTO Light, NYS Ortho 2021, and NYS Ortho 2025.
Overlay layer: USGS Hydro Overlay.
Watershed polygons: Neversink and Basha Kill.
Marker scheme: NYenvironcom stations are circle markers; USGS stations are triangle markers.



The 2025 monitoring network included 8 NYenvironcom stations and 2 USGS stations, for 10 stations total.

Table 15. *Mapped Station Inventory and Coordinates (2025)*

Site	Code	Station Name	Source	Nearest Town	Lat	Lng
USGS Basherkill Marsh	USGS01437349	BASHER KILL BLW BASHAKILL MARSH AT WESTBROOKVILLE	USGS	Westbrookville	41.499639	-74.552222
PKBK7S	PKBK7S	PKBK7S (South of USGS)	NYenvironcom	Mamakating	41.499369	-74.552702
PKBK10S	PKBK10S	PKBK10S (OCLT-1)	NYenvironcom	Cuddebackville	41.462540	-74.585480
PKBK8S	PKBK8S	PKBK8S (OCLT-2)	NYenvironcom	Cuddebackville	41.461460	-74.585490
PKBK2S	PKBK2S	PKBK2S (Upstream Dragon Springs)	NYenvironcom	Deerpark	41.458690	-74.586540
PKBK3S	PKBK3S	PKBK3S (Downstream Dragon Springs)	NYenvironcom	Deerpark	41.452180	-74.591120
PKBK4S	PKBK4S	PKBK4S (Further Downstream DS)	NYenvironcom	Deerpark/Cuddebackville	41.450909	-74.591978
PKBK6S	PKBK6S	PKBK6S (Above Neversink)	NYenvironcom	Deerpark	41.450290	-74.592622
USGS Neversink	USGS01437500	NEVERSINK RIVER AT GODEFFROY NY	USGS	Godeffroy	41.441278	-74.601833
PKBK9S	PKBK9S	PKBK9S (Neversink Station)	NYenvironcom	Cuddebackville	41.398880	-74.645900

8.3 Event Documentation & Terminal Diagnostic Analysis for Station PKBK5S:

Overview:

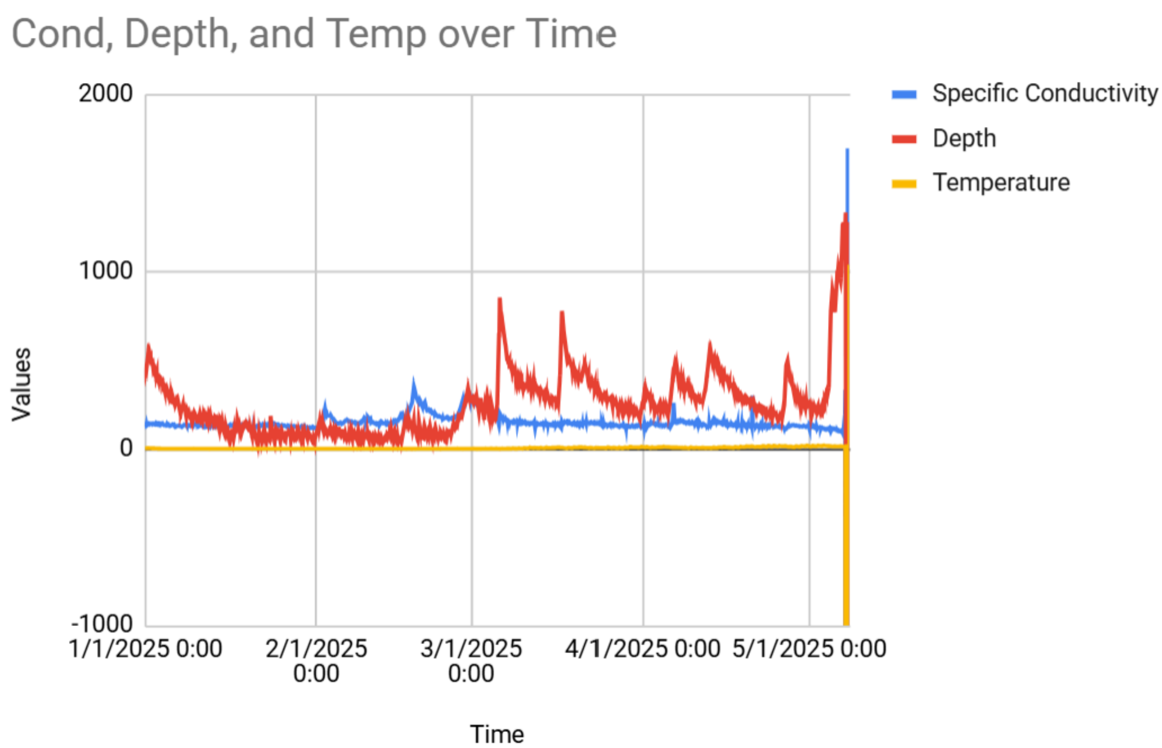
Station PKBK5S was a NYenvironcom CTD monitoring deployment situated along the Neversink, at the convergence with the Basha Kill wetland-stream corridor. Operating on a five-minute sampling interval, the station generated 35,120 raw records across 128 days of continuous deployment before its data record ended permanently on the morning of May 8, 2025, at 09:25 a.m. The station's loss resulted from the catastrophic hydraulic forces associated with the exceptional May 2025 precipitation pulse, 8.96 inches of rainfall over the month, with a maximum single-day event of 43.70 mm, which generated flood-stage conditions throughout the Basha Kill system, sufficient to physically displace or destroy the sensor deployment. Because the record was terminated mid-season, PKBK5S does not appear in any of the 2025 network-wide summary statistics, trend classification tables, or seasonal analyses of conductivity/depth/temperature compiled for the nine stations that remained operational. Its partial record is documented here for methodological transparency and to preserve the unique storm-response data it captured before being lost.

