

PARSONS CREEK

WATER QUALITY REPORT

December 2025



PREPARED FOR

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TRACKING FECAL CONTAMINATION

2025 PARSONS CREEK MONITORING OVERVIEW

In 2025, FB Environmental sampled five sites in Parsons Creek on six dates from June to October. Sampling results from the NHDES Beaches Program and the Surfrider Foundation of the public beaches downstream of Parsons Creek were also analyzed. Below is an analysis of 2025 data and an update of long term trends in water quality for Parsons Creek and the downstream beaches.

STATEWIDE FECAL CONTAMINATION ISSUE

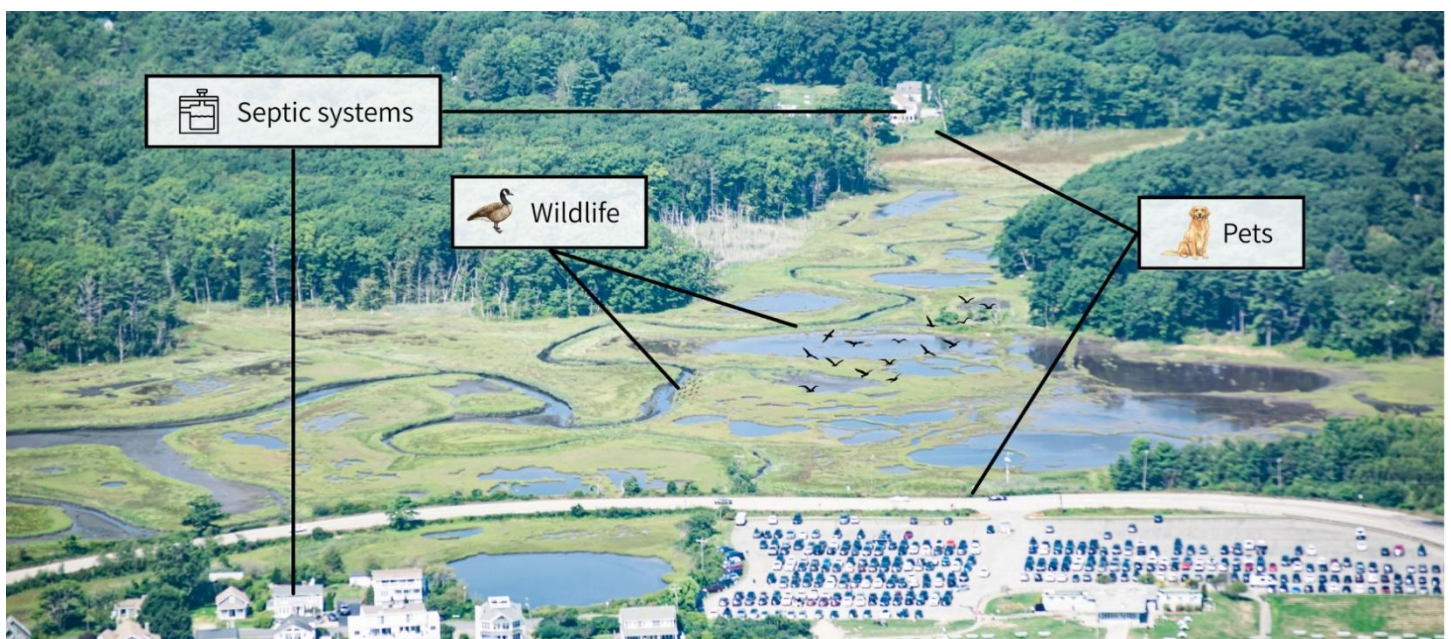
The State of New Hampshire lists over 450 waterbodies as impaired for fecal indicator bacteria (FIB), including Parsons Creek (estuary). These impaired waterbodies are particularly concentrated in the populated Seacoast Region. Generally, sources of fecal contamination include polluted stormwater runoff, malfunctioning septic systems, pet, livestock, and wildlife waste, leaky sewer lines, and other aging infrastructure. Fecal contamination is a public health risk impacting water-based recreation and negatively affects the local economy.

TRACKING FECAL SOURCES

Identifying fecal pollution sources is extremely difficult. Sources of pollution are not necessarily constant in time, and as a result, FIB concentrations in water samples (*E. coli*, Enterococci, or fecal coliform) are highly variable from one sample to another. Laboratory analysis of indicators can also be variable due to the biological nature of the bacteria. Overall, laboratory and field duplicates can vary up to 200% or more, particularly at lower concentrations, and for this reason longer term averages are considered more representative of environmental conditions. FIB provide no information on sources (e.g., human, pet, wildlife). Individual bacteria results should not be interpreted as absolute numbers, but as approximate estimates of concentrations. In Parsons Creek and elsewhere, long-term sampling is essential to identify patterns and trends.

Additional testing methods like DNA analysis and nutrient sampling (“co-indicators”) are needed to identify sources. One type of DNA analysis is mitochondrial DNA (mtDNA), which can identify specific source categories such as humans, raccoons, or other animals. Elevated ammonia concentrations (0.9 ppm or higher can suggest untreated sewage leaks (Tillett, et al., 2018).

Sources of fecal indicator bacteria (FIB) are diverse, including human sewage, pets, farm animals and wildlife (typical source locations shown, actual locations will vary).



BEACH MONITORING

Wallis Sands State Park and Wallis Sands Beach at Wallis Road (Pirates Cove), Rye, NH

NHDES BEACHES PROGRAM

NHDES regularly samples beaches, issuing advisories when bacteria counts exceed public health criteria. Annual geometric means for all six monitored sites near the Parsons Creek outlet met NHDES water quality standards in 2025 (Figure 1 and Figure 2). However, all three sites on Wallis Sands Beach (also known as Pirate's Cove) and two out of three on the Wallis Sands State Park beach have shown statistically significant declines in water quality since monitoring began. The site closest to Parsons Creek (BCHPICRYERT) has consistently had the highest bacteria geomean of the Wallis Sands Beach sites since 2017 and has the steepest increasing trend. In 2025, both beaches experienced multiple advisories due to elevated bacteria levels. Wallis Sands State Park had one advisory in June; and Wallis Sands Beach had three, two in July and one in August. However, this is a decrease from the number of advisories issued in 2024 for both beaches. Advisories are issued when Enterococci counts exceed 104 MPN/100mL. The State Park advisory was in response to a measurement of 118 MPN/100mL, while the exceedances at Pirate's Cove ranged from 107–195 MPN/100mL.

Wallis Sands Beach continues to show elevated individual FIB counts with a worsening long term trend at BCHPICRYERT, the swimmable area near the outlet of Parsons Creek. However, 2025 FIB counts were generally lower than 2024 counts, except for one site on Wallis Sands Beach.

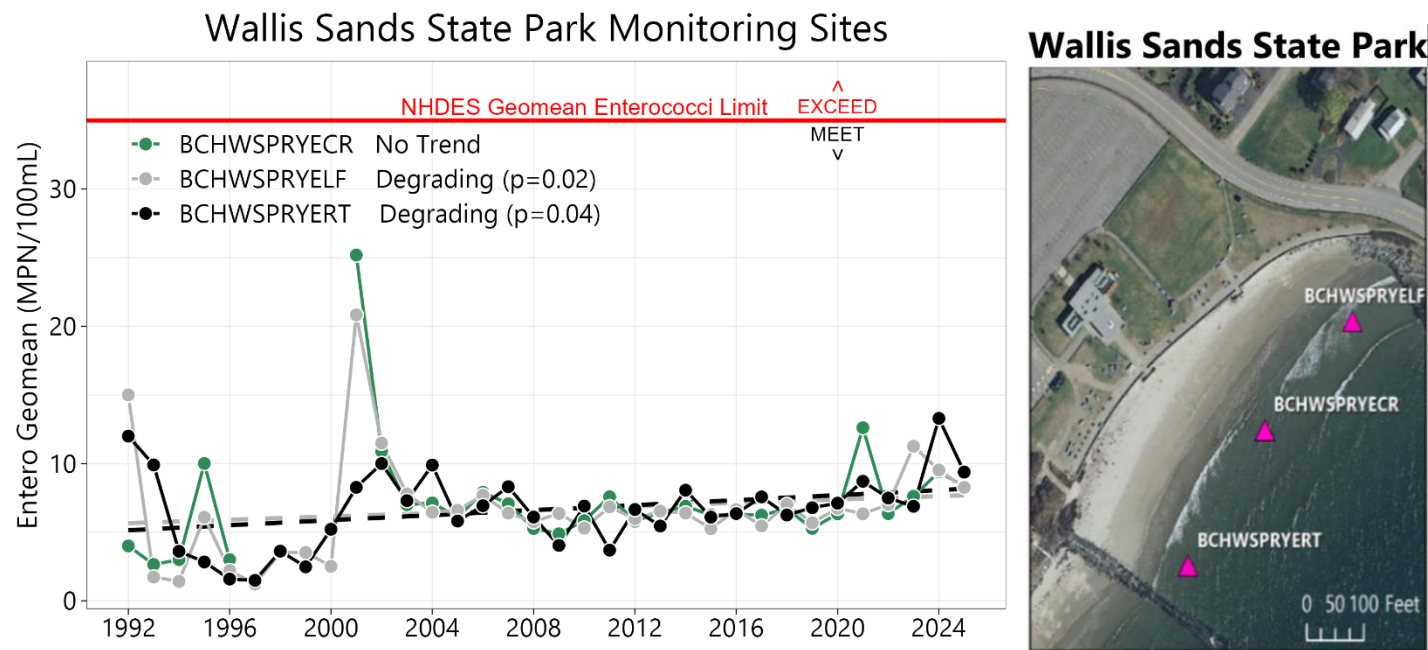


Figure 1. Enterococcus geomean trends at three Wallis Sands State Park sites near Parsons Creek. Data acquired from NHDES OneStop.

Wallis Sands Beach (Pirate's Cove) Monitoring Sites

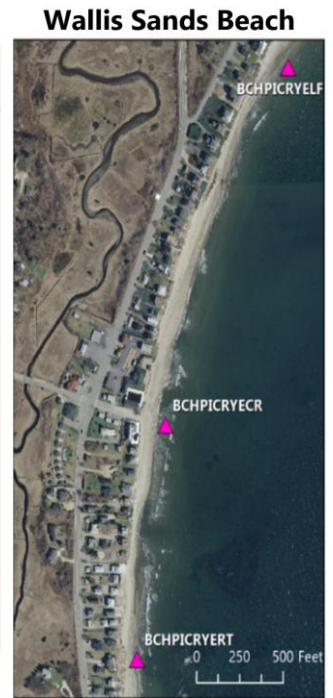
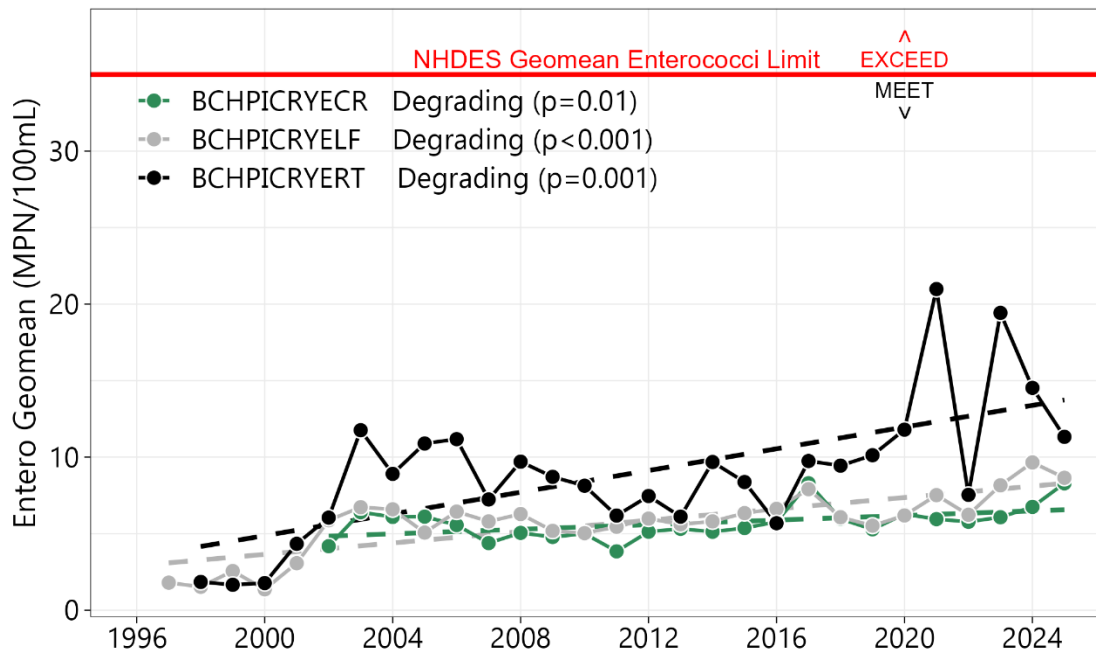