Baseline Conditions: January 1 – April 30, 2025

During the first four months of deployment, PKBK5S recorded the stable dormant-season and early-spring baseline conditions characteristic of a low-gradient wetland channel. Across 33,110 valid five-minute readings spanning January through April, the station maintained the following ambient parameter ranges:

Parameter	Jan–Apr Mean	Jan–Apr Median	Jan–Apr Min	Jan–Apr Max
Specific Conductivity (μS/cm)	152.2	140.0	110.0	351.2
Water Depth (mm)	236.4	230.7	25.2	850.2
Water Temperature (°C)	4.1	—	0.1	18.2

These values are consistent with low-flow, ionic-stable conditions typical of the Basha Kill in winter and early spring, when precipitation is distributed more evenly, evapotranspiration is minimal, and groundwater contributions sustain a modest, predictable baseflow. The maximum depth of 850.2 mm recorded during the baseline period represents an isolated high-water event but remained well within the channel's normal operating range and did not compromise sensor integrity. The conductivity signal during this period was stable, clustering near the network mean of 145.79 μS/cm reported across all ten 2025 NYenvironcom stations.



Storm Onset: May 1 – May 6, 2025

The first week of May 2025 marked a sharp and sustained departure from baseline conditions at PKBK5S, driven by the initial surge of the exceptional spring precipitation pulse. The daily summary table below presents all confirmed valid (non-sentinel) readings for the May 1–8 deployment window:

Date	Cond. Mean (µS/cm)	Cond. Min	Cond. Max	Depth Mean (mm)	Depth Max (mm)	Temp Mean (°C)	Valid Records	Sentinel (−9999) Records
May 1	129.9	114.7	138.2	230.3	248.8	14.8	285	0

May 2	122.3	118.0	129.7	224.1	236.2	16.4	287	0
May 3	115.0	108.2	120.2	231.6	294.3	17.4	288	0
May 4	110.3	99.0	117.5	432.1	812.5	15.9	288	0
May 5	111.4	106.0	117.2	844.8	938.3	14.1	288	0
May 6	100.8	90.0	107.8	1,011.4	1,246.0	13.9	288	0
May 7	138.4	85.5	1,695.0	1,242.2	1,332.5	13.4	206	43
May 8	—	27.3	58.4	399.2*	741.4*	—	3†	34

May 8 depth values are physically anomalous terminal readings rather than valid environmental measurements.
†May 8's three "valid" transmissions are diagnostically incoherent (see Terminal Failure section).

Beginning May 1, specific conductivity began a persistent, progressive decline from the baseline mean of 152.2 μS/cm, dropping to a daily mean of 129.9 μS/cm on May 1, 115.0 μS/cm by May 3, and reaching 100.8 μS/cm on May 6 — a 33.8% reduction from the January–April mean. This dilution trajectory is the electrochemical fingerprint of large-scale storm runoff infiltrating the channel: as precipitation-driven freshwater enters the system, it dilutes the ambient ionic load carried by groundwater and baseflow, thereby suppressing conductivity in direct proportion to the volume of influx. The 2025 Annual Water Quality Report documents the same pattern: a synchronized, network-wide decline in conductivity across all ten monitoring stations during the May precipitation pulse, confirming that the PKBK5S record is a site-level manifestation of a basin-scale hydrologic response.

The depth signal tells an equally unambiguous story. From a daily mean of approximately 230 mm on May 1–3, channel depth surged to a mean of 432.1 mm on May 4 as the first wave of storm runoff arrived — a near-doubling in 24 hours — and continued rising to 844.8 mm on May 5 and 1,011.4 mm by May 6. This represents a 4.3-fold increase over the January–April mean of 236.4 mm in just six days. The depth ascent on May 4, accompanied by conductivity minima dropping below 100 µS/cm, shows that rainfall was not merely incrementally adding to baseflow but was actively overwhelming the channel's capacity and flooding the surrounding low-gradient marsh. Crucially, across all of May 1–6, the sensor transmitted a complete record of 1,724 valid five-minute readings with zero sentinel interruptions — demonstrating that the deployment remained mechanically intact and the sensor remained in stable contact with the water column, even as it logged unprecedented inundation levels.

Regional Forcing Context

The destruction of PKBK5S was not an isolated local failure but the site-level consequence of exceptional, basin-wide hydrologic forcing documented across the entire NYec monitoring network. Key contextual metrics from the 2025 Annual Water Quality Report include:

- **May 2025 precipitation**: 8.96 inches (227.58 mm), representing 21.3% of the 2025 annual total of 1,069.50 mm.
- **Maximum single-day precipitation**: 43.70 mm, recorded in the Port Jervis region.
- **BK Marsh USGS gauge peak discharge**: 910.0 ft^3/s, a peak-to-mean ratio of 10.46× relative to the annual mean of 87.00 ft^3/s.
- **Network-wide depth response**: Synchronized depth expansion across all stations, with PKBK3S recording a maximum stage of 1,141.7 mm — 5.03× its annual mean — during the same event.
- **Network-wide conductivity response**: Synchronized dilution decline across all ten stations, confirming that the ionic suppression signal at PKBK5S was watershed-scale rather than site-specific.

These figures establish that the May 8 storm event generated hydraulic forces well beyond what standard shallow-water benthic CTD anchoring can withstand in a low-gradient, flashy wetland-stream system such as the Basha Kill. The PKBK5S record, cut short as it was, nonetheless documents the full arc of storm response: a pre-event baseline, a storm-onset dilution and inundation phase spanning May 1–6, escalating sensor stress and telemetry degradation on May 7, and catastrophic mechanical failure on May 8.