Figure 2. Enterococcus geomean trends at three Wallis Sands Beach sites near Parsons Creek. Data acquired from NHDES OneStop.

SURFRIDER FOUNDATION SAMPLING

The Blue Water Task Force of the Surfrider Foundation tested for FIB counts at [Pirates Cove](#) (officially referred to as Wallis Sands Beach at Wallis Road by NHDES, as mentioned above) on four dates in 2025 (in May, June, and September). Enterococci levels of <10 MPN/100mL were recorded on all occasions. Although Wallis Sands Beach and the other beach sites lie outside the Parsons Creek watershed, they are close to the creek's outflow and likely influenced by the same fecal pollution sources. The developed area along Ocean Boulevard straddles the divide between the creek and coastal drainage, allowing similar inputs to affect both areas. These results provide relevant insight into fecal indicator bacteria trends in the area.

WATERSHED MONITORING

Parsons Creek, Rye, NH

BACTERIA

Five sites (ACPS005-U35, PC07, PC08, BCH11, and PC-OUT) within the Parsons Creek watershed were sampled for Enterococci six times at low tide during wet and dry weather conditions from June through October in 2025. These sites have historically shown elevated Enterococci levels for multiple years and have been positive for human fecal contamination by either genetic testing or canine detection or both.

All sites exceeded the state criterion for geometric mean (35 MPN/100mL) in 2025 (Figure 3, Figure 4, Figure 5). 50% of the samples (15 out of 30) failed to meet the instantaneous state criterion for secondary contact recreation (104 MPN/100mL) in 2025. This is an improvement over 2024, when 80% samples exceeded this threshold (Figure 4). All sites saw fewer exceedances than in 2024, except for PC-OUT, which had an equal

amount. Duplicate samples were omitted from the data distributions and geometric means. Refer to Appendix A-B for data and Appendix C for methods.

Similar to previous years, bacteria counts exceeded state criteria at all five monitoring locations in Parsons Creek. Mean Enterococci counts at all sites except PC-OUT decreased from 2024.

PC-OUT values were lower than in 2017–2023 despite the slight increase from 2024.

BCH11 experienced its lowest count since monitoring began.

ACPS005-U35 had its lowest recorded geomean, falling below the secondary contact recreation standard for the first time since monitoring of this site began in 2021.

PC07 and PC08 geomeans were at their lowest since 2017, though these sites are highly variable.

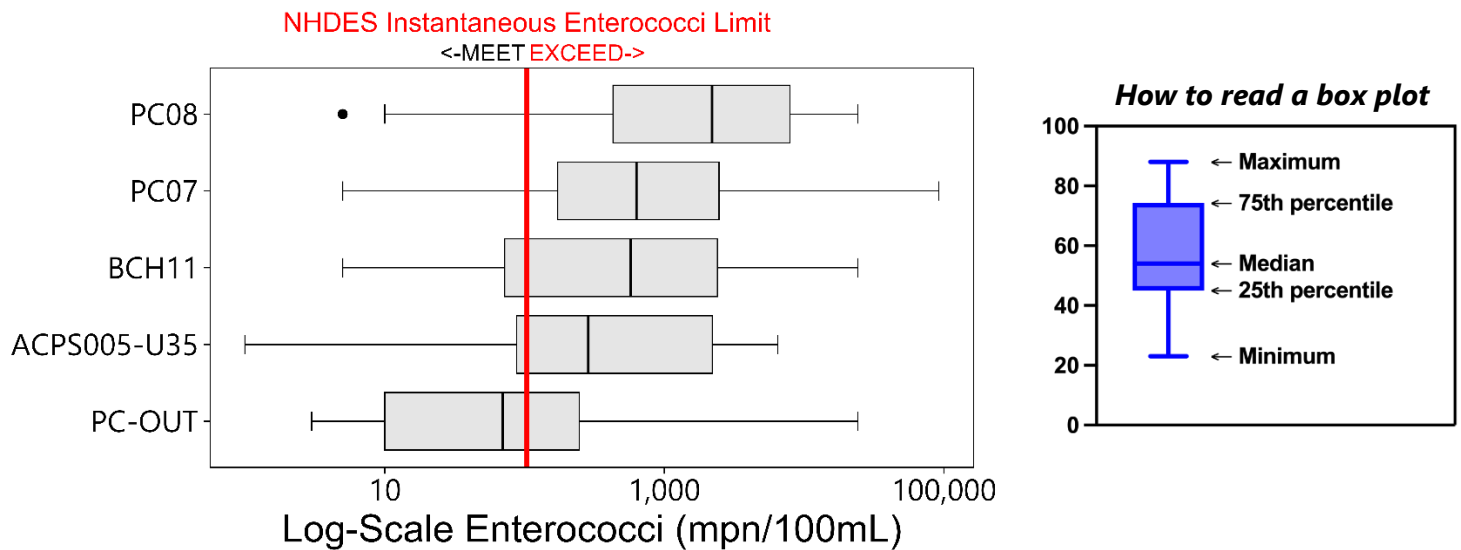


Figure 3. Bacteria results (2001–2025) for the five sites monitored in 2025.

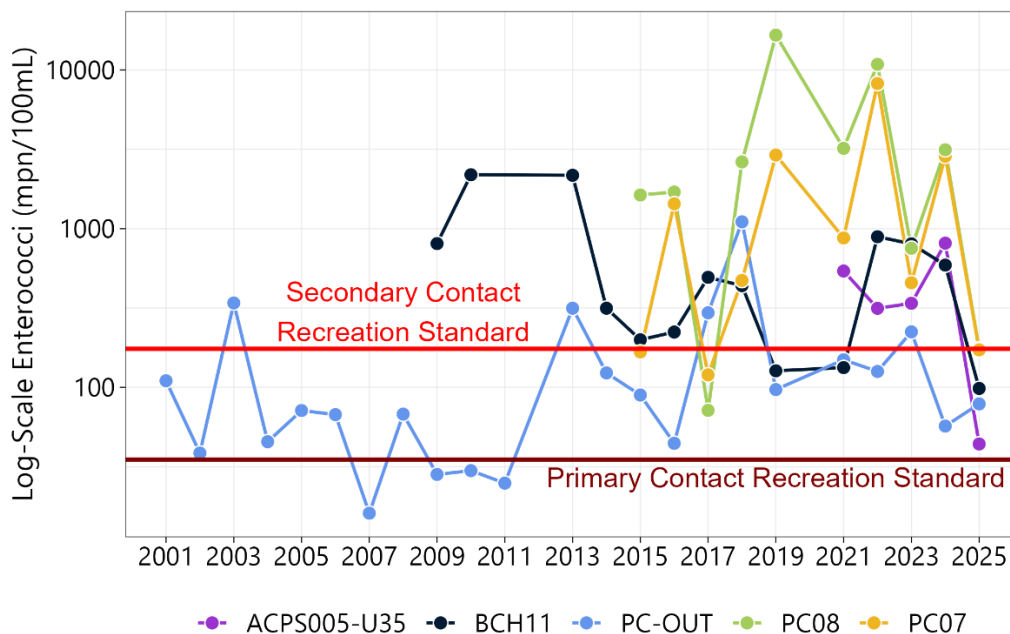


Figure 4. Annual bacteria geometric mean from 2001–2025 for the five sites monitored in 2025.

2025 BACTERIA RESULTS

Parsons Creek Watershed | Rye, NH

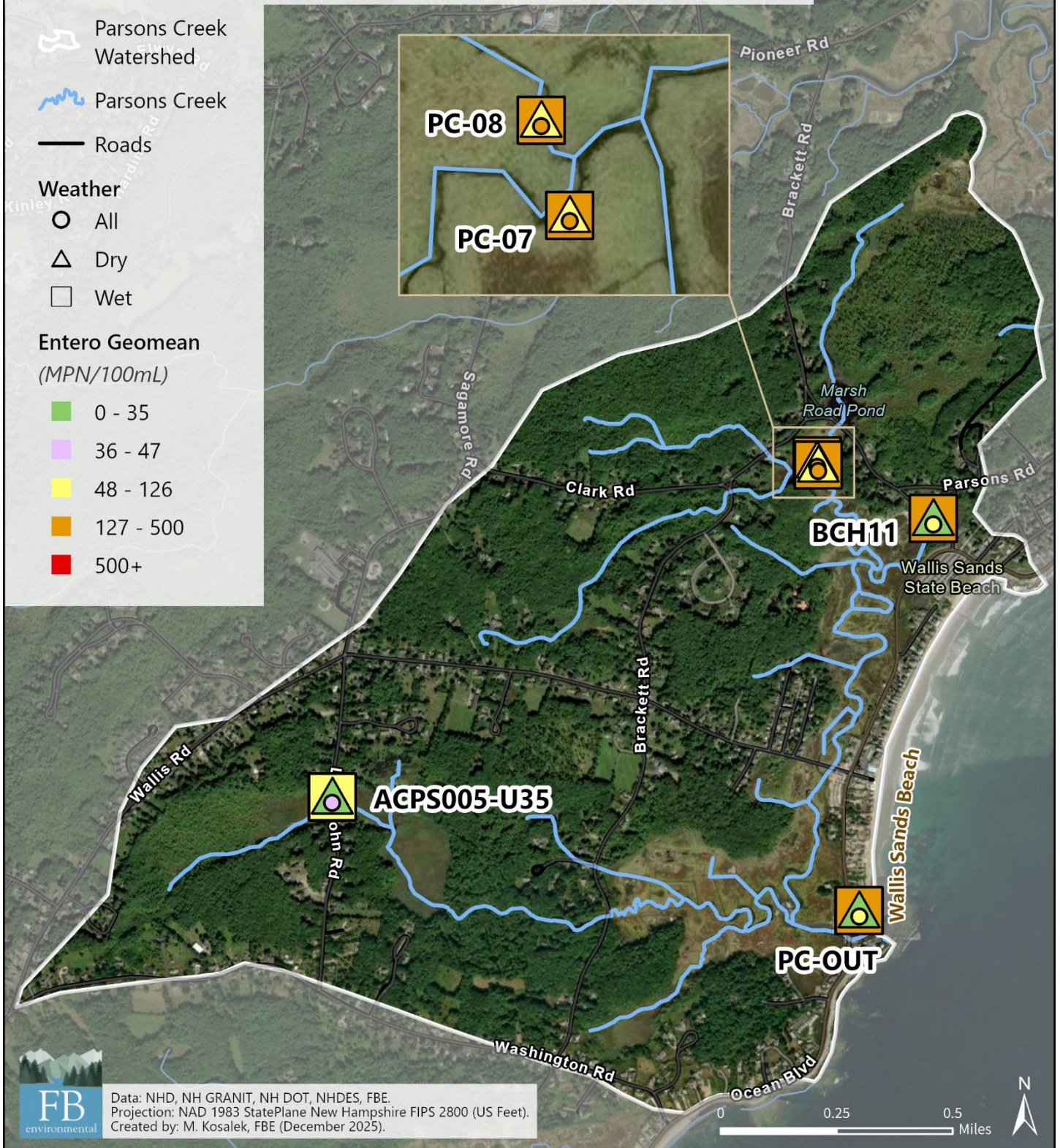


Figure 5. Map presenting 2025 bacteria levels in Parsons Creek.

BACTERIA WET/DRY WEATHER ANALYSIS

Wet weather in 2025 was associated with higher bacteria counts, consistent with long-term observations at Parsons Creek (Figure 6 and Figure 7). This pattern differed from 2024, when several sites showed higher bacteria levels during dry weather. Elevated counts during wet conditions indicate that land-based runoff is a major pathway for transporting fecal contamination to Parsons Creek.

However, bacteria levels also remained high during dry weather at several locations, particularly PC07 and PC08, suggesting some persistent sources such as wastewater flowing through groundwater. This is supported by the watershed’s soil characteristics: while most soils are well to excessively drained and readily convey precipitation downward, large areas of very poorly drained mucky peat remain saturated for long periods. These contrasting soil types can both influence bacterial transport. Well-drained soils facilitate rapid infiltration that can carry fecal bacteria into shallow groundwater, while poorly drained organic soils can store contamination and gradually release it to surface waters through slow seepage. Together, these conditions provide a possible explanation for high bacteria levels even without recent rainfall.

All sites exceeded the state geometric mean criterion for bacteria(35 MPN/100 mL) during wet-weather sampling, whereas PC-OUT, BHC11, and ACPS005-U35 were below this threshold during dry events. When considering geometric means across all samples (i.e., without separating by weather), all sites exceeded the 35 MPN/100 mL criterion in 2025.

Low-lying topography, a high groundwater table, and a mix of very coarse and very poorly draining soils create challenging conditions for septic leachfields, making them a likely and ongoing source of elevated bacteria within the watershed and at the beaches.

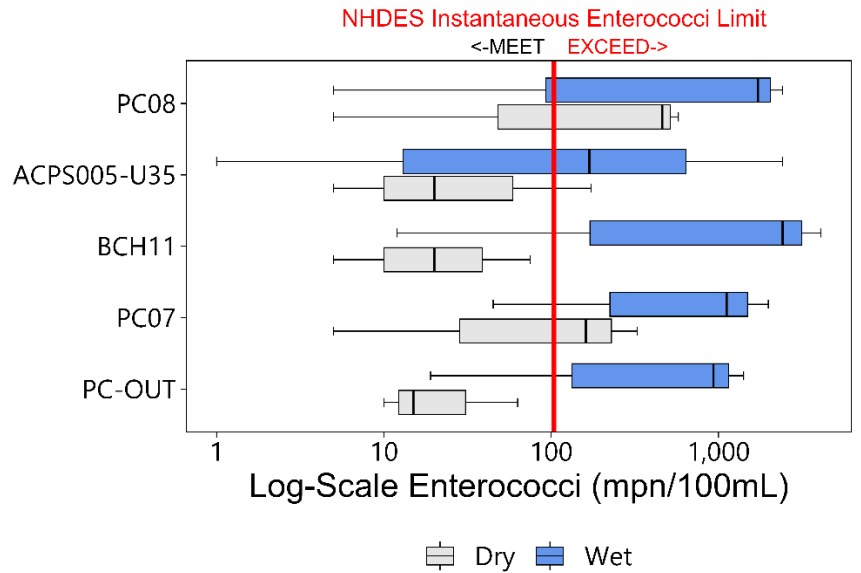


Figure 6. Bacteria count distribution for the five sites monitored this year by weather condition (dry and wet) in 2025.

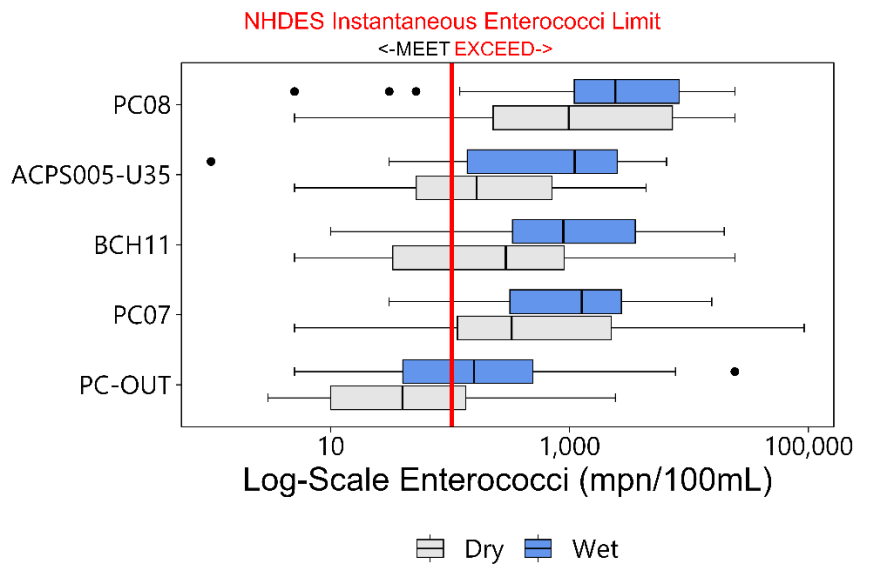


Figure 7. Bacteria count distribution by weather condition (dry and wet) for the period 2001–2025 for PC08 (n years= 10), ACPS005-U35 (n = 5), BCH11 (n = 14), PC07 (n = 10), and PC-OUT (n = 23).



PC-OUT during dry weather on 9/4/2025.



PC-OUT during wet weather on 10/14/2025.



BCH11 during dry weather, 9/4/2025.



BCH11 during wet weather, 9/8/2025.



PC07 during dry weather, 9/4/2025.



PC07 during wet weather, 9/8/2025.



ACPS005-U35 during dry weather on 9/4/2025.



ACPS005-U35 during wet weather on 10/14/2025.



PC08 during dry weather, 7/2/2025.



PC08 during wet weather, 10/14/2025.



The outlet of Parson's Creek on 10/14/2025. © FBE

CO-INDICATORS: AMMONIA

Ammonia is a major component in wastewater which comes from urine and decomposing organic matter. Ammonia in wastewater is converted relatively quickly to other compounds, so its presence in the environment can be a useful indicator of ongoing raw wastewater pollution such as sewage or septic system leaks. Elevated ammonia concentrations can also result from naturally occurring chemical reactions in salt marsh environments, so additional follow up is needed if found.

All Parsons Creek sites were tested for ammonia using Hach test strips at low tide after wet and dry weather during the six sampling events in June-October 2025. Concentrations of ammonia greater than 0.9 ppm would suggest that the dominant source of fecal contamination is from illicit discharges of human waste (Tillett, et al., 2018).

No sites had an ammonia concentration that exceeded the wastewater indicator threshold (>0.9 ppm). The highest observed levels of ammonia (0.25 ppm) occurred at each site on at least two occasions in 2025, and on three occasions at BCH11 and PC08 (Figure 8). These results are consistent with 2024 observations, where ammonia was only detected twice, also at 0.25 ppm at BCH11 and PC08. BCH11 exceeded 0.9 ppm on one date in 2023, indicating improvement at this site over the last two years.

Average ammonia concentrations were below the thresholds of likely raw sewage pollution for all sites in 2025. BCH11 and PC08 have slightly higher concentrations than the other sites but are still below the threshold.

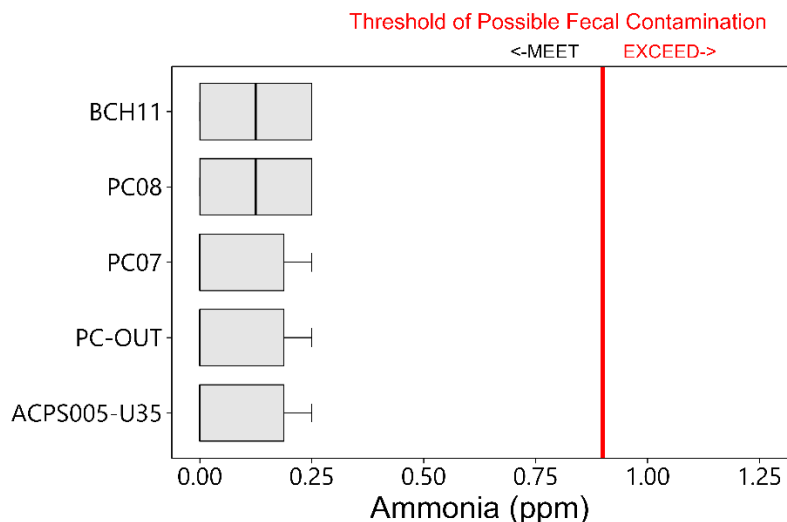


Figure 8. 2025 data distribution for ammonia.



BCH11 with turbid water and surface scum possibly from natural plant decay, 9/4/2025.



PC08 on a day where ammonia measured 0.25 ppm. 6/4/2025.











CO-INDICATORS: MTDNA (GENETIC SOURCE TRACKING)

To test for human fecal contamination in Parsons Creek, samples were taken at each site during regular monitoring events to be evaluated at Dr John Bucci’s lab at the University of New Hampshire. To analyze DNA at each site, sample water was filtered through a fine membrane to collect particles. DNA was extracted from these particles and analyzed using quantitative Polymerase Chain Reaction (qPCR). This method amplifies specific DNA biomarkers unique to human fecal material (mtDNA and Bacteroides). Results marked as present indicate a clear DNA signal that exceeds the detection limit, with background noise accounted for. To identify false positives, known DNA material was used as a positive control, and PCR-grade water was used as a negative control. If the target fecal marker was detected, it was recorded as present, and its relative quantity was measured on a scale of 1 to 10.

In 2025, four Parsons Creek sites tested positive for the human fecal mtDNA marker on at least one date (Figure 9). ACPS005-U35 tested positive on four dates, the most of all sites. PC07 tested positive on three dates, BCH11 on two dates, and PC08 on one date but with the highest relative quantity. Several samples tested positive for mtDNA even though their enterococcus levels were below the 104 MPN/100 mL instantaneous threshold (depicted in green in Figure 9). The highest relative concentration of human fecal mtDNA measured was 4/10, measured at PC08.

Compared to 2024 mtDNA data, ACPS005-U35 and PC07 had fecal presence on one additional day. PC08 had fecal presence on two fewer days and PC-OUT one fewer days. BCH11 remained the same.

The results suggest that human fecal contamination is present in Parsons Creek, as indicated by the detection of human fecal mtDNA at all sites except PC-OUT. Human fecal contamination did not show a clear correlation with Enterococci levels in 2025.

	6/4/2025	7/2/2025	8/1/2025	9/4/2025	9/8/2025	10/14/2025
ACPS005-U35	 2	 3	 3	 2		
PC08		 4				
PC07		 2	 2		 2	
BCH11					 2	 1
PC-OUT						

Colors denote corresponding Enterococci value (MPN/100mL):

 0-104  105 - 1,000  1,001 - 2,419  > 2,419

Figure 9. Human fecal mtDNA results for the six Parsons Creek sites sampled in 2025. Icons represent the presence of human fecal biomarkers, with the relative quantity (out of 10) shown to the right of each icon.

SUMMARY

Overall, the Town of Rye, the NHDES Beaches Program, the NHDES Watershed Assistance Section, the NH Shellfish Program, FB Environmental Associates, the Jackson Laboratory, John Bucci's UNH laboratory, and Environmental Canine Services have done a considerable amount of work to track sources of fecal contamination transported through both runoff and groundwater within the Parsons Creek watershed and along the beach. This work has generated a long-term dataset that can be analyzed and interpreted to guide the next steps in addressing this issue. A summary of results is provided below.

Beach Monitoring Results

- ❖ Wallis Sands State Park was issued one water quality advisory in 2025, and Wallis Sands Beach at Wallis Road was issued three advisories in 2025. These are both decreases from 2024.
- ❖ FIB counts at the site nearest to the Parsons Creek outlet (BCHPICRYERT) exceeded the threshold of 104 MPN/100mL on one occasion (7/21), reaching 110 MPN/100mL. This is a decrease from 2024 where the location exceeded the criteria on five occasions.
- ❖ All three sites on Wallis Sands Beach at Wallis Road show statistically significant degrading trends over time, as do two sites at Wallis Sands State Park (BCHWSPRYELF and BCHWSPRYERT). The steepest degrading trend is at the site nearest to the Parsons Creek outlet (BCHPICRYERT).

Watershed Monitoring Results

- ❖ In 2025, all Parsons Creek watershed sites exceeded the state criterion for FIB geometric mean, although four out of five sites showed improvement from 2024.
- ❖ Average ammonia levels in 2025 were below the guideline for possible fecal contamination at all sites, though BCH11 and PC08 showed low levels on three occasions each. This is consistent with 2024 results. Ammonia in surface waters could result from raw wastewater discharge, but it may also stem from natural chemical reactions in the salt marsh environment.
- ❖ mtDNA results indicated human fecal contamination at ACPS005-U35, PC07, PC08, and BCH11, which are spread throughout the watershed. These results indicate that human-source bacterial pollution is likely coming from many diffuse sources in the watershed, such as septic systems.

Wet/Dry Weather Analysis

- ❖ Wet weather in 2025 was associated with higher FIB counts, consistent with long-term observations. However, some dry-weather samples showed FIB counts which exceeded state criteria, indicating that fecal contamination reaches Parsons Creek via both stormwater runoff and from persistent sources such as undertreated wastewater transported by groundwater. Overall, wet weather continues to result in considerably higher bacteria counts than dry weather.

NEXT STEPS

Recommendations and Priorities

The following recommended next steps are associated with the Action Plan in the [2025 Parsons Creek Watershed Based Plan Update](#) and the 2025 sampling results presented above. The relevant watershed plan Action Item is cited for each.

Address groundwater sources of fecal contamination

- ❖ Continue to update the septic system database on a regular basis and enforce the septic system health regulation that requires pump-outs every 3 years (Action Item 3.d.).
- ❖ Continue working toward implementing a mandatory septic system inspection program for properties in the Parsons Creek watershed (Action Item 3.a.).

Address sources of fecal contamination via surface runoff

- ❖ Implement BMPs at NPS sites identified in the 2024 watershed survey to address stormwater runoff (Action Item 2.a.).
- ❖ Continue to secure funding that implements these candidate BMP sites (Action Item 7).
- ❖ Establish a program within the Town to monitor and maintain public BMP sites. Extend this to private BMP sites where possible (Action Item 2).
- ❖ Maintain installed pet waste bag/disposal stations and consider installing additional stations in high-traffic areas (Action Item 4.b.).

Enhance public outreach program

- ❖ Continue to distribute educational materials and reports to the public via the Town's website (Action Item 4.c.).
- ❖ Consider hosting workshops to educate homeowners on proper maintenance of septic systems (Action Item 4.a.ii.).
- ❖ Convene a Parsons Creek Committee to lead implementation of water quality initiatives and outreach activities (Action Item 1.a. and 1.b.).

Continue monitoring program

- ❖ Continue water quality sampling throughout the Parsons Creek watershed under varying weather conditions to track changes in FIB over time, especially given the concerning trend at the Parsons Creek outlet (Action Item 6.a.). This action item would also help detect any improving trends over time.
- ❖ Develop a robust dataset of soil types, groundwater levels, and septic system locations in the watershed to understand areas that are especially vulnerable to septic system underperformance and pollution (Action Item 3.b.).
- ❖ Install groundwater monitoring wells to track groundwater level changes over time (Action Item 6.b.).
- ❖ Re-delineate the Parsons Creek watershed boundary. Identify if any new areas should be tested based on the new boundary (Action Item 6.c.).

APPENDIX A: 2025 WATERSHED MONITORING DATA

Table A-1 displays all data obtained from 2025 monitoring, including in-situ measurements (water temp, DO, conductivity, salinity, pH, and ammonia) and laboratory-analyzed samples (Enterococci and mtDNA).

Table A-1. All data obtained from 2025 monitoring. Italicized red text indicates exceedance of the state criterion threshold or natural background guideline for individual samples (DO = 5 ppm; enterococci = 104 MPN/100mL; ammonia = 0.9 ppm).

Date	Dry/Wet	Site ID	Water Temp (°C)	DO (ppm)	Conductivity (mS/cm)	Salinity (ppt)	pH	Ammonia (ppm)	Enterococci (MPN/100mL)	mtDNA analysis
6/4/2025	Dry	PC08	20.6	7.64	8,027	4.46	6.31	0.25	5	Absent
6/4/2025	Dry	PC07	17.2	<i>2.75</i>	4,590	2.47	7.93	0.25	5	Absent
6/4/2025	Dry	BCH11	19.3	<i>1.27</i>	24,840	15.16	6.49	0.25	20	Absent
6/4/2025	Dry	PC-OUT	20.5	<i>4.44</i>	27,405	16.87	6.94	0.25	10	Absent
6/4/2025	Dry	ACPS005-U35	16.5	<i>0.92</i>	342.9	0.16	6.42	0.25	5	2/10
7/2/2025	Dry	PC08	25.2	<i>0.33</i>	28,723	17.58	6.70	0.25	<i>576</i>	4/10
7/2/2025	Dry	PC07	23.3	<i>0.51</i>	29,803	18.47	6.97	0.25	<i>161</i>	2/10
7/2/2025	Dry	BCH11	21.3	<i>0.09</i>	32,982	18.54	6.56	0.25	5	Absent
7/2/2025	Dry	PC-OUT	24.1	7.02	41,541	26.64	7.35	0	63	Absent
7/2/2025	Dry	ACPS005-U35	20.2	<i>0.5</i>	418.2	0.2	6.16	0	<i>173</i>	3/10
8/1/2025	Wet	PC08	21.8	<i>1.57</i>	41,145	26.39	6.60	0.25	<i>>2,419.6</i>	Absent
8/1/2025	Wet	PC07	21.3	<i>3.2</i>	13,759	8.06	6.81	0	<i>1,986.3</i>	2/10
8/1/2025	Wet	BCH11	22.5	<i>0.2</i>	36,928	23.41	6.64	0	<i>>2,419.6</i>	Absent
8/1/2025	Wet	PC-OUT	23.3	8.72	36,090	22.8	7.17	0.25	<i>1,413.6</i>	Absent
8/1/2025	Wet	ACPS005-U35	18.9	<i>0.43</i>	538	0.26	6.59	0	<i>>2,419.6</i>	3/10
9/4/2025	Dry	PC08	24.9	12.81	46,953	30.51	6.75	0	<i>461.1</i>	Absent
9/4/2025	Dry	PC07	21.8	<i>0.4</i>	48,524	31.7	6.79	0	<i>325.5</i>	Absent
9/4/2025	Dry	BCH11	20.3	<i>0.07</i>	46,952	30.58	6.54	0.25	75.4	Absent
9/4/2025	Dry	PC-OUT	22.4	6.45	48,061	31.38	7.61	0	15.2	Absent
9/4/2025	Dry	ACPS005-U35	16.6	<i>0.51</i>	491	0.24	7.15	0	20.4	2/10
9/8/2025	Wet	PC08	15.3	<i>1.68</i>	23,830	14.5	6.63	0	<i>1,722</i>	Absent
9/8/2025	Wet	PC07	15.2	<i>2.34</i>	32,294	20.21	6.73	0	<i>1,119</i>	2/10

Date	Dry/Wet	Site ID	Water Temp (°C)	DO (ppm)	Conductivity (mS/cm)	Salinity (ppt)	pH	Ammonia (ppm)	Enterococci (MPN/100mL)	mtDNA analysis
9/8/2025	Wet	BCH11	15.1	0.2	37,800	24.04	6.73	0	4,106	2/10
9/8/2025	Wet	PC-OUT	14.6	3.17	43,850	28.31	7.06	0	934	Absent
9/8/2025	Wet	ACPS005-U35	15.9	0.44	580	0.28	6.65	0.25	169	Absent
10/14/2025	Wet	PC08	12.9	3.33	43,816	28.26	6.61	0	5.2	Absent
10/14/2025	Wet	PC07	12.4	4.25	36,487	23.06	6.58	0	44.8	Absent
10/14/2025	Wet	BCH11	12.8	0.8	26,500	26.07	6.64	0	12.1	1/10
10/14/2025	Wet	PC-OUT	12.5	6.1	44,252	28.53	7.14	0	18.7	Absent
10/14/2025	Wet	ACPS005-U35	12.2	0.89	848	0.42	7.45	0	1	Absent

APPENDIX B: DATA QUALITY CHECK

No enterococci samples were flagged for elevated field duplicates (Table B-1). Values are flagged if the Relative Percent Difference (RPD) is greater than 20%, the Relative Standard Deviation (RSD) is greater than 30%, and the values are greater than five times the detection limit. Since the RPD is only greater than 20% for one sampling event, and the RSD for the duplicate sample during that one sampling event is less than 30%, these data are acceptable. Three field duplicates were taken in 2025.

On 8/1/2025, enterococcus samples were not diluted by the Eurofins. Three samples taken on this date had enterococcus results reported as ">2,419.6 MPN/100mL"). On other dates, the lab performed dilutions which allowed higher maximum values to be enumerated.

Table B-1. Duplicate sample data quality check.

Date	Dry/Wet	Site ID	Rep	Enterococci (MPN/100mL)	Enterococci RPD
7/2/2025	Dry	PC07	1	161	1%
7/2/2025	Dry	PC07	2	160	
9/4/2025	Dry	PC-OUT	1	15.2	19%
9/4/2025	Dry	PC-OUT	2	18.3	
10/14/2025	Wet	BCH11	1	12.1	34% [†]
10/14/2025	Wet	BCH11	2	8.6	

[†] RSD = 24%, which is below 30%, therefore the elevated RPD is acceptable.

APPENDIX C: SUMMARY OF METHODS

SAMPLING PROTOCOL

Baseline bacteria sampling was performed as documented in the NHDES Generic Beach Program Quality Assurance Project Plan dated April 3, 2012, RFA # 06193, Section B2.0. Bacteria and DNA samples were collected in labeled whirlpak bags and stored on ice in a cooler for transport to Absolute Resource Associates Laboratory/ Eurofins in Portsmouth, NH for analysis of Enterococci, and to John Bucci's Marine Genomics and Biogeochemistry Lab at the University of New Hampshire, Durham, NH for mtDNA analysis. Water was tested in the field for ammonia using Hach AquaChek® Water Quality Test Strips for Ammonia. Water quality parameters (temperature, dissolved oxygen, specific conductivity, salinity, and pH) were collected in the field using calibrated instruments: YSI ProSolo® and Oakton pHTestr® 30. Three duplicate samples were collected and all fell within the acceptable difference (see Appendix B).

WET/DRY WEATHER CLASSIFICATION

Wet weather was defined as: >0.1" of precipitation in the prior 24 hours; or >0.25" in the prior 48 hours; or >2.0" in the prior 96 hours. Conditions were considered dry weather when precipitation was <0.1" for each day within the previous 72 hours.

STATISTICAL METHODS

A Mann-Kendall trend analysis was performed for beach sites with at least 10 years of data, using the *rkt* package (Marchetto, 2024) in RStudio. This non-parametric test assesses whether the median of a dataset has shifted over time. The non-parametric approach is well-suited to this analysis as it does not require assumptions about data normality or consistent variability. This means that fluctuations observed between years or within seasons are less likely to impact results, unlike parametric tests, which can be more sensitive to such variation.

DATA INTERPRETATION – WATER QUALITY STANDARDS

The NHDES Consolidated Assessment Listing Methodology (CALM) describes the process and water quality standards used to assess the state's waters. This information is used to help interpret Parsons Creek water quality results and relate them to [state criteria](#).

REFERENCES

- Marchetto, A. (2024). *rkt: Mann-Kendall Test, Seasonal and Regional Kendall Tests*. R package version 1.7. Retrieved from <https://CRAN.R-project.org/package=rkt>
- Tillett, B. J., Sharley, D., Almeida, M., Valunzuela, I., Hoffman, A. A., & Pettigrove, V. (2018). A short work-flow to effectively source faecal pollution in recreational waters—A case study. *Science of the Total Environment*, 644, 1503-1510. Retrieved from <https://doi.org/10.1016/j.scitotenv.2018.07.005>